Arkansas Water Resources Center

WATER QUALITY SAMPLING, ANALYSIS AND ANNUAL LOAD DETERMINATIONS FOR TSS, NITROGEN AND PHOSPHORUS IN THE BAYOU BARTHOLOMEW AT GARRETT BRIDGE, AR AND NEAR PORTLAND, AR

Submitted to the
Arkansas Soil and Water Conservation Commission

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June 2005

Publication No. MSC-324

Arkansas Water Resources Center
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2004 Annual Report

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INTRODUCTION

Water quality sampling stations were installed at the Bayou Bartholomew at Garrett Bridge, AR and near Portland, AR. These stations are coordinated with USGS gauging stations at the same locations. These stations are instrumented to collect samples at sufficient intervals across the hydrograph to accurately estimate the flux of total suspended solids, nitrogen and phosphorus in the River. Bayou Bartholomew watershed is about 1.08 million acres and is located in the south east corner of the state. The land use in the watershed is mostly in forest and cropland agriculture with some urban area. High turbidity levels and excessive silt loads in the streams are problems in this watershed. The reason for high turbidity levels and silt loads are thought to be row crop agriculture. Accurate determination of stream nutrients and sediment is critical for future determinations of TMDLs, effectiveness of best management practices and trends in water quality.

SCOPE

This project is a cooperative effort between AWRC and the ADEQ Environmental Preservation Division. This report is for continued water quality sampling, water sample analysis and annual pollutant load calculations at the Bayou Bartholomew at Garrett Bridge, AR and near Portland, AR. The Garret Bridge site is a full storm-water sampling station with auto-sampler and data sonde. The Portland site has a data sonde only. These stations were installed in August 2004 and began operation in January 2005. The parameters measured from collected samples are nitrate-nitrogen, ammonia-nitrogen, total nitrogen, total phosphorus, dissolved reactive phosphorus and total suspended solids. In addition turbidity, conductivity and pH will be measured in-situ and recorded in sixty-minute intervals. Also, the AWRC in conjunction with the USGS will conduct cross-section sampling to determine the relationship between autosampler concentrations and cross-section concentrations. AWRC and ADEQ will collect samples and analyze the data from the water quality sampling stations, compute the annual loads for all parameters and report annually to the ASWCC. This data will be incorporated into ADEQ's monitoring database and the ASWCC's Annual Report on the NPS Management Program. This report is for calendar year 2004.

METHODS

The Garret Bridge site is a full storm-water sampling station. It uses an automatic sampler to collect storm water samples as well as a data sonde to collect continuous turbidity and conductivity information. The Portland site is instrumented with a data sonde measuring turbidity and conductivity. There will be grab samples collected every two weeks at the Portland as well as one per storm event, which will be used to develop surrogate relationships between turbidity and TSS and conductivity and nutrient concentrations.

Initially, the sampler will be operated in a discrete mode, taking timed discrete samples during two storm events. The sampler will be set to begin taking samples when the stage rises to ten percent over the prior base flow. Discrete samples will be collected when all twenty-four bottles are filled or within forty-eight hours after the first sample. Grab samples will be taken often enough to have a minimum of one sample between each storm event. The samplers will be operated using this protocol until two storms are adequately sampled. The results from this initial sampling phase will be used to determine the sampling start (trigger) and frequency for flow-weighted composite sampling. In addition, the results will be used to develop rating curves to predict pollutant concentrations as a function of discharge in order to calculate loads for inadequately sampled storm events.

The trigger levels for the storm sampling will be set after studying the results from the initial (intensive) sampling period. Trigger levels will be chosen so that any chemograph peaks that may occur early in a storm will be included in the storm sampling. The volume used in the flow-weighted composite sampling will be determined from the results of the intensive sampling.

The sampler will begin sampling after the stage rises to ten percent over the prior base flow. They will take a discrete sample after a fixed volume of water has passed. The volume of water used for the flow-weighted composite samples, i.e. sampling frequency, is to be determined from the results of the initial sampling phase. The discrete samples will be composited by combining equal volumes of each into a single sample for analysis. Discrete samples will be collected for compositing when all twenty-four bottles are filled or within forty-eight hours after the first sample. Storms will be sampled in this manner for the period when the river stage is rising and for some period after. Grab samples will be taken approximately every two weeks, but a minimum of once between each storm event after the initial sampling phase. All samples will be collected by ADEQ personnel and transported to the AWRC Water quality Laboratory for analysis. All samples will be analyzed for nitrate-nitrogen, ammonia-nitrogen, total nitrogen, total phosphorus, dissolved reactive phosphorus, turbidity and total suspended solids.

In addition to the above sampling for load determination, the AWRC in conjunction with the USGS will conduct cross-section sampling to determine the relationship between autosampler concentrations and cross-section concentrations. The USGS will collect evenly weighted integrated (EWI) cross section samples at the same time AWRC collects discrete autosamples. All samples will be transported and analyzed by the AWRC Water

Quality Lab and the results used to determine correction factors for the auto sample concentrations. Six storm flow samples will be taken and compared during the first year at each site.

RESULTS

Although the sampling equipment for these sites was installed in August 2004, no samples were collected until January 2005.