RPS Indicator Scoring Techniques

There are usually multiple ways to measure a watershed attribute when a new indicator is being developed. This document describes several of the common ways in which different indicators can scored.

Continuous values. The indicator can have any numerical value along a gradient of possible values (Examples: 3,212.4 acres of protected riparian buffer; 32% highly erodible soils in the watershed). This scoring approach is important when useful to know the differences in magnitude among different entities the indicator is comparing. Most recovery potential indicators are scored in this manner.

Rank ordering. The raw, continuous value of the indicator is used to arrange the entities from highest to lowest and give each a rank number (Examples: 15th highest bioassessment score; smallest watershed size). This method still provides comparisons among entities but the magnitude of differences among ranks is unknown and may involve abrupt or gradual changes.

Intervals. Ranges of indicator value are established and all members within the same interval have the same score (Examples: Percent protected land in 25% increments based on land measurement; number of impairment causes in 25% increments based on quartering the rank-ordered list of waters). This method trades off detail for simplicity, but can be appropriate when all members of each interval can be legitimately generalized to the same value. Intervals may be equal in value ranges or numbers of members, or may be unequal but based on natural breaks in the range of values.

Thresholds. This approach combines continuous and interval valuing concepts, and involves scoring continuously on one side of a threshold value while assigning a simplified, single value to entities on the other side of the threshold (Example: use actual % of impervious cover below 14%, assigning a uniform value of 1 if above 14%).

Absolute value scoring. Some characteristics may have a key target value most meaningful for recovery potential somewhere in the mid-range of values instead of at the maximum or minimum. Values closest to a target value on either side are desirable, and greater distance to either side diminishes the value (Example: nearness to a numeric water quality criterion - waters barely failing the criterion have greater recovery potential than waters severely below the criterion, and threatened waters barely achieving the criterion are of greater priority for restoration than unthreatened waters well above the criterion). Using the mathematical concept of absolute value enables such situations to be scored by calculating the absolute value of the target value minus the individual water's value.

Binary values. The indicator scoring has just two values, 1 or 0. This type of scoring reflects simple presence or absence of a recovery-relevant characteristic (Examples: existence of a TMDL or watershed plan; presence/absence of a target fish species being assessed). When this indicator type is being developed, special care should go into deciding whether a watershed with no reported presence of the indicator trait is truly its absence (which might justify the score of 0 for those watersheds) or merely lack of evidence about presence (which is properly expressed by leaving the value blank for those watersheds).

Ordered categorical values. This approach starts with non-numeric categories and assigning them in sequence of importance according to a stated criterion (Example: assigning urban-dominated, agriculture-dominated, and forest-dominated subwatersheds different category values based on general restoration cost and complexity). The method enables coarse consideration of non-numeric concepts that may significantly affect recovery, but if used, assignment of relative value differences should be reasonably supportable.

Special note: local vs cumulative values. For all indicators, users should be aware of whether the indicator value represents local or cumulative conditions. This can have a strong influence on screening results. The distinction between local and cumulative is due to the fact that most commonly-used watershed units, such as the Hydrologic Unit Codes (HUCs) that have been delineated at several scales across the country, are partial rather than whole watersheds. In other words, a HUC may be a drainage area that has other upstream HUCs draining into it, or it may be a true watershed in the headwaters with nothing else draining into it. It would have been impossible to map the HUC units across the nation at several useful scales (with similarly-sized watershed units in each) without mapping many HUCs that have additional watersheds upstream. For this reason, an indicator value for a specific HUC may represent either the measured characteristic only within the HUC (i.e., a **local** indicator) or the accumulation of the characteristic throughout the HUC plus all its upstream HUCs (i.e., a **cumulative** indicator, which sums the characteristic through its whole watershed). Only in the case of true headwaters HUCs will the local and cumulative versions of an indicator be identical. Local indicator datasets are far more common than cumulative datasets. If only local data are available but cumulative values are also desired, cumulative values can be calculated from local data where flow routing relationships among the units are known. In the case of HUC12s, about 50% from the lower 48 states are actually true watersheds whereas the other half receive flow from additional HUC12s up-gradient from them.