A99 Identifying Vulture Scavenging Locations Through Global Positioning Systems (GPS), Geographic Information Systems (GIS), and Remote Sensing

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After attending this presentation, attendees will be aware of how GPS, GIS, and remote sensing were used to identify when and where vultures scavenge.

This presentation will impact the forensic science community by demonstrating how GPS, GIS, and remote sensing were used to locate 2,104 vulture scavenging locations and to identify their predominant geographic, environmental, and temporal features. The information from this presentation derives from the only study that has tagged and released vultures from a forensic anthropology research facility. This study's findings can aid investigators and forensic anthropologists trying to determine if vultures were at a scene involving human remains.

Vultures have a profound impact on the taphonomic record because these obligate scavengers accelerate decay. As a result, forensic scientists need to account for vulture scavenging when estimating the postmortem interval; however, vultures' scavenging efficiency makes identifying their prior presence at a scene difficult to detect.

To determine the environments where vultures are likely to scavenge and outcompete necrophagous insects and other scavengers in the acquisition of decomposing remains, six vultures were intentionally trapped at the Texas State Forensic Anthropology Research Facility (FARF). Prior to their release on April 10, 2013, the vultures were fitted with 70g solar-powered GPS trackers (transmitters). The tagged vultures included two adult turkey vultures, two adult black vultures, and two sub-adult black vultures (approximately one year old), and they were released in good health and unharmed. The vultures were monitored through satellites for six months, and each transmitter collected hourly spatial point data for 19 hours per day.

More than 15,000 vulture GPS data points obtained between April 2013 and October 2013 revealed the vultures traveled throughout most of Texas and into Oklahoma. Moreover, each data point recorded by the transmitters included the vultures' location in latitude and longitude, altitude above sea level, flight speed, course direction, and a time stamp. The GPS point data had a spatial accuracy of ±18m and a vertical accuracy of ±22m.

To determine where the vultures were scavenging, a digital elevation model was generated for the Texas and Oklahoma study area. Ground elevation was determined for all 15,000 vulture GPS points, then subtracted from the vultures' height above sea level, which resulted in a dataset with the vultures' height above ground. From this new dataset, scavenging locations were defined as daytime points with heights above ground ranging from ±10m; negative values can result from normal variability in the GPS data.

A GIS was used to extract land cover values associated with each scavenging location and to calculate distances between vulture scavenging locations and water and roads.

Results reveal both turkey and black vultures prefer evergreen forests and shrub land for scavenging and normal daily movements. Additionally, vulture scavenging sites on average are located closer to a permanent water source than to a road. Turkey vulture scavenging locations (n=695) averaged 450m from permanent water sources and 609m from roads. Black vulture scavenging sites (n=1,409) averaged 361m from permanent water sources and 547m from roads. The isolation of scavenging locations within the GPS tracking data also revealed that turkey vultures prefer to scavenge in the afternoon, whereas black vultures prefer to scavenge the morning.

GPS tracking of vultures trapped and released from the FARF provided new insight on flight and scavenging behaviors of vultures in Texas and Oklahoma. GIS and remote sensing allowed for the identification and analysis of vulture scavenging locations. The results from this study can help forensic investigators decide which habitats and landscapes are associated with increased vulture scavenging when assessing human remains at crime scenes.

Support for this research was provided by the National Science Foundation (NSF) Doctoral Dissertation Research Improvement Grant (PD 98-1352) and the Louisiana State University (LSU) West-Russell Award. The findings and opinions to be presented are those of the authors and not necessarily those of either the NSF or LSU.

Vulture Scavenging, GPS, GIS

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