



PERSPECTIVE



Pioneers from Northern Japan in Idaho 16,000 Years Ago? A Critical Evaluation of the Evidence from Cooper's Ferry

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ABSTRACT

Davis et al. (2019) recently presented the results of excavations at the Cooper's Ferry site, located beside the Salmon River in Idaho. They claim that initial occupation of this site dates from ~16,000 calendar years ago, that the first inhabitants came from northern Japan, and that this site conclusively demonstrates that "humans initially migrated into the Americas along the Pacific coast." Here, we critically examine the chronological, geoarchaeological, and artifactual evidence for the claimed antiquity of the Cooper's Ferry site and show that this evidence remains inconclusive. We also show that the coastal migration theory proposed by Davis et al. is incompatible with emerging paleogenomic evidence. We conclude that the oldest demonstrated occupation of Cooper's Ferry dates to ~11,500 calendar years ago, although ambiguous evidence might (but probably does not) indicate an earlier episode of occupation at ~14,600–14,100 calendar years ago.

KEYWORDS

Cooper's Ferry; coastal migration; Western Stemmed Tradition; pre-Clovis

1. Introduction

Davis et al. (2019) recently presented the results of excavations at the Cooper's Ferry site, located on an alluvial terrace beside the Salmon River in Idaho (Davis et al. 2019). This is one of the few known terminal-Pleistocene archaeological sites in the Plateau, along with Sentinel Gap, Marmes Rockshelter, Wewukiyepuh, and Lind Coulee. As such, it is a very significant discovery, and Davis's painstaking, innovative, and well-reported excavation of the site has been commensurate with its importance.

However, Davis et al. deploy the Cooper's Ferry evidence in support of a very dubious hypothesis. They claim that initial occupation of this site dates from ~16,000 calendar years ago (cal yr BP), and propose that the first inhabitants came from northern Japan via migration along the Pacific coast, then up the Columbia River to this location, about 500 km inland. They further contend that this evidence definitively resolves the ongoing debate (e.g., Braje et al. 2019; Faught 2017; Fiedel 2018; Pedersen et al. 2016; Potter et al. 2018; Potter et al. 2018; Waters 2019) about migration route(s) of ancestral Native Americans from Beringia southward: did they move down the Pacific coast or through the "ice-free corridor" (IFC) between the retreating Laurentide and Cordilleran ice sheets? Specifically, Davis et al. (2019) state:

Cooper's Ferry provides direct evidence for human settlement south of Late Wisconsinan ice sheets in the upper Columbia River basin before the earliest hypothesized opening of the IFC at ~14,800 cal yr B.P. This evidence refutes the IFC hypothesis and leads us to deduce that humans initially migrated into the Americas along the Pacific coast. (895–896)

The Cooper's Ferry report is the latest in a series of high-profile articles, by both archaeologists (e.g., Braje et al. 2017; Dillehay et al. 2008; Erlandson et al. 2011; Lesnek et al. 2018; Waters 2019) and science reporters (e.g., Balter 2008; Balter 2011; Gramling 2016; Wade 2017, 2018, 2019; Waters 2019) advocating the hypothesis of a pre-Clovis coastal migration down the Pacific coast. Most recently, Braje et al. (2019, 1) argue "that stemmed points, foliate points, and crescents (lunates) found around the Pacific Rim may corroborate genomic studies that support an early Pacific Coast dispersal route into the Americas." As in that paper, putatively pre-Clovis Western Stemmed points – despite their generally interior distribution – are often tied to the hypothetical coastal migration. Among those advocating or sympathetic to this hypothesis, the current consensus on the antiquity of Western Stemmed points is that they may date to ca. 14,500 cal yr BP (e.g., Smith et al. 2019). Some researchers have questioned this age, given secure ages from multiple sites of ~12,800–9000 cal yr BP (e.g., Fiedel and Morrow 2012; Goebel and Keene 2014; Reid et al.

2015). With their new claim of a 16,000-year-old occupation of Cooper's Ferry, Davis et al. would extend the ages of stemmed points and the hypothetical Pacific-Rim migration, by more than 1500 years. These inferences, if correct, would require a major revision of prevailing interpretations of the peopling of the Americas, and therefore a careful evaluation of the data is necessary.

Here, we critically examine the chronological, geoarchaeological, and artifactual evidence for the claimed antiquity of the Cooper's Ferry site and show that this evidence remains inconclusive. We also show that the coastal-migration theory proposed by Davis et al. is incompatible with emerging paleogenomic evidence. We conclude that the oldest unequivocal occupation of Cooper's Ferry dates to about 11,500 cal yr BP, although some ambiguous evidence might (but probably does not) indicate an earlier episode of occupation at ca. 14,600–14,100 cal yr BP.

2. Stratigraphy, features and radiocarbon dates

The ages of the Cooper's Ferry occupations are based primarily on radiocarbon and luminescence dating of geologic strata and archaeological features, supported by the presence of one tooth fragment from an extinct horse. Eight geologic strata (lithostratigraphic units, "LU") are recognized, from the lowest, LU1, up through LU8. Lithic artifacts are concentrated within LU3 and LU6, but most of the culturally and temporally

diagnostic stemmed projectile points have been recovered from the fill of pit features that intrude into LU3. Bioturbation (mainly rodent burrowing) is extensive in these fine-textured fluvial and putatively eolian sediments; this disturbance is reported and is also readily visible in published illustrations (Davis et al. 2019; Davis and Schweger 2004). The relationship of the radiocarbon-dated samples to the stratigraphy is complicated (Davis et al. 2019, figure 2). To understand the sequence of human occupations, we must closely examine both the cultural features and the ages and characteristics of the strata, particularly LU3, the stratum into which those features intruded (Figure 1).

In 1997, Davis excavated a cache pit, now labeled PFA2, which contained four projectile points at the bottom (Davis and Schweger 2004; Davis and Sisson 1998). Charcoal and bone pieces sampled from within PFA2 yielded discordant radiocarbon dates: $11,370 \pm 40$, 8710 ± 120 , and 7300 ± 70 radiocarbon (^{14}C) yr BP on charcoal, and $12,020 \pm 170$ ^{14}C yr BP on artiodactyl bone collagen. Charcoal from the top of LU3, the surface from which the pit appeared to have been dug, yielded a date of $11,410 \pm 130$ ^{14}C yr BP, while a bone fragment found within LU3 was dated to $10,050 \pm 180$ ^{14}C yr BP. Based on the published stratigraphic profiles and the discordant dates obtained for the feature contents, Fiedel and Morrow (2012) suggested that PFA2 might have been dug around 9800–10,300 ^{14}C yr BP, or even as late as 8700 ^{14}C yr BP. Similarly, Goebel and Keene (2014) inferred an age of ca. 8000–9000 ^{14}C yr BP for the pit and its cultural fill.

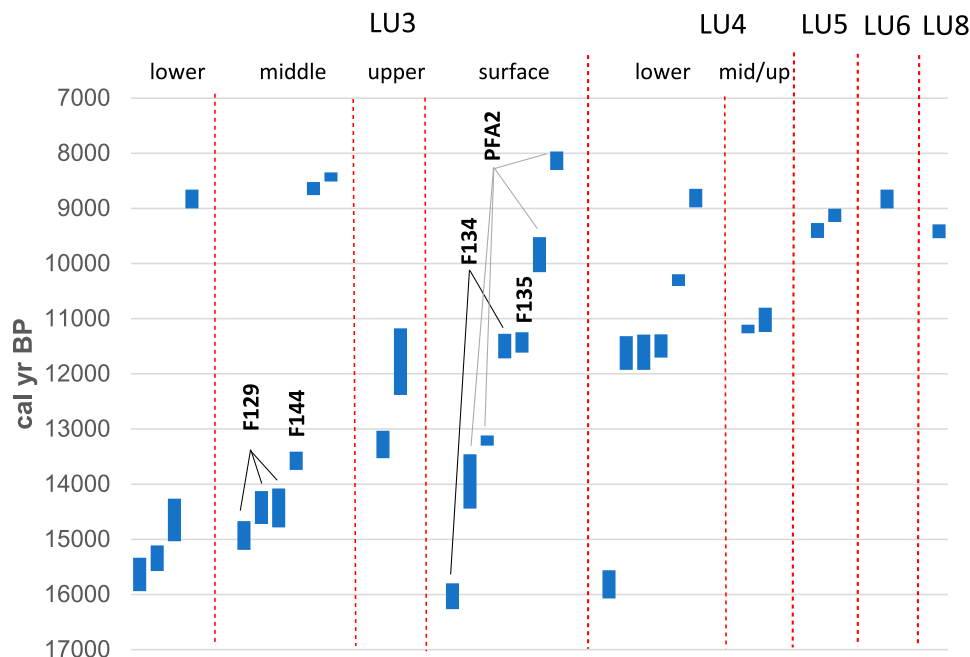


Figure 1 Cooper's Ferry calibrated radiocarbon assays (2 σ).

Davis, Nyers, and Willis (2014) later reported 84 AMS radiocarbon dates on prismatic carbonate (aragonite) in freshwater mussel shells from LU6, ranging between 9138 ± 38 and 8030 ± 37 ^{14}C yr BP. Excluding four outliers, the LU6 dates are 8500–8900 ^{14}C yr BP (ca. 9500–10,050 cal yr BP). This is probably a roughly accurate *terminus ante quem* for the underlying cultural deposits, although we note that large reservoir effects of ca. 2000 years have been reported for mussel shell dates in the Snake River drainage (Osterkamp et al. 2014). Davis et al. (2019) now report a bone from lower LU6 dated to 7984 ± 40 ^{14}C yr BP which indicates a slightly younger age for LU6 (9000–8650 cal yr BP). The LU6 shell dates seemed to demonstrate that the charcoal pieces within PFA2, dated to 8710 and 7300 ^{14}C yr BP, were likely transported downward by burrowing rodents. Indeed, Davis and Schweger (2004, 699) reported “the presence of rodent bones and teeth in the matrix of Pit Feature 2” and cited “faunalturbation” as the cause of “inverted radiocarbon ages” (Davis and Schweger 2004, 702). Davis et al. (2019) have recognized numerous infilled rodent burrows (*krotovinas*) traversing the strata.

As Davis and Schweger (2004, 699) rightly asked, “Given the aforementioned problem of faunalturbation as a probable source of younger-than-expected charcoal samples in the deeper reaches of the site, how can we be confident that these late Pleistocene dates are actually associated with early human occupation at Cooper’s Ferry?” They recognized that, “To counter the effects of faunalturbation on site chronology, we must draw upon other independent data sets to help establish a temporal context” (Davis and Schweger 2004, 792).

Since 1997, Davis has favored the date of $11,370 \pm 40$ ^{14}C yr BP (ca. 13,250 cal yr BP) for PFA2. A primary motivation for his continued excavation of the site was validation of this age, which would make the Western Stemmed Tradition (WST) occupation of Cooper’s Ferry contemporaneous with, or even older than, the ubiquitous Clovis complex.

Davis, Bean, and Nyers (2017) reported discovery of a similar cache pit (PFP1) that contained 14 stemmed projectile points, identical in style to those from PFA2 (i.e., Lind Coulee points). This pit was located about 50 m southeast of PFA2 in Area B, which had been heavily disturbed by previous excavations that truncated the pit. Nevertheless, based on the color of the pit fill, Davis, Bean, and Nyers (2017) inferred that the original top of the pit lay just above a stratum interface equivalent to the LU3/LU4 interface in Area A, where PFA2 was located. No radiocarbon dates have been reported for PFP1, but it appears to be contemporaneous with PFA2.

Davis et al. (2019) now report two additional pit features, F134 and F135, located just east of PFA2. Like PFA2, these are deep cylindrical pits that penetrated into the basal fluvial gravels (LU1). When they were backfilled, the fill included lithic artifacts, bone fragments, charcoal pieces, and stream cobbles, in much greater density than is reported either from the surrounding LU3 matrix or from the overlying LU4. The fill of PFA2 also incorporated redeposited sediments that had been dug up from LU3, LU2, and LU1 when the pit was created (Davis and Schweger 2004). Unlike PFA2, neither F134 nor F135 contained projectile points, so there is no basis for stylistic dating of these pits. However, they did yield datable organic samples. A bone fragment from the fill of F135 dates to 9955 ± 50 ^{14}C yr BP (ca. 11,380 cal yr BP). Two bones from F134 yielded discordant dates: a piece found near the top of the pit dates to $10,010 \pm 50$ ^{14}C yr BP (ca. 11,500 cal yr BP), while a piece from the middle of the pit dates to $13,335 \pm 75$ ^{14}C yr BP (ca. 16,040 cal yr BP). No evidence is presented that would suggest serial deposition of materials in this pit over an incredible 4500-year span, and, in view of other stratigraphic evidence, it is obvious that the 16,000-year-old bone – wherever it came from originally – was an accidental inclusion in the pit feature. In view of the proximity and similarity of F134 and F135, and their overlapping, statistically indistinguishable dates, it is more probable that they were excavated by the same resident band during one or several encampments around 11,500 cal yr BP. We note that this is the same age (9800–10,300 ^{14}C yr BP) previously suggested by Fiedel and Morrow (2012) for PFA2.

Davis, Nyers, and Willis (2014) argued that PFA2 originated at the LU4/3 interface, but its top may have been about 20 cm higher. Davis et al. (2019, SOM, p. 8) now acknowledge, regarding F134, that “the feature may have been dug down from a higher surface that was present during the formation of LU4”, and, they also observe, “The upper boundary of F135 appears to coincide with the LU4-LU3 boundary but may also originate within LU4” (Davis et al. 2019, SOM, p. 25, figure S15).

Unfortunately, the new report does not illustrate the distributions of cultural materials in LU4 or LU5, so it is difficult to discern the exact proveniences of reported radiocarbon samples or their relationship to the tops of the pit features or to overlying LU6 or underlying LU3. However, their elevations and assigned strata are provided. Based on previous publications (e.g., Davis and Willis 2018), there seem to be relatively sparse cultural materials within LU4. Figure S11 in the SOM indicates that only about 20 lithic artifacts were recovered from LU4 (Davis et al. 2019).

Davis et al. (2019) report only one date for LU5 and a total of eight dates for LU4. A bone from the middle of

LU5 dates to 8141 ± 38 ^{14}C yr BP. A bone from upper LU4 dates to 9755 ± 50 ^{14}C yr BP, and charcoal from the middle of LU4 dates to 9714 ± 57 ^{14}C yr BP. Two dates from lower LU4 appear to be too recent: 7944 ± 39 ^{14}C yr BP on charcoal, and 9110 ± 50 ^{14}C yr BP on bone. In contrast, a date of $13,165 \pm 70$ ^{14}C yr BP ($16,070$ – $15,560$ cal yr BP) for another bone fragment from lower LU4 is clearly anomalously ancient and indicates secondary deposition. Another bone found at exactly the same depth (412.027 m asml) dated to $10,005 \pm 40$ ^{14}C yr BP. Two more bone pieces, 56199 and 56422, found very close to one another and about 10 cm above the top of F134, produced nearly identical dates of $10,055 \pm 55$ and $10,050 \pm 60$ ^{14}C yr BP, respectively. These three bone dates of ca. $10,000$ ^{14}C yr BP from lower LU4 are consistent with the dates of bones incorporated within Feature 134 ($10,010 \pm 50$ ^{14}C yr BP) and Feature 135 (9955 ± 50 ^{14}C yr BP), which presumably were excavated from an occupation surface within lower LU4. The previously reported (but rejected (Davis and Schweger 2004)) artiodactyl-bone date of $10,050 \pm 180$ ^{14}C yr BP from LU3 seems to be derived from the same occupation episode.

The pit features, PFA2, F134, and F135 intruded into LU3 either from the LU3/LU4 interface or from higher up in LU4, and thus were dug $\sim 10,000$ ^{14}C yr BP ($\sim 11,500$ cal yr BP). In contrast, Davis et al. (2019) describe four additional, putatively cultural features that seem to have originated within LU3: F129, F142, F143, and F144. To understand the character of these features, it is necessary to examine the formation and chronology of LU3. LU3 contains a paleosol with a developed calcic horizon. Davis et al. (2019), following Davis and Schweger (2004), equate the “Rock Creek paleosol” to a soil found elsewhere in alluvial sediments in the Salmon River canyon. At another site, charcoal from that soil was dated to $10,740 \pm 220$ ^{14}C yr BP or $12,041$ – $13,085$ cal yr BP. The degree of soil development in LU3 bespeaks a long period of surface stability, which radiocarbon dates affirm.

The most credible ages for LU3 are seven radiocarbon dates that range from $11,410 \pm 130$ to $12,830 \pm 65$ ^{14}C yr BP. Three samples that yielded much younger dates – 7605 ± 40 and 7985 ± 40 ^{14}C yr BP on bone, and 7831 ± 40 ^{14}C yr BP on charcoal – must have been transported as much as 1.5 m vertically from LU8 or LU6 (now dated to 7984 ± 40 ^{14}C yr BP) via now-vanished rodent burrows (see Figure 1).

In addition to the radiocarbon dates, Davis et al. (2019) obtained three optically stimulated luminescence (OSL) dates on LU3 sediments. They report an OSL date of $13,710 \pm 2620$ yr BP (before AD 2000, equivalent to $13,640 \pm 2620$ cal yr BP in calibrated radiocarbon years

before AD 1950) on sediment sampled from 1 m north of PFA2, at an elevation of ca. 411.700 m amsl within LU3. In the SOM, Davis et al. (2019) report that the “raw” age of this sample (before correction for anomalous fading) was $10,530 \pm 810$ yr BP. A sample taken from 20 cm higher, in LU4, was dated to 9780 ± 730 (corrected to $12,730 \pm 2400$) yr BP, and a third, from 30 centimeters higher (in LU5) was dated to 9360 ± 730 (corrected to $12,170 \pm 2320$) yr BP. At two standard deviations, both the raw and fading-corrected OSL ages are consistent with the age of ca. $11,500$ cal yr BP we have inferred for the LU3/4 interface based on the radiocarbon dates of ca. $10,000$ ^{14}C yr BP.

F129, with three radiocarbon dates ($12,348$, $12,472$, and $12,598$ ^{14}C yr BP, or $14,075$ – $15,195$ cal yr BP), is interpreted by Davis et al. (2019) as an anthropogenic hearth. Although the published plan and cross-section of this feature show a well-defined circular concentration with an ovoid periphery (Davis et al. 2019, figure 2), the photographs in the SOM show instead a vague, irregular dark patch with an even more vague, slightly discolored area beside it. The plan view shows an ostensible artifact concentration around F129, but most of these are just charcoal fragments. The feature contained 10 pieces of bone (one of them burned) and five pieces of lithic debitage. Debitage is no more concentrated in and around the supposed hearth than in the general background haze seen across the entire excavation area at ca. 411.70 m amsl within upper LU3 (Davis et al. 2019, figure 2). Thus, we see no compelling indication that the putative “hearth” was a focus of human activity; it may instead have been produced by a brush fire that burned the roots of a tree or shrub. Even if the fire was anthropogenic, it is possible that it was fueled with centuries-old wood. That might explain the somewhat discordant ages of the dated charcoal. The possibility of an old-wood effect has also been raised in a critique of the radiocarbon dates by S. Manning, who also questions the assumptions underlying the Bayesian model of the site’s chronology (Manning 2020).

Features F142–144 are not clearly defined cultural pit features, as depicted in Davis et al. (2019, figure 2), but only vague ovoid depressions. In the photographs in the SOM, all three features have irregular outlines, which suggest that they could have been created by bioturbation (i.e., rodent burrows). In the SOM Davis et al. (2019) report:

While F142 was excavated into but not through the Rock Creek paleosol’s carbonate horizon, F144 could be seen to penetrate through the carbonate horizon and extended down into LU2. These observations show that F142 and F144 postdate some of the pedogenic development of the Rock Creek paleosol. (S8)

F143 begins within the calcic horizon and has penetrated through and removed it. F144 also clearly penetrated the calcic horizon. The calcic horizon would have formed during a period of surface stability – a depositional hiatus. Therefore, it should have formed *after* LU3 was in place, not while this stratum was deposited. Thus, it appears that all three of these “features” postdate formation of the soil; in other words, they probably originated, at earliest, at or just below the LU3/LU4 contact. This supports their identification as rodent burrows.

The vertical distribution of the artifacts within LU3 appears to have been affected by the well-documented bioturbation of the sediments. They are concentrated, not at the surface, but in the middle of the stratum, above the calcic horizon. The greatest numbers of artifacts were found in a 30-cm-thick zone from 411.900 to 411.600 m amsl, which seems to correspond to a former surface from which Features 142, 144, and 129 originated. This concentration is evident, whether the contents of the features are included or excluded from the total count (Davis et al. 2019, figure S11). The artifacts tend to be most densely distributed horizontally near the intrusive pit features PFA2 and F134, perhaps indicating that many of them were translocated from the pit interiors by burrowing rodents. Artifact numbers drop off sharply below 411.600 m, then decline steadily with depth. A few bone fragments were found below 411.200 m, but no artifacts.

A curious hiatus is evident both in the stratigraphy and radiocarbon record (Davis et al. 2019, figure 3) (see Figure 1). There are no dates from middle or upper LU3 in the interval between $11,370 \pm 40$ and ca. 10,050 ^{14}C yr BP (ca. 13,250–11,500 cal yr BP) (Davis et al. 2019, figure 3). During this period, Clovis people were in the Columbia River basin northwest of Cooper’s Ferry (as attested by the spectacular cache from East Wenatchee) and in the Snake River drainage to the southeast, as demonstrated by the Simon cache and the Copper Creek and Lake Cascade Clovis-point finds (Reid et al. 2015). Farther to the south, WST occupation intensified around pluvial lakes in the Great Basin during the Younger Dryas chron (12,900–11,600 cal yr BP) (Smith et al. 2019). The absence of deposits or dates from this 1700-year span at Cooper’s Ferry undercuts the implicit assumption by Davis et al. (2019) that the putative first settlers at 16,000 cal yr BP were direct ancestors of the WST inhabitants who deposited Lind Coulee points in PFA2 and PFP1 after more than 4000 years of continuous occupation.

The hypothesized occupation at 16,000 cal yr BP is based primarily on three new dates: $13,335 \pm 75$ ^{14}C yr BP (16,265–15,795 cal yr BP), $13,165 \pm 70$ ^{14}C yr BP (16,070–15,560 cal yr BP), and $13,070 \pm 80$ ^{14}C yr BP

(15,945–15,335 cal yr BP). We consider these three dates here. As we have already noted, the bone fragment dated to 13,335 ^{14}C yr BP was clearly displaced, found within a pit feature (F134) that was probably created around 11,500 cal yr BP. The date of 13,165 ^{14}C yr BP was on a bone found in lower LU4, which cannot date much earlier than 11,500 cal yr BP; so again, the anomalously old bone must have been displaced from its original position. The date of 13,070 ^{14}C yr BP was on a piece of charcoal within the middle of LU3 (at 411.572 m amsl). According to the Bayesian model of the site’s chronology (Davis et al. 2019, figure S11), the material at this depth should date to sometime between ca. 15,335 and 14,260 cal yr BP. It would seem, then, that this charcoal fragment was also displaced upward, probably by bioturbation. If there is an intact cultural deposit dating to 16,000–15,300 cal yr BP at the site, it should be at an elevation of 411.100–411.300 m. In fact, below 411.550 m, Davis et al. (2019, SOM, table S4) recorded in situ only one piece of charcoal, nine pieces of lithic debitage, and 21 bone fragments. There are no cultural features at that depth, and the very small amount of debitage most plausibly drifted down from the denser deposits in upper LU3.

3. Projectile points and lithic technology

The four stemmed points previously found in PFA2 (e.g., Figure 2(j)) are unquestionably Lind Coulee points; so are the 14 points found recently in PFP1 in Area B (Davis, Nyers, and Willis 2014, 12; Davis, Bean, and Nyers 2017; Smith et al. 2019). The Lind Coulee point type, a Western Stemmed variant, was originally defined at the Lind Coulee site, located about 190 miles (300 km) northwest of Cooper’s Ferry. Associated AMS dates on charcoal from that site are $10,060 \pm 45$ and 9810 ± 40 ^{14}C yr BP (Craven 2004, 29; Table 1). Similar dates, ranging from 10,100–9700 ^{14}C yr BP, were obtained for the horizon containing Lind Coulee points at the Marmes Rockshelter (Hicks 2004; Sheppard et al. 1987; Table 1).

At Lind Coulee, an AMS date of $10,250 \pm 45$ ^{14}C yr BP was associated with a point lacking the sharply defined shoulders and serrated blade edges of the Lind Coulee points (Craven 2003). This point can be assigned to the Haskett type defined by Butler (1967). Haskett points resemble and may be somehow related to the Agate Basin points of the northern Plains. Haskett points and preforms at the Sentinel Gap site, located west of the Columbia River in central Washington, date between 10,200 and 10,100 ^{14}C yr BP (ca. 11,900–11,600 cal yr BP) (Galm and Gough 2008). At the Wishbone site in

Table 1 Radiocarbon dates associated with Lind Coulee, Haskett, and other point types.

Type	Site	Stratum	Material	Lab number	Radiocarbon age	Source
Lind Coulee	Marmes Rockshelter	Marmes horizon	Bone	Beta-156699	9710 ± 40	Hicks (2004, 390)
		Marmes horizon	Shell	W-2209	9820 ± 300	Sheppard et al. (1987)
		Marmes horizon	Bone	Beta-120802	9870 ± 50	Hicks (2004, 390)
		Marmes horizon	Shell	Y-2481	9970 ± 110	Sheppard et al. (1987)
		Harrison horizon	Charcoal	W-2212	9840 ± 300	Sheppard et al. (1987)
		Harrison horizon	Charcoal	W-2218	10,130 ± 300	Sheppard et al. (1987)
	Lind Coulee	0.30–0.40 m ad	Bone collagen	CAMS-95524	9810 ± 40	Craven (2003)
Haskett	Sentinel Gap	0.29–0.39 m bd	Bone collagen	CAMS-94856	10,060 ± 45	Craven (2003)
		...	Charcoal AMS	Beta-124167	10,180 ± 40	Galm and Gough (2000, 31)
		Feat. 99.1	Charcoal (radiometric)	Beta-133650	10,680 ± 190	Galm and Gough (2000, 31)
		Feat. 99.1	Charcoal AMS	Beta-133663	10,160 ± 60	Galm and Gough (2000, 31)
		Feat. 99.3	Charcoal AMS	Beta-133665	10,130 ± 60	Galm and Gough (2000, 31)
		Feat. 99.6	Charcoal AMS	Beta-133664	10,010 ± 60	Galm and Gough (2000, 31)
	Lind Coulee	0.20–.025 m bd	Bone collagen	CAMS-94857	10,250 ± 40	Craven (2003)
Unstemmed	Wewukiyepuh	Hearth feature	Charcoal AMS	Beta-124446	10,270 ± 50	Sappington and Schuknecht-McDaniel (2001)
Lanceolate		Near bear mandible	Charcoal AMS	Beta-124447	10,390 ± 40	(2001)
Parman	Buhl	Buhl burial	Bone collagen	Beta-43055	10,675 ± 95	Green et al. (1998)

western Utah, Haskett points are associated with a feature dated to 10,400 ^{14}C yr BP (ca. 12,400–12,100 cal yr BP) (Duke et al. 2016). Recently reported dates from

Connley Caves, Cougar Mountain Cave, Smith Creek Cave, Paisley Caves, and Bonneville Estates Rockshelter all indicate an age of ca. 12,600–11,500 cal yr BP for

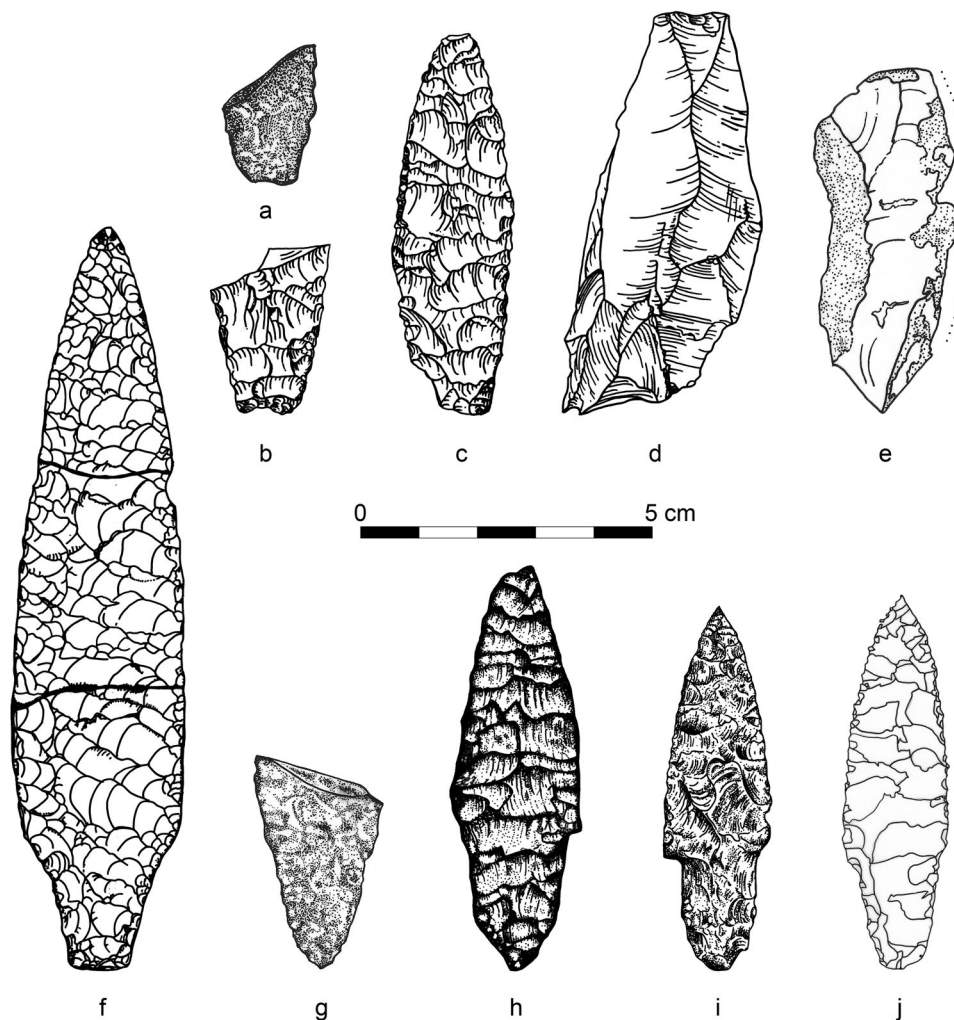


Figure 2 Comparison of chipped stone points (a–c, f–j) and utilized blade-like flakes (d–e) from Cooper's Ferry (a, e, g, j), Wewukiyepuh (b–d), Lind Coulee (h,i), and Kamashirataki (f) (a, e, g after Davis et al. (2019); j after Davis, Nyers, and Willis (2014); b, d after Sappington and Schuknecht-McDaniel (2001); f after Nagai (2007) and Davis et al. (2019); h–i after Daugherty (1959)).

the Haskett type (Smith et al. 2019). These dates suggest that lanceolate Haskett points may pre-date Lind Coulee stemmed points.

As we have already shown, the most likely age for the occupation responsible for the digging of pits PFA2, PFP1, F134, and F135 at Cooper's Ferry is about 10,000 ^{14}C yr BP (11,500 cal yr BP). This date falls exactly within the temporal range (ca. 10,200–9800 ^{14}C yr BP, 11,900–11,200 cal yr BP) one would anticipate for an assemblage that includes Lind Coulee points.

The larger of the basal fragments (73-60685) (Figure 2(g)) reported from the recent excavations also appears to be a Lind Coulee point (Davis et al. 2019, figure 4A; compare Daugherty 1959, figures 19 and 20) (Figure 2(h–i)). It was found within the artifact concentration in LU3 at 411.871 m amsl. Based upon its position relative to two radiocarbon-dated samples and the Bayesian model of the site's chronology, Davis et al. (2019) assign a date of ~14,780–13,500 cal yr BP to this artifact. If it is a Lind Coulee point, as we suggest, it should be much younger, about 12,000–11,500 cal yr BP. The other fragment, 73-42800 (Figure 2(a)), was found at a slightly higher elevation in LU3; Davis et al. (2019, 823, SOM p. 9) believe that it dates to about 13,460–13,260 cal yr BP. This fragment is too small for secure typological comparison, and its irregular edges indicate it may not be a projectile point at all. If it is a point base, it may be part of a Haskett point, a type that dates elsewhere in the Plateau and Basin to between 12,600–11,500 cal yr BP (Smith et al. 2019).

This presumed basal fragment also bears some resemblance to two points that were found at Wewukiyepuh, located on the eastern bank of the Snake River, 100 km to the west of Cooper's Ferry (Sappington and Schuknecht-McDaniel 2001). The nearly complete projectile point and basal fragment (Figure 2(b,c)), ascribed by the excavators to the Windust cluster, are lanceolate with slightly concave bases, not stemmed. Two associated charcoal samples, one of them from a hearth, produced radiocarbon dates of $10,270 \pm 50$ and $10,390 \pm 40$ ^{14}C yr BP (ca. 12,000–12,400 cal yr BP). Faunal remains included bones of grizzly bear and elk. Notably, bones of mammoth and bison – with no indication of human modification – were recovered from the gravels underlying the occupation.

If we rely on known regional artifact typology for an “independent data set,” there are two logical possibilities to explain the relative positions of the ca. 12,400–11,500-year-old point fragments and much older dated organic samples: (1) the two point fragments and other artifacts are in situ in LU3 and the older radiocarbon-dated material is extraneous; or, (2) the dates are valid, the dated organic material is in situ, and the later points have been carried down (by rodents?) into this zone of

LU3 from their original locations at or above the LU3/LU4 interface. Instead, Davis et al. (2019, SOM p. 9) ignore the established regional stylistic sequence and rely solely on the site's ostensible internal chronology, leading to their inference that “When combined with the four points found in PFA2, WST projectile point technologies dates [*sic*] from ~12,475–11,370 yr B.P. (~14,660–13,210 cal yr B.P.)” We note that even this longer chronology would date the earliest appearance of WST points at the site to a time some 1400 years *after* Davis et al. (2019) claim the original inhabitants (presumably bringing a stemmed point tradition from Japan) first camped there.

Davis and others have previously argued that the lithic technology of the Western Stemmed Tradition is markedly different from that of the Clovis complex (e.g., Beck and Jones 2010; Davis, Willis, and Macfarlan 2012), and Davis et al. (2019) frame their brief discussion of the small lithic assemblage from LU3 within this context. They assert that, “The artifacts contained within LU3 and PFA2 temporally precede and partially overlap with the Clovis Point Tradition (CPT) but represent a separate technological tradition distinguished by flake- and macroblade-based lithic tool production, including but not limited to stemmed, lanceolate, and foliate projectile point forms; Levallois-like and discoidal unidirectional and multidirectional core design; predetermined flake and macroblade blanks; and flake and blade tools” (Davis et al. 2019, 895). While this might be a valid comparison for the Lind Coulee-associated WST assemblage from the features, it cannot be applied to the nine pieces of non-diagnostic debitage reported from lower LU3.

Here and elsewhere, Davis et al. (2019) overstate the differences between WST and Clovis. As Beck and Jones (2010, 99) observed: “[...] the types of tools represented [in early Western Stemmed assemblages] are similar to those from other Paleoindian assemblages across the continent” and “Since fluted points, when found as more than isolates, almost always occur together with stemmed points, it is difficult to judge what constitutes the ‘fluted’ toolkit versus the ‘stemmed’ toolkit, or if they are, in fact, the same” (Beck and Jones 1997, 199). Clovis points typically were made from bifacial preforms, but they were sometimes made on flakes (e.g., Bradley et al. 2010; Morrow 2015; Wernick 2015). Macroblades are, of course, a well-known element of the Clovis toolkit. In contrast, we see little indication in the evidence presented by Davis et al. (2019) that blades were systematically detached from prepared cores at Cooper's Ferry. The two “blades” they illustrate (Davis et al. 2019, figure 4(G, I)) may be only blade-like flakes. The utilized “macroblade” (Davis et al. 2019, figure 4(I)) (Figure 2(e)) is quite similar to a tool found at Wewukiyepuh (Figure 2(d)). Davis and Willis (2018)

note that Levallois-like cores are most numerous in LU6, although two were found in LU3. They conclude that these represent a convergent development, not derived from Old World Levallois industries (see also Pratt et al. 2019, 8). Because Clovis assemblages include discoidal cores (Bradley et al. 2010; Ferring 2001), they are a plausible ultimate ancestral source for this technique; or a shared northeast Asian ancestral complex might be the source of both the Clovis and WST cores (Pratt et al. 2019, 30, 33). Davis et al. (2019, 894) note that a small overshot flake was recovered from a depth of 411.838 m amsl within LU3: “This debitage was found in situ below the stratigraphic position of the three oldest radiocarbon ages, dating 15,310–15,100 cal yr B.P. (95.4% confidence range).” Overshot flakes are common in Clovis assemblages (Bradley et al. 2010; Morrow 2015; Waters et al. 2011). We are not suggesting that a single, deeply buried flake denotes an early, pre-WST, Clovis presence at Cooper’s Ferry. Its stratigraphic position relative to displaced radiocarbon samples is not particularly meaningful. We only cite this as another indication that the Clovis-WST contrast has been exaggerated.

We have already noted the obvious resemblance of the points from PFA2 and PFP1, and one of the new point fragments from LU3, to Lind Coulee points. Davis also has previously typed the PFA2 points as Lind Coulee points (Davis, Nyers, and Willis 2014, 12). However, Davis et al. (2019) now compare the PFA2 points and the point fragments to stemmed bifaces of the so-called Tachikawa type from Hokkaido. All of the examples they illustrate (Davis et al. 2019, figure 5(B, E, I-K)) come from the Kamishirataki 2 locus; numerous radiocarbon dates for this site are about 11,600 ^{14}C yr BP (Buvit et al. 2016). Stratified sequences indicate that bifacial stemmed points in Hokkaido post-date 15,500 cal yr BP (Otsuka 2017; Sano 2010, 221, figure 5; Hirasawa, personal communication). Therefore, they are very unlikely ancestors for points in Idaho claimed to be 16,000 years old. As Pratt et al. (2019, 31) have pointed out, “the oldest potential Western Stemmed occupation at Cooper’s Ferry is synchronous, not younger than, the earliest bifacial stemmed points known in Japan.” The Tachikawa points regularly occur in assemblages containing microblades (e.g., Otsuka 2017); they are not elements of a Levallois-like, flake-based lithic industry (Pratt et al. 2019, 26). Nagai (2007) observes that the stemmed points in Hokkaido, unlike those from southern Japan, were made using what he calls the “Ishi pressure flaking technique” which produced lower-right to upper-left diagonally oriented flake scar patterns (Figure 2(f)). We do not see evidence of this oblique flake pattern in the Cooper’s Ferry points, which exhibit the broad collateral flaking, oriented

perpendicular to the long axis, that is characteristic of the Western Stemmed Tradition. In addition, most of the PFA2 and PFP1 points are clearly serrated, and this attribute is not seen in the illustrated Japanese bifaces, or reported as a regular attribute of Incipient Jomon stemmed points. We must observe that serration is also not common in the small sample of Lind Coulee points from other sites on the Columbia Plateau, or in the WST generally. However, slight serration is evident on the points from the type site (Figure 2(i)) and on one Lind Coulee point from the oldest component at Marmes Rockshelter (Carlson and Magne 2008, figure 7). Stemmed points from the Channel Islands off southern California are often serrated; these date from about 12,200–11,400 cal yr BP, about the same age as the Cooper’s Ferry points (Erlandson et al. 2011). Serration is also common on early or mid-Holocene-age stemmed and foliate points from the coast of British Columbia (Eldridge and Steffen 2008) and Washington (Chatters et al. 2011). This shared attribute might well be the result of independent, convergent development; or, it could indicate some cultural relationship between the inhabitants of the Snake River and the Pacific coast – but in post-Clovis time, ca. 12,000–11,000 cal yr BP, not at 16,000 cal yr BP.

4. Chronological implications of extinct megafauna

Davis et al. (2019) report a fragment of enamel identified as part of a horse tooth, which was found within LU3, near the edge of F143. Neither this “feature” nor the horse-tooth fragment has been directly dated. The presence of a tooth of an extinct Pleistocene horse in ostensible association with artifacts would appear to lend credence to a date older than ca. 12,800 cal yr BP (the approximate extinction date of Rancholabrean fauna in North America) for the assemblage. However, no evidence is offered to show that this fragment was modified or introduced by human activity.

There is no reason to suspect that the dated bone fragments of terrestrial mammals at Cooper’s Ferry have been affected by some local freshwater reservoir effect. However, the excavators previously rejected bone-collagen dates of $10,050 \pm 180$ ^{14}C yr BP from LU3 and $12,020 \pm 170$ ^{14}C yr BP from PFA2, owing to their suspicion that the collagen was somehow contaminated; they also noted the generally poor preservation of collagen in small bone fragments from the lowest levels of the site (Davis and Schweger 2004). Given the subsequent replication of these ages by the new dates, perhaps this rejection should be reconsidered. While noting the possibility of contamination by older or younger humates, we will

take the newly reported dates at face value. The dated bones show that mammals were living in the vicinity during four discrete periods of the terminal Pleistocene: ca. 13,300–12,800 ^{14}C yr BP (16,200–15,500 cal yr BP), 12,475 ^{14}C yr BP (14,300 or 14,700 cal yr BP), 11,700 ^{14}C yr BP (13,500 cal yr BP) and 10,000 ^{14}C yr BP (11,700–11,300 cal yr BP). Isolated mammoth bones are common on the Columbia Plateau; many of them, as well as bones of bison and camel, have been found in late-Pleistocene slackwater deposits of the Missoula Flood (Barton 1999). It is not unusual in this region for some bones of Pleistocene fauna to turn up during the excavation of human-occupation sites that fortuitously were located on top of the much older bone deposits (e.g., Chatters 1980). This seems also to have happened at Wewukiyepuh (Sappington and Schuknecht-McDaniel 2001), where unmodified bones of mammoth and bison were recovered from the gravels underlying the occupation. At Lind Coulee, bones of mastodon and bison were present (Drucker 1948); there was an anomalous date on bison bone ($12,830 \pm 1050$ ^{14}C yr BP) (Irwin and Moody 1978) that seems unrelated to the human occupation and curiously resembles the old dates from Cooper's Ferry (e.g., $12,830 \pm 65$ ^{14}C yr BP, on bone). Absent any evidence (such as cut marks) showing that the horse-tooth fragment or the unidentified dated bone fragments were used or modified by humans, we think it is unreasonable to cite the ca. 16,200–15,500 cal yr BP, 14,300–14,700 cal yr BP, and 13,500 cal yr BP bones as proof of pre-13,000 cal yr BP human occupation.

5. Ancient genomes constrain archaeological interpretations

It is not preposterous to suggest that ancestors of Native Americans might have arrived in Idaho ca. 16,000 cal yr BP. In fact, this is precisely the place and time of arrival, after a coastal migration, that was hypothesized by Llamas et al. (2016, figure 1), based on the ages of American mitochondrial (mt)DNA lineages. However, as in many recent studies of the peopling process, Llamas et al. (2016) derive this founder population from interior Beringia, not Japan or coastal northeast Asia. The currently prevalent idea of a long (e.g., 23,000–15,000 cal yr BP) “Beringian standstill” of the ancestral population fails to confront the absence of any significant Last Glacial Maximum (LGM) to Late Glacial archaeological record in Beringia (Faught 2017). Recognizing this problem, Buvit and Terry (2016) recently suggested that Siberians might have retreated instead to northern Japan during the LGM. Graf and Buvit (2017) would extend the hypothesized refugium to include the Russian Far East

(Primorye). Certainly, the Upper Paleolithic cultures of Hokkaido and Sakhalin contain bifaces and microblades that are plausible prototypes for Paleoindian tools. Northern Japan would be a logical place of origin for hypothesized Paleoamerican coastal migrants. Unfortunately, the available genomic data offer no support for this scenario.

Davis et al. (2019) (including Buvit) state that the cultural relationship they now posit between late Upper Paleolithic Hokkaido and the Cooper's Ferry assemblage “complements current evidence of shared genetic heritage between late Pleistocene peoples of northern Japan and North America” (Davis et al. 2019, 895). The supportive reference they cite is Adachi, Shinoda, and Izuhō (2015). However, more recent studies show that ancient Jomon and modern Ainu genomes are only very remotely related to those of Native Americans; their shared Asian ancestors diverged more than 26,000 cal yr BP (Gakuhari et al. 2019). Unlike ancient and recent Native Americans, no Mal'ta-like Ancient North Eurasian genetic component is present in the genome of a 2500-year-old Jomon individual (Gakuhari et al. 2019). The most common mtDNA haplogroup in ancient Jomon samples is N9b; although its date of origin is estimated as ca. 22,000 cal yr BP (Adachi et al. 2011), this clade is completely absent from both ancient and modern Native American populations (e.g., Llamas et al. 2016). The ubiquitous Native American clades of Y chromosome haplogroup Q, found both in modern groups and ancient individuals (including Anzick, Kennewick, and *Shuka Kaa* from the Alaskan coast) (Grugni et al. 2019; Moreno-Mayar et al. 2018) are absent from Japan (Watanabe et al. 2019) and coastal China. Conversely, the ca. 20,000-cal-yr-BP O3a2b2 clades of coastal East Asian males (Wei et al. 2017) are not found in Native American men. The D-M125 or D-1b clade, very common among Ainu and also Japanese males, is also completely absent from the Americas. The rapid radiation of D-1b males in Japan appears to have begun about 13,000 cal yr BP (Watanabe et al. 2019).

The Jomon culture is generally thought to have developed from the first pottery-making culture of Japan, called Incipient Jomon, which began around 16,000–15,000 cal yr BP. Most scholars also assume that the Incipient Jomon people were descendants of the local Upper Paleolithic people, not a new intrusive population (Gakuhari et al. 2019; Kaner 2010). In that case, Native American ancestors, very distinct genetically from later Jomon people, could not have originated in Japan and followed the Pacific Rim to the Northwest Coast (*contra* Braje et al. 2018). However, it is not impossible that the late-Pleistocene inhabitants of Hokkaido were a “ghost” population completely replaced by intrusive Incipient

Jomon. From ca. 19,000–13,000 cal yr BP, the Yubetsu/Diuktai-type microblade-dominated lithic assemblages of Hokkaido are clearly linked to mainland northeast Asian industries. Afterward, there is a virtually total hiatus in occupation during the Younger Dryas (12,900–11,600 cal yr BP), and extending into the early Holocene (Morisaki, Izuho, and Sato 2018; Nakazawa et al. 2011). Perhaps Hokkaido was re-occupied by pottery-making people from southern Japan (including D-1b men), who were ancestral to later Jomon and Ainu. Natsuki (2017) suggests that the Incipient Jomon of southern Japan, with pottery and arrowheads, and the terminal Upper Paleolithic culture of Hokkaido and Sakhalin, represent two distinct populations that coexisted around 14,500 cal yr BP. In northern Japan, it seems that spear points became more common, replacing microblades, as megafauna disappeared (Otsuka 2017). These speculations aside, present evidence indicates it is very unlikely that Native American ancestors emigrated from northern Japan (*contra* Buvit and Terry 2016; Graf and Buvit 2017). Recovery of ancient genomes from (geographically) Japanese skeletons older than 12,000 cal yr BP would be needed to resolve this issue.

In 2012, the 14,500-year-old, putatively human-derived coprolites found in the Paisley Caves of Oregon were interpreted, along with 13,000-year-old Western Stemmed tools, as conclusive evidence that “the colonization of the Americas involved multiple technologically divergent, and possibly genetically divergent, founding groups” (Jenkins et al. 2012, 223). However, accumulating genomic evidence, particularly the autosomal DNA of two ancient (10,700 cal yr BP) individuals from Spirit Cave, Nevada, now shows that Western Stemmed and Clovis toolmakers belonged to a single biological population. As Moreno-Mayar et al. (2018) conclude:

It was previously surmised that Clovis (Anzick1) and Western Stemmed (Spirit Cave) technologies [...] represented “genetically divergent, founding groups.” [...] It appears instead that the divergence is principally cultural, between genetically close populations living on opposite sides of the Rocky Mountains. This result affirms the point that archaeological, anatomical, and genetic records are not necessarily congruent. (7)

The differing lithic complexes are now attributed to “The attenuating effects of distance, compounded (in places) by geographic barriers,” which “led to cultural drift and regional adaptations, even early in the peopling process” (Moreno-Mayar et al. 2018).

There is no human DNA from Cooper’s Ferry. It is not impossible that the original WST inhabitants of the site were completely replaced, perhaps during the Cascade/Old Cordilleran complex expansion ca. 9000 cal yr BP (Chatters et al. 2012). However, all ancient individuals or

populations of western North America that might have been associated with the Western Stemmed Tradition or some hypothetical ancestral or cognate “Paleocoastal” complex – Kennewick Man, the Spirit Cave people, the 4900-cal-yr-BP people of San Nicolas Island off southern California – are closely related genetically to the Anzick Clovis boy (Moreno-Mayar et al. 2018; Posth et al. 2018).

6. Geologic history

Davis, as quoted by Wade (2019, 348), states:

‘It’s easy to see how seafaring people might have reached Cooper’s Ferry’ [...]. Although the site is more than 500 kilometers from the coast, the Salmon, Snake, and Columbia rivers link it to the sea. ‘As people come down the coast, the first left-hand turn to get south of the ice comes up the Columbia River Basin,’ Davis says. ‘It’s the first off-ramp.’

Davis et al. (2019, SOM p. 7) acknowledge that “The early occupation of Cooper’s Ferry [...] coincides with later outburst floods from Glacial Lake Missoula” but emphasize that “the site is situated ~3 km upstream of the flood pool and escaped the geomorphic forces that would have destroyed or deeply buried other contemporaneous sites that existed in the lower reaches of the Columbia River basin.” More importantly, we suggest, those floods would have rendered the 500-km stretch of river basin from the coast to interior Idaho either impassable or inhospitable. Glacial Lake Wallula on the middle Columbia (which lay on the presumed route from the coast to Idaho) was filled repeatedly (perhaps every 30 years) by floodwaters originating from Glacial Lake Missoula until about 15,000 or 14,000 cal yr BP (Clague et al. 2003; Hanson and Clague 2016; Waitt 2016). Balbas et al. (2017) report cosmogenic ^{10}Be dates of $14,000 \pm 1400$ – $14,400 \pm 1300$ cal yr BP for the youngest flood(s) from glacial Lake Columbia in the northeastern Columbia River valley. Hypothetical migrants from Hokkaido turning from the Pacific coast into the Columbia River basin at any time between 16,000 and 14,000 cal yr BP would have encountered, not a linear water route drawing them inland straight to Idaho, but a mostly barren landscape scoured repeatedly by massive floods, and rivers lacking the massive salmon runs that, millennia later, would make this region so attractive to maritime-adapted people (Butler and O’Connor 2004; Sutton 2017, 236).

7. Conclusions

Our reconsideration of the stratigraphy, chronology, and lithic technology reported from Cooper’s Ferry leads us

to different conclusions from those offered by Davis et al. (2019). We hope that our observations may lead to renewed testing of multiple hypotheses about the age (s) of the Cooper's Ferry occupations.

Of the 21 ages for lower LU4 and LU3 now reported by Davis et al. (2019), more than half (12) are younger than 12,000 ^{14}C yr BP (13,800 cal yr BP). Artifacts, bones, and charcoal pieces are dispersed vertically (through at least 60 cm) within LU3 without any discernible traces of sequential occupation surfaces; nevertheless, Davis et al. (2019) infer a series of discrete occupation episodes from the non-overlapping, discordant dates for charcoal or bone fragments incorporated within the fill of intrusive features. Two possibly cultural features (F142 and F143) are undated. The similarly ambiguous F144 has one date on bone, $11,720 \pm 80$ ^{14}C yr BP (13,745–13,410 cal yr BP). A clearly cultural feature, F134, has two disparate, irreconcilable dates, $10,010 \pm 50$ ^{14}C yr BP (ca. 11,500 cal yr BP) and $13,335 \pm 75$ ^{14}C yr BP (ca. 16,040 cal yr BP). The only date for another unambiguous feature, F135, is 9955 ± 50 ^{14}C yr BP (ca. 11,380 cal yr BP). The first feature discovered, PFA2, yielded four inconsistent ages ($11,370 \pm 40$, 8710 ± 120 , and 7300 ± 70 ^{14}C yr BP on charcoal, and $12,020 \pm 170$ ^{14}C yr BP on bone). The two youngest dates are now credibly attributable to rodent transport from LU6, but the new evidence still does not demonstrate that the 11,370 ^{14}C yr BP (ca. 13,200 cal yr BP) date was any more accurate than the 12,020 ^{14}C yr BP (ca. 13,800 cal yr BP) age. None of the new suite of dates precisely replicates the ca. 13,200 cal yr BP date (two are ca. 300 years older), nor do they suggest a flurry of pit-digging or other activities at the surface of LU3 at 13,200 cal yr BP. Pits PFA2, F134, and F135 must have been excavated into LU3 by the inhabitants of a living surface at or above the LU4/LU3 interface. However, Davis et al. (2019) present no *in situ* evidence of this occupation, thus leaving open the distinct possibility that all of the artifacts now within LU3, apart from the pit contents, drifted down over time from that now-vanished surface. Davis, Nyers, and Willis (2014, 601) contended that “the unconformable contact between LU3 and its overlying LU4 is attributed to the previously reported presence of a buried paleosol (Davis and Schweger 2004), which marks the loss of depositional time because of surficial stability, not erosional loss”. Therefore, an early-Holocene living surface associated with the top of the PFA2 pit could not have been removed by erosion. But in that case, where are the hundreds or thousands of artifacts one would expect to be in lower LU4?

Given the presence of distinctive Lind Coulee points in PFA2 and PFP1, and multiple concordant dates of

ca. 10,000 ^{14}C yr BP from features and from the matrix of LU3 and lower LU4, we think it is most likely that the pits were created during an occupation that occurred ca. 11,500 cal yr BP.

If all the reported dates are associated with cultural activities, then there are at least six discrete components within LU3 with ages that do not overlap at two standard deviations (Figure 1). These dates cluster at ~8800, 10,300, 11,500, 13,250, 14,600, and 15,800 cal yr BP. The dates of 8800 and 10,300 cal yr BP can be credibly dismissed as rodent disturbances, but there is no way to be sure how many artifacts may have been carried down along with the dated displaced organic pieces. If we disregard those anomalously young dates as intrusive, then there were four discrete episodes of occupation during the span of ca. 4000 years from 15,800–11,500 cal yr BP. PFA2 – probably representing the 11,500 cal yr BP occupation – contained, besides formed stone tools, 724 pieces of debitage, most of which were at the top of the pit (Davis, Nyers, and Willis 2014, figure 6). Feature 134 contained 131 pieces of debitage, and Feature 135 contained 74 pieces of debitage. Apart from the feature contents – which must have come from lower LU4 – in total, only 189 lithic artifacts were recovered from the 37 m² excavated in LU3, including 161 pieces of debitage (Davis et al. 2019, table S3). This is a very small artifact assemblage, even for a single brief episode of occupation. By way of comparison, a 37-m² exposure of a single Clovis component at Shawnee-Minisink in northeastern Pennsylvania yielded about 23,000 lithic artifacts (Gingerich 2013). At Wewukiyepuh, a single occupation episode produced 9 lithic tools, 2677 pieces of debitage, 1714 pieces of bone, and 8.3 grams of freshwater clam shell within an area of 10 m² (Sappington and Schuknecht-McDaniel 2001). If one were to divide the Cooper's Ferry artifacts from LU3 equally among the four ostensibly dated occupation episodes, they would amount to only about 40 lithics each. It strains credulity, and is inconsistent with our knowledge of normative cultural behaviors, to suppose that this location was visited repeatedly over a span of 4000 years by groups chipping just a few flake tools while digging storage pits at exactly the same spot.

F129 is the most convincing evidence for a pre-Clovis occupation at Cooper's Ferry. It lies entirely within LU3 and it has produced three consistent radiocarbon dates on charcoal (12,348, 12,472, and 12,598 ^{14}C yr BP) that overlap at two sigma and suggest an age of ca. 14,600 cal yr BP. However, its anthropogenic origin remains questionable. The feature is reported to have contained only ten pieces of bone (one of them burned) and five pieces of lithic debitage; in profile view, however, these items appear to be located mostly above and below the

charcoal concentration, not within it (Davis et al. 2019, figure 2B).

Additional analyses of the bones and debitage could make a stronger case for a series of *in situ* occupations within LU3. The bone fragments might exhibit cut marks, or diagnostic features or molecular markers indicating their assignment to extinct or extant species. It would be particularly important to verify the attribution of some of the mammal-bone fragments from F143 to extinct horses (Davis et al. 2019, 893). Some of the lithic flakes may refit, or display colors or textures that demonstrate their association and preclude extensive post-depositional vertical and/or horizontal dislocation. These analyses should be undertaken as a test of multiple working hypotheses, a method that Davis, Nyers, and Willis (2014, 601–604) have previously employed. They rejected a “straw man” hypothesis that PFA2 had been dug in the early Holocene, but they observed that, “the recovery and analysis of many more datable samples [...] should ultimately resolve the remaining two hypotheses,” those being, that the ca. 11,400 ^{14}C -yr-BP age of the pit was accurate, or that the dated charcoal was old “fossil” wood, much older than the feature. Unfortunately, the newly reported dates have not provided the anticipated resolution.

We conclude that the oldest *unequivocal* occupation of Cooper’s Ferry dates to about 11,500 cal yr BP. Very sparse and ambiguous evidence from the middle of LU3 (the F129 charcoal concentration and a few flakes and bone fragments) *might* (but probably does not) indicate a previous episode of occupation at ca. 14,600–14,100 cal yr BP. However, massive floods before that time probably would have discouraged any hypothetical immigrant population from ascending the Columbia and Snake rivers. Any resemblance of the Cooper’s Ferry lithic artifacts to northern Japanese assemblages of the terminal Pleistocene appears fortuitous and does not warrant inference of an ancestor-descendant cultural or biological relationship. In fact, all available DNA evidence, both ancient and modern, is inconsistent with this suggestion, but rather indicates a rapid star-like radiation of all Paleoindians including Clovis (Anzick) and Western Stemmed (Spirit Cave) from a single ancestral source in Siberia, not Japan.

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No potential conflict of interest was reported by the author(s).

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