D48 Bone and Body Part Deposition in Rivers: Where to Look for the Rest of the Body

Thomas Evans, MA, Montana State Univ, Dept of Earth Sciences, PO Box 173480, Bozeman, MT 59717-3480*

After attending this presentation, attendees will learn the results of eight empirical trials performed by seeding rivers with real and synthetic bones and tracking where samples were deposited. Trends in the location (geomorphology) and river bed features at locations of deposition will be described.

This presentation will impact the forensic science community by learning about the most likely locations of deposition, which can aid law enforcement agencies in the recovery of more remains from fluvial systems, allowing search personnel to be deployed more efficiently to spend more time searching in locations with a higher likelihood of success.

Knowing the most likely locations of deposition can aid law enforcement agencies in the recovery of more remains from fluvial systems. Search personnel can be deployed more efficiently and can spend more time searching in locations with a higher likelihood of success, thus increasing the recovery rate of remains and reducing the cost of searches. In addition, since rivers are hazardous environments, personnel above and below water will be exposed to fewer hazards since searches can be targeted to higher probability locations, thus reducing the time individuals spend in and around dangerous working conditions.

To determine where skeletal remains are deposited in rivers, animal bones and casts of sheep bones were seeded in three rivers and observed yearly. Bones were seeded in the East Fork Sevier River (EFSR), UT, and Big Beef Creek (BBC), WA, and bone casts were seeded in both these rivers and Levelock Creek (LC), AK. The EFSR is a sinuous river with a sand to gravel bed with a study reach of ~25 miles long, while BBC is a braided river with a gravel to cobble bed and a study reach of about two miles in length. LC is a highly sinuous river with a sand to fine gravel bed and a study reach length of ~1.5 miles. Empirical seeding trials were performed by placing bones or bone casts in the rivers with known initial locations and orientations then visiting the rivers every summer thereafter. During trial observations, the rivers were searched and, when samples were located, their location of deposition (geomorphology), bed characteristics (grain size, distribution, woody debris, etc.), distance downstream (measured with a fiberglass tape measure), orientation, and burial were recorded. Located samples were collected and archived for later laboratory analysis. A total of eight empirical trials utilizing bones are in progress, six in the EFSR, and two in BBC. Five empirical trials using bone casts are in progress, one in LC, three in the EFSR, and one in BBC. In addition to empirical trials, 14 rivers have been searched for skeletal material, and when remains were located, observations were recorded like the empirical trials.

Of the 6,000+ bones and 3,686 bone casts seeded, 218 bones and 307 bone casts have been recovered. While observing bones in rivers, 485 bones have been observed in addition to 33 articulated body parts. Of the 644 bones with good location descriptions, 4.3% (N=28) were found on point bars, 23.6% (N=152) on lateral bars, and 4.3% (N=28) on median bars, for a total of 32.2% of bones found on bars of one form or another. 26.4% (N=170) of bones were found on either the right or left banks, and the remaining 41.3% (N=266) were found in the thalweg (deepest part of the river channel). 24.7% (N=184) of bones were found in association with woody debris out of 744 bones with notes on woody debris associations, and three bones were found hanging in vegetation above the river bed. Results for the 307 casts recovered were broadly similar with 11.7% (N=36) found on point bars, 14.0% (N=43) on lateral bars, and 9.1% (N=28) found on median bars, for a total of 34.9% of bone casts found on bars. 33.9% (N=104) of casts were found on banks, and 31.3% (N=96) of casts were found in the thalweg. 53.1% (N=163) of casts were found in association with woody debris.

These results suggest that skeletal material can be found in any location with a change in flow competence (the ability of the river to transport material). This includes locations where rivers suddenly become deeper or shallower, like bars of any form (point, lateral, and median bars), as well as the upstream end of pools. In addition, flow obstructions (woody debris, bridge pilings, large rocks, etc.) catch skeletal material and prevent further transport, which accounted for many of the bones and casts found in thalwegs. Articulated remains showed similar trends though a large enough sample size for comparison is not yet available.

Taphonomy, Fluvial, Bones

