***Methods for setting AERO benchmarks for the sandy ecological site***

1. Benchmarks are set based on literature descriptions of potential and observed transport in reference plant communities – plant communities functioning sustainably- and in degraded plant communities.
2. Benchmarks are set based on structural thresholds described in the literature for bare ground cover, gap cover, and grass cover.
3. Benchmarks are set based on functional thresholds where AERO estimates increase significantly in response to changes in structure (gap cover and bare ground)
4. Benchmarks are set based on low, medium, and high values determined from literature describing changes in magnitude.
5. Benchmarks are set based on quantiles in the 90th, 75th, and 67th percentile (previous literature setting quantitative benchmarks with quantiles varied in the percentile used).
6. Benchmarks are set based on the AERO estimates for plots identified as being within the reference state.

***Method Description***

1. Literature was reviewed that described sediment transport in drylands including in the sandy ecological sites. To summarize: literature describes sandy sites as having low to no sediment transport when there is crusting, regardless of season. We will consider low to no sediment transport to be 0-1 gm-1d-1 for the non-logged AERO values because AERO values are up to ~276 for the BLM data, making 1 a negligible value. However, lack of crusting and sediment availability could increase sediment transport ~4-4.5 fold in the sandy site. Also, research in an arid, sandy environment found drought could increase sediment transport ~1.6 fold. Considering the potential increases in sediment transport because of drought and sediment availability, a value of up to ~7 gm-1d-1 can occur at sandy sites even within the reference state. Literature also describes degraded states as experiencing an order of magnitude or greater increase in sediment transport, making 7 appear as a reasonable benchmark.
2. We identified the AERO values at structural threshold values identified in literature (Bare ground = 20%; Gap (> 100 cm) = 30%; Grass = 25%). The two approaches for identifying the AERO benchmark included using the maximum AERO estimate occurring below the structural threshold or using the linear model of the comparison of bare ground and log horizontal sediment flux.
3. We evaluated the value at which AERO estimates increase significantly with structural changes (bare ground and gap cover) using the log-fit curve to help identify where the AERO values increase.
4. This method considers that sites departed from reference (shrublands), could experience an order of magnitude increase in sediment transport compared to the reference sites, and bare sites could experience two orders of magnitude increase. An increase by one and two orders of magnitude could serve as a "medium" and "high" level of erosion, respectively, whereas less than 10 is considered a “low” level of erosion.
5. We determined the AERO estimates at the 90th, 75th, and 67th percentile.
6. We set a benchmark range based on the AERO estimates for the plots within the reference state. Reference state was identified by J. Schallner using quantitative values describing the structure of the site and potential based on site characteristics (e.g., soil texture).

***Strengths of the approach***

1. This approach is based on multiple studies describing sediment transport and provides a well-informed explanation for setting the benchmark.
2. This approach uses quantitative benchmarks to understand the impacts on AERO estimates, providing a more objective approach. Also, where there are multiple structural benchmarks available, this provides multiple lines of evidence for what AERO benchmark should be.
3. This approach enables development of benchmarks where literature and research are lacking, but core method measurements are available. The observer can also use discretion in setting this benchmark and establish a more conservative benchmark.
4. Using low, medium, and high values are helpful for land managers because it provides a clear visualization of the plot’s departure relative to the potential range of departure and could be useful in conservation and restoration planning.
5. Multiple other disciplines have used quantiles to establish quantitative benchmarks because it is quantitative, objective and does not require describing a reference state or ecosystem changes. Additionally, only the quantitative data for AERO inputs are necessary for this approach.
6. Using reference state values to set the benchmark provides an approach that considers the range of spatial variability for reference state. This approach would also align with methods already used by land management agencies.

***Weaknesses of the approach***

1. This approach uses research describing ecosystem characteristics which may be specific to the area being studied. Also, the literature necessary to set these benchmarks may be lacking. Finally, measured sediment transport may not translate directly to AERO estimates, especially where there is relatively low sediment transport.
2. As with method 1, literature regarding structural benchmarks for an ecosystem may be lacking. Also, this method may not encompass all structural benchmarks that may be important in evaluating ecological states. For example, a threshold for biodiversity index rather than grass cover could present a different AERO benchmark. Identifying the AERO benchmark using the linear model may not work if there is not a linear relationship between log horizontal sediment flux and the structural characteristic. For instance, the grass cover and log horizontal sediment flux did not have a linear relationship and this approach could not be used. Additionally, there may not be a sufficient number of points to evaluate the AERO benchmark below the structural threshold. For example, bare ground only had 2 points below the bare ground structural threshold from literature.
3. There is subjectivity in determining the structural benchmark visually from the log relationship with the structural characteristic and AERO estimates. Also, certain increases in AERO estimates may not be ecologically important (i.e., lead to ecosystem changes).
4. Low, medium, and high wind erosion estimates using order of magnitude increases may not apply to different ecosystems, and where research is limited, it could be difficult to determine the low, medium, and high values.
5. Quantiles could provide arbitrary values that are not ecologically significant.
6. Areas may lack quantitative core method data for the reference state, as in this example. Also, in some locations, the reference state is not well described.