USGS water-quality sampling in the lower Clark Fork basin

SCOPE OF WORK

Prepared by U.S. Geological Survey
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Background

The U.S. Environmental Protection Agency (EPA) has a need to measure and evaluate nutrient, suspended-sediment, and trace-element concentrations and loads in the lower Clark Fork basin associated with construction and operational activities at Milltown Dam. EPA has requested the U.S. Geological Survey (USGS) to conduct high-flow sampling at 6 sites in the basin to obtain information that can be used to estimate constituent loads discharged from various source areas to downstream reaches of the Clark Fork above Thompson Falls. The six sites are current USGS streamflow-gaging stations:

1. Clark Fork at Turah Bridge (12334550)
2. Blackfoot River near Bonner (12340000)
3. Clark Fork above Missoula (12340500)
4. Bitterroot River near Missoula (12352500)
5. Clark Fork at St. Regis (12354500)
6. Flathead River at Perma (12388700)

Approach

The lower Clark Fork sampling effort is planned to begin in the spring of 2006. Sampling primarily would be conducted during the high-flow period of April–June when scour and transport of bottom sediments from Milltown Reservoir to downstream reaches is most likely to occur. Sampling will proceed in a progression from upstream to downstream sites in an attempt to obtain a general representation of synoptic transport of constituent load. Sampling frequency will be approximately twice-monthly during April and once-weekly during May and June (about 10 samples per site). In addition, attempts will be made to collect several samples near the peak of major runoff events (about 3 samples per site). The actual frequency of sample collection will depend on the hydrologic conditions, with fewer samples collected if runoff is low. An additional 3 samples per site may be collected, as directed by EPA, during reservoir drawdowns or other unique conditions. A maximum of 16 samples per site is planned for 2006.

Samples will be collected using standard USGS protocols, as described in the National Field Manual (http://water.usgs.gov/pubs/twri). These protocols incorporate depth- and width-integrated sampling through the total depth of the water column at multiple verticals across the stream. The sampling method and use of isokinetic samplers provide a discharge-weighted sample that represents the average concentration of constituents throughout the entire cross section of the stream. This method of sampling accounts for non-uniform distribution of constituents due to incomplete mixing of inflows or

variations in hydraulic forces that affect suspension of particulate materials. In addition to discharge-weighted sampling, clean protocols for sample handling and processing (http://water.usgs.gov/pubs/twri) will be used to prevent trace-element contamination of samples by equipment or other potential sources of trace-element exposure.

Samples will be analyzed for nutrients (total nitrogen and total phosphorus), suspended sediment, hardness, and the same trace elements (dissolved and total recoverable arsenic, cadmium, copper, iron, lead, manganese, and zinc) as those in the long-term monitoring program for the upper Clark Fork basin (Dodge and others, 2005). Nutrients, hardness, and trace elements will be analyzed by the USGS National Water Quality Laboratory in Denver, Colo.; suspended sediment (concentration and sand-silt particle size) will be analyzed by the USGS Sediment Laboratory in Helena, Mont. Quality-control samples (blanks and replicates) will be collected at a proportion equal to about 10 percent of the total number of samples. The same quality-assurance practices used for the long-term monitoring program will be used for sample collection, analysis, and data management.

Data

Provisional results of water-quality samples will be provided in the Clark Fork quarterly progress reports, and are available electronically upon request. Final, approved data will be published in the annual USGS report "Water Resources for Montana", and are available at the USGS web site http://waterdata.usgs.gov/nwis/mt.

The analytical and streamflow data for each sample can be used to calculate an instantaneous load at the time of sampling. The loads for Clark Fork at St. Regis and Flathead River at Perma can be summed to approximate the total load transported to the reach of the lower Clark Fork near Plains. The knowledge of loads at various points in the basin can be used to determine the percentage of total load derived from each source area in the upstream parts of the basin.

References

Dodge, K.A., Hornberger, M.I., and Dyke, J.L., 2005, Water-quality, bed-sediment, and biological data (October 2003 through September 2004) and statistical summaries of data for streams in the upper Clark Fork basin, Montana: U.S. Geological Survey Open-File Report 2005-1356, 124 p.

U.S. Geological Survey, variously dated, National Field Manual for the collection of water-quality data: U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chaps. A1-A9, available online at http://water.usgs.gov/pubs/twri.