H54 Fluvial Transport Distances and Postmortem Interval in the Sacramento River, California

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After attending this presentation, attendees will gain a better understanding of the relationship between fluvial transport distance and Postmortem Interval (PMI) for human remains recovered from the Sacramento River, California. The goal of this presentation is to evaluate the key variables that influence transport rates of human remains in fluvial systems.

This presentation will impact the forensic science community by promoting an understanding of how river systems transport human remains and how this information can be used to establish a predictive model for narrowing down search parameters for victims who entered the river on known dates.

The transport of human remains in riverine systems has received attention by forensic anthropologists and law enforcement over the past several decades, with effort directed at search areas for missing persons. Until recently, studies of fluvial transport of human remains have largely been limited to the eastern United States.[1-3] However, recent research conducted within the Sacramento River found that long-distance transport is correlated with high discharge rates at the time the victim entered the river.[4] This research hypothesized a correlation between discharge rates and transport distances over known PMIs. The present study examines this relationship using a large sample of river victim cases.

The Sacramento River comprises the largest fluvial system in California, flowing 335 miles north-to-south, and passing though eight counties in northern California. Discharge rates vary based on annual snowmelt and precipitation, with an average rate of 350m^3/sec. Modeled after previous research, this project involves two broad categories of variables: victim demographics and river dynamics.[3] Demographic variables include the biological profile of the victim; victim weight; PMI, or number of days in the river; date of river entry and exit; location and side of entry and exit; preservation state; manner and cause of death; and the number of river miles traveled. The study sample currently includes data on over 120 cases from sheriff's/coroner's offices in three northern California counties. These cases span the 1970s to present and include all cases where the PMI exceeded two hours. Variables related to river dynamics include: season; water and air temperature; water discharge rate; depth; and bed load. Transport rates of human remains were estimated using recorded average United States Geological Survey (USGS) water discharge rate records between the nearest river mile data collection station to each victim's point of entry and exit.

Together, variables from these two categories have demonstrated a relationship with transport rates of human remains within this fluvial system. Analysis of the current data indicates that the majority of victims are found within several hours to several days of entering the river, and they are usually found within two miles of the location of entry. Under these circumstances, water discharge rates do not factor significantly in the fluvial transport of human remains; however, for PMIs longer than several days, hydrological factors can significantly influence transport. In these cases, transport distances are associated with rapid increases in water volume, especially in cases in which dam regulation is used to offset heavy rainfall or snowmelt into the river.

While results indicate that the majority of individuals are more likely to be found in close proximity to where they entered the river, the addition of known death and recovery dates from case files from additional counties along the river, in conjunction with river discharge rates, will permit more precise estimations of transport rates for different sections of the river. This research will help to narrow down search parameters for locating victims.

References:

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Taphonomy, Fluvial Transport, Postmortem Interval

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