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EMAP-West Communications

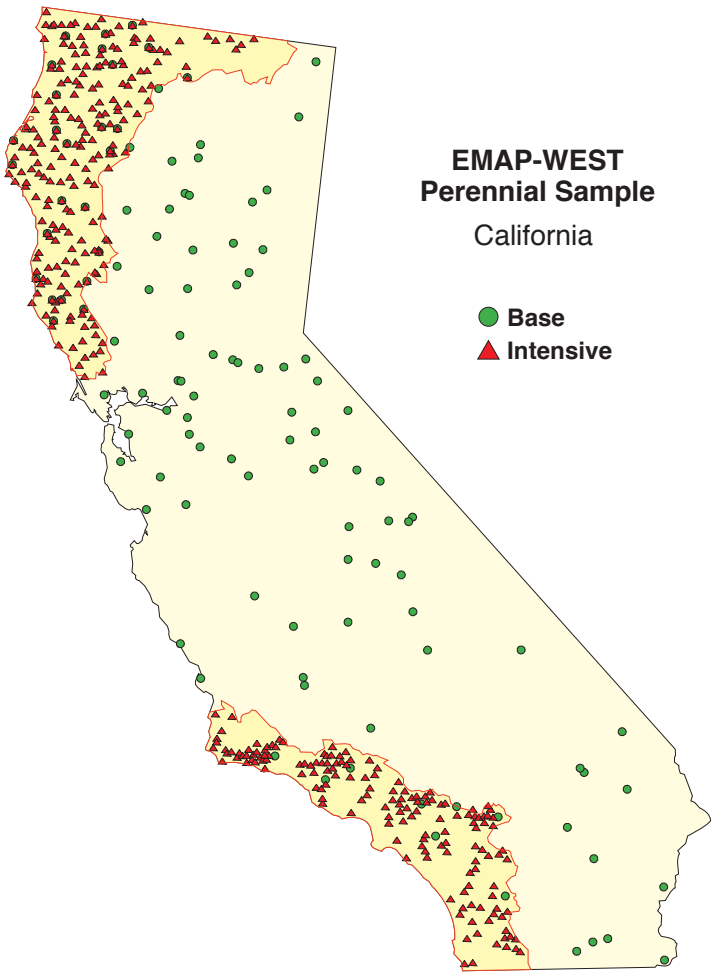
Survey Designs for Sampling Surface Water Condition in the West

Monitoring the condition of the Nation's waters, as required by the Clean Water Act (CWA), is an enormous task. The CWA delegates the bulk of this burden to the states and tribes under the guidance of the U.S. Environmental Protection Agency. State and tribal monitoring programs are challenged to meet these requirements as they are faced with growing monitoring needs and often have no additional, or in some cases dwindling, resources. Therefore, the sampling designs used for these monitoring activities must be as efficient as possible. To help meet this need, EPA's Environmental Monitoring and Assessment Program (EMAP) has developed a partnership, called EMAP-West, with the states and tribes of 14 Western states to evaluate and demonstrate the effectiveness of new aquatic monitoring designs.

It is clearly not economically possible to actually visit and monitor every single waterbody or stream segment within a state or tribal nation. The survey designs being developed by EMAP provide a rigorous way to sample a subset of all waters and then provide an estimate of the quality of all waters along with a statement about the uncertainty surrounding that estimate. These designs, also known as "sample survey designs" or "probability survey designs," have been in common use in many economic, political, and social fields as well as in timber inventory and agricultural crop surveys. EMAP has been among the earliest efforts to apply these survey designs to aquatic systems. Use of the EMAP design concepts allow the states and tribes to rigorously defend that their estimates represent all waters of the state and to estimate the uncertainty surrounding their assessments.

One of the real advantages of the survey designs developed by EMAP is that they offer the states and tribes enormous flexibility. Many states want an overall estimate of the quality of their waters, but they also may want to focus on aquatic systems in particular geographic regions or in areas of particularly high public interest. Probability surveys have the flexibility to provide both. Because of the rigorous procedure for drawing these subsamples, all of the data can be used in providing the statewide estimate and then a separate estimate for the subset of waterbodies of concern. The figure illustrates how the design is being used for the state of California in EMAP-West. Statements of condition will be possible for the entire state as well as for the shaded northern and southern coastal watersheds individually. The data from the more intensively sampled areas nest within the statewide sample and improves its reliability.

The survey design can also be integrated with indicators that have different temporal sampling requirements. For example, many states collect biological data such as fish and macroinvertebrate information during a single time of the year. They may, however, require that chemical indicators be collected on a seasonal or more frequent basis. The probability survey designs can be developed to take advantage of indicators collected on either or both of these temporal sequences.



EMAP-West is a demonstration monitoring and assessment project that encompasses nearly one third of the conterminous U.S. area and is a dramatic demonstration of the importance and flexibility of new monitoring designs to aid the states and tribal nations in meeting their requirements of the Clean Water Act. When completed, each state will be able to make a statement of condition of all their streams. The design will also support West-wide assessments as well as large areas such as ecoregions or large river basins.

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