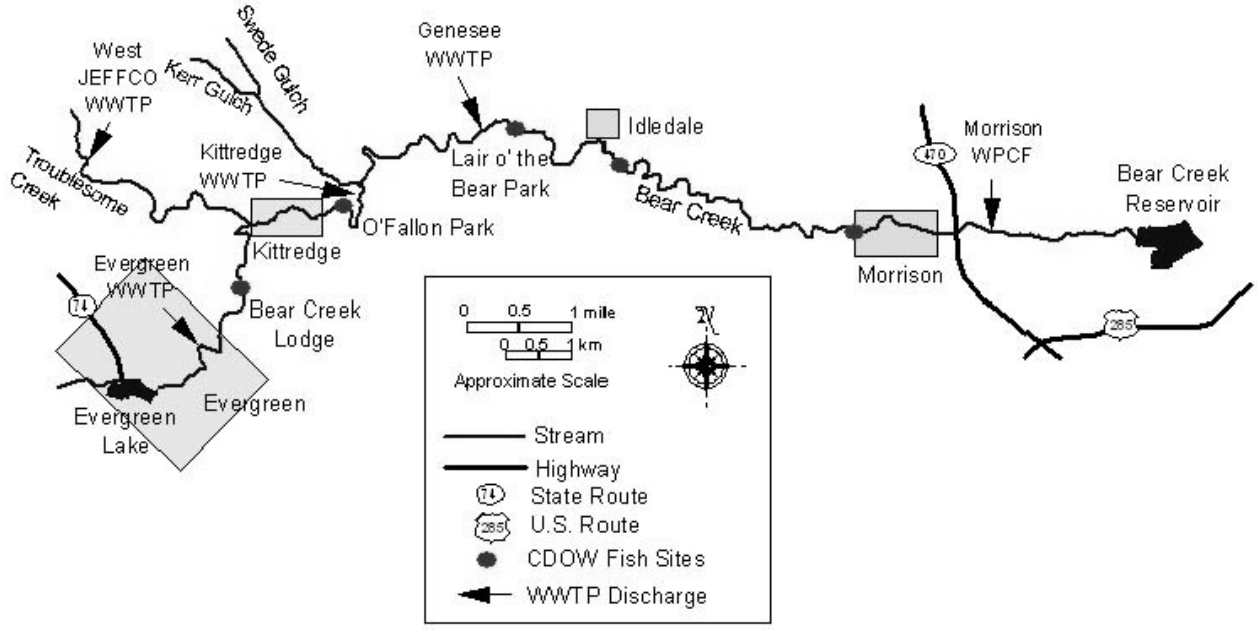
Appendix A: Summary of the Bear Creek Segment 1a Supplemental Monitoring Program For May 1-September 30, 2006

TABLE OF CONTENTS

LIST OF TABLES

PURPOSE SUPPLEMENTAL MONITORING PROGRAM

The Bear Creek Watershed Association (Association) continued a special stream monitoring program for Bear Creek Segment 1a during the summer of 2006. The portion of Bear Creek Segment (COSPBEO1a) listed on the State of Colorado's Monitoring and Evaluation List Regulation #94 is from below Evergreen Lake to the Harriman Diversion. Temperature and water quality monitoring data, and sampling results obtained from ten in-stream locations, and data from four wastewater treatment plant (WWTP) effluents are summarized in this report.



The Association Monitoring Program (Program) included data gathering locations outside of the listed Segment. Those locations and parameters include: Above Evergreen Lake at the Clear Creek County line (Temperature), above Evergreen Lake at the Colorado Division of Wildlife (CDOW) site (Temperature, sampling and water quality monitoring), at the inlets of Bear Creek to Evergreen Lake-at the wetlands, at the secondary channel and the main channel (all Temperature), in Evergreen Lake, near the dam at a profiling station: Surface (Temperature, sampling and monitoring), 5 feet down (Temperature), 10 feet down (Temperature and monitoring) and 15 feet down (Temperature). The complete 2006 water quality data set is an electronic attachment to this data summary report.

The Program is a cooperative effort between the Association and the four larger wastewater treatment plant dischargers into Bear Creek Segment 1a. The entities include Evergreen Metropolitan District (EMD), West Jefferson County Metropolitan District (WJCMD), Kittredge Sanitation and Water District (KSWD) and Genesee Water and Sanitation District (GWSD). This supplemental 2006 monitoring program began May 1, 2006 and was completed on September 30, 2006. (A limited sampling and monitoring program continues through the spring of 2007.) The in-stream monitoring program provides more detailed water quality information specifically for temperature, pH, dissolved oxygen, specific conductance and ammonia in Bear Creek Segment 1a. The monitoring program design specially addresses the listing parameters of aquatic life, temperature and ammonia as included in the 2004 and 2006 Colorado Monitoring and

Evaluation Lists. The Water Quality Control Division (Division), as supported by the Colorado Division of Wildlife (CDOW) recommended retaining the segment on the 2006 Monitoring and Evaluation List (Regulation #94).

An evaluation of temperature data collected by the Bear Creek Watershed Association (Association) from 2002-2005 using a maximum weekly average temperature threshold of 20 degrees Celsius (MWAT 20) had no exceedances. As such, the impact of temperature on the stream fishery remains controversial.

In 2005 and 2006, the Environmental Protection Agency (EPA) listed a portion of the Bear Creek Segment 1a from the Evergreen Lake outfall to the Harriman Ditch in Morrison, Colorado as impaired by temperature resulting in an impact to the aquatic life, specifically the fishery. EPA claims evaluated temperatures in the segment above a 20 degree Celsius mark stressed the fishery during lower flow periods and caused a decline in the biomass and size class at several upstream locations.

BACKGROUND INFORMATION

A portion of Bear Creek Segment 1a proposed for listing as an impaired stream segment was not included on the 2004 or 2006 Colorado 303(d) list by the Colorado Water Quality Control Commission (WQCC). However, the WQCC listed the portion of Bear Creek Segment 1a on the 2004 and 2006 Monitoring and Evaluation Lists (Regulation #94).

- The 2004 Colorado Monitoring and Evaluation List identified a portion of Bear Creek Segment 1a as potentially impaired due to temperature and ammonia, and conditions affecting aquatic life. The Association was required to obtain detailed water quality data throughout Segment 1a to determine if temperature and ammonia were a water quality problem. Although the Association has eliminated temperature and ammonia as potential problems, the Association continues to sample and monitor these parameters.

- The Association will maintain a detailed temperature and ammonia monitoring program on segment 1a for five years (through 2010) and will maintain a sampling effort until the temperature issue is resolved. The Association has committed funding to this special study through 2010. The Association will develop a minimum five-year data set of temperature readings on segment 1a. The monitoring program is detailed in a quality assurance plan.

- The Water Quality Control Division and CDOW continue to question the status of the fishery and recovery of the fishery from severe drought conditions remains debatable. The fishery data collected by CDOW for Bear Creek Segment 1a in the Bear Creek Watershed has been interpreted in different ways and providing disputed conclusions. The health of the fishery in Bear Creek segment 1a appears affected by unknown or speculated anthropogenic causes that result in annual variations (erratic increases and declines) as measured at fishery trend monitoring sites in the monitored stream reach. The Association, Division and CDOW believe more habitat, macroinvertebrate and fishery data correlated with river chemistry and flow is needed to address potential aquatic life concerns. These agencies,

along with Evergreen Trout Unlimited (ETU) want to identify factors that could or do affect the fishery and could or do result in fishery declines either within the entire stream reach or at specific locations along the stream reach.

- The routine water quality monitoring program maintained by the Association (for Bear Creek Reservoir) had not demonstrated a temperature or ammonia toxicity problem; consequently the supplemental monitoring effort was designed to assess gaps in the routine monitoring program by expanding the temporal and spatial data gathering efforts on the stream. Once the more detailed stream data was analyzed, the Association would determine the best location and sampling protocol to characterize Segment 1a.

- The Association wanted to obtain water quality data that could be used in future stream modeling and prediction. Additional evaluation and modeling of the temperature information was necessary to determine a management strategy for the stream.

- The listing for aquatic life required a more detailed stream characterization to assess how the trout populations are responding to both natural and human induced alterations. The supplemental data set allowed the Association to determine if chemical effects were part of the problem.

- The Association wanted to evaluate the cause and effect response to stream chemistry and recommend a management strategy to the Water Quality Control Commission.

SPECIAL STREAM MONITORING PROGRAM COMPONENTS

The Program consisted of several components in an effort to assemble as much pertinent scientific data and information about Bear Creek Segment 1a as possible. Components included:

Temperature Dataloggers

Programmable temperature dataloggers measure and record Segment 1a and WWTP effluent temperatures every thirty minutes. The loggers used in the Program are Onset Computer Corporation brand, HOBO model H5, HOBO model H8 and model Water Temp Pro v2 programmable dataloggers. Prior to the start of the study, the H5 and H8 model dataloggers were returned to Onset for NIST (National Institute of Standards and Technology) two-point certification and a 'tune-up'. The two-point certification was performed against calibration standards at 10°C and 20°C. The 'tune-up' consists of a new battery and quality control testing, assuring the datalogger meets manufacturer's operating specifications. The new U22 model dataloggers also received NIST two-point certifications at the same temperature points. This process occurs every spring, prior to the start of the special stream Study. The Association maintains a fact sheet with temperature monitoring protocols, as included in the Association annual report.

The dataloggers are placed into watertight cases (as necessary) and secured to weights before being placed underwater. The Program uses Onset computer software specifically designed for these dataloggers, which enables launch and readout (start and stop) and viewing of downloaded data. Data download devices (Shuttles) were employed to download temperature data from the HOBO model and Water Temp Pro units in the field. This provided downloads with little or no omission of data. The software automatically presents the downloaded data in graph and table formats and allows data export into a spreadsheet format.

Dataloggers were placed at ten locations in Segment 1a and in all four WWTP effluents. Additionally, one datalogger recorded measurements in Bear Creek at the Clear Creek County line, above Evergreen Lake (at the CDOW site), in Evergreen Lake (at three inlets to the lake from Bear Creek) and at four different depths at one profile station near Evergreen Dam. As mentioned above, these nine dataloggers were not within the scope of this report, but utilized for supplementary data collection and historical record. Their data will be included as an electronic attachment to this report. The datalogger identification codes and locations are shown, proceeding in a downstream direction, in Table 1.

Table 1 Datalogger Identification and Location

Datalogger ID	Datalogger Location
ALKCC	Above Evergreen Lake, at the Clear Creek county line
ALKDOW	Above Evergreen Lake, at the CDOW site
INLET1	Evergreen Lake, at the Bear Creek main channel inlet
INLET2	Evergreen Lake, at Bear Creek wetland inlet
INLET3	Evergreen Lake, at Bear Creek secondary channel inlet
EMD2A	Evergreen Lake Profile Station, Surface
EMD2B	Evergreen Lake Profile Station, 5 feet down
EMD2C	Evergreen Lake Profile Station, 10 feet down
EMD2D	Evergreen Lake Profile Station, 15 feet down
LTLBAR	Bear Creek Segment 1a, across from Little Bear, at the CDOW site
EMD4	Bear Creek Segment 1a, above EMD WWTP effluent
EMD5	EMD WWTP effluent
EMD3	Bear Creek Segment 1a, below EMD WWTP effluent
BCCDOW	Bear Creek Segment 1a, above Bear Creek Cabins, at CDOW site
WJ6	WJCMD WWTP effluent
OFPDOW	Bear Creek Segment 1a, O'Fallon Park at CDOW site
KSWD7	Bear Creek Segment 1a, above KSWD WWTP effluent
KSWD8	KSWD WWTP effluent
GWSD9	Bear Creek Segment 1a, west end of Lair o' the Bear Park, above GWSD WWTP effluent
GWSD9A	GWSD WWTP effluent
LOBDOW	Bear Creek Segment 1a, Lair o' the Bear Park, at CDOW site
EMD5A	Bear Creek Segment 1a, below Idledale, at the CDOW site
MORR10	Bear Creek Segment 1a, above Morrison, at CDOW site

The dataloggers were programmed for measurements every thirty minutes at an office computer equipped with the Onset software. At this frequency, the memory capacity is approximately 35 days for the H5 series logger, 165 days for the H8 series logger and 905 days for the U22 (Water Temp Pro) series logger. However, because of certain Onset datalogger models, some units begin recording temperatures immediately, once launched. The Association employs newer model with delayed-start capabilities. Logsheets were

utilized to record the exact time of deployment and retrieval of all units, so that erroneous measurements (measurements recorded out of water) could be omitted during the data evaluation process. In 2006, the Association purchased "shuttle" devices capable of field-downloading data from newer model dataloggers. This capability eliminated much of the erroneous measurements mentioned above.

A typical data retrieval procedure is as follows for the loggers located at WWTP effluents: Older H5 series loggers were utilized at the WWTPs because of their secure location. A laptop with the Onset software was brought to the effluent locations and the loggers were removed from their cases, data downloaded, relaunched (started) and returned to the effluent flow. After downloading, the logger cases are prepared for re-immersion by inserting a fresh desiccant packet and coating the o-ring with silicone sealant. Each logger is closed hand-tight and re-immersed.

The H8 series loggers were utilized at the Evergreen Lake locations. For downloading, these loggers were removed from their cases, connected to a shuttle device and data downloaded. After downloading, the logger cases are prepared for the re-immersion by coating the o-ring with silicone sealant. Each logger is closed hand-tight and re-immersed. H8 loggers continue with programmed measurements and do not require a re-launch. The shuttle device is then offloaded to the PC at the EMD office. Occasionally, the download process occurred precisely at the measurement instance and a measurement was lost.

The U22 series loggers were utilized in all Segment 1a locations, in addition to the two Bear Creek locations above Evergreen Lake. These loggers were downloaded to a shuttle device. Occasionally, the download process occurred precisely at the measurement instance and a measurement was lost. There are no watertight cases required for the U22 model loggers. The date and deployment time for all loggers is noted on a log sheet.

After downloading the last logger in Morrison, the laptop and shuttles are transported to the desktop computer with the Onset software at the EMD Administration office. The logger data is transferred from the laptop and from the shuttles to the desktop. The shuttles are connected to the computer via a download cable, and data on the shuttles are individually downloaded into separate program files.

Precautions were taken during the Program to avoid lost temperature data. In previous years, dataloggers have been stolen from their location and all data for that recording period lost. In an effort to minimize lost data, all dataloggers located in Segment 1a, and WWTP effluent were retrieved and/or downloaded on an approximate monthly schedule. Summary results from the temperature dataloggers are presented in the table format.

Weekly Monitoring Measurements

Monitoring for pH, dissolved oxygen, temperature and specific conductance was performed weekly at ten locations in Segment 1a. All of the locations were coincident with temperature dataloggers. (Monitoring was performed above Evergreen Lake, in Evergreen Lake at the dam face and ten feet down. These data are presented as an

electronic attachment to this report.) The monitoring identifications and locations are shown in Table 2 and parameters measured shown in Table 3.

Table 2 Monitoring Identification and Location

Monitoring ID	Location
LTLBAR	Bear Creek Segment 1a, across from Little Bear, at the CDOW site
EMD4	Bear Creek Segment 1a, above EMD WWTP effluent
EMD3	Bear Creek Segment 1a, below EMD WWTP effluent
BCCDOW	Bear Creek Segment 1a, above Bear Creek Cabins, at CDOW site
OFPDOW	Bear Creek Segment 1a, O'Fallon Park at CDOW site
KSWD7	Bear Creek Segment 1a, above KSWD WWTP effluent
GWSD9	Bear Creek Segment 1a, west end of Lair o' the Bear Park, above GWSD WWTP effluent
LOBDOW	Bear Creek Segment 1a, Lair o' the Bear Park, at CDOW site
EMD5A	Bear Creek Segment 1a, below Idledale, at the CDOW site
MORR10	Bear Creek Segment 1a, above Morrison, at CDOW site

Table 3 Weekly Monitoring Events

Sampling/ Monitoring ID	Parameters
LTLBAR	pH, Temperature (Temp.), Dissolved Oxygen (DO), Specific Conductance (SpCd); Total Ammonia; Temp. Datalogger
EMD4	pH, Temp, DO, SpCd, Total Ammonia: Temp. Datalogger
EMD3	pH, Temp, DO, SpCd, Total Ammonia: Temp. Datalogger
BCCDOW	pH, Temp, DO, SpCd, Total Ammonia: Temp. Datalogger
OFPDOW	pH, Temp, DO, SpCd, Total Ammonia: Temp. Datalogger
KSWD7	pH, Temp, DO, SpCd, Total Ammonia: Temp. Datalogger
GWSD9	pH, Temp, DO, SpCd, Total Ammonia: Temp. Datalogger
LOBDOW	pH, Temp, DO, SpCd, Total Ammonia: Temp. Datalogger
EMD5A	pH, Temp, DO, SpCd, Total Ammonia: Temp. Datalogger
MORR10	pH, Temp, DO, SpCd, Total Ammonia: Temp. Datalogger

Weekly measurements were performed in the morning and began at approximately 8:00 in Evergreen Lake. Measurements were recorded with a Yellow Springs Instruments, Inc. (YSI) Model 556 MPS hand-held meter. The meter utilizes a multi-probe sensor, capable of measuring pH, temperature, dissolved oxygen and specific conductance simultaneously. The measurements are logged and retained in the on-board computer until manually or electronically downloaded. Typically, the logged data was manually downloaded by viewing each file and transcribing data onto weekly Logsheets. At the completion of the Program, the memory was downloaded to a computer for use as a quality control check. Prior to the Program, the meter was calibrated by certified technicians at Geotech Environmental Equipment in Denver. Prior to each monitoring event, the meter was calibrated for each parameter, using a purchased calibration solution for specific conductance and technician-mixed pH buffers (two-point calibration, 7.00 and 10.01). All calibrations were documented on a Calibration Logsheet.

Fresh batteries were installed in the meter at the start of the Program and batteries were replaced when the observed battery charge reached 50%. The YSI multimeter utilizes an YSI software program to download and present collected data. Ecowatch software presents the data in graphic and tabular formats and data can be exported into a spreadsheet program.

Total Ammonia Weekly Sampling

Weekly sampling for total ammonia was performed at ten locations in Segment 1a. In addition, one of the sites above (ALKDOW) and one in Evergreen Lake (EMD2A) were sampled. As stated above, this data will be included as an electronic attachment to this report.

Sampling was performed concurrently with weekly monitoring. The weekly sampling and monitoring was also coordinated with permit sampling performed by the WWTP's discharging into Bear Creek. The reason for this coordinated effort was to attempt to provide a water quality "snapshot" of Bear Creek at that point in time. Also, measuring pH and temperature at the exact time and location of ammonia sampling provided the necessary data to calculate the unionized fraction of ammonia.

WWTP effluent ammonia samples are analyzed by treatment plant laboratories: EMD, WJCMD and KSWD plant effluents were analyzed by EMD personnel, as typically done for CPDES permit reporting. EMD personnel utilize the EPA-approved Method 4500-NH3 D., *Standard Methods for the Analysis of Water and Wastewater, 20th Edition.* Similarly, GWSD WWTP personnel analyzed plant effluent per approved methods: Method 4500-NH3 D., *Standard Methods for the Analysis of Water and Wastewater, 20th Edition.*

Samples taken in the field were documented on Weekly Logsheets and on EMD Chain of Custody forms. Samples were taken in polyethylene bottles, unpreserved, and immediately iced. Sampling events resulted in same-day transport to the University of Colorado Limnology Laboratory. Samples were iced upon collection and during transport. The CU Limnology Laboratory uses a low level, spectrophotometric method: Method 4500-NH3 F., *Standard Methods for the Analysis of Water and Wastewater, 20th Edition.* Summary results of the ammonia sampling are presented in the table formats.

Monthly Total Organic Carbon (TOC) Sampling

Monthly sampling for total organic carbon (TOC) was performed at the seven CDOW fish survey locations in Bear Creek. Six of the seven locations are within the listed portion of Segment 1a. The remaining location (ALKDOW) was above Evergreen Lake. As stated above, this dataset will be included as an electronic attachment to this report.

Sampling was performed at the CDOW fish survey sites in a growing effort to obtain the most complete definition of water quality parameters affecting aquatic life.

Samples taken in the field were documented on Weekly Logsheets and on EMD Chain of Custody forms. Samples were taken in polyethylene bottles, unpreserved, and immediately iced. Sampling events resulted in same-day transport to the University of Colorado Limnology Laboratory. Samples were iced upon collection and during transport.

The CU Limnology Laboratory uses a High-Temperature Combustion Method (Method 5310 B, Section 5-20), *Standard Methods for the Examination of Water and Wastewater, 20th Edition.* The samples were not filtered before they were run. Summary results of the TOC sampling are presented in a separate table format.

24-hour Profiling at Three Locations

In addition to weekly sampling and monitoring, the Association employed a programmable, sonde-type, recording, multi-sensor probe to simultaneously profile selected sites for pH, temperature, dissolved oxygen and specific conductance over a 24-hour period. Two primary locations were selected: Bear Creek Segment 1a, above KSWD WWTP effluent (KSWD7) and Lair o' the Bear Park (LOBDOW), near Idledale. Because of lower flows in Bear Creek in June and July, the Association relocated the 24-hour monitoring location from LOBDOW to a third location below Idledale (EMD5A).

The location above KSWD WWTP effluent is at the east end of O'Fallon Park. This Denver Mountain Park is a high-use park popular with day users from the Denver area. The Park has been identified as a problem area for water quality in past years. The Lair o' the Bear Open Space Park site was chosen for its proximity to the midpoint of the Segment. This location is also located within the CDOW fish survey site. Both sites were chosen for their accessibility and cover from the public. The third location (EMD5A) was selected primarily for security, but the location was very close to the CDOW fish survey site below Idledale. The reason for 24-hour profiling was to document naturally occurring, diurnal parameter fluctuations. In prior years, high parameter fluctuations (pH) were documented, but attributed to low flows. This is an effort to begin historical data collection to compare normal and low flow years.

The probe employed for the Program was an YSI 600XLM. Calibrations were performed and documented prior to each use. A two-point calibration was used for pH (7.00 and 10.01) and the specific conductance calibration was performed with a purchased solution. The probe was programmed for a delayed start and to measure parameters at 30-minute intervals. The probe was weighted, disguised and deployed at the KSWD7 location five times during the Program, and at the LOBDOW and EMD5A locations twice. The YSI Ecowatch software downloads data and presents it in graphic and tabular formats. Data can be exported into a spreadsheet program.

Wastewater Treatment Plant Data

Since there are four "major" wastewater treatment facilities that discharge into Bear Creek Segment 1a, an effort was undertaken to analyze effluent parameters that would be consequential to the receiving waters (Table 4). Effluent flow, temperature, dissolved oxygen, pH and total ammonia data has been collected and analyzed. Only data that typically comprises daily Process Control and permit-mandated monitoring was reviewed. In prior years, the same data was collected and combined with monitoring and measurements taken in Bear Creek. This combined data was introduced to separate temperature, dissolved oxygen models to document existing effects, and predict possible outcomes of specific scenarios.

Table 4 Wastewater Treatment Plants and Parameters

WWTP	Parameters
EMD	Flow, pH, Temperature, Dissolved Oxygen, Total Ammonia; Temp Datalogger
WJCMD	Flow, pH, Temperature, Dissolved Oxygen, Total Ammonia; Temp Datalogger
KSWD	Flow, pH, Temperature, Dissolved Oxygen, Total Ammonia; Temp Datalogger
GWSD	Flow, pH, Temperature, Dissolved Oxygen, Total Ammonia; Temp Datalogger

The sampling and monitoring portion of the Program was coordinated with the permit required effluent sampling. This occurred on Thursdays during the Program. Because pH and temperature were typically recorded when effluents were sampled for ammonia, the unionized fraction of ammonia was calculated.

Weather (local)

A National Weather Service reporting station is maintained at the EMD WWTP. Daily high and low air temperatures and precipitation are recorded and transmitted monthly to the National Weather Service. Weather data was tabulated and correlated with Bear Creek stream flows (obtained at the USGS gage above Evergreen Lake) for the Program.

Weather data collected during the Study period was compared to the available historical weather records, obtained at the NWS.

Gaging Station Stream Flows

A USGS stream gage (USGS 06710385) is maintained at a location above Evergreen Lake, near the CDOW fish survey site identified as ALKDOW. The gage location is adjacent to the Denver Mountain Parks golf course and restaurant (Keys on the Green) parking lot. The gage station received restoration in early July 2005. The dam structure creating the pool for level sensing was rebuilt. A second gaging station is located below the temperature datalogger location ID MORR10, above the town of Morrison, just west of the Highway 8 Bridge over Bear Creek. This station (BCMORCO 06710500) is maintained by the US Army Corps of Engineers and the Colorado Division of Water Resources. Weekly stream flow graphs were printed from both stations and filed for record. Monthly average daily flows from both gages have been exported to a spreadsheet for comparison with historical data.

For this report, there were 21 years of historical record available for the gage above Evergreen Lake (October 1984 through September 2005). For the gage located in Morrison, there were 87 years of historical record available. Although flow records have been kept at this location since 1899, the most complete data record exists from 1919 through 2005.

Data Management

Large quantities of varied data were collected during the Program: Weekly stream monitoring and sampling, laboratory results, thirty-minute temperature measurements from dataloggers, wastewater treatment plant effluent process control and permit monitoring data (from four treatment plants), weather statistics and stream flows comprise

raw data. All data are stored on an office computer, using Microsoft Office XP Professional software. The majority of the data resides in and analyses occurred in Excel spreadsheet format. The PC is connected to a LAN, which provides nightly backup to a server. Other software programs that contain raw data include Onset Computer Corporation Boxcar software and YSI Ecowatch software. Both of these programs reside on the same PC.

Laboratory results consisted of low-level total ammonia and Total Organic Carbon (TOC) results from the Limnology Laboratory at CU Boulder. Results in spreadsheet form were transmitted to the EMD staff electronically via email attachments. Results are incorporated into the spreadsheet files for individual sampling locations.

Weekly Stream Monitoring and Sampling Data

Weekly stream monitoring and sampling data are tabulated into datasets. Data was retrieved from the YSI memory shortly after each monitoring event. Data are transcribed onto the Weekly Logsheets and subsequently entered onto Excel spreadsheets. Each monitoring site has an individual folder, with spreadsheet files of data. Additionally, individual parameter files were created to evaluate separately. Minimum, maximum, average and standard deviation analyses were performed on this (and mostly all) data.

Temperature Datalogger Measurements

30-minute datalogger temperature measurements were exported from the Onset Computer software into Excel spreadsheets. Each download of temperature data is treated as a file in the Onset software. Once the Onset file formats had been exported and saved as separate Excel files, the Excel spreadsheets for each location were combined into one Excel file with multiple worksheets. Therefore, each Excel file contains multiple worksheets, one for each separate download of data, and a summary worksheet. The summary worksheet contains the combined individual data files and statistical analysis.

The date and time recorded on the Launch/Retrieval logsheet were used to eliminate erroneous temperature measurements prior to data analysis. The majority of these erroneous measurements were eliminated by utilizing the shuttle devices to field-download data. Occasionally, the field download process occurred exactly at the time of a measurement, and an erroneous value was recorded or missed. These were also removed from the raw data prior to analysis. Once in a spreadsheet format, the data was evaluated against the Weekly Average Temperature (WAT) criteria of 17°C and against the Maximum Weekly Average Temperature (MWAT) criteria of 20°C. Percentages of compliance were calculated. Weekly average temperatures were determined by calculating the mean temperature of seven consecutive days beginning with either May 1, 2006 or the first day of data collection. Any lack of data collection resulting in a data gap of one day or more, required that the seven-day period begin anew. Maximum Weekly Average Temperatures were calculated utilizing a moving average of the Weekly Average Temperatures.

Problems

Relatively few major problems were encountered during the Program. The BCCDOW datalogger located at the Bear Creek Cabins Bridge, just above the Bear Creek Cabins WWTP effluent outfall, experienced a malfunction typically associated with a faulty thermistor. Data was recorded from May 5, 2006 at 16:13 until August 3, 2006 at 15:13. After that time, the datalogger recorded all negative values for the remainder of the Study. These erroneous values were omitted from the data analysis. Datalogger KSWD7, located just above the Kittredge WWTP effluent outfall, experienced erroneous recorded values at a random frequency. A total of 89 negative values were recorded from May 1, 2006 through September 30, 2006. These erroneous values were omitted from the data analysis. On July 21, 2006, the watertight case for datalogger EMD5, located in the EMD WWTP effluent, was found to have a leak. There were no values recorded from June 21, 2006 15:00 through July 21, 2006 at 14:17.

- Dataloggers were relocated, as necessary, due to fluctuating flows in Bear Creek.

- Weekly Specific Conductance measurements were not recorded for the week 9/28/06 due to an inability to calibrated the YSI556 for that parameter.

- Weekly sampling and monitoring was not performed on 8/10/06 due to personnel scheduling conflicts.

- Weekly monitoring for Evergreen Lake locations was canceled for the weeks of 5/4/06 and 9/21/06 because of weather-related safety concerns.

- Flow (velocity) readings were obtained at 5 of the 7 selected sites on May 22, 2006. The meter malfunctioned (leaking seal) and EMD5A and MORR10 were not measured. The seal problem was addressed and four additional, complete measurement events occurred.

- On June 28, 2006, the YSI 600XLM was deployed at the EMD5A location instead of the LOBDOW location, due to low flows and associated security factors.

- The YSI 600XLM experienced calibration problems, sensor replacement and software upgrade issues during the Study period.

- On June 29 and July 6, 2006, the Segment 1a pH values were measured with a HACH pH meter borrowed from the EMD Water Treatment Plant. (The BCWA YSI 556 pH sensor was awaiting replacement.)

OTHER SUPPORTING STREAM STUDY EFFORTS

Special Flow Study

A portable velocity meter was purchased by the BCWA to spot check estimated flows at CDOW fish survey sites. CDOW locations were monitored for flows seven times during the Study period. The results of these sequential flow studies are presented in Table 5. The Flows in Bear Creek got very low in early summer. Figure 1 shows the estimated

stream flows from May 22 through November 20, 2006. The flow measurements match closely with the USGS measured flows at Keys on the Green and Morrison. The flow drop from Morrison Park to Bear Creek Park is due to diversion at the Harriman Ditch.

Figure 1 Estimated 2006 Stream Flows in Bear Creek Segment 1a

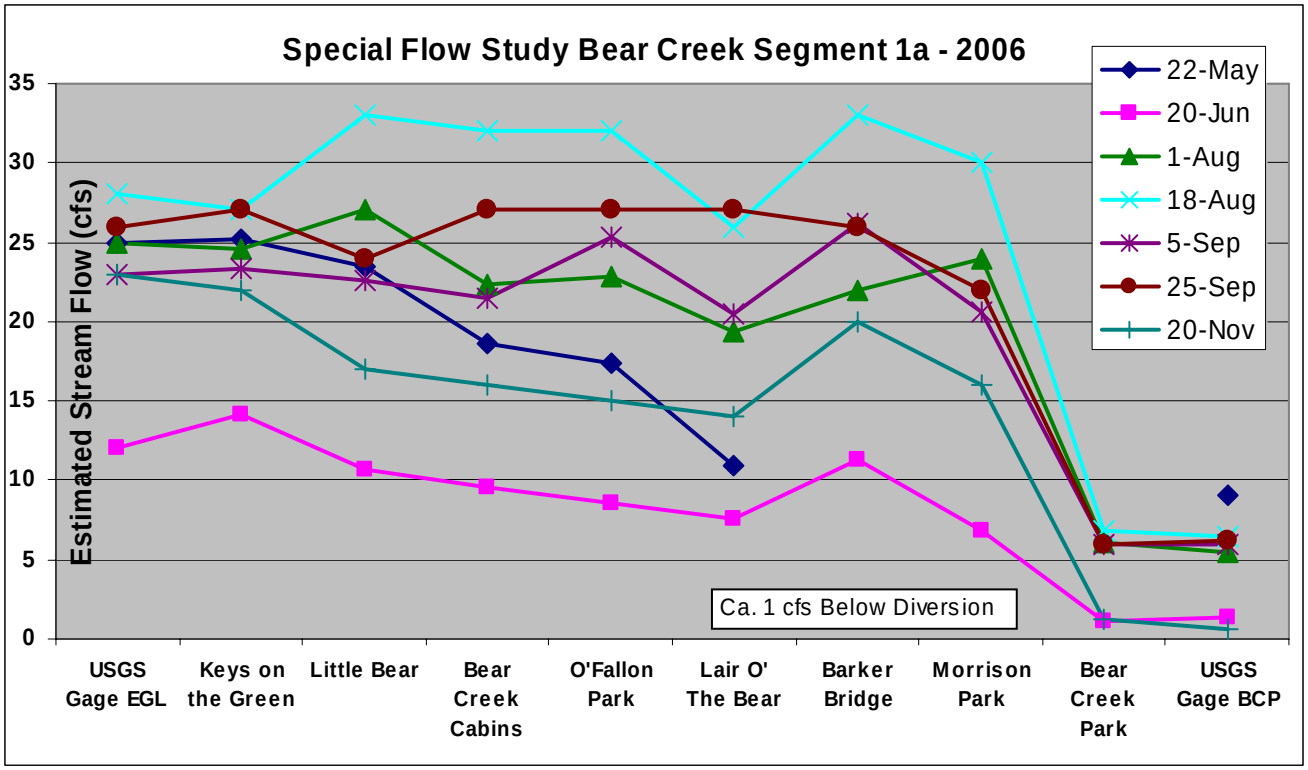


Table 5 2006 Bear Creek Segment 1a Stream Flow Study Data

2006 Bear Creek Special Study - Flow (cfs)

Site	22-May	20-Jun	1-Aug	18-Aug	5-Sep	25-Sep	20-Nov
USGS Gage EGL	25	12	25	28	23	26	23
Keys on the Green	25.2	14.21	24.6	27	23.3	27	22
Little Bear	23.5	10.66	27.1	33	22.6	24	17
Bear Creek Cabins	18.63	9.6	22.3	32	21.5	27	16
O'Fallon Park	17.42	8.61	22.8	32	25.3	27	15
Lair O' The Bear	10.93	7.51	19.4	26	20.5	27	14
Barker Bridge		11.31	22	33	26.2	26	20
Morrison Park		6.77	23.9	30	20.6	22	16
Bear Creek Park		1.16	6.1	6.8	6	6	1.3
USGS Gage BCP	9	1.4	5.4	6.5	6	6.2	0.6

Macroinvertebrate, Habitat and Stream Pebble Count Assessments

The macroinvertebrate integrity of Bear Creek Segment 1a is under assessment by collecting macroinvertebrate samples at the seven CDOW fish survey sites along Bear Creek: Morrison (west end), Idledale, Lair o' the Bear Park, O' Fallon Park, Bear Creek Cabins, Main Street Evergreen (across from the Little Bear) and above Evergreen Lake

upstream of the USGS gaging station. The cooperative macroinvertebrate sampling was done with the WQCD staff, the Association manager and EMD staff on September 5, 2006 at the DOW fish survey locations. The state timed-kick net methodology was used.

Annual macroinvertebrate samples will be collected in the fall at fish survey sites, within limits of sample collection. The state collection method will be used and data will be incorporated into both state and Bear Creek data sets. The timed kick net method will be used. Several Bear Creek sampling and monitoring sites were adjusted to coincide with fishery survey sites. The Association will target a minimum five-year data set. Once sufficient data is obtained, the processed species indexes will be used to help establish expected conditions.

The Association cooperated with the WQCD in the collection of habitat and stream substrate characterizations (pebble counts) at the fishery monitoring sites. This data will also be used to establish expected conditions along the target section of Bear Creek Segment 1a.

Total Organic Carbon (TOC) Sampling

The Association performed TOC sampling monthly throughout the Study period. Only the CDOW fish survey sites were sampled in an effort to gather varying data from parameters that could affect aquatic life (Table 6). Results are summarized in Table 7.

Table 6 Total Organic Carbon Sampling Locations

Locations	Parameter
ALKDOW	Monthly Total Organic Carbon (TOC)
LTLBAR	Monthly (TOC)
BCCDOW	Monthly (TOC)
OFPDOW	Monthly (TOC)
LOBDOW	Monthly (TOC)
EMD5A	Monthly (TOC)
MORR10	Monthly (TOC)

Table 7 Total Organic Carbon Data in Bear Creek Segment 1a

	Total Organic Carbon, mg/L				
Site	**18-May**	**15-Jun**	**6-Jul**	**17-Aug**	**14-Sep**
BCC	6.8	5.3	5.1	5.2	3.1
EMD 5A	2.9	7.8	3.4	4.1	3.2
MORR 10	2.9	4.0	4.5	3.6	3.4
ALK DOW	2.7	1.9	4.0	3.2	2.4
LOBDOW	3.0	3.7	5.2	3.5	3.1
LTLBAR	2.7	3.4	4.8	3.4	3.1
OFPDOW	3.0	5.6	5.5	3.6	3.3

CDOW Fish Survey

CDOW conducted their annual fish survey at seven locations between September 25 and 27, 2006. The survey included six historic sites and one additional site. The added fishery survey site was upstream of Evergreen Lake (ALKDOW), near Keys-on-the Green restaurant. The seven sites will have continuous annual fish monitoring. Table 8 summarizes the fishery data at the sites for the 2006 sampling event. .

The health of the trout fishery in a portion of Bear Creek segment 1a appears affected by unknown or speculated anthropogenic causes that result in annual variations (erratic increases and declines) as measured at fishery trend monitoring sites in the stream reach. The fishery data collected by the Colorado Division of Wildlife for Bear Creek Segment 1a from 1988 through 2006 has been interpreted in different ways and provides disputed conclusions among interested agencies and individuals. To address this problem a number of agencies are identifying factors that could or do affect fishery health and could or do result in fishery declines either within the entire stream reach or at specific locations along the stream reach.

The Bear Creek Watershed Association (Association), Water Quality Control Division (WQCD), Colorado Division of Wildlife (CDOW) and Evergreen Trout Unlimited (ETU) have reviewed the fishery data and propose using consistent protocols and/or methodologies for determining the fishery health in the portion of Bear Creek from Evergreen Lake (Keys on the Green) to Morrison (above Harriman Ditch) [*Stream Reach*].

Multiple reference points in the steam reach coupled with coordinated chemistry, biological, physical data collection and an analysis matrix will establish a reference condition for the entire “Stream Reach” or reference conditions by sub-reaches, if appropriate (Table 8).

Table 8 2005 Raw Fishery Data

Station	Standardized Average Width (ft)	Species	2006			
			No./Acre	lb/Acre	No./Acre >12cm	lb/Acre >12cm
Dedisse Park	33	Brown	805	71	412	66
		Rainbow	82	9	39	9
		TOTAL	887	80	451	75
Downtown Evergreen	34	Brown	1121	233	753	225
		Rainbow	283	37	119	33
		TOTAL	1404	270	872	258
Bear Creek Cabins	32	Brown	902	136	607	133
		Rainbow	184	46	149	46
		TOTAL	1086	182	756	179
O'Fallon Park	31	Brown	638	108	529	106
		Rainbow	117	18	113	18
		TOTAL	755	126	642	124
Lair O' the Bear	29	Brown	1449	226	1076	221
		Rainbow	382	58	370	58
		TOTAL	1831	284	1446	279

Station	Standardized Average Width (ft)	Species	2006			
			No./Acre	lb/Acre	No./Acre >12cm	lb/Acre >12cm
Idledale	25	Brown	1229	147	685	138
		Rainbow	203	50	200	50
		TOTAL	1432	197	885	188
Morrison	30	Brown	675	69	376	65
		Rainbow	507	71	500	71
		TOTAL	1182	140	876	136

Table 9 Potential Reference Reaches in Bear Creek Segment 1a

Bear Creek Segment 1a	Reference Points
Stream Reach	(1) Keys on the Green, (2) Little Bear Evergreen, (3) Bear Creek Cabins, (4) O'Fallon Park, (5) Lair O' the Bear, (6) Idledale, (7) Morrison Park
Sub-reach 1	(2) Little Bear Evergreen, (3) Bear Creek Cabins, (4) O'Fallon Park, (5) Lair O' the Bear, (6) Idledale, (7) Morrison Park
Sub-reach 1a	(2) Little Bear Evergreen, (3) Bear Creek Cabins, (4) O'Fallon Park, (5) Lair O' the Bear
Sub-reach 1b	(6) Idledale, (7) Morrison Park
Sub-reach 2	(1) Keys on the Green

DATA SHEETS AND STUDY FORMS

Several forms were generated by EMD personnel to document measurements and actions during the Program. Logsheets used in the Program include:

- Datalogger Launch/Retrieve
- Calibration Record-YSI 556
- Calibration Record-YSI Sonde
- Bear Creek Weekly Checks Log
- EMD Chain of Custody form

Data Sheets-Launch/Retrieve Record

This form was used during the Program to document the precise time and date when the dataloggers were removed from and immersed in Bear Creek. This was an important to document because not all of the dataloggers have delayed-start capabilities. For some of the dataloggers, temperature measurement began as soon as the logger was launched at the computer, so documenting exactly when the logger was immersed allows for the exclusion of erroneous readings. Date, time and initials were recorded.

Data Sheets-Calibrations

The two-calibration log sheets used during the Program documented the instrument calibrations performed before each measuring activity. Date, time, equipment warm-up time, pH (7.00 and 10.01), dissolved oxygen, temperature, specific conductance and initials were recorded. Both the YSI 556 and the YSI 600 XLM Sonde instruments were calibrated prior to each use. Any unusual conditions (unit will not calibrate) or service activities (changing batteries) were also noted.

Data Sheets-Weekly Log

The weekly log sheets used during the Program summarized sampling and monitoring event results. Date, pH, temperature, dissolved oxygen, specific conductance, sampling time and initials were documented. Parameter results and monitoring time were transcribed from the YSI 556 meter memory. A note was also made regarding the presence (or absence) of the datalogger. Weather observations were noted.

Data Sheets-EMD Chain of Custody

The Chain of Custody form was used during the Program to document the secure handling of stream samples obtained. Date, time, sample location, sample type (composite/grab), number of containers, analysis (Total Ammonia, Total Organic Carbon), sampler signature, remarks, relinquished by and received by signatures was recorded. The form is a carbonless copy, and the copy remained with the samples in the Limnology Laboratory at CU Boulder and the original was retained on file by EMD. Datasets include all locations from individual events, graphed representation of such data and all recorded temperature data (exported to spreadsheet format) from the dataloggers. This data is available from the Association. Total ammonia results were combined with pH and temperature measurements recorded at the time of sampling to calculate the unionized fraction.

DATA TABLES—BEAR CREEK IN-STREAM

Table 10 Downtown Evergreen, at CDOW site

[Monitoring station/Datalogger ID: LTLBAR GPS Coordinates: 39.6327 °N, 105.3183 °W; Sampling /monitoring site is in Bear Creek, near the west end of the public parking lot, across from the Little Bear, at the CDOW fish survey site.]

21 weekly sampling/monitoring events May 1-Sept 30, 2006						
Weekly Parameter results	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Sp. Cond., mS/cm	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	6.80	8.14	7.10	0.064	10.0	0.022
Max	8.17	17.87	9.79	0.100	23.3	0.793
Avg	7.65	14.43	8.13	0.076	16.8	0.252
Std. Dev.	0.32	3.01	0.92	0.010	3.4	0.190
# of measurements	20	21	21	20	21	20

Datalogger Temperature Data				
All Temperatures in °C	30-Min Temp.	Daily Avg. Temp.	WAT Weekly Average Temp.	MWAT Max Weekly Avg.Temp.
Min	8.20	9.31	10.26	14.73
Max	21.39	20.15	19.17	18.17
Avg	15.77	15.77	16.00	17.12
Std. Dev.	3.07	3.00	2.73	1.07
# of measurements	7344	153	21	15
# of 17°C WAT exceeded			10	
% Compliance WAT			52.4	
# of 20°C MWAT exceeded				0
% Compliance MWAT				100.0

Existing stream standards: 0.02 mg/L (20.0 ug/L) Unionized Ammonia (NH3-N), chronic; pH 6.5-9.0; DO 6.0 mg/L; Threshold to Evaluate Potential Temperature Impairment: 17°C WAT, 20°C MWAT

Table 11 Above EMD WWTP effluent

[Monitoring station/Datalogger ID: EMD4 GPS Coordinates: 39.6376°N, 105.3150°W; Sampling/monitoring site is in Bear Creek, behind the EMD WWTP UV building, upstream of the plant effluent outfall.]

21 weekly sampling/monitoring events May 1-Sept 30, 2006						
Weekly Parameter results	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Sp. Cond., mS/cm	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	6.87	8.03	7.02	0.065	7.0	0.023
Max	8.19	17.95	9.99	0.101	24.0	0.760
Avg	7.64	14.51	8.21	0.078	15.4	0.226
Std. Dev.	0.29	3.02	0.92	0.011	4.8	0.174
# of measurements	20	21	21	20	21	20

Datalogger Temperature Data				
All Temperatures in °C	30-Min Temp.	Daily Avg. Temp.	WAT Weekly Average Temp.	MWAT Max Weekly Avg.Temp.
Min	8.00	9.34	10.27	14.70
Max	21.80	20.17	19.15	18.16
Avg	15.75	15.75	15.98	17.09
Std. Dev.	3.11	2.98	2.71	1.08
# of measurements	7344	153	21	15
# of 17°C WAT exceeded			10	
% Compliance WAT			52.4	
# of 20°C MWAT exceeded				0
% Compliance MWAT				100.0

Existing stream standards: 0.02 mg/L (20.0 ug/L) Unionized Ammonia (NH3-N), chronic; pH 6.5-9.0; DO 6.0 mg/L; Threshold to Evaluate Potential Temperature Impairment: 17°C WAT, 20°C MWAT

Table 12 Below EMD WWTP effluent

[Monitoring station/Datalogger ID: EMD3 GPS Coordinates: 39.6377°N, 105.3141°W; Sampling/monitoring site is in Bear Creek, on the upstream side of the Highway 74 vehicle bridge, downstream of the EMD WWTP plant effluent outfall.]

21 weekly sampling/monitoring events May 1-Sept 30, 2006						
Weekly Parameter results	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Sp. Cond., mS/cm	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	6.91	8.51	6.97	0.079	9.8	0.038
Max	8.09	18.08	9.87	0.131	188.8	1.763
Avg	7.57	14.73	8.19	0.101	45.9	0.547
Std. Dev.	0.27	2.97	0.90	0.015	45.1	0.505
# of measurements	20	21	21	20	21	20

Datalogger Temperature Data				
All Temperatures in °C	30-Min Temp.	Daily Avg. Temp.	WAT Weekly Average Temp.	MWAT Max Weekly Avg.Temp.
Min	8.00	9.41	10.33	14.68
Max	21.92	20.14	19.13	18.15
Avg	15.77	15.77	15.99	17.08
Std. Dev.	3.07	2.92	2.66	1.06
# of measurements	7344	153	21	15
# of 17°C WAT exceeded			10	
% Compliance WAT			52.4	
# of 20°C MWAT exceeded				0
% Compliance MWAT				100.0

Existing stream standards: 0.02 mg/L (20.0 ug/L) Unionized Ammonia (NH3-N), chronic; pH 6.5-9.0; DO 6.0 mg/L; Threshold to Evaluate Potential Temperature Impairment: 17°C WAT, 20°C MWAT

Table 13 Bear Creek Cabins

[Monitoring station/Datalogger ID: BCCDOW GPS Coordinates: 39.6425°N, 105.3084°W; Sampling/ monitoring site is in Bear Creek, at the Bear Creek Cabins bridge, above the Bear Creek Cabins WWTP effluent discharge, at the CDOW fish survey site.]

21 weekly sampling/monitoring events May 1-Sept 30, 2006						
Weekly Parameter results	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Sp. Cond., mS/cm	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	7.05	8.51	6.90	0.079	8.0	0.067
Max	8.10	18.04	9.92	0.122	151.0	2.019
Avg	7.71	14.70	8.26	0.101	39.0	0.514
Std. Dev.	0.26	2.93	0.93	0.015	39.0	0.476
# of measurements	20	21	21	20	21	20

Datalogger Temperature Data				
All Temperatures in °C	30-Min Temp.	Daily Avg. Temp.	WAT Weekly Average Temp.	MWAT Max Weekly Avg.Temp.
Min	7.47	9.36	10.34	15.24
Max	23.18	20.11	18.74	17.64
Avg	16.44	16.47	16.25	16.79
Std. Dev.	3.02	2.51	2.38	0.81
# of measurements	4319	90	12	6
# of 17°C WAT exceeded			7	
% Compliance WAT			41.7	
# of 20°C MWAT exceeded				0
% Compliance MWAT				100.0

Existing stream standards: 0.02 mg/L (20.0 ug/L) Unionized Ammonia (NH3-N), chronic; pH 6.5-9.0; DO 6.0 mg/L; Threshold to Evaluate Potential Temperature Impairment: 17°C WAT, 20°C MWAT

Table 14 O'Fallon Park

[Monitoring station/Datalogger ID: OFPDOW GPS Coordinates: 39.6564°N, 105.2917°W; Sampling/ monitoring site is in Bear Creek, on the north side of the creek above the ETU restoration site across Hwy 74 from the CDOT station, at the CDOW fish survey site.]

21 weekly sampling/monitoring events May 1-Sept 30, 2006						
Weekly Parameter results	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Sp. Cond., mS/cm	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	7.21	7.22	7.05	0.077	7.7	0.077
Max	8.30	17.51	10.63	0.155	28.4	0.964
Avg	7.88	13.97	8.76	0.108	17.5	0.386
Std. Dev.	0.28	3.10	1.02	0.021	5.6	0.227
# of measurements	20	21	21	20	21	20

Datalogger Temperature Data				
All Temperatures in °C	30-Min Temp.	Daily Avg. Temp.	WAT Weekly Average Temp.	MWAT Max Weekly Avg.Temp.
Min	5.98	8.57	9.92	14.27
Max	24.94	20.01	19.02	17.90
Avg	15.37	15.37	15.59	16.70
Std. Dev.	3.65	2.97	2.69	1.13
# of measurements	7344	153	21	15
# of 17°C WAT exceeded			10	
% Compliance WAT			52.4	
# of 20°C MWAT exceeded				0
% Compliance MWAT				100.0

Existing stream standards: 0.02 mg/L (20.0 ug/L) Unionized Ammonia (NH3-N), chronic; pH 6.5-9.0; DO 6.0 mg/L; Threshold to Evaluate Potential Temperature Impairment: 17°C WAT, 20°C MWAT

Table 15 Above KSWD WWTP effluent

[Monitoring station/Datalogger ID: KSWD7 GPS Coordinates: 39.6586°N, 105.2864°W; Sampling/ monitoring site is in Bear Creek, at the east end of O'Fallon Park in Kittredge, just upstream of the Kittredge WWTP effluent outfall.]

21 weekly sampling/monitoring events May 1-Sept 30, 2006						
Weekly Parameter results	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Sp. Cond., mS/cm	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	7.21	6.89	6.95	0.081	6.3	0.066
Max	8.25	18.05	10.59	0.161	31.8	0.656
Avg	7.84	13.95	8.49	0.107	17.0	0.320
Std. Dev.	0.27	3.14	0.96	0.022	6.3	0.184
# of measurements	20	21	21	20	21	20

Datalogger Temperature Data				
All Temperatures in °C	30-Min Temp.	Daily Avg. Temp.	WAT Weekly Average Temp.	MWAT Max Weekly Avg.Temp.
Min	5.54	8.48	10.09	14.41
Max	24.99	20.17	19.17	18.03
Avg	15.55	15.48	15.70	16.81
Std. Dev.	3.72	2.96	2.68	1.13
# of measurements	7250	153	21	15
# of 17°C WAT exceeded			10	
% Compliance WAT			52.4	
# of 20°C MWAT exceeded				0
% Compliance MWAT				100.0

Existing stream standards: 0.02 mg/L (20.0 ug/L) Unionized Ammonia (NH3-N), chronic; pH 6.5-9.0; DO 6.0 mg/L; Threshold to Evaluate Potential Temperature Impairment: 17°C WAT, 20°C MWAT

Table 16 Above GWSD WWTP effluent

[Monitoring station/Datalogger ID: GWSD9 GPS Coordinates: 39.6669°N, 105.2657°W; Sampling/ monitoring site is in Bear Creek, at the west end of Lair o' the Bear Park near Idledale, just upstream of the Genesee WWTP effluent outfall.]

21 weekly sampling/monitoring events May 1-Sept 30, 2006						
Weekly Parameter results	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Sp. Cond., mS/cm	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	7.30	6.49	7.05	0.086	6.8	0.076
Max	8.24	17.10	10.86	0.187	35.8	1.100
Avg	7.88	13.35	8.73	0.121	16.7	0.338
Std. Dev.	0.27	3.14	1.04	0.029	8.1	0.258
# of measurements	20	21	21	20	21	20

Datalogger Temperature Data				
All Temperatures in °C	30-Min Temp.	Daily Avg. Temp.	WAT Weekly Average Temp.	MWAT Max Weekly Avg.Temp.
Min	5.13	8.19	9.78	14.24
Max	24.15	20.04	19.15	18.02
Avg	15.34	15.34	15.57	16.71
Std. Dev.	3.75	3.07	2.77	1.19
# of measurements	7344	153	21	15
# of 22.4°C WAT exceeded			9	
% Compliance WAT			57.1	
# of 17°C MWAT exceeded				0
% Compliance MWAT				100.0

Existing stream standards: 0.02 mg/L (20.0 ug/L) Unionized Ammonia (NH3-N), chronic; pH 6.5-9.0; DO 6.0 mg/L; Threshold to Evaluate Potential Temperature Impairment: 17°C WAT, 20°C MWAT

Table 17 Lair o' the Bear

[Monitoring station/Datalogger ID: LOBDOW GPS Coordinates: 39.6672°N, 105.2687°W; Sampling/ monitoring site is in Bear Creek, at the end of main path to Bear Creek from the parking lot, at the CDOW fish survey site.]

21 weekly sampling/monitoring events May 1-Sept 30, 2006						
Weekly Parameter results	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Sp. Cond., mS/cm	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	7.38	5.13	6.99	0.095	7.5	0.078
Max	8.30	17.54	10.84	1.107	59.1	1.386
Avg	7.95	13.47	8.76	0.186	18.7	0.443
Std. Dev.	0.25	3.60	1.07	0.209	11.7	0.302
# of measurements	20	21	21	20	21	20

Datalogger Temperature Data				
All Temperatures in °C	30-Min Temp.	Daily Avg. Temp.	WAT Weekly Average Temp.	MWAT Max Weekly Avg.Temp.
Min	5.21	8.17	9.83	14.33
Max	24.20	20.08	19.21	18.08
Avg	15.41	15.41	15.64	16.78
Std. Dev.	3.74	3.07	2.77	1.18
# of measurements	7344	153	21	15
# of 17°C WAT exceeded			10	
% Compliance WAT			52.4	
# of 20°C MWAT exceeded				0
% Compliance MWAT				100.0

Existing stream standards: 0.02 mg/L (20.0 ug/L) Unionized Ammonia (NH3-N), chronic; pH 6.5-9.0; DO 6.0 mg/L; Threshold to Evaluate Potential Temperature Impairment: 17°C WAT, 20°C MWAT

Table 18 Below Idledale

[Monitoring station/Datalogger ID: EMD5A GPS Coordinates: 39.6614°N, 105.2355°W; Sampling/ monitoring site is in Bear Creek, at the east end of Idledale, at the upstream side of the Baker bridge, near the CDOW fish survey site.]

21 weekly sampling/monitoring events May 1-Sept 30, 2006						
Weekly Parameter results	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Sp. Cond., mS/cm	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	7.29	6.96	6.98	0.092	5.6	0.069
Max	8.41	17.80	10.76	0.178	38.6	1.375
Avg	7.97	13.95	8.62	0.128	17.0	0.423
Std. Dev.	0.27	3.19	1.01	0.028	9.0	0.309
# of measurements	20	21	21	20	21	20

Datalogger Temperature Data				
All Temperatures in °C	30-Min Temp.	Daily Avg. Temp.	WAT Weekly Average Temp.	MWAT Max Weekly Avg.Temp.
Min	5.00	7.88	9.60	2.65
Max	24.03	20.02	19.16	17.65
Avg	15.40	15.40	15.63	13.17
Std. Dev.	3.81	3.12	2.80	4.50
# of measurements	7344	153	21	15
# of 17°C WAT exceeded			9	
% Compliance WAT			57.1	
# of 20°C MWAT exceeded				0
% Compliance MWAT				100.0

Existing stream standards: 0.02 mg/L (20.0 ug/L) Unionized Ammonia (NH3-N), chronic; pH 6.5-9.0; DO 6.0 mg/L; Threshold to Evaluate Potential Temperature Impairment: 17°C WAT, 20°C MWAT

Table 19 West End of Morrison

[Monitoring station/Datalogger ID: MORR10 GPS Coordinates: 39.6529°N, 105.2003°W; Sampling/ monitoring site is in Bear Creek, at the west end of Morrison, at the gated bridge to Denver Mountain parks Headquarters, at the CDOW fish survey site.]

21 weekly sampling/monitoring events May 1-Sept 30, 2006						
Weekly Parameter results	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Sp. Cond., mS/cm	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	7.38	7.53	7.14	0.096	4.9	0.075
Max	8.39	18.69	10.83	0.179	34.5	1.317
Avg	8.01	14.35	8.73	0.131	15.0	0.432
Std. Dev.	0.23	3.31	1.00	0.027	8.9	0.362
# of measurements	20	21	21	20	21	20

Datalogger Temperature Data				
All Temperatures in °C	30-Min Temp.	Daily Avg. Temp.	WAT Weekly Average Temp.	MWAT Max Weekly Avg.Temp.
Min	5.57	8.09	9.73	14.67
Max	23.52	20.28	19.45	18.42
Avg	15.69	15.69	15.92	17.09
Std. Dev.	3.65	3.15	2.83	1.21
# of measurements	7344	153	21	15
# of 17°C WAT exceeded			11	
% Compliance WAT			47.6	
# of 20°C MWAT exceeded				0
% Compliance MWAT				100.0

Existing stream standards: 0.02 mg/L (20.0 ug/L) Unionized Ammonia (NH3-N), chronic; pH 6.5-9.0; DO 6.0 mg/L; Threshold to Evaluate Potential Temperature Impairment: 17°C WAT, 20°C MWAT

DATA TABLES-WWTP EFFLUENT

The following data tables summarize the wastewater plant effluent quality for dischargers into Bear Creek Segment 1a. Data was obtained from daily plant process control sheets and laboratory results that are utilized to complete CDPES Discharge Monitoring Reports (DMR). Since daily plant operations and reporting requirements differ, only available data was used. There were no additional requirements requested of plant operators for the Program. Datalogger temperature measurements of plant effluent were obtained at the identical frequency of the in-stream dataloggers (30-minute intervals). Total ammonia results were combined with effluent pH and temperature measurements to calculate the unionized fraction. The datasheets will be listed in a downstream direction, as the effluents enter Bear Creek, from the EMD WWTP to the Genesee WWTP.

Table 20 Evergreen Metropolitan District

[Datalogger ID: EMD5 GPS Coordinates: 39.6376°N, 105.3150°W; Sampling/monitoring site is the EMD WWTP effluent. The datalogger was located in the UV channel, just upstream of the outfall. Effluent flows directly from the UV building to Bear Creek.]

EMD WWTP Effluent May 1-Sept 30, 2006						
Process Control and Permit Sampling and Monitoring						
Parameter	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Flow, MGD	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	6.53	12.40	2.02	0.3598	68.0	0.17
Max	7.09	20.40	5.63	0.7281	2700.0	5.96
Avg	6.74	17.56	4.09	0.5231	719.5	1.55
Std. Dev.	0.12	2.19	0.88	0.0462	645.5	1.61
# of Measurements	110	106	106	153	22	22

Datalogger Temperature Data			
All Temperatures in °C	30-Min Temp.	Daily Avg.Temp.	Weekly Avg. Temp.
Min	12.1	12.1	12.3
Max	20.2	20.2	19.7
Avg	17.1	17.1	17.0
Std. Dev.	2.3	2.3	2.3
# of measurements	5885	123	17

Notes: Discharge permit limits for Total Ammonia (NH3-N), in ug/L are as follows: May-5,800 June-8,200 July-8,000 August-6,400 September-5,200; pH 6.5-9.0

Table 21 West Jefferson County Metropolitan District

[Datalogger ID: WJ6 GPS Coordinates: 39.6621°N, 105.3351°W; Sampling/monitoring site is the WJCMD WWTP effluent. The datalogger was located in the end of the abandoned chlorine contact chamber. (Disinfection currently occurs by UV radiation.) The effluent flows into a ditch and joins Troublesome Gulch just outside the plant boundary. Troublesome Gulch flows to Kittredge and combines with Bear Creek at the west end of Kittredge.]

WJCMD WWTP Effluent May 1-Sept 30, 2006						
Process Control and Permit Sampling and Monitoring						
Parameter	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Flow, MGD	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	6.65	15.10	2.71	0.3502	30.0	0.09
Max	7.13	21.90	4.74	0.6210	5400.0	15.41
Avg	6.83	19.80	3.63	0.4636	740.6	1.76
Std. Dev.	0.08	1.96	0.29	0.0514	1394.1	3.73
# of Measurements	110	104	104	153	22	22

Datalogger Temperature Data			
All Temperatures in °C	30-Min Temp.	Daily Avg.Temp.	Weekly Avg. Temp.
Min	8.6	11.9	12.4
Max	20.2	19.4	19.2
Avg	17.1	17.1	17.1
Std. Dev.	2.0	2.0	2.0
# of measurements	7329	153	21

Notes: Discharge permit limits for Total Ammonia (NH3-N), in ug/L are as follows: May-10,000 June-12,600 July-13,000 August-10,700 September-8,400; pH 6.5-9.0

Table 22 Kittredge Sanitation and Water District

[Datalogger ID: KSWD8 GPS Coordinates: 39.6585°N, 105.2868°W; Sampling/monitoring site is the KSWD WWTP effluent. The datalogger was located near the flow-measuring flume, just upstream of the outfall. Effluent flows from the datalogger location under Highway 74 to the outfall in Bear Creek.]

KSWD WWTP Effluent May 1-Sept 30, 2006						
Process Control and Permit Sampling and Monitoring						
Parameter	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Flow, MGD	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	6.51	11.00	2.15	0.0056	117.0	0.24
Max	7.54	19.90	17.00	0.0939	4120.0	19.73
Avg	6.85	16.81	4.42	0.0524	654.4	2.00
Std. Dev.	0.17	2.36	1.75	0.0111	902.3	4.46
# of Measurements	106	100	100	153	17	17

Datalogger Temperature Data			
All Temperatures in °C	30-Min Temp.	Daily Avg.Temp.	Weekly Avg. Temp.
Min	10.2	11.2	12.2
Max	20.5	19.8	19.3
Avg	16.6	16.6	16.8
Std. Dev.	2.3	2.2	2.0
# of measurements	7309	153	21

Notes: Discharge permit limits for Total Ammonia (NH3-N), in ug/L are as follows: May-5,500 June-5,200 July-7,700 August-5,500 September-3,300; pH 6.5-9.0

Table 23 Genesee Water and Sanitation District

[Datalogger ID: GWSD9A GPS Coordinates: 39.6732°N, 105.2712°W; Sampling/monitoring site is the GWSD WWTP effluent. The datalogger was located in a wet well, just upstream of the outfall at the plant. Effluent flows from the datalogger location into a drainage, down to and under Highway 74 at the west end of Lair o' the Bear Park, and into Bear Creek.]

GWSD WWTP Effluent May 1-Sept 30, 2006						
Process Control and Permit Sampling and Monitoring						
Parameter	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Flow, MGD	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	6.53	7.60	0.10	0.1980	67.0	0.25
Max	8.02	20.00	8.10	0.3220	2516.0	10.83
Avg	7.20	17.22	6.16	0.2539	336.4	1.97
Std. Dev.	0.32	2.16	2.18	0.0233	493.2	2.43
# of Measurements	151	151	150	153	22	22

Datalogger Temperature Data			
All Temperatures in °C	30-Min Temp.	Daily Avg.Temp.	Weekly Avg. Temp.
Min	12.5	12.8	12.9
Max	22.8	19.8	19.7
Avg	17.4	17.4	17.4
Std. Dev.	2.1	2.1	2.2
# of measurements	7309	153	21

Notes: Discharge permit limits for Total Ammonia (NH3-N), in ug/L are as follows: May-8,300 June-12,600 July-13,000 August-10,700 September-8,400; pH 6.5-9.0

DATA TABLES—24-HOUR PROFILE

A recording, multi-sensor probe collected 24-hour data from two specific sites in Bear Creek during the Program. Parameters measured were pH, temperature, dissolved oxygen and specific conductance. Sensors were calibrated prior to each deployment and data was downloaded following retrieval. The purpose was to evaluate multiple parameters over a 24-hour period. Two locations were selected for their accessibility and ability to conceal the probe. The KSWD7 location was at the east end of O'Fallon Park, just upstream of the KSWD WWTP effluent discharge. (This was the same location as the KSWD7 weekly sampling and monitoring and datalogger measurements.) The Lair o' the Bear (LOBDOW) location was within Lair o' the Bear Open Space Park, almost a half-mile downstream of the GWSD WWTP effluent discharge. A third site (EMD5A) was employed because low flow in Bear Creek at the LOBDOW site caused the site to be susceptible to vandalism.

Five profiles were collected for the KSWD7 site. Two profiles were collected for the LOBDOW site. Two profiles were collected for the EMD5A site. Data collection began May 10, 2006 and was completed on July 26, 2006. The 24-hour data collection stopped at this point because of software issues with the YSI 600XLM. Frequency of data collection was originally scheduled to be weekly, but the schedule was modified as necessary, because of weather and stream conditions. The recording frequency was at 30-minute intervals.

Minimum, maximum and averages were calculated for all four parameters. Existing stream standards for pH and dissolved oxygen were foot-noted at the bottom of the tables, but temperature and specific conductance were not. There is no existing stream standard for specific conductance and temperature data collected could not be evaluated against the proposed standards.

Table 24 KSWD7 May 10, 2006

GPS Coordinates: 39.6585°N, 105.2863°W

Date	Time	Temp °C	Specific Conductance, mS/cm	Dissolved Oxygen, mg/L	pH, S. U.
5/10/06	10:00	8.54	0.120	9.88	8.04
		9.38	0.119	9.77	8.15
	11:00	10.18	0.120	9.66	8.26
		10.94	0.124	9.55	8.39
	12:00	11.58	0.129	9.46	8.49
		12.26	0.134	9.36	8.60
	13:00	12.96	0.137	9.22	8.69
		13.50	0.137	9.05	8.76
	14:00	14.19	0.139	8.94	8.82
		14.68	0.135	8.80	8.84
	15:00	15.10	0.130	8.68	8.87
		15.55	0.130	8.57	8.90
	16:00	15.63	0.130	8.51	8.90
		15.56	0.128	8.40	8.87
	17:00	15.36	0.129	8.36	8.85
		15.04	0.128	8.29	8.80
	18:00	14.60	0.130	8.26	8.70
		14.09	0.128	8.29	8.60
	19:00	13.60	0.130	8.33	8.44
		13.04	0.131	8.39	8.25
	20:00	12.37	0.132	8.47	8.05
		11.70	0.132	8.58	7.91
	21:00	11.04	0.135	8.71	7.82
		10.51	0.134	8.83	7.77
	22:00	10.00	0.134	8.96	7.74
		9.58	0.137	9.07	7.72
	23:00	9.17	0.139	9.19	7.71
		8.78	0.139	9.30	7.70
5/11/06	00:00	8.41	0.140	9.40	7.69
		8.07	0.142	9.50	7.69
	01:00	7.76	0.143	9.59	7.69
		7.50	0.143	9.67	7.68
	02:00	7.26	0.143	9.74	7.68
		7.03	0.144	9.80	7.68
	03:00	6.83	0.144	9.86	7.67
		6.65	0.143	9.91	7.67
	04:00	6.47	0.141	9.97	7.67
		6.30	0.139	10.02	7.67
	05:00	6.14	0.137	10.07	7.66
		5.99	0.133	10.12	7.66
	06:00	5.85	0.130	10.18	7.65
		5.73	0.129	10.26	7.66
	07:00	5.64	0.126	10.33	7.67
		5.59	0.125	10.42	7.69
	08:00	5.63	0.125	10.48	7.72
		5.85	0.124	10.51	7.76
	09:00	6.34	0.122	10.48	7.83
		7.06	0.121	10.41	7.91
MIN		5.59	0.119	8.26	7.65
MAX		15.63	0.144	10.51	8.90
AVG		10.02	0.133	9.37	8.10

Existing stream standards: pH 6.5-9.0; DO 6.0 mg/L

Table 25 KSWD7 May 24, 2006

GPS Coordinates: 39.6585°N, 105.2863°W

Date	Time	Temp °C	Specific Conductance, mS/cm	Dissolved Oxygen, mg/L	pH, S. U.
5/24/06	10:00	13.34	0.100	8.98	7.95
		14.13	0.100	8.82	8.03
	11:00	14.89	0.099	8.70	8.12
		15.63	0.101	8.61	8.22
	12:00	16.45	0.103	8.50	8.32
		17.23	0.102	8.37	8.41
	13:00	18.06	0.102	8.22	8.49
		18.85	0.104	8.08	8.55
	14:00	19.53	0.103	7.95	8.60
		20.09	0.103	7.81	8.63
	15:00	20.58	0.106	7.71	8.65
		20.93	0.104	7.62	8.65
	16:00	21.13	0.102	7.53	8.64
		21.06	0.102	7.48	8.60
	17:00	20.87	0.101	7.41	8.51
		20.55	0.101	7.36	8.39
	18:00	19.98	0.100	7.36	8.24
		19.43	0.099	7.42	8.12
	19:00	18.77	0.098	7.48	7.97
		18.05	0.098	7.60	7.87
	20:00	17.34	0.099	7.72	7.79
		16.64	0.100	7.82	7.72
	21:00	15.98	0.100	7.93	7.68
		15.39	0.101	8.06	7.65
	22:00	14.86	0.100	8.18	7.63
		14.45	0.098	8.26	7.62
	23:00	14.11	0.098	8.34	7.61
		13.79	0.099	8.41	7.60
5/25/06	00:00	13.50	0.100	8.48	7.60
		13.26	0.099	8.54	7.60
	01:00	13.06	0.099	8.58	7.59
		12.88	0.099	8.63	7.59
	02:00	12.72	0.099	8.67	7.59
		12.60	0.099	8.70	7.58
	03:00	12.51	0.099	8.72	7.58
		12.40	0.098	8.74	7.58
	04:00	12.28	0.099	8.78	7.58
		12.15	0.099	8.82	7.58
	05:00	12.03	0.097	8.87	7.57
		11.90	0.095	8.90	7.57
	06:00	11.76	0.093	8.97	7.57
		11.67	0.092	9.04	7.58
	07:00	11.58	0.092	9.10	7.59
		11.55	0.091	9.15	7.61
	08:00	11.69	0.091	9.18	7.64
		11.99	0.090	9.19	7.68
	09:00	12.52	0.090	9.15	7.73
		13.24	0.090	9.08	7.80
MIN		11.55	0.090	7.36	7.57
MAX		21.13	0.106	9.19	8.65
AVG		15.40	0.099	8.35	7.93

Existing stream standards: pH 6.5-9.0; DO 6.0 mg/L

Table 26 KSWD7 June 7, 2006

GPS Coordinates: 39.6585°N, 105.2863°W

Date	Time	Temp °C	Specific Conductance, mS/cm	Dissolved Oxygen, mg/L	pH, S. U.
6/7/06	10:00	16.02	0.117	7.70	7.64
		17.13	0.115	7.74	7.78
	11:00	18.30	0.114	7.66	7.88
		19.41	0.113	7.57	7.97
	12:00	20.35	0.115	7.47	8.06
		20.73	0.116	7.40	8.13
	13:00	21.90	0.116	7.29	8.20
		22.45	0.115	7.14	8.23
	14:00	23.03	0.116	7.11	8.26
		22.67	0.121	6.93	8.22
	15:00	22.10	0.125	6.78	8.06
		21.90	0.129	6.93	8.06
	16:00	22.19	0.132	7.05	8.14
		22.33	0.132	7.02	8.13
	17:00	22.29	0.135	6.92	8.09
		22.27	0.137	6.92	8.06
	18:00	22.16	0.137	6.92	8.07
		21.93	0.132	6.82	8.00
	19:00	21.73	0.126	6.68	7.84
		21.52	0.122	6.69	7.74
	20:00	21.25	0.120	6.68	7.66
		20.80	0.121	6.68	7.60
	21:00	20.41	0.120	6.76	7.56
		19.96	0.118	6.82	7.54
	22:00	19.52	0.115	6.89	7.51
		19.11	0.114	6.96	7.50
	23:00	18.74	0.114	7.03	7.48
		18.36	0.120	7.11	7.48
6/8/06	00:00	18.00	0.125	7.19	7.50
		17.67	0.131	7.26	7.50
	01:00	17.38	0.140	7.33	7.52
		17.13	0.143	7.38	7.54
	02:00	16.89	0.143	7.43	7.54
		16.67	0.145	7.48	7.55
	03:00	16.44	0.145	7.53	7.55
		16.19	0.145	7.59	7.55
	04:00	15.92	0.144	7.65	7.55
		15.65	0.144	7.71	7.55
	05:00	15.37	0.145	7.78	7.55
		15.11	0.146	7.84	7.56
	06:00	14.90	0.146	7.93	7.57
		14.71	0.143	8.04	7.59
	07:00	14.63	0.140	8.16	7.62
		14.60	0.138	8.25	7.65
	08:00	14.74	0.136	8.32	7.70
		15.15	0.135	8.39	7.78
	09:00	15.65	0.130	8.39	7.86
		16.34	0.127	8.34	7.94
MIN		14.60	0.113	6.68	7.48
MAX		23.03	0.146	8.39	8.26
AVG		18.74	0.129	7.37	7.77

Existing stream standards: pH 6.5-9.0; DO 6.0 mg/L

Table 27 KSWD7 June 21, 2006

GPS Coordinates: 39.6585°N, 105.2863°W

Date	Time	Temp °C	Specific Conductance, mS/cm	Dissolved Oxygen, mg/L	pH, S. U.
6/21/06	10:00	14.62	0.148	9.65	8.09
		15.55	0.142	9.51	8.13
	11:00	16.32	0.136	9.38	8.19
		17.91	0.131	9.19	8.31
	12:00	18.66	0.128	9.02	8.37
		20.23	0.127	8.73	8.46
	13:00	19.81	0.125	8.55	8.43
		20.36	0.124	8.46	8.39
	14:00	20.87	0.126	8.25	8.42
		19.94	0.126	8.12	8.27
	15:00	19.51	0.124	8.33	8.28
		19.44	0.125	8.42	8.28
	16:00	19.63	0.131	8.36	8.29
		19.15	0.134	8.17	8.14
	17:00	19.00	0.132	8.24	8.10
		19.00	0.131	8.26	8.02
	18:00	19.22	0.135	8.36	8.07
		19.12	0.149	8.23	8.04
	19:00	19.01	0.157	8.07	7.94
		19.10	0.160	8.10	7.94
	20:00	19.03	0.156	7.92	7.87
		18.74	0.153	7.91	7.80
	21:00	18.41	0.151	7.92	7.76
		18.06	0.149	7.98	7.72
	22:00	17.73	0.150	8.03	7.71
		17.39	0.152	8.11	7.70
	23:00	17.03	0.154	8.18	7.69
		16.76	0.156	8.31	7.68
6/22/06	00:00	16.50	0.158	8.38	7.68
		16.27	0.154	8.44	7.69
	01:00	16.00	0.151	8.50	7.67
		15.77	0.157	8.50	7.63
	02:00	15.53	0.163	8.52	7.61
		15.29	0.159	8.59	7.61
	03:00	15.03	0.157	8.66	7.60
		14.77	0.161	8.70	7.59
	04:00	14.52	0.164	8.74	7.59
		14.32	0.160	8.82	7.59
	05:00	14.13	0.157	8.90	7.58
		13.95	0.160	8.96	7.59
	06:00	13.78	0.160	9.05	7.61
		13.67	0.155	9.18	7.65
	07:00	13.57	0.148	9.28	7.68
		13.62	0.142	9.44	7.73
	08:00	13.79	0.135	9.49	7.78
		14.03	0.129	9.52	7.83
	09:00	14.28	0.125	9.48	7.86
		14.79	0.122	9.42	7.89
MIN		13.57	0.122	7.91	7.58
MAX		20.87	0.164	9.65	8.46
AVG		16.94	0.144	8.63	7.91

Existing stream standards: pH 6.5-9.0; DO 6.0 mg/L

Table 28 KSWD7 July 12, 2006

GPS Coordinates: 39.6585°N, 105.2863°W

Date	Time	Temp °C	Specific Conductance, mS/cm	Dissolved Oxygen, mg/L	pH, S. U.
7/12/06	10:00	14.30	0.089	8.43	7.60
		14.65	0.088	8.42	7.61
	11:00	15.05	0.089	8.39	7.63
		15.54	0.090	8.33	7.64
	12:00	15.81	0.090	8.28	7.63
		15.92	0.089	8.25	7.65
	13:00	15.97	0.090	8.25	7.64
		16.03	0.089	8.21	7.63
	14:00	16.42	0.089	8.14	7.66
		16.78	0.089	8.08	7.63
	15:00	16.79	0.089	8.07	7.62
		16.84	0.089	8.06	7.64
	16:00	17.34	0.088	7.97	7.67
		17.58	0.089	7.92	7.64
	17:00	17.34	0.090	7.95	7.60
		16.95	0.089	8.02	7.59
	18:00	16.64	0.089	8.04	7.60
		16.11	0.089	8.14	7.59
	19:00	15.62	0.089	8.20	7.59
		15.32	0.089	8.25	7.57
	20:00	15.36	0.089	8.21	7.58
		15.80	0.090	8.13	7.58
	21:00	16.15	0.091	8.06	7.53
		16.19	0.091	8.04	7.50
	22:00	16.17	0.090	8.06	7.49
		16.05	0.090	8.08	7.48
	23:00	15.85	0.090	8.12	7.47
		15.66	0.090	8.15	7.48
7/13/06	00:00	15.51	0.090	8.18	7.48
		15.44	0.090	8.19	7.48
	01:00	15.36	0.090	8.20	7.48
		15.13	0.090	8.24	7.47
	02:00	14.88	0.090	8.27	7.47
		14.75	0.089	8.29	7.48
	03:00	14.59	0.089	8.30	7.48
		14.46	0.089	8.34	7.47
	04:00	14.38	0.089	8.35	7.47
		14.26	0.089	8.38	7.47
	05:00	14.10	0.088	8.41	7.47
		13.98	0.089	8.43	7.47
	06:00	13.92	0.088	8.44	7.47
		13.84	0.088	8.46	7.47
	07:00	13.77	0.087	8.47	7.47
		13.77	0.088	8.48	7.49
	08:00	13.83	0.088	8.47	7.50
		13.98	0.088	8.47	7.53
	09:00	14.21	0.089	8.45	7.54
		14.48	0.090	8.42	7.55
MIN		13.77	0.087	7.92	7.47
MAX		17.58	0.091	8.48	7.67
AVG		15.39	0.089	8.24	7.55

Existing stream standards: pH 6.5-9.0; DO 6.0 mg/L

Table 29 LOBDOW May 17, 2006

GPS Coordinates: 39.6672°N, 105.2587°W

Date	Time	Temp °C	Specific Conductance, mS/cm	Dissolved Oxygen, mg/L	pH, S. U.
5/17/06	10:00	11.43	0.148	10.13	8.52
		12.23	0.156	10.02	8.51
	11:00	13.07	0.163	9.83	8.59
		13.89	0.153	9.62	8.68
	12:00	14.61	0.152	9.35	8.77
		15.01	0.149	9.17	8.81
	13:00	15.65	0.151	9.03	8.83
		15.63	0.149	8.51	8.78
	14:00	16.34	0.150	8.68	8.76
		16.95	0.149	8.66	8.82
	15:00	17.45	0.148	8.55	8.89
		17.39	0.151	8.11	8.86
	16:00	16.91	0.156	7.74	8.59
		17.01	0.157	8.25	8.47
	17:00	16.98	0.155	8.36	8.52
		17.03	0.154	8.38	8.58
	18:00	16.92	0.155	8.17	8.55
		16.72	0.156	8.06	8.43
	19:00	16.57	0.154	7.94	8.29
		16.32	0.149	7.78	8.13
	20:00	16.03	0.149	7.78	8.01
		15.63	0.154	7.86	7.94
	21:00	15.30	0.155	7.93	7.89
		15.02	0.154	7.99	7.86
	22:00	14.82	0.154	8.04	7.83
		14.62	0.153	8.08	7.82
	23:00	14.39	0.153	8.13	7.80
		14.11	0.153	8.19	7.79
5/18/06	00:00	13.82	0.153	8.27	7.78
		13.52	0.152	8.34	7.78
	01:00	13.27	0.153	8.39	7.77
		13.06	0.154	8.44	7.76
	02:00	12.89	0.153	8.48	7.76
		12.73	0.154	8.51	7.75
	03:00	12.55	0.154	8.56	7.75
		12.37	0.154	8.60	7.74
	04:00	12.21	0.151	8.64	7.74
		12.02	0.148	8.68	7.74
	05:00	11.82	0.148	8.73	7.73
		11.64	0.150	8.76	7.72
	06:00	11.45	0.150	8.84	7.73
		11.27	0.150	8.94	7.73
	07:00	11.15	0.150	9.07	7.75
		11.14	0.150	9.22	7.79
	08:00	11.23	0.149	9.35	7.84
		11.46	0.148	9.46	7.91
	09:00	11.79	0.151	9.52	8.00
		12.30	0.152	9.55	8.10
MIN		11.14	0.15	7.74	7.72
MAX		17.45	0.16	10.13	8.89
AVG		14.12	0.15	8.64	8.15

Existing stream standards: pH 6.5-9.0; DO 6.0 mg/L

Table 30 LOBDOW May 31, 2006

GPS Coordinates: 39.6672°N, 105.2587°W

Date	Time	Temp °C	Specific Conductance, mS/cm	Dissolved Oxygen, mg/L	pH, S. U.
5/31/06	10:00	12.51	0.138	10.99	8.32
		13.20	0.143	10.99	8.40
	11:00	13.52	0.142	10.72	8.44
		14.34	0.143	10.83	8.49
	12:00	14.51	0.144	10.68	8.52
		14.40	0.145	10.38	8.49
	13:00	14.59	0.151	10.39	8.45
		15.56	0.140	10.35	8.50
	14:00	16.24	0.138	10.28	8.54
		17.12	0.141	10.14	8.58
	15:00	17.88	0.143	9.90	8.62
		18.00	0.143	9.77	8.61
	16:00	17.98	0.148	9.59	8.58
		17.80	0.150	9.60	8.52
	17:00	17.76	0.153	9.52	8.48
		17.45	0.150	9.37	8.38
	18:00	17.32	0.149	9.30	8.29
		17.24	0.148	9.17	8.20
	19:00	17.05	0.151	9.13	8.10
		16.83	0.151	9.14	8.04
	20:00	16.57	0.152	9.02	7.97
		16.32	0.157	9.02	7.91
	21:00	16.09	0.158	9.07	7.87
		15.87	0.157	9.12	7.85
	22:00	15.66	0.156	9.19	7.82
		15.43	0.154	9.22	7.81
	23:00	15.22	0.151	9.26	7.79
		15.00	0.150	9.32	7.77
6/1/06	00:00	14.77	0.151	9.38	7.77
		14.53	0.152	9.41	7.76
	01:00	14.29	0.152	9.48	7.75
		14.02	0.155	9.50	7.74
	02:00	13.74	0.154	9.57	7.70
		13.45	0.152	9.63	7.71
	03:00	13.16	0.150	9.67	7.72
		12.87	0.148	9.71	7.73
	04:00	12.58	0.146	9.79	7.72
		12.30	0.143	9.84	7.73
	05:00	12.02	0.141	9.87	7.74
		11.75	0.140	9.95	7.74
	06:00	11.48	0.141	10.03	7.75
		11.26	0.141	10.13	7.77
	07:00	11.10	0.145	10.25	7.79
		11.08	0.147	10.40	7.85
	08:00	11.14	0.145	10.48	7.90
		11.33	0.144	10.53	7.96
	09:00	11.63	0.143	10.56	8.02
		12.12	0.142	10.60	8.08
MIN		11.08	0.14	9.02	7.70
MAX		18.00	0.16	10.99	8.62
AVG		14.54	0.15	9.84	8.07

Existing stream standards: pH 6.5-9.0; DO 6.0 mg/L

Table 31 EMD5A June 28, 2006

GPS Coordinates: 39.6614°N, 105.2355°W

Date	Time	Temp °C	Specific Conductance, mS/cm	Dissolved Oxygen, mg/L	pH, S. U.
6/28/06		16.16	0.145	8.72	7.84
	11:00	16.24	0.147	8.66	8.09
		16.65	0.147	8.61	8.20
	12:00	17.56	0.147	8.45	8.27
		17.79	0.146	8.36	8.29
	13:00	18.54	0.145	8.32	8.36
		19.58	0.142	8.16	8.41
	14:00	20.01	0.139	7.80	8.39
		19.38	0.138	7.63	8.24
	15:00	19.32	0.148	7.56	8.12
		19.02	0.163	7.64	8.06
	16:00	18.94	0.171	7.72	8.04
		19.12	0.177	7.96	8.09
	17:00	19.16	0.178	8.03	8.16
		19.15	0.176	7.94	8.20
	18:00	18.78	0.173	7.93	8.18
		18.39	0.166	7.93	8.14
	19:00	18.13	0.162	7.92	8.10
		17.93	0.159	7.92	8.05
	20:00	17.78	0.155	7.96	8.03
		17.63	0.151	7.94	7.99
	21:00	17.51	0.146	7.94	7.96
		17.35	0.144	7.96	7.93
	22:00	17.13	0.141	8.01	7.91
		16.85	0.139	8.07	7.90
	23:00	16.63	0.138	8.12	7.89
		16.44	0.137	8.15	7.89
6/29/06	00:00	16.20	0.139	8.21	7.89
		15.94	0.141	8.25	7.89
	01:00	15.61	0.146	8.33	7.89
		15.32	0.149	8.39	7.90
	02:00	15.10	0.150	8.45	7.91
		14.83	0.151	8.48	7.91
	03:00	14.60	0.151	8.55	7.91
		14.41	0.151	8.59	7.91
	04:00	14.14	0.151	8.64	7.91
		13.85	0.152	8.72	7.91
	05:00	13.64	0.153	8.76	7.91
		13.41	0.152	8.83	7.91
	06:00	13.23	0.152	8.90	7.91
		13.09	0.155	8.98	7.92
	07:00	12.96	0.156	9.05	7.93
		12.85	0.157	9.12	7.95
	08:00	12.83	0.153	9.16	7.97
		12.97	0.149	9.19	8.00
	09:00	13.40	0.146	9.22	8.03
		13.87	0.145	9.15	8.06
	10:00	14.43	0.142	9.08	8.12
MIN		12.83	0.14	7.56	7.84
MAX		20.01	0.18	9.22	8.41
AVG		16.33	0.15	8.36	8.03

Existing stream standards: pH 6.5-9.0; DO 6.0 mg/L

Table 32 EMD5A July 26, 2006

GPS Coordinates: 39.6614°N, 105.2355°W

Date	Time	Temp °C	Specific Conductance, mS/cm	Dissolved Oxygen, mg/L	pH, S. U.
7/26/06	13:00	20.52	0.095	7.43	7.97
		20.61	0.095	7.56	7.96
	14:00	20.89	0.095	7.63	8.01
		21.04	0.095	7.64	8.05
	15:00	21.07	0.096	7.57	8.00
		20.82	0.095	7.51	7.91
	16:00	20.58	0.095	7.54	7.85
		20.58	0.095	7.57	7.96
	17:00	20.55	0.095	7.60	7.94
		20.46	0.095	7.53	7.89
	18:00	20.36	0.095	7.54	7.88
		20.28	0.094	7.57	7.90
	19:00	20.13	0.094	7.54	7.89
		19.88	0.094	7.51	7.87
	20:00	19.48	0.098	7.51	7.84
		19.08	0.102	7.51	7.83
	21:00	18.81	0.103	7.51	7.81
		18.55	0.100	7.54	7.81
	22:00	18.27	0.102	7.56	7.81
		18.01	0.102	7.56	7.81
	23:00	17.78	0.101	7.57	7.81
		17.57	0.101	7.57	7.80
	00:00	17.42	0.100	7.59	7.80
		17.29	0.100	7.59	7.80
	01:00	17.18	0.100	7.59	7.80
		17.08	0.100	7.58	7.80
	02:00	17.01	0.101	7.58	7.79
		16.95	0.096	7.58	7.79
7/27/06	03:00	16.90	0.097	7.57	7.77
		16.81	0.098	7.57	7.77
	04:00	16.71	0.097	7.57	7.77
		16.62	0.095	7.57	7.77
	05:00	16.52	0.094	7.57	7.77
		16.46	0.095	7.58	7.79
	06:00	16.42	0.095	7.57	7.78
		16.35	0.095	7.58	7.79
	07:00	16.29	0.095	7.58	7.80
		16.24	0.095	7.58	7.81
	08:00	16.21	0.095	7.58	7.83
		16.23	0.096	7.60	7.86
	09:00	16.28	0.095	7.61	7.90
		16.42	0.095	7.66	7.93
	10:00	16.71	0.094	7.68	7.98
		16.98	0.094	7.67	8.02
	11:00	17.35	0.095	7.67	8.06
		17.82	0.099	7.66	8.09
	12:00	18.33	0.099	7.66	8.11
		18.92	0.100	7.64	8.14
MIN		16.21	0.09	7.43	7.77
MAX		21.07	0.10	7.68	8.14
AVG		18.23	0.10	7.58	7.88

Existing stream standards: pH 6.5-9.0; DO 6.0 mg/L

DATA TABLES—STREAM FLOW

During the Program, stream flows for Bear Creek were tracked using two gaging stations. The stations are the USGS station above Evergreen Lake and the DWR/U.S. Army COE station above Morrison. Weekly downloads of flow graphs were printed to document flows. Downloads were obtained at http://www.dwr.state.co.us/Hydrology/flow_search.asp.

The gaging station above Evergreen Lake underwent restoration efforts during July 2005. 2006 Daily Mean Flows and Historical Record of Daily Mean Flows are presented in tables for each month of the Study period. The available historic record for this gage is 21 years (1984-2005).

The gaging station in Morrison is located below the MORR10 sampling and monitoring location. 2006 Daily Mean Flows and Historical Record of Daily Mean Flows are presented in tables for each month of the Study period. The available historic record for this gage is 87 years (1899-2005— however, permanent reliable data was recorded from 1919).

The 2006 Study period and historical Minimum, Maximum and Average were calculated. A Deviation from Historic averages was also calculated. When both the Minimum and Maximum values for Deviation from Historic were negative, these values were interchanged to reflect the desired interpretation.

Table 33 2006 May Bear Creek Evergreen vs. Historic Bear Creek Flow

USGS 06710385 GPS Coordinates: 39.6328°N, 105.3361°W

Date	Daily Mean Flow (cfs) May 2006	Historic Daily Mean Flow (cfs) 21 Years for May	Deviation from Historic Flow (cfs)
1	18	73	-55
2	18	74	-56
3	19	74	-55
4	20	74	-54
5	22	79	-57
6	22	83	-61
7	23	84	-61
8	20	84	-64
9	21	85	-64
10	19	87	-68
11	17	87	-70
12	17	84	-67
13	19	83	-64
14	21	86	-65
15	19	87	-68
16	20	91	-71
17	20	93	-73
18	21	93	-72
19	22	98	-76
20	24	99	-75
21	24	100	-76
22	22	100	-78
23	28	98	-70
34	24	100	-76
25	22	111	-89
26	20	113	-93
27	20	112	-92
28	18	109	-91
29	18	110	-92
30	17	109	-92
31	18	104	-86
MIN	17	74	-54
MAX	28	113	-93
AVG	21	93	-73

Historic flows calculated on 21 years of data obtained at the USGS gaging station above Evergreen Lake. Minimum and Maximum Deviation from Historic Flow values are results of formula calculations. When both values are negative, these two values have been interchanged to reflect the intended representation.

Table 34 2006 June Bear Creek Evergreen vs. Historic Bear Creek Flow

USGS 06710385 GPS Coordinates: 39.6328°N, 105.3361°W

Date	Daily Mean Flow (cfs) June 2006	Historic Daily Mean Flow (cfs) 21 Years for June	Deviation from Historic Flow (cfs)
1	16	106	-90
2	17	102	-85
3	16	101	-85
4	16	100	-84
5	15	100	-85
6	16	100	-84
7	16	106	-90
8	16	102	-86
9	16	111	-95
10	15	109	-94
11	14	102	-88
12	14	100	-86
13	14	100	-86
14	14	99	-85
15	12	99	-87
16	13	100	-87
17	13	101	-88
18	11	104	-93
19	10	95	-85
20	10	94	-84
21	10	91	-81
22	14	91	-77
23	12	87	-75
34	11	83	-72
25	10	81	-71
26	12	81	-69
27	12	78	-66
28	11	78	-67
29	10	78	-68
30	10	74	-64
MIN	10	74	-64
MAX	17	111	-95
AVG	13	95	-82

Historic flows calculated on 21 years of data obtained at the USGS gaging station above Evergreen Lake. Minimum and Maximum Deviation from Historic Flow values are results of formula calculations. When both values are negative, these two values have been interchanged to reflect the intended representation.

Table 35 2006 July Bear Creek Evergreen vs. Historic Bear Creek Flow

USGS 06710385 GPS Coordinates: 39.6328°N, 105.3361°W

Date	Daily Mean Flow (cfs) July 2006	Historic Daily Mean Flow (cfs) 21 Years for July	Deviation from Historic Flow (cfs)
1	10	70	-60
2	12	65	-53
3	13	63	-50
4	18	62	-44
5	17	61	-44
6	27	60	-33
7	29	61	-32
8	71	62	9
9	160	65	95
10	144	63	81
11	96	61	35
12	93	59	34
13	75	60	15
14	61	57	4
15	55	54	1
16	52	54	-2
17	46	59	-13
18	44	55	-11
19	44	55	-11
20	44	54	-10
21	61	53	8
22	45	51	-6
23	39	55	-16
34	38	55	-17
25	39	53	-14
26	47	54	-7
27	41	50	-9
28	35	51	-16
29	32	53	-21
30	29	54	-25
31	27	54	-27
MIN	12	50	-53
MAX	160	65	95
AVG	51	57	-6

Historic flows calculated on 21 years of data obtained at the USGS gaging station above Evergreen Lake. Minimum and Maximum Deviation from Historic Flow values are results of formula calculations. When both values are negative, these two values have been interchanged to reflect the intended representation.

Table 36 2006 August Bear Creek Evergreen vs. Historic Bear Creek Flow

USGS 06710385 GPS Coordinates: 39.6328°N, 105.3361°W

Date	Daily Mean Flow (cfs) August 2006	Historic Daily Mean Flow (cfs) 21 Years for August	Deviation from Historic Flow (cfs)
1	28	55	-27
2	27	54	-27
3	26	54	-28
4	27	59	-32
5	27	63	-36
6	36	61	-25
7	37	57	-20
8	34	55	-21
9	28	54	-26
10	27	56	-29
11	27	55	-28
12	26	53	-27
13	33	53	-20
14	34	51	-17
15	35	49	-14
16	29	48	-19
17	28	48	-20
18	29	48	-19
19	46	50	-4
20	43	46	-3
21	36	45	-9
22	34	45	-11
23	30	47	-17
34	28	48	-20
25	29	45	-16
26	32	43	-11
27	33	42	-9
28	28	42	-14
29	27	41	-14
30	26	40	-14
31	25	38	-13
MIN	25	38	-3
MAX	46	63	-36
AVG	31	50	-19

Historic flows calculated on 21 years of data obtained at the USGS gaging station above Evergreen Lake. Minimum and Maximum Deviation from Historic Flow values are results of formula calculations. When both values are negative, these two values have been interchanged to reflect the intended representation.

Table 37 2006 September Bear Creek Evergreen vs. Historic Bear Creek Flow

USGS 06710385 GPS Coordinates: 39.6328°N, 105.3361°W

Date	Daily Mean Flow (cfs) September 2006	Historic Daily Mean Flow (cfs) 21 Years for September	Deviation from Historic Flow (cfs)
1	26	40	-14
2	26	39	-13
3	26	37	-11
4	24	37	-13
5	23	36	-13
6	22	35	-13
7	22	35	-13
8	24	35	-11
9	35	35	0
10	28	36	-8
11	25	37	-12
12	25	36	-11
13	22	34	-12
14	21	33	-12
15	22	32	-10
16	21	30	-9
17	19	30	-11
18	18	29	-11
19	20	29	-9
20	19	30	-11
21	26	30	-4
22	25	30	-5
23	24	29	-5
34	23	29	-6
25	24	28	-4
26	23	28	-5
27	22	27	-5
28	22	28	-6
29	20	28	-8
30	20	28	-8
MIN	18	27	-14
MAX	35	40	0
AVG	23	32	-9

Historic flows calculated on 21 years of data obtained at the USGS gaging station above Evergreen Lake. Minimum and Maximum Deviation from Historic Flow values are results of formula calculations. When both values are negative, these two values have been interchanged to reflect the intended representation.

Table 38 2006 May Bear Creek Morrison vs. Historic Bear Creek Flow

USGS 06710500 GPS Coordinates: 39.6530°N, 105.1950°W

Date	Daily Mean Flow (cfs) May 2006	Historic Daily Mean Flow (cfs) 87 Years for May	Deviation from Historic Flow (cfs)
1	19	118	-99
2	19	117	-98
3	18	117	-99
4	23	118	-95
5	24	123	-99
6	25	136	-111
7	24	151	-127
8	22	149	-127
9	21	146	-125
10	24	147	-123
11	21	146	-125
12	19	146	-127
13	19	144	-125
14	21	144	-123
15	22	143	-121
16	19	149	-130
17	20	151	-131
18	20	151	-131
19	21	154	-133
20	24	157	-133
21	24	156	-132
22	23	157	-134
23	26	155	-129
34	24	155	-131
25	21	157	-136
26	19	156	-137
27	18	155	-137
28	16	151	-135
29	15	152	-137
30	15	151	-136
31	17	149	-132
MIN	15	117	-95
MAX	26	157	-137
AVG	21	145	-124

Historic flows calculated on 87 years of data obtained at the USGS gaging station above Morrison.
Minimum and Maximum Deviation from Historic Flow values are results of formula calculations. When both values are negative, these two values have been interchanged to reflect the intended representation.

Table 39 2006 June Bear Creek Morrison vs. Historic Bear Creek Flow

USGS 06710500 GPS Coordinates: 39.6530°N, 105.1950°W

Date	Daily Mean Flow (cfs) June 2006	Historic Daily Mean Flow (cfs) 87 Years for June	Deviation from Historic Flow (cfs)
1	15	148	-133
2	13	148	-135
3	13	150	-137
4	12	151	-139
5	10	158	-148
6	10	152	-142
7	10	152	-142
8	10	151	-141
9	10	154	-144
10	11	157	-146
11	10	156	-146
12	10	149	-139
13	9	149	-140
14	9	146	-137
15	8	143	-135
16	10	139	-129
17	12	136	-124
18	9	135	-126
19	9	129	-120
20	7	124	-117
21	6	122	-116
22	11	128	-117
23	13	118	-105
34	10	111	-102
25	8	107	-99
26	8	106	-98
27	11	100	-89
28	9	96	-87
29	7	94	-87
30	8	94	-86
MIN	6	94	-86
MAX	15	158	-148
AVG	10	133	-124

Historic flows calculated on 87 years of data obtained at the USGS gaging station above Morrison.
Minimum and Maximum Deviation from Historic Flow values are results of formula calculations. These two values have been interchanged to reflect the intended representation.

Table 40 2006 July Bear Creek Morrison vs. Historic Bear Creek Flow

USGS 06710500 GPS Coordinates: 39.6530°N, 105.1950°W

Date	Daily Mean Flow (cfs) July 2006	Historic Daily Mean Flow (cfs) 87 Years for July	Deviation from Historic Flow (cfs)
1	7	90	-83
2	7	85	-78
3	11	82	-71
4	12	79	-67
5	17	77	-60
6	18	76	-58
7	34	79	-45
8	81	75	6
9	206	76	130
10	197	74	123
11	109	72	37
12	95	72	23
13	79	68	11
14	63	67	-4
15	56	66	-10
16	50	65	-15
17	46	66	-20
18	43	67	-24
19	43	67	-24
20	41	67	-26
21	57	65	-8
22	45	69	-24
23	37	68	-31
34	34	67	-33
25	36	67	-31
26	42	68	-26
27	43	64	-21
28	32	66	-34
29	28	66	-38
30	25	65	-40
31	23	67	-44
MIN	7	64	-83
MAX	206	90	130
AVG	52	71	-19

Historic flows calculated on 87 years of data obtained at the USGS gaging station above Morrison. Minimum and Maximum Deviation from Historic Flow values are results of formula calculations. These two values have been interchanged to reflect the intended representation.

Table 41 2006 August Bear Creek Morrison vs. Historic Bear Creek Flow

USGS 06710500 GPS Coordinates: 39.6530°N, 105.1950°W

Date	Daily Mean Flow (cfs) August 2006	Historic Daily Mean Flow (cfs) 87 Years for August	Deviation from Historic Flow (cfs)
1	24	68	-44
2	24	69	-45
3	23	72	-49
4	24	75	-51
5	21	74	-53
6	30	73	-43
7	33	71	-38
8	32	69	-37
9	26	68	-42
10	22	65	-43
11	22	62	-40
12	23	63	-40
13	25	62	-37
14	29	63	-34
15	30	62	-32
16	27	60	-33
17	24	62	-38
18	24	62	-38
19	37	62	-25
20	42	62	-20
21	33	64	-31
22	30	62	-32
23	26	60	-34
34	24	60	-36
25	25	60	-35
26	31	58	-27
27	31	56	-25
28	26	54	-28
29	24	53	-29
30	23	56	-33
31	21	52	-31
MIN	21	52	-20
MAX	42	75	-53
AVG	27	63	-36

Historic flows calculated on 87 years of data obtained at the USGS gaging station above Morrison. Minimum and Maximum Deviation from Historic Flow values are results of formula calculations. These two values have been interchanged to reflect the intended representation.

Table 42 2006 September Bear Creek Morrison vs. Historic Bear Creek Flow

USGS 06710500 GPS Coordinates: 39.6530°N, 105.1950°W

Date	Daily Mean Flow (cfs) September 2006	Historic Daily Mean Flow (cfs) 87 Years for September	Deviation from Historic Flow (cfs)
1	22	51	-29
2	23	56	-33
3	24	53	-29
4	20	51	-31
5	20	49	-29
6	18	48	-30
7	18	49	-31
8	20	50	-30
9	29	47	-18
10	27	49	-22
11	24	50	-26
12	24	47	-23
13	21	44	-23
14	20	43	-23
15	19	41	-22
16	21	40	-19
17	18	40	-22
18	17	38	-21
19	17	37	-20
20	17	38	-21
21	28	37	-9
22	25	37	-12
23	25	37	-12
34	23	36	-13
25	23	37	-14
26	22	36	-14
27	22	36	-14
28	20	35	-15
29	20	35	-15
30	19	35	-16
MIN	17	35	-9
MAX	29	56	-33
AVG	22	43	-21

Historic flows calculated on 87 years of data obtained at the USGS gaging station above Morrison. Minimum and Maximum Deviation from Historic Flow values are results of formula calculations. These two values have been interchanged to reflect the intended representation.

Weather Data

Local weather data was documented at the Evergreen Metropolitan District's WWTP. The plant has been operating the National Weather Service reporting station since EMD assumed operations of the plant in 1974. Online historical records however, are available from 1971 through 2000. Historical weather data was obtained from the National Oceanographic and Atmospheric Administration/National Weather Service.

Maximum and minimum air temperature values along with precipitation measurements are read each morning. Daily readings were entered into a NWS software program. Local weather statistics were summarized, comparing 2006 monthly maximum, minimum and mean air temperatures and monthly precipitation to 30-year (1971-2000) historical data.

Table 43 Weather Data May-September 2006 Summary

Monthly Weather Data	May 2006	June 2006	July 2006	August 2006	September 2006
Air Temp Low Max (°C)	48	65	58	66	45
Air Temp High Max (°C)	80	91	93	85	79
Air Temp High Avg (°C)	68	79	82	78	67
Total Precip (in.)	1.10	1.08	4.02	1.4	1.52
Days of Precip.	12	9	13	15	8

Table 44 2006 Weather Data vs. Historical Weather Data (30 years 1971-2000)

	May 2006	May Hist	% Dev	June 2006	Jun Hist	% Dev	July 2006	July Hist	% Dev.	Aug 2006	Aug Hist	% Dev.	Sept 2006	Sept Hist	% Dev.
Avg Daily Min (°F)	37	34.0	8.8	53	41.3	28.3	53	46.5	13.9	54	45.5	20.9	37	37.3	-0.8
Avg Daily Max (°F)	64	64.4	-0.6	71	75.6	-6.1	74	80.8	-8.4	73	79.3	-7.2	62	72.0	-13.9
Avg Mon. Mean (°F)	52	49.2	6.5	62	58.5	5.98	66	63.7	3.6	64	62.4	2.5	52	54.7	-4.9
Precip (in.)	1.10	2.71	-59.	1.08	2.05	-47.3	4.02	2.29	75.5	1.4	2.32	-39.6	1.52	1.45	4.8

Streamflows vs. Local Weather

Streamflows, as measured at the USGS gage above Evergreen Lake, were compared to local weather observations obtained from the NWS reporting station located at the EMD WWTP. The following tables illustrate the relationship between high air temperatures and measured precipitation, and their effect on streamflows measured above Evergreen Lake.

Table 45 2006 May Bear Creek Evergreen vs. Weather Data

USGS 06710385 GPS Coordinates: 39.6328°N, 105.3361°W

Date	May 2006 Daily Mean Flow (cfs)	May 2006 Daily Air Max Temp (°F)	May 2006 Precip. (in.)
1	18	66	0.06
2	18	68	0
3	19	73	0
4	20	51	0.1
5	22	43	0.25
6	22	45	0.16
7	23	59	0.01
8	20	64	0
9	21	67	0
10	19	61	0.13
11	17	55	0
12	17	62	0
13	19	75	0
14	21	73	0
15	19	61	0
16	20	66	0
17	20	72	0
18	21	72	0.01
19	22	76	0
20	24	79	tr
21	24	77	0.12
22	22	80	0
23	28	66	0.14
34	24	70	0
25	22	78	0
26	20	78	0.04
27	20	80	0
28	18	80	0
29	18	76	0
30	17	62	0.01
31	18	60	0.07
MIN	17	43	
MAX	28	80	0.25
AVG	21	68	
TOTAL			1.1

Historic flows calculated on 21 years of data obtained at the USGS gaging station above Evergreen Lake. Minimum and Maximum Deviation from Historic Flow values are results of formula calculations. When both values are negative, these two values have been interchanged to reflect the intended representation.

Table 46 2006 June Bear Creek Evergreen vs. Weather Data

USGS 06710385 GPS Coordinates: 39.6328°N, 105.3361°W

Date	June 2006 Daily Mean Flow (cfs)	June 2006 Daily Max Air Temp (°F)	June 2006 Precip (in.)
1	16	67	0.01
2	17	75	0
3	16	83	0
4	16	85	0
5	15	82	0
6	16	84	0
7	16	85	0
8	16	90	0
9	16	84	0
10	15	79	0
11	14	81	0
12	14	82	0
13	14	82	0
14	14	89	0
15	12	91	0
16	13	72	0.18
17	13	66	0.29
18	11	80	0
19	10	85	0
20	10	84	0
21	10	83	0
22	14	71	0.45
23	12	68	0.02
34	11	82	0
25	10	73	0.1
26	12	65	0.01
27	12	73	
28	11	78	0.01
29	10	78	0.01
30	10	83	
MIN	10	65	
MAX	17	91	0.45
AVG	13	79	
TOTAL			1.08

Historic flows calculated on 21 years of data obtained at the USGS gaging station above Evergreen Lake. Minimum and Maximum Deviation from Historic Flow values are results of formula calculations. When both values are negative, these two values have been interchanged to reflect the intended representation.

Table 47 2006 July Bear Creek Evergreen vs. Weather Data

USGS 06710385 GPS Coordinates: 39.6328°N, 105.3361°W

Date	July 2006 Daily Mean Flow (cfs)	July 2006 Daily Max Air Temp (°F)	July 2006 Precip (in.)
1	10	85	0
2	12	85	0.01
3	13	85	0.11
4	18	75	0.01
5	17	76	0.05
6	27	76	0
7	29	77	0.41
8	71	80	1.36
9	160	59	1.21
10	144	58	0.25
11	96	74	0
12	93	79	0.01
13	75	83	0
14	61	86	0
15	55	89	0
16	52	91	0
17	46	93	0
18	44	82	0
19	44	88	0
20	44	87	0
21	61	80	0.08
22	45	77	0
23	39	80	0
34	38	88	0
25	39	87	0.21
26	47	79	0.18
27	41	82	0.13
28	35	83	0
29	32	85	0
30	29	87	0
31	27	91	0
MIN	12	58	
MAX	160	93	1.36
AVG	51	82	
TOTAL			4.02

Historic flows calculated on 21 years of data obtained at the USGS gaging station above Evergreen Lake. Minimum and Maximum Deviation from Historic Flow values are results of formula calculations. When both values are negative, these two values have been interchanged to reflect the intended representation.

Table 48 2006 August Bear Creek Evergreen vs. Weather Data

USGS 06710385 GPS Coordinates: 39.6328°N, 105.3361°W

Date	August 2006 Daily Mean Flow (cfs)	August 2006 Daily Max Air Temp (ºF)	August 2006 Precip (in.)
1	28	84	0
2	27	78	0
3	26	74	0.09
4	27	77	0.02
5	27	82	0
6	36	73	0.26
7	37	76	0.06
8	34	75	0.08
9	28	83	0
10	27	85	0.01
11	27	84	0
12	26	82	0
13	33	79	0.01
14	34	74	0
15	35	76	0.02
16	29	81	0
17	28	78	0.01
18	29	82	0.01
19	46	77	0.05
20	43	77	0.28
21	36	79	0
22	34	77	0
23	30	84	0
34	28	85	0
25	29	84	0
26	32	71	0.26
27	33	66	0.22
28	28	69	0
29	27	70	0.02
30	26	75	0
31	25	83	0
MIN	25	66	
MAX	46	85	0.28
AVG	31	78	
TOTAL			1.4

Historic flows calculated on 21 years of data obtained at the USGS gaging station above Evergreen Lake. Minimum and Maximum Deviation from Historic Flow values are results of formula calculations. When both values are negative, these two values have been interchanged to reflect the intended representation.

Table 49 2006 September Bear Creek Evergreen vs. Weather Data

USGS 06710385 GPS Coordinates: 39.6328°N, 105.3361°W

Date	September 2006 Daily Mean Flow (cfs)	September 2006 Daily Max Air Temp (ºF)	September 2006 Precip (in.)
1	26	77	0
2	26	78	0.05
3	26	62	0
4	24	68	0
5	23	69	0
6	22	75	0
7	22	74	0
8	24	73	0.03
9	35	54	0.26
10	28	63	0.1
11	25	66	0.1
12	25	69	0.29
13	22	70	0
14	21	79	0
15	22	78	0
16	21	73	0
17	19	64	0
18	18	58	0
19	20	60	0
20	19	71	0
21	26	69	0.67
22	25	58	0
23	24	45	0.02
34	23	47	0
25	24	59	0
26	23	63	0
27	22	72	0
28	22	67	0
29	20	76	0
30	20	78	0
MIN	18	45	
MAX	35	79	0.67
AVG	23	67	
TOTAL			1.52

Historic flows calculated on 21 years of data obtained at the USGS gaging station above Evergreen Lake. Minimum and Maximum Deviation from Historic Flow values are results of formula calculations. When both values are negative, these two values have been interchanged to reflect the intended representation.

DATA SUMMARIES

Summary of In-Stream Temperature Datalogger Results

A total of 70,321 temperature data points were obtained for the ten datalogger locations within Segment 1a. The evaluating criteria used to determine potential impairment of stream temperature is the proposed underlying17°C Weekly Average Temperature (WAT) and the interim (July 2009) 20°C Maximum Weekly Average Temperature (MWAT). The WAT is determined by calculating the seven-day average temperature of all measurements collected in seven consecutive days, beginning with the first day of data collection. There were 201 weekly averages calculated for the Study period. There were 96 exceedances of the evaluating criteria (17°C WAT) at all of the ten locations within the Segment. **This results in 52.3% compliance with the interim standard of 17°C as a WAT.**

The second and currently applicable evaluating criteria used to determine potential impairment of stream temperature is the interim 20°C Maximum Weekly Average Temperature (MWAT). The MWAT is determined by calculating the average of seven consecutive WAT measurements calculated, beginning with the first day of data collection. There were 141 maximum weekly averages calculated for the Study period. There were no exceedances of the evaluating criteria (20°C MWAT), at any of the ten locations within the Segment. **This results in 100% compliance with the interim standard of 20°C as an MWAT.**

Summary of In-Stream Weekly Monitoring Parameter Results

Weekly monitoring measurements were obtained from ten locations in Segment 1a over 21 weeks. 210 total measurements of temperature were obtained at a total of ten locations within Segment 1a. Since these were weekly monitoring events, the evaluating criteria mentioned above were not considered. **Maximum temperature values at any location did not exceed 18.69°C and the average of all weekly Maximum temperatures for the Segment was 17.86°C.**

200 total measurements of pH were obtained at a total of ten locations within Segment 1a. The pH stream standard range is 6.5 – 9.0. **100% of the weekly pH values were in compliance.**

210 total measurements of dissolved oxygen were obtained at a total of ten locations within Segment 1a. The dissolved oxygen stream standard is 6.0 mg/L. **100% of the weekly dissolved oxygen measurements were in compliance.**

Summary of In-Stream Ammonia Results

Weekly grab samples were taken at ten locations in Segment 1a over 21 weeks. The unionized ammonia stream standard is 20.0 ug/L. 210 samples were analyzed for total ammonia, however due to a pH probe malfunction; only 200 unionized ammonia results were calculated. **100% of calculated unionized ammonia results were in compliance.**

Summary of WWTP Effluent Temperature Datalogger Results

A total of 27,832 temperature data points were obtained from the four dataloggers located in the WWTP effluents that discharge into Segment 1a. Recognizing that there are no permit related temperature limits, the following summary is presented: **Daily Average Temperatures for all four effluents was 17.05°C and Weekly Average Temperatures for all effluents was 17.07°C.**

Summary of WWTP Effluent Sampling and Monitoring Parameter Results

WWTP effluent measurements and samples were taken as necessary according to discharge permit requirements. Process control measurements were taken during the normal course of plant operations. 461 total measurements of temperature were obtained at the four WWTP effluents during the Program. None of the four WWTP discharge permits has limits for temperature. As a benchmark, 71 temperature values recorded were greater than 20°C. **This results in 85% of the measurements less than 20°C.**

477 total measurements of pH were obtained at the four WWTP effluents that discharge into Segment 1a. The discharge permit pH range is 6.5 – 9.0. **100% of pH values were in compliance.**

460 total measurements of dissolved oxygen were obtained at the four WWTP effluents that discharge into Segment 1a. None of the four WWTP discharge permits has limits for dissolved oxygen. 83 total ammonia samples were analyzed during the Study period. **100% of the effluent analysis results for total ammonia for each permit limit were in compliance.**

Although discharge permit limits specify total ammonia, unionized ammonia results were calculated from total ammonia results. **All WWTP effluent sample results calculated were below the existing stream standard of 20.0 ug/L unionized ammonia.**

Summary Of 24-Hour Profiling Results (3 Sites)

At the KSWD7 location (east end of O'Fallon Park), 120 measurements were obtained for each of the four parameters: pH, Temperature, Dissolved Oxygen and Specific Conductance. The existing stream standard for pH is 6.5-9.0 and 6.0 mg/L for Dissolved Oxygen. There are no existing stream standards for Specific Conductance. Temperatures could not be evaluated against the proposed WAT and MWAT values.

- **There was 100% compliance with pH stream standard.**
- **There was 100% compliance with Dissolved Oxygen stream standard.**

At the LOBDOW location (in Lair o' the Bear Park), 96 measurements were obtained for each of the four parameters: pH, Temperature, Dissolved Oxygen and Specific Conductance.

- **There was 100% compliance with pH stream standard.**
- **There was 100% compliance with Dissolved Oxygen stream standard.**

At the EMD5A location (below Idledale), 96 measurements were obtained for each of the four parameters: pH, Temperature, Dissolved Oxygen and Specific Conductance.

- **There was 100% compliance with pH stream standard.**
- **There was 100% compliance with Dissolved Oxygen stream standard.**

Summary of Stream Flow Data and Weather

The stream flows recorded during the Program, on daily average at the gage above Evergreen Lake, were significantly lower than the historic daily average in May and June, slightly lower in August and September and slightly higher than the historic average in July. Measurable precipitation was recorded on 12 days in May, 9 days in June, 13 days in July, 15 days in August and 8 days in September. Precipitation was below monthly historical average in May, June and August. Precipitation was slightly above monthly historical average in September and significantly above monthly historical average in July. The higher stream flows in July coincided with higher total precipitation and lower stream temperatures measured with dataloggers. This is clearly illustrated in the precipitation events of July 8-11.

The Average Monthly Mean temperatures were greater than the historical data for all months except September. The Average Monthly Maximum temperatures were actually lower than historical average, but the Average Monthly Minimum temperatures were higher in all months except September (equal to average). This equates to higher overnight temperatures and less overnight cooling. The Average Daily Maximum temperatures were within 1 to 3 degrees of historical averages, with the highest average daily maximum temperatures in July. The Average Monthly temperatures were within one degree of historical averages, with the exception of July and September at 3 degrees above historical average monthly temperatures.

The comparison illustrates that with higher air temperatures and no precipitation, stream temperatures naturally increase and flows decrease. The almost immediate lowering of stream temperatures coincides with the period of measurable precipitation, higher stream flows and lowered air temperatures.

COMPLIANCE SUMMARY

The 30-minute temperature datalogger measurements recorded in Bear Creek at ten locations from just below the Evergreen Lake dam to the west end of Morrison do not indicate that a problem exists, either man-induced or natural. The 30-minute temperature measurements that are used to calculate the WAT values result in 52.3% compliance of the evaluating criteria of 17°C WAT, utilizing the 85th%-tile qualifier, as a proposed underlying standard for class 1 cold waters. This proposed limit was not met this Study period, and this limit will probably prove to be difficult to meet, even during a Study period that includes more typical precipitation events and more average minimum and maximum air temperatures. **52.3% of the 2006 recorded values would be consistent with a proposed temperature standard of 17°C WAT temperatures, which supports the**

supposition that a stream standard of 17°C WAT would be overly restrictive for the lower portion of Bear Creek Segment 1a.

The 30-minute temperature measurements that are used to calculate the MWAT values result in full compliance of the evaluating interim standard criteria of 20°C MWAT, utilizing the 85th%-tile qualifier. Although this proposed limit was met during this Study period, the assumption should not be made that this will always be the case. **100% of the 20°C MWAT temperature values were in compliance with an interim temperature standard of 20°C MWAT.**

Weekly in-stream monitoring measurements recorded in Bear Creek at ten locations from just below the Evergreen Lake dam to the west end of Morrison, do not indicate that a problem exists, either man-induced or natural, that results in the non-compliance of stream standards for pH and Dissolved Oxygen, utilizing the 85th%-tile qualifier. Temperature could not be evaluated against the proposed criteria because of the weekly monitoring frequency. There is no stream standard for Specific Conductance. **Analysis of all (21 weeks, ten locations) in-stream measurements (200 for pH and 220 for dissolved oxygen) results in 100% compliance for pH and Dissolved Oxygen.**

Weekly in-stream ammonia sampling results and calculations obtained in Bear Creek at ten locations from just below the Evergreen Lake dam to the west end of Morrison, do not indicate that a problem exists, either man-induced or natural, that results in the non-compliance of stream standards for Ammonia, utilizing the 85th%-tile qualifier. pH and Temperature values recorded at the time of sampling were combined with Total Ammonia results to produce calculated Unionized Ammonia results. **Analysis of all in-stream sampling results and calculated unionized values (200 measurements) results in 100% compliance for the stream standard of 20.0 ug/L Unionized Ammonia.**

The 30-minute temperature datalogger measurements recorded in the four WWTP effluents that discharge into Bear Creek in Segment 1a do not indicate that a problem exists in the temperature of any WWTP effluent that results in the non-compliance of the proposed WAT stream standard, utilizing the 85th%-tile qualifier. It is unclear if WWTP effluent temperatures adversely affected stream temperatures with regards to MWAT values. **Since there are no temperature effluent limits for the four-wastewater plants, the Daily Average Temperature and Weekly Average Temperatures were evaluated. For all four WWTP effluents, Daily Average temperatures equaled 17.05°C. For all four WWTP effluents, Weekly Average Temperatures equaled 17.08°C.**

The daily WWTP Process Control measurements recorded in the four WWTP effluents that discharge into Bear Creek in Segment 1a do not indicate that a problem exists in any WWTP effluent that results in the non-compliance of any pH, Temperature, Dissolved Oxygen or Unionized Ammonia stream standard, utilizing the 85th%-tile qualifier. It is important to note that there were no permit violations for any WWTP with respect to pH or Ammonia. None of the WWTP discharge permits have temperature or dissolved oxygen limits. **100% of the effluent pH and total ammonia values met permit limits. 100% of**

the calculated unionized ammonia values for all WWTP effluents were lower than a stream standard of 20.0 ug/L.

The results of the 24-hour profiling at the two selected locations in Bear Creek Segment 1a do not indicate that a problem exists, either man-induced or natural, that results in the non-compliance of stream standards for pH and Dissolved Oxygen, utilizing the 85th%-tile qualifier. A total of 120 measurements per parameter were recorded at the KSWD7 location. A total of 96 measurements per parameter were recorded at the LOBDOW location. A total of 96 measurements per parameter were recorded at the EMD5A location. Temperature could not be evaluated against the proposed criteria because of the weekly monitoring frequency. There is no stream standard for Specific Conductance. **100% compliance was achieved for the pH and Dissolved Oxygen stream standards at all three locations.**

Weather records and stream gage readings indicated that the 2006 Study period was warmer and drier, but this was not detrimental to water quality conditions in Bear Creek. Stream gage measurements recorded at the gaging station above both Evergreen Lake and Morrison showed lower than historic averages for June and September, but the beginning of a return to regular summer precipitation pattern produced higher than historical average flows in July and August. For the Study period, the precipitation was significantly below historical average, with the exception of July. For the Study period, average daily minimum air temperatures were significantly higher and monthly average temperatures were slightly higher than historical average.

No Water Quality Impairment in 2006

The 2006 special stream monitoring program in Bear Creek segment 1a showed no evidence of impairment. Comparisons with the interim temperature standards resulted in compliance. The interim Maximum Weekly Average Temperature of 20ºC was met with full compliance at all monitoring locations. A comprehensive temperature data collection effort, summarized in 70,321 30-minute measurements at ten in-stream locations throughout the Segment, provided the data for analyses. The calculated MWAT values were met this year.

There were no compliance issues regarding ammonia stream standards during the Program period. 200 unionized ammonia results from ten locations throughout the Segment, showed full compliance with existing stream standards and no evidence of ammonia toxicity or impairment.

A factor in the 2006 Program were the regular precipitation events in July that produced and sustained above average stream flows during the typically warmest period of the summer. These precipitation events occurred in 2004, but were absent in 2005. However, the 2006 snow pack runoff proved below average for May and June. Monthly average stream flow for May 2006 was 21 cfs, as compared to the historical 93 cfs, as measured above Evergreen Lake. Monthly average stream flow for June 2006 was 13 cfs, as compared to the historical 95 cfs. These low values, when coupled with below average precipitation for the same months, resulted in well below average stream flows. When July and September precipitation events occurred, stream flows were increased. Monthly average precipitation was significantly below average, compared to historical

values, excepting July and September. The lack of precipitation and low snow pack/runoff resulted in lower than historic average stream flows for the majority of the Study period.

A comprehensive temperature data collection effort, summarized in 27,832 30-minute measurements in four wastewater treatment plant effluents that discharge into Bear Creek Segment 1a, showed no evidence of thermal pollution. Similarly, there was no evidence of ammonia or pH exceedances during the typical operation of these plants. All four plants met discharge limits stated in their Colorado Discharge Pollutant Elimination System (CDPES) permit for parameters of concern regarding this report during the Program period.

There were no observed impairment issues in the Segment or any permit violations in wastewater plant effluents during the Program. There were no observed temperature or ammonia issues with the Segment. Wastewater treatment plant effluents had no detrimental effect on the water quality of Segment 1a. Decreased flows from lack of regular summer precipitation events produced below average stream flows for most of the Program period, yet proposed MWAT criteria was not exceeded in the stream. Bioassessment and fish survey data indicate that the fishery continues to recover from the drastic conditions encountered in the most severe drought year of 2002.

EXAMPLE DATA FORMS

EVERGREEN METROPOLITAN DISTRICT
Water and Wastewater
P.O. Box 3819
Evergreen, Colorado 80437-3819
303-674-4112
Fax 303-674-7267

BEAR CREEK STUDY—SUMMER 2005 DATALOGGER LAUNCH/RETRIEVE

LOGGER #	LOGGERLOCATION	DATE OUT	TIME OUT	DATE IN	TIME IN	INITIALS
EMD1	Above Evergreen Lake, at gaging station					
EMD2	In Evergreen Lake, near dam, at surface					
EMD4	Above EMD WWTP effluent					
EMD3	Below EMD WWTP effluent					
EMD5	EMD WWTP effluent					
EMD5A	Below Idledale, at McGoldrick bridge					
WJ6	WJCMD WWTP effluent					
KSWD7	Above KSWD WWTP effluent, east end of O'Fallon					
KSWD8	KSWD WWTP effluent					
GWSD9	Above GWSD WWTP effluent, west end of Lair o' the Bear					
GWSD9A	GWSD WWTP effluent					
Morr10	Morrison gaging station, west end of town above Harriman Diversion					
Morr11	Above Morrison WWTP effluent, start of Bear Creek segment 1b					
Morr12	Morrison WWTP effluent					

COMMENTS:_____

EVERGREEN METROPOLITAN DISTRICT
Water and Wastewater
P.O. Box 3819
Evergreen, Colorado 80437-3819
303-674-4112
Fax 303-674-7267

BEAR CREEK STUDY—SUMMER 2005
pH/Temp/DO/COND METER CALIBRATION RECORD

MAKE __YSI_____MODEL___556 MPS____S/N____02E1048AA_____

Comments:_____

DATE	20 Min Warm up	DO Calib. OK?	pH 7 Calib OK?	PH 10 Calib OK?	Temp ºC	COND 1.413 mS/cm OK?	Probe Maint?	Init

EVERGREEN METROPOLITAN DISTRICT
Water and Wastewater
P.O. Box 3819
Evergreen, Colorado 80437-3819
303-674-4112
Fax 303-674-7267

BEAR CREEK STUDY—SUMMER 2005
pH/Temp/DO/COND SONDE CALIBRATION RECORD

MAKE __YSI Sonde___MODEL___600 XLM____S/N____03C0209_____

Comments:_____

_

DATE	20 Min Warm up	DO Calib. OK?	pH 7 Calib OK?	PH 10 Calib OK?	Temp ºC	COND 1.413mS @ 25˚C OK?	Probe Maint?	Init

BEAR CREEK STUDY—SUMMER 2005
WEEKLY CHECKS

DATE:_____ WEATHER:_____

LOGGER or YSI ID	LOCATION	PH (SU)	TEMP ˚C	DO (mg/L)	COND (mS)	Monitoring Time	Logger Intact? Y/N	Location Sampled? Y/N	Sampling Time
KSWD7	Above KSWD WWTP effluent, east end of O'Fallon Park								
KERR	Kerr Gulch, at Hwy 74 bridge						N/A		
GWSD9	Above GWSD WWTP effluent, west end of Lair o' the Bear Park								
IDLEWEST	Above Idledale, west end of town						N/A		
EMD5A	Below Idledale, at McGoldrick bridge								
Morr10	At Morrison gaging station, above Harriman Diversion								
Morr11	Above Morrison WWTP effluent, at start of Bear Creek segment 1b								

START TIME:_____ END TIME:_____INITIALS:_____

LOGGER or YSI ID	LOCATION	PH (SU)	TEMP ˚C	DO mg/L	COND (mS)	Monitoring Time	Logger Intact? Y/N	Location Sampled? Y/N	Sampling Time
EMD1	Above Evergreen Lake, at gaging station								
EMD2	In Evergreen Lake, near dam, at surface							N	N/A
EVLKMID	In Evergreen Lake, middle						N/A	N	N/A
EMD4	Above EMD WWTP effluent						N/A	N	N/A
EMD3	Below EMD WWTP effluent								
BCC1	Above Bear Creek cabins						N/A		
BCC	Below Bear Creek cabins, at bridge						N/A		
WELCHBR	Below Troublesome Gulch, at Welch Ave. bridge						N/A		
OFPWEST	O'Fallon Park, west end						N/A		

COMMENTS: Data retrieved from YSI memory
_____
_____

Evergreen Metropolitan District Sampler (Signature)					# of Containers	Matrix (Water, Soil, Sludge)	List analyses requested here					
Sample Number	Date	Time	Comp/ Grab	Sample Location								Remarks

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

Notes: 1.) Label all samples.

2.) Transport all samples in coolers with ice or freeze packs. Store at 4°C.