

Developing New Recovery Potential Screening Indicators

After reviewing lists and definitions of available indicators, RPS users often decide that they have additional data and can compile more indicators that will make their screening results better. Although it can be time-consuming to compile additional indicators, local or state-specific data sources often include key parameters (such as bioassessment datasets) that haven't been possible to compile nationally. It can be well worth the effort to compile new indicators if they can fill information gaps or add significant value to the quality of watershed comparison results. This document can help RPS users ensure that new indicators will be properly formatted and fully usable along with existing RPS indicator data.

Conceptualizing an indicator need: what gap might it fill? After reviewing all the sources of existing indicator data and the subcategories of information recommended under the ecological, stressor and social categories, unfilled subcategory gaps are commonly evident. Often this doesn't imply that the data are non-existent, but rather that the data for some indicator categories is available on statewide or watershed scales but spotty in coverage nationally. Biotic community data and social context data are good examples of data that are available in many states but are impractical to consistently measure nationally. A close look at the purpose for the planned screening, along with reviewing all the indicator subcategories and what is already available in each, should verify what new indicators may be worth the effort to compile.

Consistency: will new and existing indicator data be fully compatible? The answer to this question depends on several things. A new data source, first of all, must cover the entire project area in question and contain data that is finely grained enough spatially to be expressed as a watershed attribute at the same scale as the rest of your watershed indicators (e.g., as a measured attribute per HUC12). Second, it would be best if the distribution of the new data is spatially dense enough that it will generate indicator values for most if not all of the watersheds in the RPS Tool (some 'no value' blanks are acceptable). Third, new data already compiled on a watershed basis must match not just the watershed (e.g., HUC) scale but the version of the watershed boundary dataset used for all your indicators. Watershed indicator data embedded within the RPS Tool, or data from Watershed Index Online (WSIO) or the EPA EnviroAtlas, all use the same version of the national HUC12 geospatial "snapshot" dataset downloadable from WSIO as a common standard. Note that the official national download site for the Watershed Boundary Dataset managed by the US Geological Survey allows the data to be changed by state data stewards on an ongoing basis, which results in inconsistencies with the snapshot standard used by the above-named projects. In summary, all of these factors should be checked to ensure full consistency with other RPS data before investing the effort required to compile a new indicator.

Calculation: is it measurable? Even when it would appear valuable topically to a watershed comparison effort, information in a raw data source is often not in the ideal form to be used meaningfully. This is what makes indicator design and development necessary – transforming related data into usable data. For example, mapped information on stream patterns contains valuable but unusable information, unless functionally important attributes such as mean sinuosity are measured so that channelized, highly altered stream mileage can be contrasted with other, more natural stream forms. Further, as RPS compares watersheds, a measurable attribute must be reasonably suited to being expressed as a watershed attribute. The measurement also needs to be not just mechanically feasible but pertinent to the watershed screening and comparison purpose. Good indicators are developed when quality data sources are not just measurable, but measurable in relevant ways.

Directionality: what does the indicator's gradient of values mean? This question relates again to indicator use in specific RPS categories, as well as developing the calculation method. Indicator scores in each of the ecological, stressor, and social context classes need to be directionally consistent within-category for the multi-metric indices to also be directionally consistent. All ecological indicator scores are aligned so that higher values imply better condition or recovery potential, and social scores are also aligned so that higher is better. Stressor indicator scores, as most users would intuitively expect, are aligned to have a higher score associated with more impacts and lower recovery potential. However, source data may sometimes be in an opposite directional gradient of values than the indicator category must consistently have for its index to make sense. In such cases, it may be necessary to invert the order of the numerical raw scores of an indicator (for example, an ecological indicator like % highly erodible soils, whose higher values are associated with lower restorability) to align it with the other indicators of the same category. Errors in directionality are one of the more common pitfalls in new indicator development, and can have substantial negative effects on screening results.

Validation: does the indicator measure what's intended? Rarely does an indicator measure directly and exactly what would be ideal. Thus, indicators typically vary as to how well they approximate the watershed attribute they purport to measure. Although all of the principles discussed above can help improve the quality and usefulness of an indicator, testing the end result against known data is a necessary QA/QC element of indicator compilation. Quality control procedures should be part of the indicator compilation and data table development steps. It is especially important for your QA/QC process to detect indicators that are not directionally aligned (e.g., when watersheds strongly expected to score high turn out low), and guard against data transfer errors in which an entire indicator's values may be incorrect due to faulty calculation, miscopying or mislabeling. These two types of error can skew the results substantially but are relatively easy to find through diligent QC before they do their damage.

Your evaluation procedures should also examine each indicator's set of values in comparison to reference sites of known quality, including healthy as well as impaired waters or watersheds. One commonly used approach involves spot-checking sample watersheds by manually checking raw values where watershed conditions related to the indicator are well-known, particularly if examples of what should be high and low scoring watersheds are available. For each indicator's measured set of values, observe whether the indicator performed as expected with regard to these sites. For example, did a high percentage of healthy reference sites score in the top quartile for a specific ecological indicator? If healthy reference site scores were low, the indicator might have been incorrectly scored.

Compilation: what final steps add a new indicator to an RPS Tool? Ultimately, development of a new indicator for addition to an existing RPS Tool boils down to a few key products, the main one being quality-assured, watershed-specific values for that indicator for all (or most of) the watersheds of interest. These results should be compiled in a data table, organized by watershed ID and capable of being sorted into the identical order and total watershed number found in the RPS Tool to which they will be added. Metadata standards for geospatial data should also be compiled, especially a brief indicator name and descriptive definition including what has been measured, data source and date. The new names and descriptions should always be added to the Tool's INDICATOR INFO tab. Instructions for adding indicators and their data are found on the ADD INDICATORS tab of any RPS tool that has existing embedded data. Finer details on adding new indicators are available in a training video and through the RPS User Manual, both found on the RPS website's Training and User Support page.