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Using Trace Metal Concentrations in Muscle to Determine Geolocation of
White Tailed Deer
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The purpose of this research was to determine if regionality of white tailed deer (*Odocoileus, O. virginianus*) could be established through analysis of trace metals in their muscle tissue. The Organization of Scientific Area Committees for Forensic Science (OSAC) has said that determining regionality of heavily poached wildlife is one of the most important areas of future research. While DNA is a major focus and more commonly used, chemical methods- such as what this research entailed, is far more cost efficient and faster. This would be significant for the future because deer meat could then be analyzed to determine its origin. White-tailed deer are one of the most poached species in the United States. If questionable deer meat is found in a hunter's freezer and can be proved to be meat sourced from several different states, this turns from a state to a federal matter. To start this research, several tissue samples were collected from across the United States, then dried and measured. A specific, set quantity of each tissue sample was digested in 70% Nitric Acid with heat for 3 hours. The solution of acid and tissue was then diluted with 13 mL of deionized water and centrifuged to separate fully digested material from tissue particles that were still solids. Samples were collected in scintillation vials, labelled, and brought to Boston to be analyzed using inductively coupled plasma atomic emission spectroscopy (ICP-AES). This instrumentation is an analytical technique in which levels of elements present can be determined precisely and quickly. The trace metals looked at were Aluminum, Nickel, Selenium, Zinc, Iron, Phosphorus, Magnesium, Potassium, Copper, and Manganese. However, due to the elemental concentrations being so minor in some of the choice elements, numbers were only concluded for Aluminum, Zinc, Iron, Potassium, Magnesium, Phosphorus, and Copper.

After statistical analysis it was concluded that geolocation cannot be determined by looking solely at the trace metal concentration found in the tissue of white tailed deer. Data was not significantly different enough to confidently place a deer in a specific state or region. Data

was organized in multiple ways including by state, regions according to US Fish and Wildlife, and regions corresponding to directionals North, South, East, and West. However, even after experimenting with the distribution of data, the same result of not having significantly different concentrations still existed. The concentrations of trace metals found in the tissue did not demonstrate species differentiation between White Tailed Deer and Mule Deer, or between sex, Male and Female. However, it is still hypothesized that elemental differences can be discovered across the range of white tailed deer. Further research will occur to look into the reason why geolocation could not be determined from this process and what could be done differently in the future. Next, bear will be sampled and using a similar methodology, analyzed to see if their geolocation can be determined.