

SAMPLING AND ANALYSIS PLAN

***Project to Address
Water Quality Assessment
Of Owl Creek
Hot Springs County, Wyoming
2005***

SUBMITTED TO
WYOMING DEPARTMENT OF AGRICULTURE

for

Hot Springs Conservation District

Prepared By

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INTRODUCTION

Project Background

In 2002 Owl Creek, from its confluence with the Big Horn River and upward an unknown distance was listed as impaired by the Wyoming Department of Environmental Quality (DEQ) and placed on the Clean Water Act (CWA), Section 303(d) list of impaired waters for fecal coliform.

Fecal coliform levels in Owl Creek exceeded DEQ standards in 2002 from a one-time sample at the Highway 20 Bridge that crosses Owl Creek at 580 Highway 20 N. from Thermopolis, Wyoming. Hot Springs Conservation District (HSCD) has worked cooperatively with the residents/landowners of the Owl Creek Watershed to bring about a resolution to the situation. Following a resident/landowner meeting in the spring of 2005, a steering committee was formed to guide the HSCD. Following the advice of the steering committee, the HSCD wrote a grant to apply for funding from Wyoming Department of Agriculture to do water quality sampling in the Owl Creek Watershed. The steering committee identified water quality monitoring as an action to evaluate the effectiveness of the watershed plan and BMPs.

Purpose

HSDC has been awarded Wyoming Department of Agriculture grant money to do water quality sampling in the Owl Creek Watershed. This Sampling and Analysis Plan (SAP) will outline water quality monitoring activities for the Owl Creek Watershed for 2005 through 2006. The SAP will be reviewed and amended as needed. The resulting data will be used for BMP selection and placement as well as land use planning. The water quality objective includes:

1. Collect geometric mean data in the Owl Creek Watershed

LOCATIONS AND TIMING

The sampling locations were chosen based on access availability. Site #1 – Owl Creek Bridge @ U.S. Highway 20 was chosen as that is the site used by USGS for their sample. Site #2 is located at the Highway 120 bridge, where it crosses Owl Creek. Site #3 is at the bridge on State Highway 170 where it crosses Owl Creek at the Arapahoe Ranch. Site #4 is at the bridge on County Road 174 as it crosses the South Fork of Owl Creek.

Designated Sampling Sites

The following locations will serve as designated sampling sites for the Owl Creek Watershed. If for some reason a sample cannot be collected at the designated site, a notation will be made to the data sheet and/or the field notebook.

<i>Site Name</i>	<i>Legal Description</i>	<i>GPS Coordinates</i>
Site #1 Bridge on U.S. Highway 20 over Owl Creek @ 580 US Highway 20 N.		
Site #2 Bridge on Wyoming Highway 120 over Owl Creek at 660 Highway 120 West		
Site #3 Bridge on Wyoming Highway 170 over Owl Creek at 2080 Hamilton Dome Road		
Site #4 Bridge on Hot Springs County Road 174 over South Fork of Owl Creek at		

Timing

A minimum of five samples per 30 days will be collected for bacterial samples for the purpose of calculating geometric mean data. Additional single samples may be collected throughout the watershed as needed. Field tests for temperature, pH, conductivity and turbidity will be collected at each sampling site.

Parameter	September	April
Temperature	<u>X</u>	X
pH	<u>X</u>	X
Conductivity	<u>X</u>	X
Turbidity	<u>X</u>	X
<i>E.coli</i>	X	X

PROJECT PERSONNEL

James Kirsch is the Water Specialist for the current water monitoring program. He will be working under the direct supervision of Hot Springs Conservation District Board of Supervisors.

SAMPLING AND ANALYSIS

Sample Collection

Bacterial samples (*E. coli*) will be collected using sterile Whirl-Pak™ bags, chilled and returned to the Hot Springs Conservation District lab according to WYDEQ SOP Manual for fecal coliform. Samples are labeled in the field at the sampling location. Sample identification consists of stream name, site name, date of collection and parameter. Collection times, collector’s name and chain of custody information are recorded on the laboratory data sheet.

Samples are taken from the middle of the moving stream just below the surface. The samples are taken immediately after breaking the sterile seal of the Whirl-Pak™ bags. Samples are then placed in a cooler with ice and delivered to the lab within 6 hours. A minimum of one trip blank and one duplicate will be collected per sampling trip. Additional duplicates will be taken as necessary to provide one duplicate for every ten samples collected.

Field tests (pH, temperature, conductivity and turbidity) will be conducted at each of the sampling locations from the middle of the stream. Attention will be paid to conduct these tests at the same location bacterial samples are collected.

Physical and Chemical Parameters:

Specific Conductivity will be measured using an Oakton TDS Testr Conductivity Meter. The calibration will be checked according to Oakton operating instructions. The meter will be calibrated prior to field sampling.

pH will be measured using a YSI D0200 portable pH meter complete with pH electrode and temperature probe. The calibration will be checked according to Oakton guidelines.

Water temperature will be measured using a YSI D0200 portable pH meter complete with pH electrode and temperature probe. The calibration will be checked according to Oakton guidelines.

Turbidity will be measured using a LaMotte 2020 Turbidimeter. The calibration will be checked on the day of testing.

Biological Parameters

E coli samples will be analyzed using the Colilert® method. Colilert®, developed by IDEXX Laboratories, Inc., is an enzyme substrate containing nutrient indicators that simultaneously detects both total coliforms and *E. coli* in water. IDEXX's multi-well quantification procedures (Quanti-Tray® and Quanti-Tray®/2000) estimate bacterial density according to the same probability model of the Most Probable Number (MPN). The Colilert® method of *E. coli* analysis will be administered by the Hot Springs Conservation District Laboratory according to procedures specific to the Colilert® method.

QUALITY ASSURANCE/QUALITY CONTROL

Quality assurance will be achieved by closely following the Wyoming Department of Environmental Quality Manual of Standard Operating Procedures for Sample Collection and Analysis. A copy of the manual will be maintained in the district office for easy reference and an additional copy will be taken to the field in case of questions arise during actual field monitoring. Field monitoring equipment will be calibrated according to the manufacture's guidelines. Calibrations will also be recorded in the calibration log book. Calibration solutions will be used in accordance with manufacture's recommendations.

The Owl Creek Water Quality Monitoring Plan is covered by the Wyoming Department of Environmental Quality, Water Quality Division, Watershed Program, Draft, BURP Monitoring

Quality Assurance Project Plan (QAPP) (2001). This plan also complies with Wyoming Statutes W.S. 35-11-103 (b) and (c) and W.S. 35-11-302, (Wyoming credible data statute).

Samples for lab analysis will be collected following the Wyoming Department of Environmental Quality Manual of Standard Operating Procedures for Sample Collection and Analysis (Available at the division's web site www.deq.state.wy.us). Samples will be stored and transported to the Hot Springs Conservation District laboratory. The Wyoming Association of Conservation Districts provides training for district personnel in water quality monitoring. The district will continue working with Wyoming DEQ and USGS on sample analysis. The conservation district will run blanks and duplicates on all samples taken to help insure quality on both lab and field sampling procedures.

Corrective Actions

For bacterial data, the HSCD District Manager will review data sheets received from the water specialist to verify that holding times do not exceed 6 hours and that all data fields are completed. The district will work cooperatively with the water specialist to verify that requirements are met. If chemical data is questionable or values seem odd, instruments will be recalibrated and standards will be checked for accuracy.

In order to identify any problem(s), the District Manager will conduct an assessment of the data sampling and analysis at least once during the project. If a major problem exists, corrective action will be taken immediately and documented. In those situations where independent expertise is needed to assess a certain aspect of the project, the district will request technical assistance from the Wyoming Department of Environmental Quality (DEQ).

Field Notebook

Field notebooks will be kept by the Hot Springs Conservation District (HSCD) Water Specialist and remain in the district's office when not in use. Field conditions, field observations, sampling location information and narrative information concerning any special circumstances or corrective action will be recorded in the field notebooks.

Sample Identification

Samples will be labeled in the field at the sampling location. Sample location, date of collection, watershed name and the initials of the sample collector will be included on sample identification labels. The lab form will be used to record time of sample collection and chain of custody.

Equipment Calibrations

The calibration of YSI D0200 pH Meter will be conducted using standard pH 7 and pH 10 buffer solutions for the two point calibration method. Specific conductivity will be checked using a standard solution (1413 μ S) on a weekly basis. All equipment will be calibrated according to the manufacturers' recommendations. A calibration log will be kept with the equipment to record calibrations completed. The log will include the dates of calibration, calibration solutions, expiration dates and initials of the person performing the calibrations.

Data Quality Objectives

Data quality objectives in terms of accuracy, precision and completeness are outlined in the table below. Geometric mean sampling of *E. coli* will consist of collecting six samples within a 30-day period with the objective of having at least five of the six samples to be of good data quality. When all six samples are of good quality, all six results will be used for calculating geometric means. Blanks will be run with each sample set to establish that samples are not contaminated but are a true representation of the stream water quality. The Colilert® method utilizes the MPN (most probable number) value to estimate the mean density of coliforms in the sample. The method will provide counts from 1 cfu (coliform forming unit) per 100mL up to 2,419 cfu/100mL. When a result is recorded as >2,419 cfu/100mL, the value 2,419 cfu/100mL will be used. If a specific sampling location consistently results in values >2,419 cfu/100mL, dilutions will be performed in an effort to more accurately reflect the water quality of that location.

Parameter	Precision from Duplicates	Accuracy	Resolution	Completeness	Method Reference
Temperature	+/- 10%	+/-0.5°C	0.1°C	90%	EPA 170.1
pH	+/- 5%	+/-0.01pH	0.01pH	90%	EPA 150.1
Conductivity	+/- 10%	+/- 1% full scale, excluding probe error	0 to 1999µS/cm	90%	EPA 120.1
Turbidity	+/- 10%	+/- 2% of reading plus stray light from 0 to 1,000 NTU	0.01 NTU on lowest range	90%	EPA 180.1
<i>E. coli</i>	*40%	**	1 cfu/100mL	85%	See WDEQ <i>E. coli</i> SOP

*Relative % difference between two different samples

**Duplicate counts of the number of positive wells identified from a Quanti-Tray® sample for the same analyst should agree within 5% and those between two different analysts within 10%.

DATA MANAGEMENT AND PRESENTATION

Data Validation

The Water Specialist will be responsible for receiving the data sheets and field/ laboratory notebooks, checking for errors in identification, decimal placement, dates, times, units reported and comments. Personnel collecting data will be contacted immediately if there are data gaps or if scheduled sampling times were missed.

Sample results will be evaluated individually by performing appropriate mathematical analysis for precision or accuracy for each sample. The District Manager and Water Specialist will be allowed to access project data and submit reports to data users. All data will be accompanied by quality control information.

Data will be printed out in lists and graphs with lists checked against original data sheets. The Water Specialist will be responsible for correcting data entry errors. It is the responsibility of the Water Specialist to evaluate the raw data generated by the contract laboratory for appropriate numeric reduction, data quality, and accuracy. All data will be reviewed and reported in units specified at the detection level of the analytical methods used.

To reduce data point loss, data that are reported as “less than” the detection level will be incorporated at a value equal to the minimum detection level. Once data are generated, they will be compiled in a data base file. During this data transfer, the information will be reviewed and verified in accordance with data quality objectives.

Biological data will be reported in milligrams per liter (mg/l). Conductivity will be reported in μS and turbidity will be reported in NTU. Scientific notation will be used if necessary and significant figures will correlate with detection levels. Both graphing and narrative conclusions will be used to describe the water quality results and trend variations.

Established data quality objectives will be compared with the results of all quality assurance and quality control samples. Data that does not meet data quality objectives will be evaluated on a case-by-case basis to determine if the data is useful for watershed planning or provides valuable information relative to the water quality objectives. The Water Specialist and District Manager will evaluate completeness, accuracy, precision, and comparability. If the data quality objectives have not or cannot be met, the problem will be addressed either by correcting errors in the system, or by adjusting the objectives.

Data Storage

Data will be maintained and kept on file at Hot Springs Conservation District, 318 North 6th, Thermopolis, WY 82443. Hot Springs Conservation District will provide copies of all data to the Wyoming Department of Agriculture and Wyoming Association of Conservation Districts after completion of sampling. Electronic copies of raw data sheets, geometric means and compiled data will be kept on the HSCD server. The HSCD server is backed up to a removable hard drive daily. The data will also be copied to compact disks and stored in the HSCD office.

Data Availability

Data will be made available to any interested party upon request as soon as lab results are available. Data will be identified as provisional, until analysis and reporting is completed. Copies of the data will be made available following HSCD policy.

Data Management

Data analysis will involve calculation of geometric means according to the WYDEQ SOP Manual for Sample Collection and Analysis. When duplicate samples are taken, the arithmetic mean of those samples will be used as the data point for that sample. All data will be organized in spreadsheet format and charts and/or graphs will be generated when needed.

REPORTS

The Hot Springs Conservation District will compile water quality data and submit the information to Wyoming Department of Agriculture and Wyoming Association of Conservation Districts for review and to fulfill grant reporting requirements. Annual reports may be written to capture both numeric and narrative data. The district will also report to the Owl Creek Steering Committee on a monthly basis regarding the water quality objectives and data collected.

REFERENCES

Manual of Standard Operating Procedures for Sample Collection and Analysis (Revised September 2004). Wyoming Department of Environmental Quality, Water Quality Division, Watershed Program. Cheyenne, WY.

Manual of Standard Operating Procedures, Wyoming State Analytical Laboratory. Laramie, WY.