Quantifying Elk Aggregation from Gps, Satellite, and UAS Data on The National Elk Refuge

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The transmission and prevalence of CWD and other wildlife diseases likely depend on the density of animals on the landscape, which can have important implications for the frequency of animal contacts and the potential for environmental transmission. Amid increasing concern regarding the spread of CWD, new tools are needed to characterize the degree to which animals are aggregated on the landscape so that managers can assess the effectiveness of actions intended to reduce aggregation and disease transmission. Ideally, the type of data used to measure aggregation would a) provide precise and accurate information on how aggregation changes through time, b) yield additional information on the number and distribution of animals, and c) be inexpensive. We evaluated 7 aggregation metrics calculated using elk locations on the National Elk Refuge derived from GPS collars, satellite, and UAS imagery. We assessed 1) the accuracy of these methods relative to traditional aerial and ground counts, 2) which approaches adequately identify changes in aggregation across time periods relevant for disease management action, and 3) whether aggregation metrics from different data sources can be compared directly to enable comparisons across multiple populations. We discuss potential pitfalls and benefits presented by new approaches to quantifying elk aggregations. We found that satellite and GPS data were most valuable for comparing elk aggregations across time and in relation to feeding activities. Inter-elk distance distributions and kernel density estimates represent easily interpretable metrics that are sensitive to changes in elk aggregation.