H69 Developing a Regional Forensic Taphonomy: Environmental and Climatic Inputs

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The goal of this presentation is for the attendee to better understand the potential for interdisciplinary environmental data and geographic information systems to improve death investigation using a regional taphonomic approach.

This presentation will impact the forensic science vommunity by assisting the attendee to consider how a regional taphonomic approach might be developed for his or her jurisdiction.

Regionally specific taphonomic models are necessary in forensic death investigation to correctly interpret the condition of the body, estimate time since death, and interpret cadaver dog searches. This is particularly true in outdoor settings where weather, climate, and topography affect temperature, moisture, and scavenging, and hence decomposition patterns. In order to refine the forensic taphonomy model for northern New England, this research uses an interdisciplinary approach (anthropology, geology, botany, entomology, chemistry, cadaver K-9 use, and wildlife management) with a combined methodology of forensic case series analysis and Geographic Information Systems (GIS) mapping of environmental variables. The project will also test key components of the revised model using actualistic experimentation with pig cadavers. In addition to public-use GIS environmental data layers and local GPS point data from the case series, the model incorporates a measure of accumulated degree days to characterize cases in the reference series that have a known time since death. Additional refinements include consideration of the impacts of recent climate change on necrophagous insect metamorphosis and on decomposition patterns.

Although it is readily acknowledged that taphonomic interpretation is ideally an interdisciplinary effort, forensic death investigation generally relies upon anthropology or entomology alone to contribute a taphonomic perspective. The very real limits of jurisdictional financial resources often prevent more elaborate approaches. However, taphonomic input can be critical for forensic investigations, especially in estimating time of death, place of death, and in differentiating trauma from postmortem artifact. Through a university-government partnership we are developing an interdisciplinary taphonomy reference database and model to improve the quality and uniformity of multidisciplinary data collection at outdoor scenes, and provide an evidence base for interpreting these taphonomic data. The initial focus is on the related goals of improving detection of remains and interpreting time since death.

In Phase I of the project a Northern New England GIS-Taphonomy Reference Archive ("NNE GIS-Taph") was created using publicly available datasets, including: topography; soil type and pH; geology; hydrology; vegetation; leaf cover; precipitation; and temperature. These GIS layers were added to statewide orthographic aerial photography data for both leaf-on and leaf-off views. The environmental layers provide an archive of generic data that can be used to inform an investigation of a new forensic site. Those preliminary data can be made more specific as a cadaver search or a body recovery is done. Point data (with specific GPS locations) have been added for cases already in our reference series, which have a known time since death; point data for cadaver dog finds are also included. When remains have been found, data describing body condition and spatial distribution are added to the GIS-Taph, which functions as a relational database. GIS software applications can also accommodate digital photographs linked to spatial locations. In this way the system accumulates case data, which provide an ongoing evidence base for forensic interpretation and modeling.

Another component of Phase I is the development of interdisciplinary assessment and data collection protocols. Members of the team have provided draft standards for a "rapid assessment" of a forensic scene's environmental characteristics: geology (topsoil, topography, drainage, pH), botany (plants, pollen), zoology (insects, scavengers), and aquatic site characteristics, as well as characteristics that potentially impact detection by cadaver dogs. The environmental assessment tools will include data collection protocols for insects, plants, soils, vertebrate and invertebrate scavengers, and volatile chemicals. Data collection protocols will be tested on the pig cadaver experimental sites as they become available. The pig cadaver test sites are each paired with an environmentally similar control site for which the same data collection protocols will be used. Pig cadavers at most sites will be protected from mammalian scavenging by custom-built cages; at other sites scavenging will be documented with video cameras.

Taphonomy, Environmental Assessment, Geographic Information Systems

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