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ARCHAEOLOGY

# Late Upper Paleolithic occupation at Cooper's Ferry, Idaho, USA, ~16,000 years ago

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**Radiocarbon dating of the earliest occupational phases at the Cooper's Ferry site in western Idaho indicates that people repeatedly occupied the Columbia River basin, starting between 16,560 and 15,280 calibrated years before the present (cal yr B.P.). Artifacts from these early occupations indicate the use of unfluted stemmed projectile point technologies before the appearance of the Clovis Paleoindian tradition and support early cultural connections with northeastern Asian Upper Paleolithic archaeological traditions. The Cooper's Ferry site was initially occupied during a time that predates the opening of an ice-free corridor (≤14,800 cal yr B.P.), which supports the hypothesis that initial human migration into the Americas occurred via a Pacific coastal route.**

Archaeological evidence predating the appearance of the Clovis Paleoindian tradition (CPT) (*1*) in the Americas by ~13,250 calibrated years before the present (cal yr B.P.) (*2*) is found at a small number of reliably dated sites (*3*–*13*) (fig. S1). These sites share technological attributes similar to Late Upper Paleolithic (LUP) sites in northeastern Asia, including flake- and blade-based stone tool traditions, use of informal lithic tools, lack of fluted bifacial technology, and use of stemmed and lanceolate projectile points (*13*–*15*). We present data from the Cooper's Ferry site in western Idaho (Fig. 1) that extend the timing of human populations south of Late Wisconsinan ice sheets to ~16,000 cal yr B.P. We describe results of excavation and analyses of stone tools and lithic tool production debris, remains from food processing, and multiple cultural features within buried stratigraphic contexts [lithostratigraphic unit 3 (LU3) to LU5] dated using accelerator mass spectrometry (AMS) radiocarbon and luminescence dating methods (*16*).

## Background and setting

The Cooper's Ferry site is located within an alluvial terrace at the confluence of Rock Creek and the lower Salmon River of western Idaho (fig. S2). The Niimíipuu (the Nez Perce Tribe) refer to this place as an ancient village site named Nipéhe (*17*, *18*). Davis led excavation of a 2 m–by–2 m unit (unit A) in 1997 that uncovered a Western Stemmed tradition (WST) equipment cache associated with radiocarbon ages of 11,370 ± 40 yr B.P. (Beta-114949; 13,300 to 13,115 cal yr B.P.) and 11,410 ± 120 yr B.P. (TO-7349; 13,475 to 13,060 cal yr B.P.) (*19*, *20*). From 2009 to 2018, Davis led more-extensive excavations of two blocks measuring 7 m by 13 m (area A) and 12 m by 12 m (area B) (figs. S3 and S4). Here, we focus discussion on the area A record.

## Stratigraphy

The stratigraphy of area A includes nine LUs and two pedostratigraphic units (table S1 and fig. S5) (*19*). The earliest radiocarbon samples and archaeological materials, which we report here, come from LU3 and LU2. A paleosol, called the Rock Creek Soil, is associated with LU3 and includes a rubified A horizon, calcic B horizon, and loessal C horizon. LU3 is an aeolian loess

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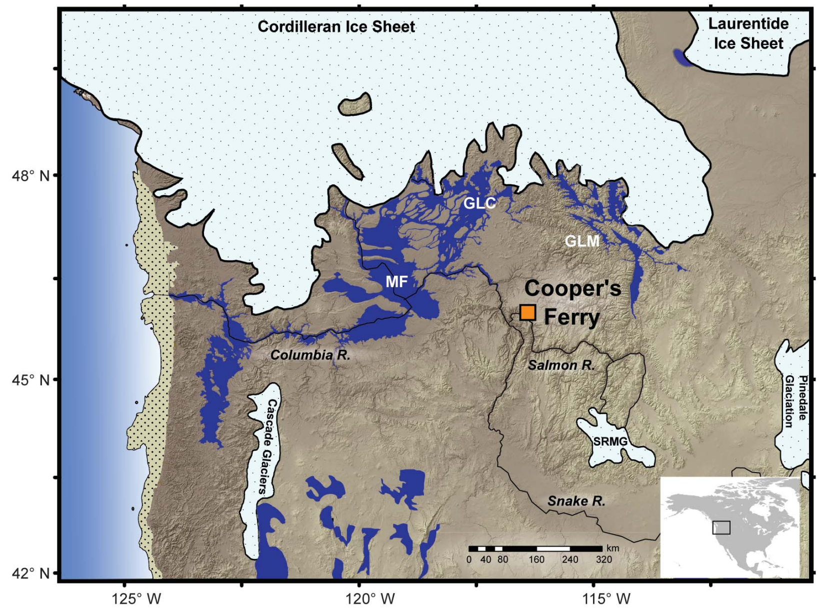


**Fig. 1. Location map for the Cooper's Ferry site.** Projected regional environmental aspects at ~16,000 cal yr B.P. are based on modeled extents of Cordilleran and Laurentide glacial ice (*41*), Cascade and Salmon River mountain glaciers (SRMG), Pinedale glaciation extents, positions of Glacial Lake Missoula (GLM) and Glacial Lake Columbia (GLC) (*41*), the modeled path of the Missoula Flood (MF) and its impoundment pool (*42*), smaller northern Great Basin pluvial lakes (*43*), and shoreline extents along the Pacific outer continental shelf (shown as a tan dotted area at left) (*44*).

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and overlies LU2 and LU1 alluvium. For the purposes of this Report we focus on LU3 to LU1 (Fig. 2). Description of stratigraphic and dating methods and additional details about the geoarchaeological context of younger site deposits are provided in the supplementary materials (*16*).

## Geochronology

The Cooper's Ferry site radiocarbon chronology for LU5 to LU3 is based on 21 ages from charcoal and bone samples recovered in situ outside of cultural pit features (Table 1). AMS dating indicates that LU5 dates from ~9250 to 9000 cal yr B.P., LU4 dates from ~11,930 to 10,410 cal yr B.P., and LU3 dates between ~15,660 and 13,260 cal yr B.P. Optically stimulated luminescence (OSL) analysis of potassium feldspar grains sampled from LU5, LU4, and upper LU3 sediments dated to 12,170 ± 2320 years ago (±1 SD), 12,730 ± 2400 years ago, and 13,710 ± 2620 years ago, respectively (Fig. 2 and table S2). Except for dates obtained from within-pit features, all other radiocarbon and OSL measurements ($n$ = 25) were incorporated into a Bayesian age model (Fig. 3). Within the general outlier model, OxA-38106, OxA-38050, OxA-38104, OxA-X-2792-42, and D-AMS 029851 were identified as outliers (>60% probability), most likely due to bioturbation (*16*). The outliers are down-weighted in the model and, in general, the sequence shows good age-depth congruence. Modeled output places the start of LU3 at 16,560 to 15,280 cal yr B.P. (95.4% confidence) and LU4 at 12,740 to 11,440 cal yr B.P. (95.4% confidence), and all dated events span 6140 to 10,120 years (95.4% confidence).

## Archaeological evidence originating within LU3

We uncovered and mapped 189 lithic artifacts in situ within LU3, including 161 pieces of debitage, 27 stone tools, and 1 piece of fire-cracked rock

**Table 1. Accelerator mass spectrometry chronometric data.** RN is the reading number. The percent collagen is the yield of extracted collagen as a function of the starting weight of bone samples. C:N is the atomic weight ratio of carbon to nitrogen. %C is the percentage of carbon in the combusted sample. Stable isotope ratios of C and N are expressed in per mil (‰) relative to Vienna Pee Dee belemnite and ambient inhalable reservoir. The calibrations were done using the OxCal 4.3 software (*46*) and the IntCal13 calibration curve (*47*). Missing chronometric data (*) are due to a lack in reporting or measurement on behalf of the laboratories. CI, confidence interval; –, not determined.

| RN | Laboratory no. | Material | Northing (m) | Easting (m) | Elevation (masl) | LU | % collagen | C:N | %C | $\delta^{13}C$ (‰) | $\delta^{15}N$ (‰) | Date | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | yr B.P. | ±1 SD | cal yr B.P. (95.4% CI) |
| 52918 | OxA-37,170 | Bone | 78.432 | 101.000 | 412.531 | Lower LU6 | 6 | 3.2 | 45 | −20.2 | 3.8 | 7984 | 40 | 9000–8655 |
| 29234 | OxA-37,169 | Bone | 81.120 | 100.500 | 412.463 | Mid LU5 | 4.16 | 3.4 | 43 | −19.1 | 6.8 | 8141 | 38 | 9250–9000 |
| 59697 | D-AMS 029851 | Charcoal | 79.842 | 106.657 | 411.981 | Lower LU4 | – | – | 37 | −20.8 | – | 7944 | 39 | 8985–8640 |
| 56440 | OxA-38,048 | Bone | 79.922 | 106.325 | 412.295 | Upper LU4 | 3.15 | 3.4 | 33 | −19.6 | 7.6 | 9775 | 50 | 11,265–11,105 |
| 56817 | OxA-X-2792-41 | Bone | 82.162 | 101.510 | 412.043 | Lower LU4 | 1.4 | 3.4 | 19 | −19.5 | 5.7 | 9110 | 50 | 10,410–10,190 |
| 56199 | OxA-38,103 | Bone | 80.880 | 103.292 | 412.036 | Lower LU4 | 3.4 | 3.2 | 41 | −19.8 | 6.9 | 10,055 | 55 | 11,930–11,310 |
| 59391 | OxA-X-2792-42 | Bone | 79.782 | 106.188 | 412.027 | Lower LU4 | 2.1 | 3.3 | 22 | −19.8 | 5.6 | 13,165 | 70 | 16,070–15,560 |
| 50554 | OxA-37,171 | Bone | 81.182 | 102.243 | 412.027 | Lower LU4 | 1.2 | 3.2 | 44 | −20.1 | 6.9 | 10,005 | 40 | 11,705–11,280 |
| 56422 | OxA-X-2792-43 | Bone | 80.900 | 103.327 | 411.990 | Lower LU4 | 0.7 | 3.4 | 24 | −20.5 | 6.6 | 10,050 | 60 | 11,930–11,285 |
| 57483 | D-AMS 029850 | Charcoal | 82.795 | 107.393 | 412.009 | Mid LU4 | – | – | 30 | −21.3 | – | 9714 | 57 | 11,245–10,795 |
| – | TO-7349 | Charcoal | 79.20 | 100.30 | 411.900 | Near surface of LU3 | * | * | * | * | * | 11,410 | 120 | 13,475–13,060 |
| 58223 | OxA-X-2792-45 | Bone | 82.630 | 103.708 | 411.785 | Upper LU3 | 1.1 | 3.5 | 12 | −20.4 | 9.6 | 11,630 | 80 | 13,610–13,275 |
| 58628 | OxA-38,104 | Bone | 82.185 | 100.293 | 411.695 | Mid LU3 | 6.8 | 3.2 | 35 | −20 | 6.9 | 7605 | 40 | 8515–8345 |
| 56446 | D-AMS 029846 | Charcoal | 82.676 | 108.954 | 411.692 | Mid LU3, within F129 (hearth feature) | – | – | 22 | −34.3 | – | 12,348 | 71 | 14,785–14,075 |
| 59379 | OxA-38,050 | Charcoal | 79.916 | 107.376 | 411.684 | Mid LU3 | – | – | 29 | −28.8 | – | 7831 | 40 | 8765–8535 |
| 56461 | D-AMS 029749 | Charcoal | 82.945 | 108.417 | 411.667 | Mid LU3, within F129 (hearth feature) | – | – | 21 | −20.8 | – | 12,598 | 54 | 15,195–14,670 |
| 56623 | D-AMS 029847 | Charcoal | 82.986 | 108.388 | 411.642 | Mid LU3, within F129 (hearth feature) | – | – | 21 | −21.2 | – | 12,472 | 61 | 15,030–14,250 |
| 56624 | D-AMS 029848 | Charcoal | 80.020 | 108.459 | 411.641 | Mid LU3 | – | – | 22 | −19.9 | – | 12,363 | 49 | 14,725–14,120 |
| 53495 | OxA-37,284 | Bone | 79.838 | 103.08 | 411.552 | Lower LU3 | 5.16 | 3.5 | 31 | −20.2 | 5.9 | 12,475 | 60 | 15,035–14,260 |
| 58720 | OxA-38,051 | Charcoal | 78.267 | 102.672 | 411.572 | Lower LU3 | – | – | 44.3 | −23.7 | – | 13,070 | 80 | 15,945–15,335 |
| 58398 | OxA-X-2792-48 | Bone | 80.995 | 103.020 | 411.486 | Lower LU3 | 1.6 | 3.3 | 28 | −21 | 6.6 | 12,830 | 65 | 15,575–15,105 |
| 23283 | OxA-38,106 | Bone | 82.520 | 102.629 | 411.310 | Lower LU3 | 1.2 | 3.4 | 42 | −20.9 | 4.5 | 7985 | 40 | 9005–8655 |
| – | Beta-114949 | Charcoal | 79.530 | 101.450 | 410.880 | Within PFA2 | * | * | * | −22 | * | 11,370 | 40 | 13,300–13,115 |
| 56823 | OxA-38,049 | Bone | 80.167 | 103.276 | 411.868 | Within F134 | 5.4 | 3.3 | 32 | −20.2 | 5.5 | 10,010 | 50 | 11,745–11,270 |
| 58673 | OxA-38,052 | Bone | 80.375 | 103.944 | 411.247 | Within F134 | 1.97 | 3.2 | 42 | −19.3 | 7.8 | 13,335 | 75 | 16,265–15,795 |
| 59294 | OxA-38,197 | Bone | 82.514 | 103.536 | 411.221 | Within F144 | 1.1 | 3.4 | 9.4 | −20.2 | 10.4 | 11,720 | 80 | 13,745–13,410 |
| 59291 | OxA-38,105 | Bone | 80.931 | 105.994 | 411.415 | Within F135 | 4.4 | 3.2 | 38 | 20 | 10.2 | 9955 | 50 | 11,615–11,240 |

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(FCR), and also 86 faunal bone fragments and 1 river mussel shell fragment (Fig. 2 and tables S3 and S4). Most bone fragments lack clear anatomical features but likely represent medium- to large-bodied mammals. Stone tools include basal fragments of 2 stemmed projectile points (Fig. 4, A to C), 4 biface fragments (Fig. 4, D to F and H), 2 blades (Fig. 4, G and I), and 19 modified flake tools (Fig. 4 and fig. S6). Stemmed point base 73-60685 (Fig. 4A) lay below OxA-X-2792-45 (13,610 to 13,275 cal yr B.P.) and above OSL sample CFA-017 (13,710 ± 2620 years ago). Stemmed point base 73-42800 (Fig. 4B) lay below TO-7349 (13,475-13,060 cal yr B.P.) and above OxA-X-2792-45 (13,610 to 13,275 cal yr B.P.; OxA-38104 is an outlier and thus excluded from this discussion).

In addition to these in situ finds, we identified four features originating within LU3. Features 142 and 144 (F142 and F144) were pits that originated at ~411.72 meters above sea level (masl), stratigraphically below OxA-X-2792-45 (13,610 to 13,275 cal yr B.P.). Whereas F142 was relatively shallow, F144 extended downward to the top of LU1 and contained two pieces of debitage, one modified flake tool, and two bone fragments—one returning an AMS age of 11,720 ± 80 yr B.P. (OxA-38,197; 13,745 to 13,410 cal yr B.P.). F129, present from ~411.73 to 411.58 masl, was a concentration of darker charcoal-bearing sediment within a small basin surrounded by a 2- to 3-cm-thick layer containing oxidized and ashy sediment, charcoal, nine bone fragments, one modified flake tool, and five pieces of debitage. We interpret F129 as a hearth (fig. S8). Three charcoal fragments from F129 date to 12,348 ± 71 yr B.P. (D-AMS 029846; 14,785 to 14,075 cal yr B.P.), 12,472 ± 61 yr B.P. (D-AMS 029847; 15,030 to 14,250 cal yr B.P.), and 12,598 ± 54 yr B.P. (D-AMS 029847; 15,195 to 14,670 cal yr B.P.), whereas charcoal found ~2.5 m away at the same elevation returned an AMS age of 12,363 ± 49 yr B.P. (D-AMS 029848; 14,725 to 14,120 cal yr B.P.). F143 was a pit that originated at ~411.62 masl and extended down to ~411.39 masl (fig. S9). A biface fragment, 15 pieces of debitage, a fragment of tooth enamel interpreted as *Equus* sp. (fig. S10) (*16*), and 7 mammal bone fragments—probably including extinct horse—were found inside and immediately surrounding F143. We interpret F143 as a food processing station. F143 is dated by its stratigraphic position between the slightly higher F129, which dates between 15,000 and 14,410 cal yr B.P. [95.4% confidence; $\chi^2(2) = 5.255$ (5%, 5.991)], and the lower stratigraphic position of three radiocarbon estimates of 12,475 ± 60 yr B.P. (OxA-37,284; 15,035 to 14,260 cal yr B.P.), 12,830 ± 65 yr B.P. (OxA-X-2792-48; 15,575 to 15,105 cal yr B.P.), and 13,070 ± 80 yr B.P. (OxA-38,051; 15,945 to 15,335 cal yr B.P.). Given the slight westward downslope of LU3 stratigraphy,

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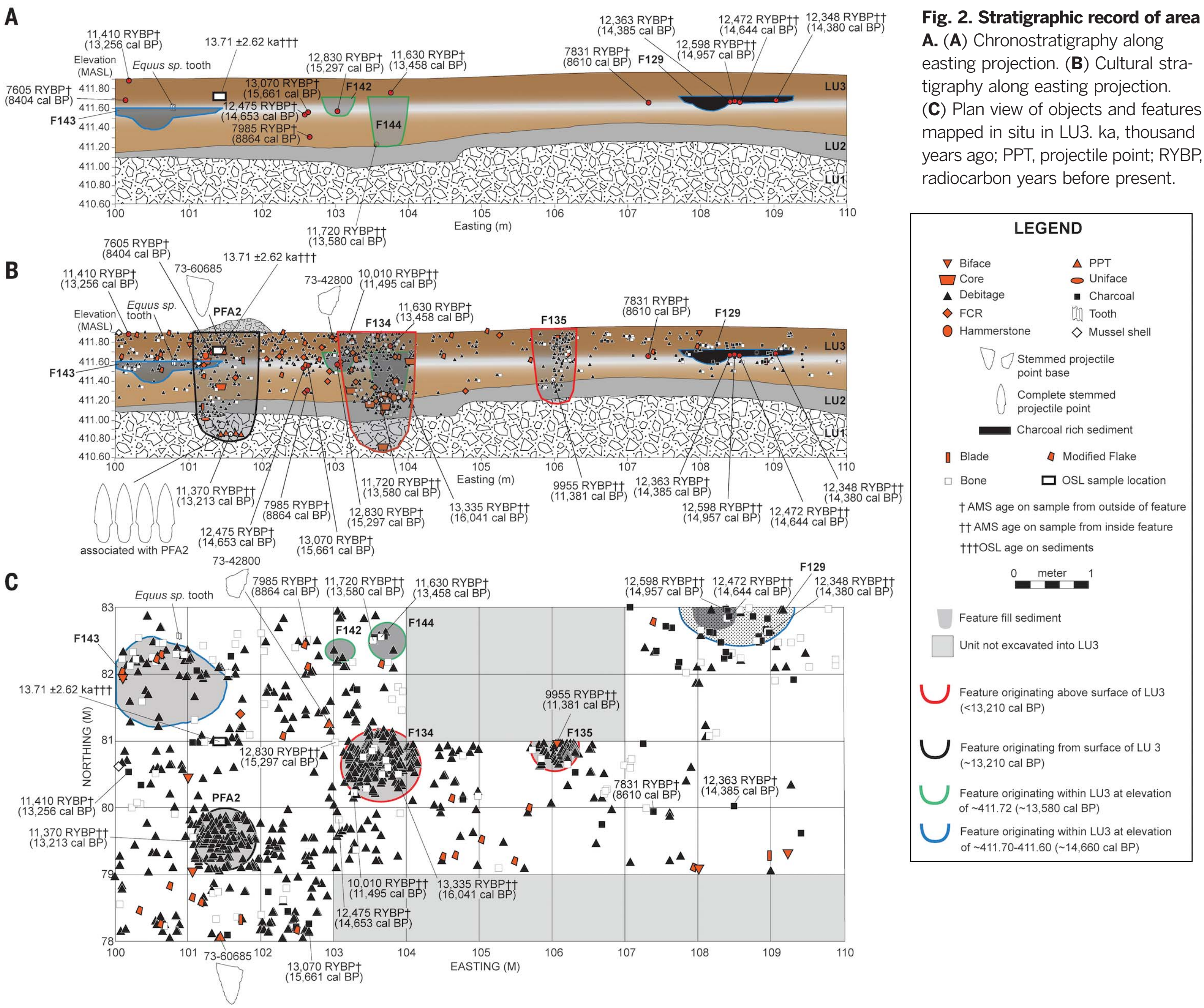


**Fig. 2. Stratigraphic record of area A.** (**A**) Chronostratigraphy along easting projection. (**B**) Cultural stratigraphy along easting projection. (**C**) Plan view of objects and features mapped in situ in LU3. ka, thousand years ago; PPT, projectile point; RYBP, radiocarbon years before present.

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F129 and F143 probably occupied a contemporaneous surface. The LU3 deposit between 411.55 masl and the lower contact with LU2 contained 43 pieces of debitage, 20 bone fragments, and a piece of charcoal excavated in situ below the stratigraphic position of OxA-38,051 (15,945 to 15,335 cal yr B.P.) (Fig. 2). These lower materials are objects discarded during repeated periods of human occupation at Cooper's Ferry, which Bayesian modeling suggests began at 16,560 to 15,280 cal yr B.P. (95.4% confidence) (Fig. 3).

Debitage recovered in situ within LU3 is made primarily from local cryptocrystalline silicate (CCS) and secondarily from fine-grained igneous toolstone. Debitage analysis reveals early to late biface reduction based on the presence of medium to small bifacial percussion flakes and a smaller number of pressure flakes (tables S5 and S6). Lithic tool maintenance is reflected by a CCS burination flake bearing an exhausted unifacial working edge (fig. S6U) and by an igneous toolstone chopper tool edge rejuvenation flake. Artifact 73-61176 (fig. S6V) is an early-stage bifacial overshot thinning flake discovered in situ at 411.455 masl with a finely faceted bifacial platform and distal termination that removed a square edge from an opposing tool margin. This debitage was found in situ below the stratigraphic position of the three oldest radiocarbon ages, dating 15,310 to 15,100 cal yr B.P. (95.4% confidence range). Overall, the quantities of provenienced lithic debitage, tools, cultural features, and bone and charcoal fragments increase from the surface of LU3 and peak at ~411.60 masl, reflecting the presence of intact buried archaeological components (fig. S11).

## Archaeological evidence intersecting the surface of LU3

Three pit features were excavated into the LU3 surface, including pit feature A2 (PFA2), F134, and F135. Pit feature A2 originates from the surface of LU3, as evidenced by a gravel cairn that marks its top. It contains 4 WST projectile points, 1 core, 1 hammerstone, 3 blades, 2 unifaces, 2 modified flakes, 724 debitage pieces, and 65 bone fragments (*19*, *20*) (figs. S12 and S13). F134 is a cylindrical pit defined at the surface of LU3 but lacking a clear upper surface. F134 intrudes down through LU2 and into LU1 and contains 131 debitage pieces, 15 FCR fragments, 1 modified flake tool, 1 hammerstone, 1 cobble tool, 3 biface fragments, 1 projectile point blade fragment, 34 bone fragments, and 3 wood charcoal fragments. F134 also contains six angular to subrounded boulder–sized clasts of fine-grained volcanic rock bearing evidence of percussive testing and multiple large flake removals (Fig. 2 and fig. S14). F135 is another cylindrical pit that lacks a defining upper limit. F135 extends downward into the LU1 and contains 1 fragmentary biface, 74 debitage pieces, 2 FCR fragments, 11 bone fragments, and 15 wood charcoal fragments (Fig. 2 and fig. S15). Because F134 and F135 originate at or slightly above the LU3-LU4 boundary, it is unclear whether they date to

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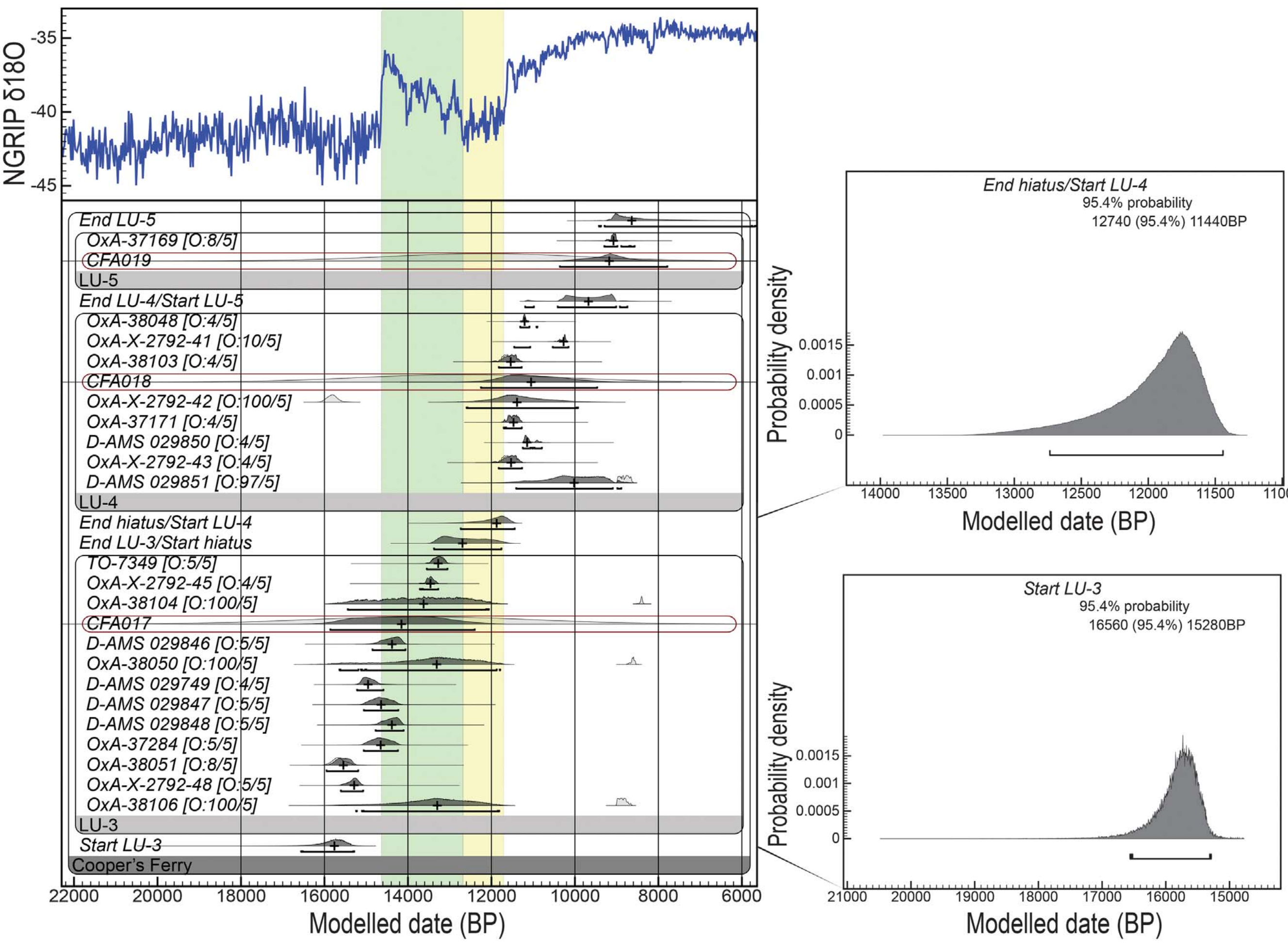


**Fig. 3. Bayesian age model of Cooper's Ferry, area A.** OSL dates (e.g., CFA017) are outlined in red. The output of the general outlier analysis is noted next to laboratory names for each date. The green vertical band represents the span of Greenland Interstadial 1 (GI-1; Bølling-Allerød), whereas the yellow vertical band indicates Greenland Stadial 1 (GS-1; Younger Dryas). The modeled output estimates the start of LU3 at 16,560 to 15,280 cal yr B.P. (95.4% confidence; prior to GI-1) and the start of LU4 to 12,740 to 11,440 cal yr B.P. (95.4% confidence; mainly during GS-1). NGRIP, North Greenland Ice Core Project.

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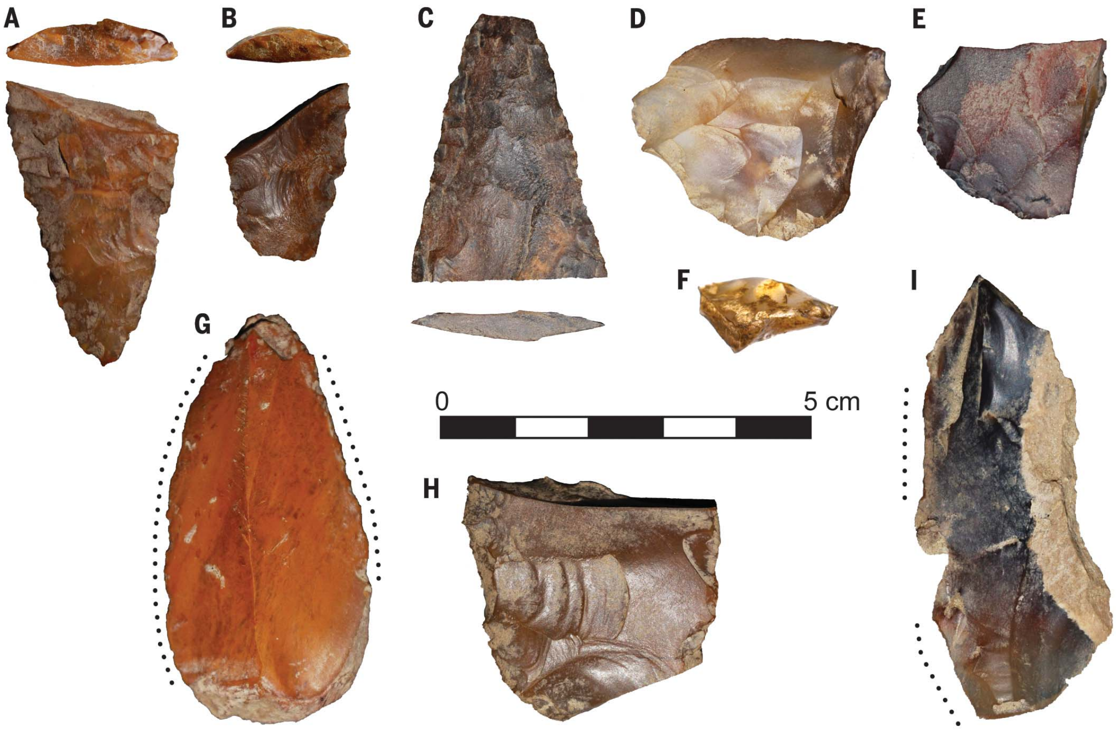


**Fig. 4. Lithic tools excavated in situ from LU3.** (**A**) Stemmed projectile point haft fragment from LU3 (73-60685; RN 56938). (**B**) Stemmed projectile point haft fragment from LU3 (73-42800; RN 50948). (**C**) Blade fragment of projectile point from LU3 (73-62464; RN 59067). (**D**) Biface preform fragment (73-61085; RN 57401). (**E**) Biface preform fragment (73-63034; RN 59076). (**F**) Biface preform fragment (73-61870; RN 58316). (**G**) Macroblade (73-62953; RN 59385). (**H**) Biface preform fragment (73-62887; RN 59367). (**I**) Macroblade (73-60855; RN 57072). Dots show areas with use wear.

the end of the LU3 occupational phase or the beginning of the LU4 occupational phase. A projectile point blade fragment made on CCS (73-62464) was discovered on the surface of LU3 (Fig. 4C).

## Technological antecedents

Stemmed projectile points appear throughout Africa, the Levant, and Europe after 50,000 years ago (*21*) and are associated with late Pleistocene evidence of human presence along the northern Pacific Rim (*22*). In Japan and Korea, Hakuhen-Sentoki projectile points dating from 30,000 to 23,000 cal yr B.P. are made by retouching the proximal end of a thick, pointed blade (*23*). The eponymous "bifacial stemmed point" type, seen mainly in Japan from 16,000 to 13,000 cal yr B.P., was often made on macroflakes or blades with contracting bases and elaborative bifacial retouch (*24*–*28*). Regional variants include the Tachikawa type on Hokkaido, the Kosegawsawa type in northern Honshu near the Sea of Japan, and the Yanagimata type in central and western Honshu. The Tachikawa type bears strong morphological similarities to the contracting margin stemmed point bases from LU3 at Cooper's Ferry (Fig. 5). Stemmed projectile points that are morphologically different from specimens from Cooper's Ferry appeared at Kamchatka's Ushki Lake site by ~13,440 to 12,640 cal yr B.P. (*29*) but were absent earlier from Beringia (*15*), suggesting that their origins lie elsewhere. The age, morphology, and technology of Cooper's Ferry LU3 artifacts share notable similarities with the nonfluted projectile point traditions dated from ~16,000 to 13,000 cal yr B.P. in Japan.

The artifacts contained within LU3 and PFA2 temporally precede and partially overlap with the 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. These technological attributes are seen among North and South American sites that predate the CPT, most recently discovered in stratified context beneath Clovis artifacts at the Gault and Friedkin sites in Texas (*2*–*13*). We interpret this temporal and technological affinity to signal a cultural connection with Upper Paleolithic northeastern Asia, which complements current evidence of shared genetic heritage between late Pleistocene peoples of northern Japan and North America (*30*). Although these archaeological connections require further study, the contemporaneous use of stemmed projectile point technologies in northeastern Asia and North America during the late Pleistocene represents an emerging Upper Paleolithic archaeological pattern that precedes the CPT (*13*). Adopting this terminology brings the earliest archaeological period of the Americas into conceptual alignment with the rest of the world and affirms the strength of observed technological connections to northeast Asia (*13*).

## Implications for the peopling of the Americas

A small number of reliably dated archaeological sites now provide evidence that humans were present in the Americas by at least 14,500 cal yr B.P. and even before 15,000 cal yr B.P. (*3*–*13*) (fig. S1). Recent genetically based estimates for the presence of people in the Americas suggest that an isolated population moved south of the ice sheets sometime after ~19,500 cal yr B.P. (*31*, *32*) and split into two major branches of northern and southern Native Americans sometime between ~17,500 and 14,600 cal yr B.P. (*33*, *34*). Bayesian age modeling and archaeological evidence from the lower portion of LU3 indicate that humans were initially present at the Cooper's Ferry site 16,560 to 15,280 cal yr B.P. (95.4% confidence level) within this timeframe of initial population expansion. The migration route these peoples employed to initially enter North America is hypothesized to have occurred either via an interior migration from eastern Beringia southward through a deglaciated ice-free corridor (IFC) that opened between continental ice sheets during the late Pleistocene (*16*, *35*) or by a combination of boat transport and walking south along the margin of glaciated and unglaciated Pacific shorelines (*35*–*40*). Models favoring migration through an IFC argue for its opening by ~14,800 cal yr B.P., providing time for humans to migrate from eastern Beringia and move throughout the Americas shortly before the appearance of the CPT (*36*). 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

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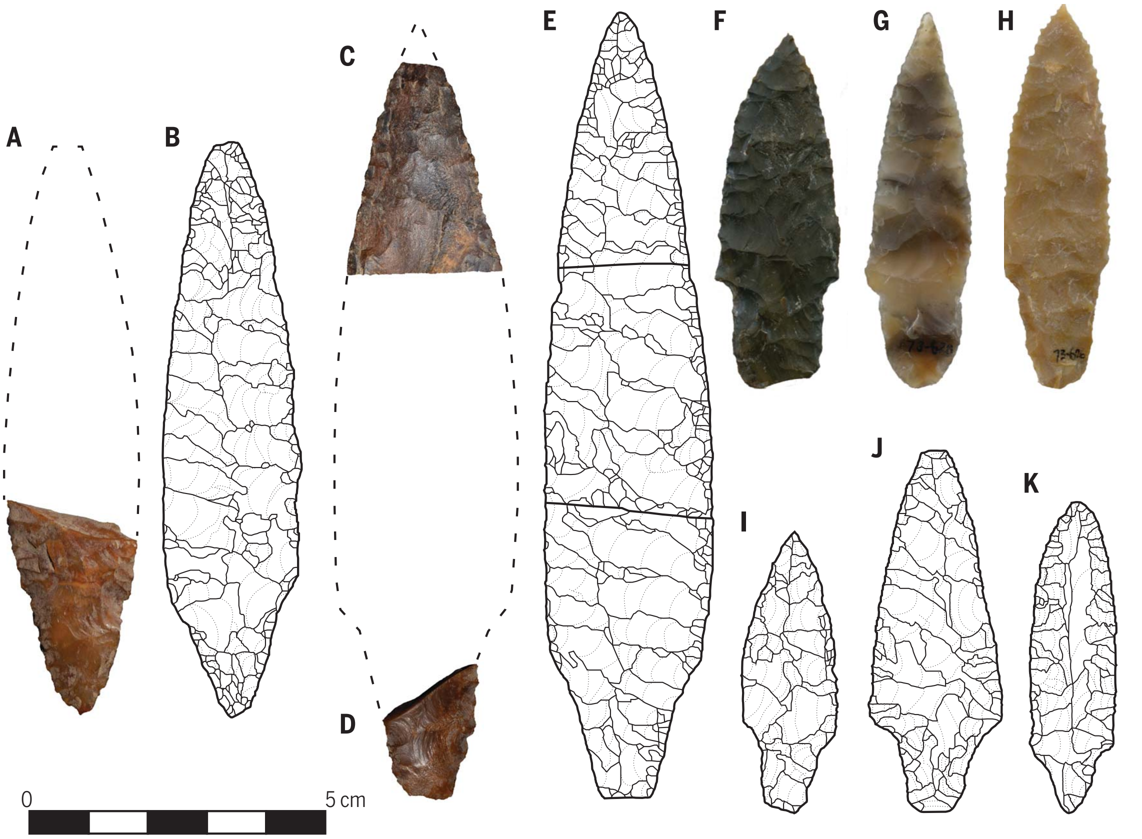


**Fig. 5. Comparison of Cooper's Ferry projectile points with late Pleistocene age Tachikawa-type stemmed points from the Kamishirataki 2 site on Hokkaido, Japan.** (**A**) Stemmed projectile point haft fragment from LU3 (73-60685; RN 56938). (**B**) Illustration of Japanese Upper Paleolithic stemmed projectile point from the Kamishiritaki 2 site [redrawn from (*45*)]. (**C**) Blade fragment of projectile point from LU3 (73-62464; RN 59067). (**D**) Stemmed projectile point haft fragment from LU3 (73-42800; RN 50948). (**E**) Illustration of Japanese Upper Paleolithic stemmed projectile point from the Kamishiritaki 2 site [redrawn from (*45*)] as one possible comparison for the reconstructed stemmed projectile point shown in (C) and (D). (**F**) Stemmed projectile point from PFA2 (73-627). (**G**) Stemmed projectile point from PFA2 (73-628). (**H**) Stemmed projectile point from PFA2 (73-626). (**I** to **K**) Illustrations of Japanese Upper Paleolithic stemmed projectile points from the Kamishiritaki 2 site [redrawn from (*45*)].

into the Americas along the Pacific coast. This does not preclude subsequent human migrations through the IFC at a later time, as suggested by paleogenomics (*34*), but such possible population movements do not represent the initial peopling of the Americas.

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## SUPPLEMENTARY MATERIALS

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Materials and Methods
Supplementary Text
Figs. S1 to S17
Tables S1 to S6
References (*48*–*80*)

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# Late Upper Paleolithic occupation at Cooper's Ferry, Idaho, USA, ~16,000 years ago

Loren G. Davis, David B. Madsen, Lorena Becerra-Valdivia, Thomas Higham, David A. Sisson, Sarah M. Skinner, Daniel Stueber, Alexander J. Nyers, Amanda Keen-Zebert, Christina Neudorf, Melissa Cheyney, Masami Izuho, Fumie Iizuka, Samuel R. Burns, Clinton W. Epps, Samuel C. Willis and Ian Buvit

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**The early occupation of America**

The Cooper's Ferry archaeological site in western North America has provided evidence for the pattern and time course of the early peopling of the Americas. Davis *et al.* describe new evidence of human activity from this site, including stemmed projectile points. Radiocarbon dating and Bayesian analysis indicate an age between 16,560 and 15,280 years before present. Humans therefore arrived in the Americas before an inland ice-free corridor had opened, so a Pacific coastal route was the probable entry route. The stemmed projectile points closely resemble those found in Upper Paleolithic Japan, also supporting the hypothesis of a coastal route.

*Science*, this issue p. 891

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