2008 Data Report

Bear Creek Watershed Association

Approved April 8, 2009

Prepared by
BT Consulting LLC
And
RNC Consulting LLC

Bear Creek Watershed Association
1529 South Telluride St
Aurora, CO 80017

Manager: Russell N Clayshulte
303-751-7144
rclayshulte@earthlink.net
www.bearcreekwatershed.org

TABLE OF CONTENTS

LIST OF TABLES

List of Figures

BCWA Sampling Program

A generally continuous collection of surface quality data began in 1990 for the Bear Creek Watershed (Figure 1) and at Bear Creek Reservoir (Figure 2). Data collection includes specific chemical, physical and biological parameters. Data is collected monthly and bi-monthly at Bear Creek Reservoir and along Turkey Creek and Bear Creek. The Association meets water quality data sampling and analyses objectives established in the Bear Creek Reservoir Control Regulation # 74 and as contained in an annually updated watershed sampling procedure memorandum.

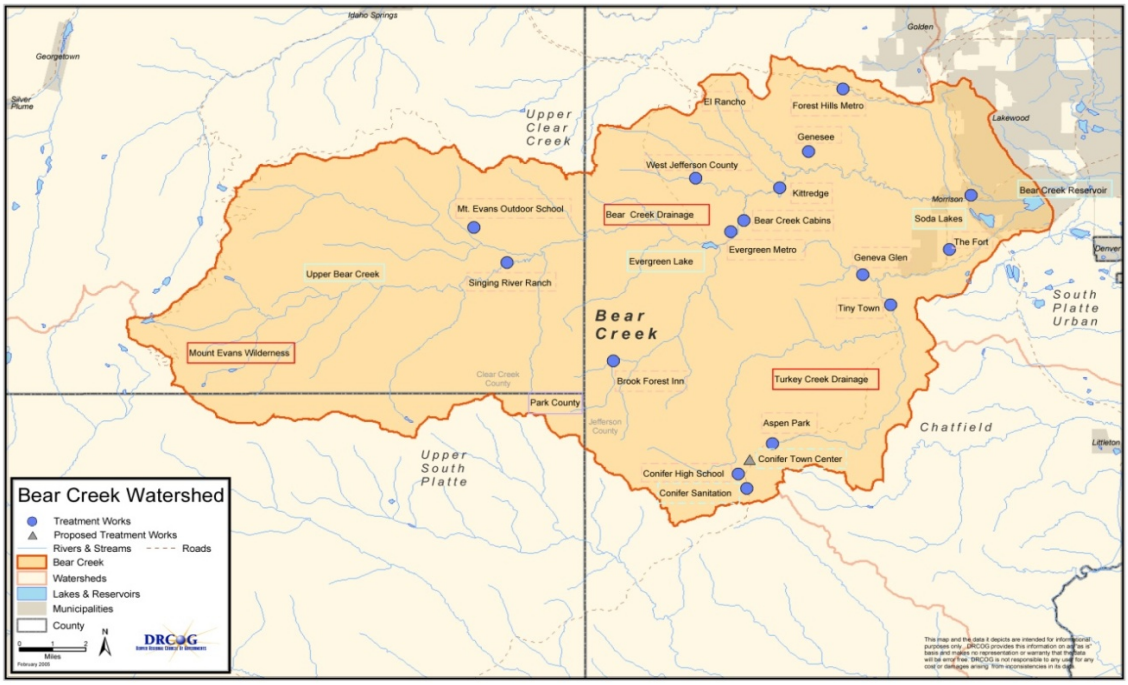

Figure 1 Bear Creek Watershed

The Bear Creek Watershed Association maintains four types of monitoring efforts to characterize water and environmental quality within the Bear Creek Watershed*:*

1. P1- Routine water quality monitoring at Bear Creek Reservoir (multiple vertical stations), Turkey Creek inflow to reservoir, Bear Creek inflow to reservoir, and reservoir discharge into lower Bear Creek (Figure 3). The P1 sites are long-term monitoring sites consistent with the intent of the monitoring program outlined in the Bear Creek Reservoir Control Regulation.

2. P2- Supplemental sampling of restoration or other project specific sites (e.g., Coyote Gulch in cooperation with the City of Lakewood, see Figure 4). These types of monitoring efforts are for limited duration and/or for specific parameters of interest.

3. P3- Watershed surface water monitoring along Bear Creek and Turkey Creek drainages for site-specific characterizations (e.g., temperature trends, nutrient loading, flow studies). These are interim and long-term monitoring sites for watershed characterizations (see Figure 5 for partial location of BCWA watershed sampling locations)

4. P4- Supplemental environmental characterizations of Bear Creek watershed including, but not limited to macroinvertebrates, flow analysis, habitat characterizations, fishery evaluations, system productivity, or other environmental factors that potentially affect fisheries or watershed health.

Figure 2 Bear Creek Reservoir with Sampling Stations

Figure 3 Bear Creek Park with BCWA Sampling Sites

Figure 4 Coyote Gulch Sampling Points and Restoration Drop Structures

P1 - Bear Creek Reservoir Monitoring Program

The Association on January 9, 2008 modified and adopted the 2008 reservoir and watershed monitoring programs and Quality Assurance Project Plan (QAPP) in cooperation with the Water Quality Control Division staff (version 2008.01). All quality assurance monitoring and analyses objectives remained unchanged from the 2007 monitoring program. The monitoring plan was updated in July 2008 (Version 2008.02) with the addition of a new reference-monitoring site on Vance Creek in the upper watershed near the Mt. Evans Wilderness, and the addition of total nitrogen analysis in the surface and bottom waters of the Bear Creek Reservoir. The seasonal watershed-monitoring program was expanded by one month into November 2008 and a complete listing of all Association monitoring sites was updated and incorporated into the monitoring plan (Version 2008.03).

The routine monitoring program (P1) focuses on Turkey Creek drainage and Bear Creek drainage inputs and discharge from Bear Creek Reservoir (Figure 2) into lower Bear Creek with a central pool characterization of the reservoir near the dam (BCWA site 40). In Figure 2, the outlet structure is near BCWA site 41 with Bear Creek inflow near BCWA site 44 and Turkey Creek inflow near BCWA site 43. The reservoir chemistry and biological characterization occurs at BCWA site 40. Vertical probe samples for specific conductance, temperature, dissolved Oxygen, and pH are measured at 1-meter intervals at all reservoir sites. The current monitoring program optimizes data generation to evaluate reservoir inflow loading, tropic state changes within the reservoir, and reservoir outflow; while minimizing monitoring cost. The aeration sites are visible in Figure 2. Monitoring stations within Bear Creek Park are shown in Figure 3. Figure 4 shows Coyote Gulch sampling sites. A map of partial sampling sites and wastewater treatment plant locations is shown in Figure 5.

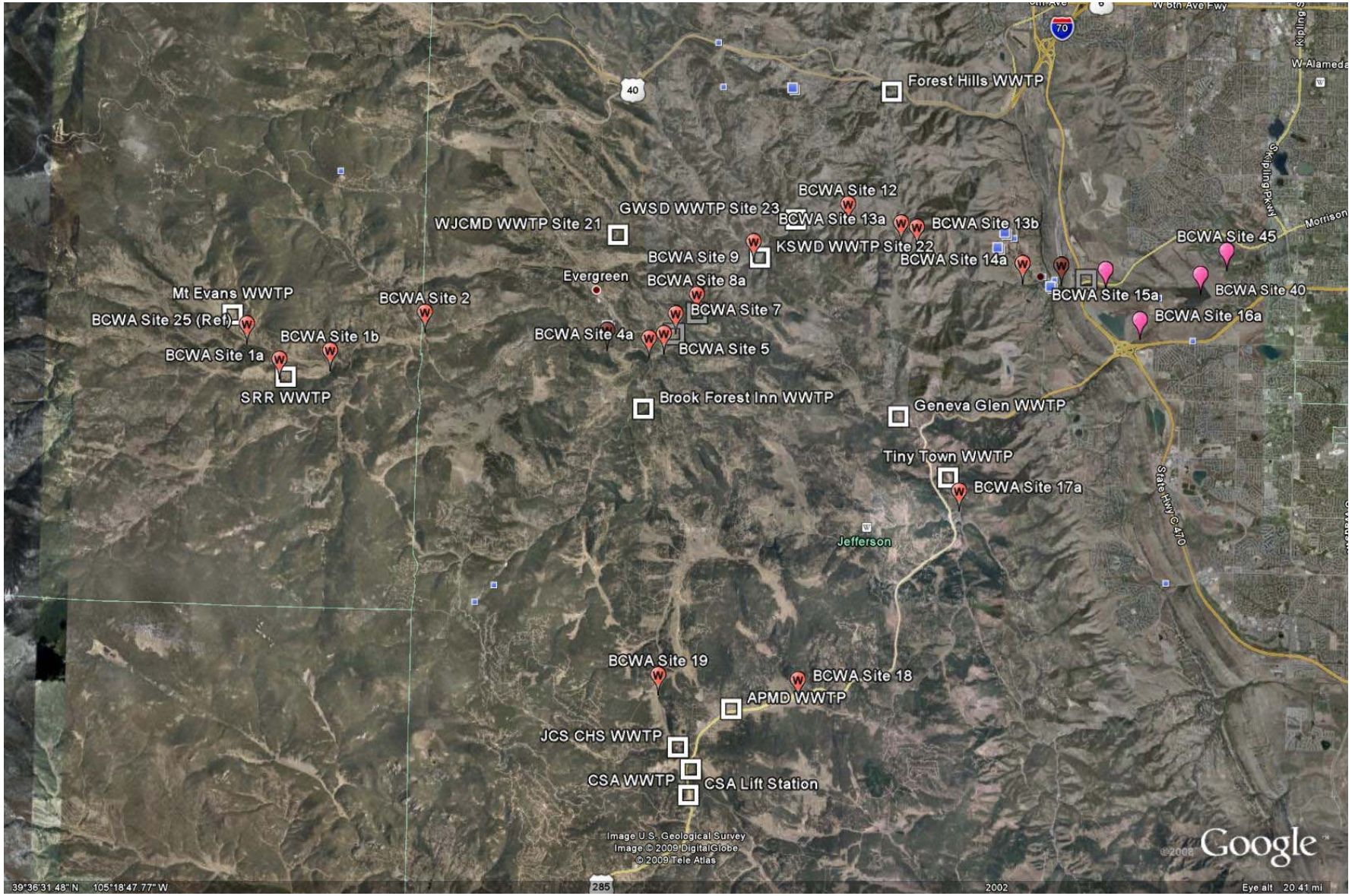

Figure 5 Bear Creek Watershed Sampling locations

The USGS in cooperation with the City of Lakewood maintains a flow monitoring station on Bear Creek near the western end of Bear Creek Park. The Association measures flow in Turkey Creek during sampling events. The Association also estimates discharge flows from Bear Creek reservoir for sampling events. The U.S. Army Corps of Engineers maintains records of flow inputs and discharge for the reservoir system.

The four 2009 P1 routine watershed-monitoring stations, including the reservoir station, are:

1. Mainstem of Turkey Creek prior to discharge into Bear Creek Reservoir, within Bear Creek Park, adjacent to the City of Lakewood Maintenance Yard;

2. Mainstem of Bear Creek prior to discharge into Bear Creek Reservoir, within Bear Creek Park, adjacent to the bridge at the western edge of the park;

3. Tail-water discharge from Bear Creek Reservoir in the concrete channel that starts the lower Bear Creek; and

4. Bear Creek Reservoir, center of main pool and supplemental vertical profile stations 1,3,4 and 5

Table 1 lists water quality monitoring parameters for the P1 sampling sites. Table 2 shows methods of analyses and detection limits. Laboratory analyses are performed by GEI Consultants, Inc. / Chadwick Ecological Division. Samples delivered to GEI Consultants, Inc. / Chadwick Ecological Division within 1 hour of final sample collection. The phytoplankton samples are a composite of the top 1-meter of the water column. Reservoir bottom samples taken at about 9 meters depth, which is + 1m above the bottom. Care is taken to not disturb the bottom sediments where the sample is collected. The top samples represent a composite water sample from -0.75m to -1.25m, as collected in a vertical Van Dorn sampler.

Table 1 Routine Monitoring Parameters

Parameter (units)	Bear Creek & Turkey Creek Inflows	Reservoir Sites	Reservoir Outflow
Physical/Field			
Flow/ Discharge (cu m/s)	X		X
Specific Conductance (umhos/cm)	X	X (Profiles at sites 40, 41, 42, 43, and 44)	X
Secchi (meters)		X (sites 40, 41, 42, 43, and 44	
Dissolved Oxygen (mg/l)	X	X (Profile sites 40, 41, 42, 43, and 44)	X
Temperature (C)	X	X (Profile at sites 40, 41, 42, 43, and 44)	X
Total Suspended Sediments (mg/l)	X	X (site 40; laboratory)	X
pH (standard unit)	X	X (Profile at sites 40, 41, 42, 43, and 44)	X
Biological (Site 40 only)			
Chlorophyll a (ug/l)		X (-1m)	
Phytoplankton (July, August, September only; six sample sets)		X (top 1-meter water column, composite)	
Nutrients (Site 40 only			
Nitrate + Nitrite (ug/l)	X	X (top, lower)	X
Total Dissolved Phosphorus (ug/l)	X	X (top, lower)	X

Parameter (units)	Bear Creek & Turkey Creek Inflows	Reservoir Sites	Reservoir Outflow
Total Phosphorus (ug/l)	X	X (top, lower)	X
Total Nitrogen		X (top, lower)	

Table 2Methods and detection limits for laboratory analyses.

Analyte	Method*	Detection limit
Total Suspended Solids	2540 D	4 mg/L
Total Dissolved Solids	2540 C	4 mg/L
Chlorophyll	10200 H (modified)	0.1 mg/m3
Orthophosphate	4500-P G	2 µg/L
Total Phosphorus	4500-P G	2 µg/L
Nitrate+Nitrite	4500-NO3 I	2 µg/L
Total Nitrogen		2 ug/l

P3 - Stream Monitoring Program

Purpose

The Association conducts special stream monitoring programs within the Bear Creek Watershed including Segment 1a and a portion of Segment 1b of Bear Creek, and a portion of the Turkey Creek Drainage (North and South Turkey Creek). The monitoring year divides into a seasonal period with more intense sampling and an off-season period, designed to provide minimal winter and spring data. This data report summarizes temperature and water quality monitoring data, sampling results obtained from in-stream locations, and data from five-wastewater treatment plant (WWTP) effluents. The complete 2007-2008 Off-Season and 2008 Seasonal water quality data set is an electronic attachment to this data summary report.

The Program is a cooperative effort between the Association and the five larger wastewater treatment plant dischargers: Evergreen Metropolitan District (EMD), West Jefferson County Metropolitan District (WJCMD), Kittredge Sanitation and Water District (KSWD), Genesee Water and Sanitation District (GWSD), and the Town of Morrison. This Seasonal 2008 monitoring program began May 1, 2008 with completion on November 13, 2008. (Measurements were recorded with temperature dataloggers from May 1, 2008 through October 31, 2008.) The in-stream monitoring program provides more detailed water quality information specifically for temperature, pH, dissolved oxygen, specific conductance, total ammonia, nitrate+nitrite and total phosphorous in Bear Creek watershed streams. The Off-Season 2007-2008 monitoring program began in November 2007 with completion in March 2008.

2007-2008 Off-Season Program

The 2007-2008 Off-Season temperature monitoring program collected data from eight in-stream Watershed locations, including the seven identified Colorado Division of Wildlife (CDOW) fish survey sites, and the five "larger" wastewater plant dischargers to Bear Creek. No monitoring or sampling was performed at any of the Watershed locations.

2008 Seasonal Program

The 2008 Seasonal sampling and monitoring program collected data from thirty locations (including the five wastewater treatment plants-WWTP) within the Watershed. The Program included the seven identified Colorado Division of Wildlife (CDOW) fish survey sites.

Monitoring for pH, dissolved oxygen, temperature and specific conductance was performed monthly at twenty-two Watershed locations, including the five WWTPs. Sampling for Total Ammonia, Nitrate+Nitrite and Total Phosphorous was performed coincidentally with monthly monitoring. Nineteen of the twenty-two locations sampled (including WWTPs), were coincident with temperature dataloggers. Analyses were performed by GEI Consultants/Chadwick Ecological Consultants, Inc. in Littleton, Colorado. WWTP

effluent data summarizes monthly process control sheets and results of permit- and non-permit required effluent analyses. Data includes pH, dissolved oxygen, temperature, effluent flow, total ammonia, nitrate and total phosphorous.

Flow data summarizes the three flow gages located on Bear Creek. These locations include above Evergreen Lake, above Morrison and below Morrison within Bear Creek Lake Park. Manual flow measurements performed at Watershed locations through the Program period. Weather data from the reporting station located at the EMD WWTP collected, analyzed and summarized.

Off-Season Monitoring Sites

Table 3 lists sampling and monitoring sites utilized in the Off-Season Program. Only temperature collected in the Off-Season using data loggers.

Table 3 2007-08 Off-Season Monitoring Stations

Site #	Site Location
Site 3a	Above Evergreen Lake at CDOW Site
Site 5	Above EMD WWTP, at CDOW downtown site
Site 8a	Bear Creek Cabins at CDOW Site
Site 9	O'Fallon Park, west end at CDOW Site
Site 12	Lair o' the Bear Park, at CDOW site
Site 13a	Below Idledale, Shady Lane at CDOW site
Site 14a	Morrison Park west end of town, at CDOW Site
Site 16a	Turkey Creek, within BCLP, near Maint. Bldg.
Site 20	EMD WWTP Effluent
Site 21	WJCMD WWTP Effluent
Site 22	KSWD WWTP Effluent
Site 23	GWSD WWTP Effluent
Site 24	Morrison WWTP Effluent

Seasonal Monitoring Sites

The locations listed in Table 4 are the sampling and monitoring sites utilized in the 2008 Seasonal Program.

Table 4 2008 Seasonal Monitoring Stations

Site #	Site Location
Site 1a	Lost & Found (Singin' River Ranch)
Site 2	Above Evergreen Lake at Clear Creek County line
Site 3a	Above Evergreen Lake at CDOW Site
Site 4a	Evergreen Lake Surface, Profile Station
Site 4b	Evergreen Lake Profile Station, one meter down
Site 4c	Evergreen Lake Profile Station, two meters down
Site 4d	Evergreen Lake Profile Station, three meters down
Site 4e	Evergreen Lake Profile Station, four meters down
Site 5	Above EMD WWTP, at CDOW downtown Site
Site 7	Below EMD WWTP effluent
Site 8a	Bear Creek Cabins at CDOW Site
Site 9	O'Fallon Park, west end at CDOW Site
Site 12	Lair o' the Bear Park, at CDOW Site
Site 13a	Below Idledale, Shady Lane at CDOW Site

Site #	Site Location
Site 14a	Morrison Park west end of town, at CDOW Site
Site 15a	Bear Creek, in Bear Creek Park at USGS gage
Site 16a	N. Turkey Creek within Bear Creek Park, near the Maintenance Bldg.
Site 17a	Near confluence of N. & S. Turkey Creeks, in N. Turkey Creek
Site 18	South Turkey Creek, Aspen Park Metropolitan District
Site 19	North Turkey Creek, Conifer Metropolitan District
Site 20	EMD WWTP Effluent
Site 21	WJCMD WWTP Effluent
Site 22	KSWD WWTP Effluent
Site 23	GWSD WWTP Effluent
Site 24	Morrison WWTP Effluent
Site 25	Mt. Evans Wilderness drainage, Vance Creek
Site 26	Cub Creek, Upstream of Hwy 73 bridge, south of EMD WTP
Site 28	Parmalee Gulch, near Hwy 285
Site 32	Troublesome Gulch, at mouth before Bear Creek confluence
Site 34	Mt. Vernon drainage, above Bear Creek, near Main St. Morrison

Seasonal Water Quality Monitoring Measurements and Methods

Monitoring for pH, dissolved oxygen, temperature and specific conductance performed monthly at seventeen stream locations in the Watershed. All but three of the locations were coincident with temperature dataloggers. Monitoring performed in Evergreen Lake at the profile station at the surface and at depths of 1.0 meter down, 2.0 meters, 3.0 meters and 4.0 meters down. Table 5 lists monitoring parameters.

Table 5 2008 Seasonal Water Quality Monitoring Events

Site #	Sam/Mon ID	Site Location
Site 1a	L&F	pH, Temperature (Temp.), Dissolved Oxygen (DO), Specific Conductance (SpCd); Total Ammonia (NH3), Nitrate+nitrite (NO3/NO2), Total Inorganic Nitrogen (TIN-calculated), Total Phosphorous (P); Temp. Datalogger (logger), flow (calculated)
Site 2	ALKCC	Temperature datalogger
Site 3a	ALKDOW	pH, Temp, DO, SpCd, NH3, NO3/NO2, P, logger, flow
Site 4a	EMD2A	pH, Temp, DO, SpCd, NH3, NO3/NO2, P, logger
Site 4b	EMD2B	Temperature datalogger
Site 4c	EMD2C	Temperature datalogger
Site 4d	EMD2D	Temperature datalogger
Site 4e	EMD2E	Temperature datalogger
Site 5	LTLBAR	pH, Temp, DO, SpCd, NH3, NO3/NO2, P, logger, flow
Site 7	EMD3	pH, Temp, DO, SpCd, NH3, NO3/NO2, P, logger, flow
Site 8a	BCCDOW	pH, Temp, DO, SpCd, NH3, NO3/NO2, P, logger, flow
Site 9	OFPDOW	pH, Temp, DO, SpCd, NH3, NO3/NO2, P, logger, flow
Site 12	LOBDOW	pH, Temp, DO, SpCd, NH3, NO3/NO2, P, logger, flow
Site 13a	IDLE	pH, Temp, DO, SpCd, NH3, NO3/NO2, P, logger, flow
Site 14a	MORR10	pH, Temp, DO, SpCd, NH3, NO3/NO2, P, logger, flow
Site 15a	MORR11	Temperature datalogger

Site #	Sam/Mon ID	Site Location
Site 16a	TURK 2	Temperature datalogger
Site 17a	TURK 1	Temperature datalogger
Site 18	APMD1	pH, Temp, DO, SpCd, NH3, NO3/NO2, P, logger, flow
Site 19	CMD1	pH, Temp, DO, SpCd, NH3, NO3/NO2, P, logger, flow
Site 20	EMDWWTP	pH, Temp, DO, NH3, NO3, P, logger, Effluent flow
Site 21	WJCMDWWTP	pH, Temp, DO, NH3, NO3, P, logger, Effluent flow
Site 22	KSWDWWTP	pH, Temp, DO, NH3, NO3, P, logger, Effluent flow
Site 23	GWSDWWTP	pH, Temp, DO, NH3, NO3, NO2, P, logger, Effluent flow
Site 24	MORRISONWWTP	pH, Temp, NH3, P, logger, Effluent flow
Site 25	ALKMEL	pH, Temp, DO, SpCd, NH3, NO3/NO2, P, logger, flow
Site 26	LTLCUB	pH, Temp, DO, SpCd, NH3, NO3/NO2, P, logger, flow
Site 28	NA	pH, Temp, DO, SpCd, NH3, NO3/NO2, P, flow
Site 32	NA	pH, Temp, DO, SpCd, NH3, NO3/NO2, P, flow
Site 34	NA	pH, Temp, DO, SpCd, NH3, NO3/NO2, P, flow

Monthly measurements performed in the morning and began at approximately 08:00 in Evergreen Lake. Measurements 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. Measurements are logged, retained in the on-board computer, and then manually downloaded. Typically, the logged data manually downloaded by viewing each file and transcribing data onto monthly Logsheets. The data was entered into a spreadsheet. 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 QA Balance in Aurora, Colorado. 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 installed in the meter at the start of the Program and batteries replaced when the observed battery charge reached 50%. The YSI multi-meter utilizes an YSI software program to download and present collected data. Ecowatch software presents the data in graphic and tabular formats and data exported into a spreadsheet program. Flow measurements were performed coincidentally with monthly sampling and monitoring. A Global Water flow probe Model FP101 was used and values obtained were combined with stream width and depth measurements to calculate estimated streamflow.

Monthly sampling for Total Ammonia, Nitrate+Nitrite and Total Phosphorous was performed concurrently with monthly monitoring at seventeen locations. The monthly sampling and monitoring was also coordinated with permit sampling performed by the WWTPs 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.

WWTP effluent Total Ammonia, Nitrate and Total Phosphorous 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. ammonia selective electrode, *Standard Methods for the Analysis of Water and Wastewater, 21st Edition* for Total Ammonia analysis, EPA-approved HACH Method 8190 (equivalent to Method 4500-P B, 5 & P E Total Phosphorous, *Standard Methods for the Analysis of Water and Wastewater, 20th Edition)* for Total Phosphorous and HACH Method 8039, cadmium reduction method for Nitrate analysis. Total Phosphorous and Nitrate analyses were performed with the HACH 2010 spectrophotometer. Similarly, GWSD WWTP personnel analyzed plant effluent per approved methods: For Total Ammonia, Method 417 E., *Standard*

Methods for the Analysis of Water and Wastewater, 16th Edition; Total Phosphorous, HACH Method 8048, Nitrate HACH Method 8039 and Nitrate HACH Method 8153. Total Phosphorous, Nitrate and Nitrite analyses were performed with the HACH 2010 spectrophotometer.

The Town of Morrison utilizes Evergreen Analytical in Wheat Ridge, Colorado for effluent testing of Total Ammonia and Total Phosphorous. Evergreen Analytical uses the following methods for testing: EPA-approved Method 4500-NH3 D., *Standard Methods for the Analysis of Water and Wastewater, 20th Edition* for Total Ammonia analysis and EPA Method 200.7, Digestion and ICP analysis for Total Phosphorous.

Samples taken in the field were documented on Monthly Logsheets and on EMD Chain of Custody forms. Samples were taken in 1-liter polyethylene bottles, unpreserved, and immediately iced. For Seasonal samples, sampling events resulted in same-day transport to GEI Consultants, Inc. /Chadwick Ecological Division in Littleton, Colorado. Samples were iced during transport. GEI Consultants use QuickChem Method 10-107-06-3 D for Total Ammonia analyses, Method 4500-NO3 I, *Standard Methods for the Analysis of Water and Wastewater, 21st Edition* for Nitrate +Nitrite analyses and Method 4500 P. G, *Standard Methods for the Analysis of Water and Wastewater, 21st Edition* for Total Phosphorous analyses. Analyses are performed with a Lachat QuickChem FIA+ 8000 series analyzer.

Stream Monitoring and Sampling Data

Monthly stream monitoring and sampling data tabulated into datasets. Data was retrieved from the YSI memory shortly after each monitoring event. Data are transcribed onto logsheets and subsequently entered onto Excel spreadsheets. Each monitoring group (Watershed stream Sites and WWTP effluents) has an individual folder, with one spreadsheet and multiple worksheets of data. Minimum, maximum, average and standard deviation analyses were performed on this (and mostly all) data.

Programmable temperature dataloggers measure and record Watershed stream and WWTP effluent temperatures every thirty minutes. The loggers used in the Program are Onset Computer Corporation brand, HOBO model H1 and H8 and model Water Temp Pro v2 (U22) programmable dataloggers. Prior to the start of the Program, all 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 dataloggers meet manufacturer's operating specifications. This process occurs every spring, prior to the start of the special stream monitoring Program. The Association maintains a fact sheet with temperature monitoring protocols, as included in the Association annual report.

The Water Temp Pro models were utilized at all locations except the Evergreen Lake profile station and at the WWTP effluents. Model HOBO 8 loggers were used at the Evergreen Lake profile station and model HOBO 1 loggers were used at all WWTP effluents. The dataloggers are placed into watertight cases (Models HOBO 1 and 8) 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.

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 H1 series logger, 165 days for the H8 series logger and 905 days for the U22 (Water Temp Pro) series logger. Certain Onset datalogger models begin recording temperatures immediately, once launched. The Association also 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 HOBO 1 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 HOBO 8 series loggers were utilized at the Evergreen Lake profile Site. 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. HOBO 8 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 Watershed stream locations. 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 logsheet.

After downloading the last logger in the Watershed, 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 Watershed stream Sites 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.

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 spreadsheet with multiple worksheets. Therefore, each Excel file contains multiple worksheets, one for each separate download of data, and a summary worksheet. The master dataset spreadsheet contains separate worksheets for each Site in the Watershed, displaying all temperature datalogger values and statistical analysis, as well as sampling and monitoring data and statistics.

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 underlying standard Weekly Average Temperature (WAT) criteria of 18.2°C, against the underlying standard Daily Maximum Temperature (DM) criteria of 23.8°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 of data beginning with either May 1, 2008 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 determined by evaluating the calculated Weekly Average Temperatures. Daily Maximum values were obtained by calculating the average temperature of a two-hour period beginning with the first temperature recorded, and determining the maximum value from each day. Again, any lack of data

collection resulting in a data gap more than two hours, required that the two-hour calculation period begin anew. In most cases, there were four measurements in a two-hour period.

Since there are five, "larger" wastewater treatment facilities that discharge into Bear Creek (four into Segment 1a and one into Segment 1b), an effort was undertaken to analyze effluent parameters that would be consequential to the receiving waters. Table 6 lists the parameters of concern (Effluent Flow, Temperature, Dissolved Oxygen, pH, Total Ammonia, Nitrate, Nitrite (GWSD only), and Total Phosphorous) that were 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 6 Wastewater Treatment Plants and Parameters

WWTP	Parameters
EMD	Flow, pH, Temperature (Temp), Dissolved Oxygen (DO); Total Ammonia (NH3), Nitrate (NO3), Total Phosphorous (P); Temp Datalogger (logger)
WJCMD	Flow, pH, Temp, DO, NH3, NO3, P, logger
KSWD	Flow, pH, Temp, DO, NH3, NO3, P, logger
GWSD	Flow, pH, Temp, DO, NH3, NO3, NO2, P, logger
Morrison	Flow, pH, Temp, DO, NH3, P, logger

The sampling and monitoring portion of the Program was coordinated with the permit required effluent sampling. This occurred on Thursdays during the Program.

Weather (local)

A National Weather Service Cooperative Reporting Station Number 052790 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 Program period was compared to the available historical weather records, obtained at the NWS High Plains Climate Center.

Gaging Station Stream Flows

A USGS stream gage (USGS 06710385) maintains 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. The 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. The third gaging station is located in Bear Creek Segment 1b (within Bear Creek Lake Park) and is operated by USGS (06710605). Weekly stream flow graphs were printed from all three stations and filed for record. Monthly average daily flows from all three gages exported to a spreadsheet for comparison with historical data.

There were 24 years of historical record available for the gage above Evergreen Lake (October 1984 through September 2008). For the gage located in Morrison, there were 89 years of historical record available. Although flow records began at this location in 1899, the most complete data record exists from 1919 through 2007. For the USGS gage within Bear Creek Lake Park, there were 23 years of record. Historic records obtained from the USGS National Water Information system website.

2008 Watershed Monitoring Problems

Relatively few major problems were encountered during the 2007-2008 Off-Season and 2008 Seasonal Programs. However, the following was noted:

- Seasonal and Off-Season: Dataloggers relocated, as necessary, due to fluctuating flows in Bear Creek. Sampling and monitoring performed only when safe conditions prevailed.

- Off-Season: A duplicate temperature datalogger installed at the WJCMD WWTP (WJ6B) to compare accuracy after the original logger recorded a majority of erroneous measurements during the 2006-2007 Program. The faulty logger identified and submitted to Onset for evaluation. The data from the properly functioning logger used for analysis.

- Seasonal: The pH sensor on the YSI 556 meter replaced prior to certification before the Seasonal program.

- Seasonal: Dissolved Oxygen reading was exceptionally high at Site 18 during the October sampling/monitoring event, but the calibration of the meter was in range and it is treated as a valid reading.

- Seasonal: Sometime during the day of October 17th, the datalogger at Site 4a (surface of Evergreen Lake) became loose and was discovered downstream by an Evergreen resident. It was retrieved on October 24th. Readings determine when the logger became loose and those readings were omitted from data analyses.

- Seasonal: Datalogger at location Site 24 (Morrison WWTP effluent) experienced issues after field downloading and re-launching on September 2nd. Temperatures recorded but the Date/Time stamp malfunctioned. After discussions with Onset technicians, it was determined that the Date/Time stamp was correct, even though the malfunction resulted in one missing value per day for the remainder of the Program.

- Seasonal: The temperature datalogger at Site 17a was removed on July 31, 2008 after it was discovered its location was dry.

BCWA Monitoring Site Characterizations

Table 7 lists all BCWA monitoring sites.

Table 7BCWA Monitoring Sites

Site ID	Location Description
Site 1a	Above Singin' River Ranch complex
Site 1b	Below West Bryant Singin' River Ranch-Williams Property
Site 2	Above Evergreen Lake at Clear Creek County Line
Site 3a	Above Evergreen Lake at CDOW Site
Site 3b	Above Evergreen Lake, at Lake House Bridge
Site 4a	Evergreen Lake, surface near dam
Site 4b	Evergreen Lake, at the profile station, near the dam, 5 feet below the surface.
Site 4c	Evergreen Lake, 10ft down, near dam
Site 4d	Evergreen Lake, at the profile station, near the dam, 15 feet below the surface.
Site 4e	Evergreen Lake Surface, profile station, 3.5 meters down
Site 4f	Evergreen Lake, inlet of the main channel of BC as it enters Evergreen Lake, closest to Hwy74.
Site 4g	Evergreen Lake, at the outlet of the wetlands, approximately 1 ft below the surface.
Site 4h	Evergreen Lake, inlet into Lake, between main channel BC & wetlands inlet, just S of sandbar.

Site ID	Location Description
Site 5	Above EMD WWTP, at CDOW downtown Site
Site 6	Above EMD WWTP effluent
Site 7	Below EMD WWTP effluent, at the Hwy 74 bridge
Site 8a	Above Bear Creek Cabins, at DOW Site
Site 8b	Below Bear Creek Cabins, upstream side of bridge at Old Stage Rd.
Site 8c	Above Bear Creek Cabins
Site 9	O'Fallon Park, west end at CDOW Site
Site 10	O'Fallon Park, east end above KSWD WWTP effluent
Site 11	Lair o' the Bear Park, west end above GWSD WWTP effluent
Site 12	Lair o' the Bear Park, at CDOW Site
Site 13a	Below Idledale, Shady Lane at CDOW Site
Site 13b	Below Idledale (Baker Br)
Site 14a	Morrison Park west end of town, at CDOW Site
Site 14b	West end of Morrison, just west of DWR gaging station
Site 14c	Above Harriman Diversion
Site 15a	Bear Creek Segment 1b at the USGS gaging station within Bear Creek Park
Site 15b	Above Bear Creek Lake inlet
Site 16a	N. Turkey Creek within Bear Creek Park at old USGS (Maint. Bldg.)
Site 16b	Turkey Creek within Bear Creek Park at inlet to reservoir
Site 17a	Near confluence of North and South Turkey Creeks, in N. Turkey Creek
Site 18	South Turkey Creek Aspen Park Metropolitan District
Site 19	North Turkey Creek Conifer Metropolitan District
Site 20	EMD WWTP Eff
Site 21	WJCMD WWTP Eff
Site 22	KSWD WWTP Eff
Site 23	GWSD WWTP Eff
Site 24	Morrison WWTP Eff
Site 25	Vance Creek below Mt. Evans Wilderness drainage
Site 26	Cub Creek, Upstream of Hwy 73 bridge, south of EMD WTP
Site 27	Above Morrison WWTP eff
Site 28	Parmalee Gulch near 285
Site 29	Upstream side of bridge over Bear Creek at Welch Avenue (Kittredge)
Site 30	West end of Idledale, west of Little Park
Site 31	Kerr Gulch, above Bear Creek
Site 32	Troublesome Gulch, at mouth before Bear Creek confluence
Site 33	Myers Gulch
Site 34	Mt. Vernon drainage, above Bear Creek, near Main St. Morrison
Site 35	Reserved
Site 36	Reserved
Site 37	Reserved
Site 38	Reserved
Site 39	Reserved
Site 40a	Bear Creek Reservoir (site 2); central pool; profile and top
Site 40b	Bear Creek Reservoir (site 2); central pool; Mid water column (5-meters)
Site 40c	Bear Creek Reservoir (site 2); central pool; lower water column (10-meters)
Site 41	Bear Creek Reservoir (site 1); reservoir outlet (profile)
Site 42	Bear Creek Reservoir (site 3); Southeast corner (profile)
Site 43	Bear Creek Reservoir (site 4); Turkey Creek inlet (profile)
Site 44	Bear Creek Reservoir (site 5); Bear Creek inlet (profile)
Site 45	Lower Bear Creek, below reservoir concrete trace/ weir (Plunge pool)

Site ID	Location Description
Site 46	Lower Bear Creek at Sheridan
Site 47a	Upper Coyote Gulch
Site 47b	Lower Coyote Gulch, discharge into reservoir
Site 47c	Coyote Gulch at Morrison Road
Site 47d	Coyote Gulch above Morrison Road (Green Mountain Subdivision)
Site 48a	Lakewood Park Tributary C (Coyote Crossing)
Site 48b	Lakewood Park Tributary D (Rooney Gulch)
Site 49a	Soda Lakes, Big (Profile Center)
Site 49b	Soda Lakes, Little (Profile Center)

P4 – 2008 Supporting Watershed Study Efforts

Special Flow Study

A portable velocity meter spot checked estimated flows at CDOW fish survey sites (Table 8; Figure 6). 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.

Table 8 2008 Bear Creek Watershed Stream Flow Data

	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Sep-08	Oct-08	Nov-08
Site 1a – Sing River Ranch	26.6	48.9	43.3	35.2	28	21.9	15.9	14.6
USGS Gage EGL	32	62	33	23	19	19	16	14
Site 3a - Keys on the Green	36.4	56	33	19	14	19	11	13
Site 5 - Little Bear	49	71.9	45.3	19.6	20.5	22.6	19.1	16.4
Site 7 - Below EMD WWTP			52.5	20.8	25.3		20.8	19
Site 8a - Bear Creek Cabins	47.4	71.4	40.8	22.3	23.9	29.7	18.5	16
Site 9 - O'Fallon Park	46.2	75.6	37.7	17.5	23.8	25	16.6	15
Site 12 - Lair O' The Bear	40.4	51.1	37.3	17.1	19.6	23	17.1	14.9
Site 13a - Idledale	56.4	79.1	40.5	17.1	20.5	21.3	19.3	14.6
Site 14a - Morrison Park West	44.1	78.8	22.1	17.6	17	18.44	19.5	17.4
USGS Gage BCP	16	43	10	5	5.1	6	7	1.2
Site 25 - Vance	9.33		17.6	6.8	6.7		3.3	6.25
Site 19 - North Turkey Creek	5.01	2.01	0.95	0.23	1.03		0.7	0.83
Site 18 - South Turkey Creek		0.7	0.15	0.05	0.05		0.06	0.07
Site 32 -Troublesome Gulch			0.55					
Site 26 - Cub Creek		7.1						
Site 28 - Parmalee Gulch				0.02				
Site 34 - MT Vernon Creek					0.65			

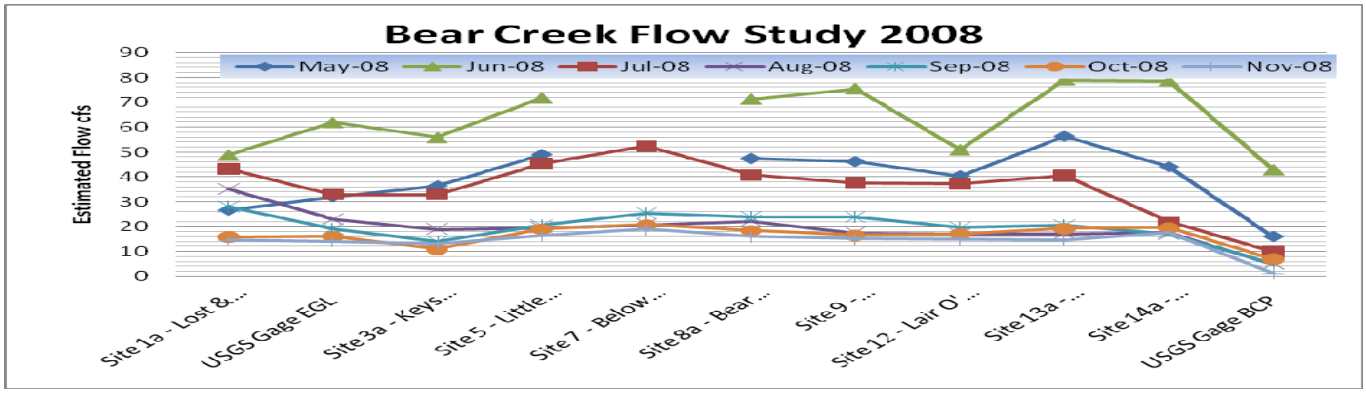

Figure 6 2008 Bear Creek Watershed Stream Flow Data

Macroinvertebrate Assessment

The macroinvertebrate integrity of Bear Creek is under assessment. Macroinvertebrate samples collected at the nine 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), above Evergreen Lake upstream of the USGS gaging station, at the Singing River Ranch (Lost and Found), and at Vance Creek. The cooperative macroinvertebrate sampling was done by the Association on September 22, 2008 at the DOW fish survey locations (Table 9) with analyze done by the WQCD. The dominate species observed at the sample sites are shown in Table 10. Sample collection done by the state timed-kick net methodology protocol. Annual macroinvertebrate samples collected in the fall at fish survey sites with a target of a five-year data set. The processed species indexes will help establish expected conditions.

Table 9 2008 Macroinvertebrate Sample Sites and Species Diversity

Sample Site	Number of Species
Vance Creek	38
Singing River Ranch	40
Keys On The Green	39
Little Bear	34
Bear Creek Cabins	37
O'Fallon Park	30
Lair O'Bear	28
Idledale	31
Morrison Park	33

Table 10 Dominate Macroinvertebrates Species (CTS > 20)

Singing River Ranch	Vance Creek	Keys On The Green	Little Bear	Bear Creek Cabins
Baetis tricaudatus	Baetis tricaudatus	Acentrella insignificans	Caecidotea	Baetis tricaudatus
Dolophilodes aequalis	Cinygmula	Baetis tricaudatus	Cheumatopsyche	Caecidotea
Drunella doddsi	Diamesa sp. pupae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	Cheumatopsyche
Ephemerella	Ephemerella	Eukiefferiella	Hydropsyche sp.	Ephemerella
Hesperoperla pacifica	Heterlimnius corpulentus	Lebertia	Optioservus sp.	Hydropsyche sp.
Heterlimnius corpulentus	Hydropsyche sp.	Nais spp.	Simulium	Lepidostoma
Hydropsyche sp.	Lepidostoma	Optioservus sp.		Optioservus sp.
Rhithrogena	Micrasema bactro	Simulium		Simulium
Rhyacophila pellisa	Optioservus sp.			

O'Fallon Park	Lair O'Bear	Idledale	Morrison Park
Cricotopus/Orthocladius	Baetis tricaudatus	Acentrella insignificans	Acentrella turbida
Ephemerella	Cheumatopsyche	Baetis tricaudatus	Baetis tricaudatus
Hydropsyche sp.	Ephemerella	Cheumatopsyche	Diamesa
Lepidostoma	Hydropsyche sp.	Diamesa	Dugesia
Optioservus sp.	Lepidostoma	Ephemerella	Ephemerella
Paraleptophlebia	Optioservus sp.	Hydropsyche sp.	Glossosoma
Simulium	Simulium	Lepidostoma	Hydropsyche sp.
		Optioservus sp.	Lepidostoma
		Simulium	Optioservus sp.
			Paraleptophlebia
			Simulium

CDOW Fish Survey Bear Creek

CDOW conducted their annual fish survey at nine locations September 2008. The survey included six historic sites and three additional sites. The added fishery survey sites were upstream of Evergreen Lake (ALKDOW), near Keys-on-the Green restaurant, and in the upper portion of the watershed at the Singing River ranch and along Vance Creek. Table 11 summarizes the fishery data at the 2008 sampling sites.

There are complete fishery data surveys from five fish monitoring stations prior to 2005 (1991, 1994, 1999, 2002, 2003, 2004, and 2005). In 2005 and into future survey years there are seven to eight fish monitoring stations and CDOW will strive to monitor all fish survey sites each year to produce, at a minimum, a five-year complete record from 2005-2010. There are partial survey year records (2-4 fish monitoring sites) for 1988, 1989, 1990, 1987, 2000, and 2001). While these partial data years provide valuable information, caution must be used to extrapolate this data over the "Stream Reach". However, this data characterizes fishery behavior at specific locations in the "Stream Reach".

Table 11 2008 Raw Fishery Data

Station	Standardized Average Width (ft)	Species	2008			
			No./Acre	lb/Acre	No./Acre >12cm	lb/Acre >12cm
Williams Property Singing R. Ranch-2008	**23**	Brown	568	58	461	56
		Rainbow	----	----	----	----
		TOTAL	568	58	461	56
Dedisse Park	**33**	Brown	1233	87	690	85
		Rainbow	153	45	119	45
		TOTAL	1386	132	809	130
Downtown Evergreen	**34**	Brown	899	161	454	155
		Rainbow	137	27	61	27
		TOTAL	1036	188	515	182
Bear Creek Cabins	**32**	Brown	738	116	529	115
		Rainbow	515	63	240	62
		TOTAL	1253	179	769	177
O'Fallon Park	**31**	Brown	939	123	548	119
		Rainbow	125	17	125	17
		TOTAL	1064	140	673	136
Lair O' the Bear	**29**	Brown	1091	150	764	149
		Rainbow	180	28	158	28
		TOTAL	1271	178	922	177
Idledale	**25**	Brown	829	124	531	123
		Rainbow	312	41	266	39
		TOTAL	1141	165	797	162
Morrison	**30**	Brown	559	55	319	54
		Rainbow	463	31	404	30
		TOTAL	1022	86	723	84
Vance Creek	**13**	Brown	1434	351	1131	347
		Rainbow	----	----	----	----
		TOTAL	1434	351	1131	347

Note: Estimates based on two-pass Seber-Lecren estimator - see station summary for standard error estimates

***** Estimates for O'Fallon in 2002 and Lair O' the Bear in 2004 based on one pass.

Association Data Record

Data Management

Large quantities of varied data were collected during the Program: Monthly stream monitoring and sampling, laboratory results, thirty-minute temperature measurements from dataloggers, wastewater treatment plant effluent process control and permit monitoring data (from five 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. Data nightly backed up to a server. Other software programs that contain raw data include Onset Computer Corporation Boxcar software and YSI Ecowatch software.

Laboratory results consisted of Total Ammonia, Nitrate+Nitrite and Total Phosphorous from GEI Consultants, Inc. in Littleton. Results in spreadsheet form transmitted to the EMD staff electronically via email attachments. Results incorporated into the spreadsheet files for individual sampling locations.

Depositories

The Association data is located at three different locations. Watershed data collected with the assistance of EMD staff is maintained on computer systems at the EMD offices. All raw watershed data electronically forwarded from EMD staff to BT Consulting, LLC for data summary and analyses. BT Consulting, LLC serves as a data depository for the Association and also maintains a full data record for all watershed sampling. RNC Consulting LLC maintains all monitoring data for all Association monitoring programs. Data is kept on a computer with daily back-up to an external hard drive. Additionally, a back-up set of data is kept on data discs.

2008 Association Data

The P1 monitoring program is contained in a spreadsheet titled *Bear Creek Reservoir 2008 Master Spreadsheet.* The spreadsheet contains all data analyses. Copies of the spreadsheet distributed to Association membership, WQCD staff and interested parties in February 2008 after approval from the Association Board (Bear Creek Association February 2009).

A specialized Temperature spreadsheet contains all temperature data from 1997-2008 for Bear Creek Reservoir and the Bear Creek and Turkey Creek monitoring sites (Bear Creek Association March 2009). Other data records developed in 2008 for the Association data record include temperature record plus chemistry for all watershed sample site: a) QA/QC spreadsheet data only; b) QA/QC spreadsheet data with summary information and standard analyses. A spreadsheet of available total inorganic nitrogen (TIN) data for P1 sites(2000-2008) and selected watershed sites in 2007 (Appendix A).

Electronic Transfers WQCD/ Depositories

1. Spreadsheet watershed QA/QC spreadsheet data only (WQCD - 4); depositories (3)

2. Spreadsheet watershed QA/QC spreadsheet with summary information and standard analyses (WQCD - 2); depositories (3)

3. Temperature record (WQCD - 2); depositories (3);

4. TIN record (WQCD - 2); depositories (3);

5. *Bear Creek Reservoir 2008 Master Spreadsheet*, plus WQCC annual report, 2008 Data report, 2008 Fishery master, 2008 macroinvertebrate spreadsheet (raw data), 2008 flow spreadsheet, Coyote Gulch master spreadsheet, site master spreadsheet (WQCD - 2), depositories (3)

Appendix A - Reservoir And Watershed Total Inorganic Nitrogen Evaluation

The BCWA available TIN record shown in Tables 12 and 13.

Table 12 Summary of TIN Data at P1 Sites

Date	Turkey Creek Inflow			Bear Creek Inflow			Sheridan		
	Total Ammonia, ug/l	Nitrate+ Nitrite, ug/l	TIN, ug/l	Total Ammonia, ug/l	Nitrate+ Nitrite, ug/l	TIN, ug/l	Total Ammonia, ug/l	Nitrate+ Nitrite, ug/l	TIN, ug/l
03/02/00	19	452	471.0	618	1,216	1,834.0	109	1,096	1,205.0
03/22/00	10	876	886.0	390	1,337	1,727.0	17	1,014	1,031.0
04/18/00	7	341	348.0	15	792	807.0	16	741	757.0
05/08/00	13			98			41		
05/23/00	15	218	233.0	26	884	910.0	32	550	582.0
06/06/00	42	150	192.0	16	821	837.0	20	456	476.0
06/20/00	49	2,111	2,160.0	17	1,320	1,337.0		558	558.0
07/05/00	33	1,206	1,239.0	31	1,679	1,710.0	32	637	669.0
07/18/00	5	499	504.0		346	346.0	96	436	532.0
08/01/00	16	1,047	1,063.0	11	2,224	2,235.0	14	599	613.0
08/15/00	29	1,311	1,340.0	17	1,945	1,962.0	5	167	172.0
09/12/00	10	1,020	1,030.0	8	1,697	1,705.0	5	118	123.0
10/04/00	6	881	887.0	9	1,980	1,989.0	17	209	226.0
10/31/00	12	748	760.0	9	1,671	1,680.0	17	362	379.0
11/28/00	15	375	390.0	17	2,847	2,864.0	15	554	569.0
03/15/01	14.6	548	562.4	26.4	2,911	2,937.2	12.1	961	972.7
04/04/01	9.3	232	240.8	15.2	1,275	1,290.2	15.3	892	906.8
04/19/01	11.7	216	227.5	14.8	854	868.9	12.4	763	775.8
05/03/01	10.6	319	330.0	9.8	540	550.2	19.2	565	583.8
05/24/01	12.3	131	143.0	8.7	269	277.5	34.4	438	472.4
06/07/01	8.0	183	191.3	22.8	371	393.8	25.3	220	244.8
06/28/01	16.1	651	667.5	17.7	1,108	1,125.7	60.1	422	482.0
07/12/01	20.8	927	947.3	17.3	323	339.9	154.9	337	492.1
07/26/01	18.3	500	518.6	8.8	434	442.6	10.8	277	288.0
08/14/01	15.0	405	420.3	9.5	309	318.9	9.2	52	61.5
08/28/01	13.4	813	826.4	10.7	667	677.7	33.4	227	260.4
09/13/01	14.0	955	968.6	10.4	911	921.7	6.4	204	210.5
09/27/01	21.3	147	168.3	24.2	1,276	1,300.1	10.3	294	304.0
10/18/01	13.8	581	594.8	4.8	803	808.0	6.2	107	113.0
11/08/01	13.8	609	622.6	8.9	1,369	1,378.0	10.7	259	269.8
12/10/01	11.3	565	576.3	27.9	2,161	2,189.3	114.7	654	768.2
02/20/02	16.4	968	984.4	30.4	2,438	2,468.4	21.0	1,014	1,035.0
03/20/02	11.7	568	579.5	20.8	2,344	2,365.2	13.6	1,058	1,071.1
04/16/02	15.8	203	218.7	24.5	895	919.7	32.1	667	699.0
05/09/02	35.1	393	427.8	29.1	1,997	2,025.8	87.7	419	507.0
05/23/02	2.4	464	466.9	54.9	743	797.6	76.0	369	445.1
06/06/02	21.2	370	390.8	32.1	1,377	1,408.7	53.9	340	394.2

Date	Turkey Creek Inflow			Bear Creek Inflow			Sheridan		
	Total Ammonia, ug/l	Nitrate+ Nitrite, ug/l	TIN, ug/l	Total Ammonia, ug/l	Nitrate+ Nitrite, ug/l	TIN, ug/l	Total Ammonia, ug/l	Nitrate+ Nitrite, ug/l	TIN, ug/l
06/20/02	21.5	711	732.6	55.1	12,695	12,750.1	27.1	194	221.0
07/01/02	58.9	789	848.0	38.2	10,670	10,708.2	52.1	294	345.7
07/24/02	29.0	959	988.3	43.8	3,671	3,714.9	52.9	244	297.2
08/08/02	15.2	964	979.0	49.5	16,282	16,331.2	26.3	226	252.1
08/22/02	11.3	1,025	1,036.1	15.1	3,773	3,788.1	20.7	186	206.7
09/12/02	36.3	1,237	1,273.5	13.7	1,844	1,857.7	26.9	270	297.0
09/26/02	7.8	411	418.9	17.4	2,308	2,325.4	10.6	67	77.1
10/10/02	9.8	609	619.1	10.3	1,517	1,527.3	13.4	75	88.7
10/24/02	8.3	721	729.6	12.3	2,274	2,286.6	12.5		
11/21/02	12.0	583	595.0	19.3	4,195	4,214.3	20.7	146	166.7
01/14/03	23.3	607	629.8	50.6	9,909	9,959.6	41.5	380	421.6
03/24/03	10.2	1,275	1,284.7	15.2	5,613	5,628.2	5.9	315	320.4
04/15/03	15.6	2,263	2,278.6	37.2	1,333	1,369.7	36.3	1,673	1,709.4
05/06/03	11.1	810	821.5	11.4	866	877.8	10.6	622	632.1
05/27/03	10.7	304	314.3	8.6	150	158.8	17.8	307	325.0
06/12/03	7.9	268	275.6	5.7	271	276.7	27.6	294	321.1
06/26/03	9.8	445	454.7	13.6	241	254.5	26.4	340	366.1
07/10/03	15.4	829	843.9	20.6	1,794	1,814.3	54.9	808	862.4
07/24/03	15.0	1,123	1,138.3	10.7	715	725.7	16.8	279	296.1
08/07/03	13.1	986	999.1	16.1	828	843.8	13.0	249	262.1
08/21/03	65.3	290	355.2	13.3	1,167	1,180.2	11.8	248	259.4
09/02/03	18.3	121	139.3	16.3	1,141	1,157.6	9.4	65	74.8
09/25/03	3.4	1,190	1,193.7	4.3	631	635.7	13.6	154	167.1
10/14/03	6.3	430	435.9	6.3	522	528.1	8.4	254	262.2
11/13/03	9.9	670	679.5	3.8	1,283	1,286.3	14.3	375	389.4
12/03/03	6.1	610	616.1	10.7	1,654	1,664.6	12.4	296	308.5
01/28/04	14.3	747	761.1	131.5	1,040	1,171.5	47.9	489	536.9
03/09/04	16.8	648	664.3	56.7	872	928.3	7.4	585	592.3
04/15/04	12.0	553	565.3	10.9	529	539.7	8.4	317	325.4
05/05/04	6.9	507	513.4	8.1	285	293.1	18.2	358	376.1
05/19/04	10.0	165	175.0	14.2	201	215.3	11.8	98	110.0
06/01/04	13.8	416	429.3	30.3	721	751.7	13.6	209	223.0
06/23/04	9.4	269	278.8	23.1	869	892.6	12.0	272	284.2
07/06/04	189.7	153	342.7	8.9	231	239.5	10.2	161	171.2
07/21/04	10.6	352	362.9	7.8	182	190.3	9.1	153	162.5
08/05/04	10.9	516	526.7	11.4	149	160.9	11.1	133	144.6
08/26/04	11.8	450	462.1	7.8	280	288.0	6.5	196	202.1
09/07/04	11.4	450	461.2	12.5	267	279.4	8.2	175	182.8
09/28/04	7.8	329	336.6	14.5	306	320.2	7.5	154	161.6
10/21/04	6.1	88	94.0	9.5	215	224.3	9.0	273	281.9
11/11/04	9.6	135	145.0	15.7	506	521.4	7.4	318	325.5

Date	Turkey Creek Inflow			Bear Creek Inflow			Sheridan		
	Total Ammonia, ug/l	Nitrate+ Nitrite, ug/l	TIN, ug/l	Total Ammonia, ug/l	Nitrate+ Nitrite, ug/l	TIN, ug/l	Total Ammonia, ug/l	Nitrate+ Nitrite, ug/l	TIN, ug/l
12/01/04	49.1			32.7			36.6		
							Bear Creek Lair O'Bear		
01/27/05	9	454	462.9	10	787	797.4	40	647	686.5
02/17/05	22	642	664.1	18	777	795.0	21	760	781.0
03/17/05	11	555	565.3	6	601	607.2	5	507	512.1
04/12/05	30	691	720.4	12	605	616.9	14	444	457.8
05/04/05	12	553	565.7	9	382	391.4	7	342	348.9
05/18/05	11	388	399.2	7	188	195.1	8	195	202.8
06/01/05	10	286	296.7	13	168	180.8	13	131	144.5
06/22/05	5	46	50.5	11	142	153.1	9	104	112.7
07/13/05	14	783	796.4	15	458	472.9	13	174	187.5
07/27/05	14	958	971.3	12	274	285.4	16	176	191.9
08/10/05	9	405	413.6	10	409	419.2	8	166	174.3
08/23/05	9	182	190.9	10	288	298.6	8	155	163.0
09/08/05	7	894	901.4	7	941	947.7	7	340	347.0
09/27/05	14	675	689.2	18	901	918.5	13	383	395.9
10/20/05	12	91	102.6	11	453	464.7	7	321	328.0
11/10/05	8	125	132.5	15	1,198	1,213.4	13	430	442.4
12/01/05	10	450	459.9	43	10,124	10,166.8	38	1,094	1,132.7
01/26/06	8.7	18	27.0	21.9	1,088	1,110.3	54.0	732	786.3
02/16/06	9.1	392	400.6	27.2	686	713.3	90.4	530	620.5
03/14/06	15.1	319	334.3	19.1	1,030	1,049.1	31.7	587	618.8
04/11/06	13.6	306	319.3	21.8	372	394.3	9.6	256	265.6
05/02/06	22.1	136	158.3	29.2	524	553.5	21.1	399	420.0
05/17/06	10.6	174	185.1	21.7	447	468.9	16.0		
06/07/06	65.0	16	80.9	43.7	3,412	3,455.8	53.3	630	683.7
06/21/06	29.4	910	939.2	64.0	9,922	9,986.0	41.7	344	385.4
07/05/06	10.6	1,732	1,742.8	13.3	1,178	1,191.1	14.1	415	428.7
07/19/06	11.0	536	547.1	11.5	1,129	1,140.7	6.6	229	235.2
08/22/06	9.8	582	591.5	8.0	372	379.5	6.5	233	239.8
09/05/06	13.2	596	609.6	14.5	1,010	1,024.9	20.5	298	318.2
09/19/06	7.7	288	296.0	7.6	1,138	1,145.5	8.8	507	515.8
10/17/06	11.2	325	336.0	10.4	519	528.9	17.5	328	346.0
11/20/06	9.9	159	168.5	11.2	1,729	1,740.0	20.7	542	562.3
12/05/06	12.4	221	233.4	61.8	556	617.8	56.2	500	556.0
01/25/07	10.0	291	300.7	195.8	937	1,132.3	262.6	523.3	785.9
02/22/07	8.7	821	830.1	28.8	952	980.4	27.9	976.8	1,004.7
03/22/07	9.7	676	685.9	7.7	475	482.7	32.2	410.1	442.3
04/12/07	8.0	457	464.5	9.1	256	265.0	8.1	264.4	272.6
05/10/07	10.7	417	428.2	13.5	348	361.9	9.9	253.1	263.0
05/23/07	8.7	336	344.2	11.7	188	199.8	15.2	141.7	156.8

Date	Turkey Creek Inflow			Bear Creek Inflow			Sheridan		
	Total Ammonia, ug/l	Nitrate+ Nitrite, ug/l	TIN, ug/l	Total Ammonia, ug/l	Nitrate+ Nitrite, ug/l	TIN, ug/l	Total Ammonia, ug/l	Nitrate+ Nitrite, ug/l	TIN, ug/l
06/07/07	12.5	296	308.5	7.3	140	147.7	7.6	98.3	105.9
06/21/07	10.6	276	287.0	6.4	113	119.4	6.6	79.6	86.1
07/05/07	11.8	272	283.8	15.3	172	187.2	15.1	86.4	101.4
07/19/07	12.2	584	596.4	11.8	227	238.9	14.2	90.2	104.4
08/02/07	8.7	563	571.3	9.5	221	231.0	9.1	115.7	124.9
08/16/07	9.9	420	430.2	14.2	198	212.0	25.7	157.0	182.7
09/04/07	14.5	501	515.6	11.0	498	508.8	10.6	248.2	258.8
10/25/07	4.9	126	130.4	5.5	461	466.7	4.9	376.6	381.5
12/03/07	11.3	232	243.1	83.4	2,189	2,272.0	153.5	462.0	615.5
12/13/07	11.5	296	307.8	83.2	4,582	4,665.3	66.6	743.1	809.7

Table 13 2007-2008 TIN Data from Selected Watershed Sites

Date	Site 1a			Site 1b			Site 2		
	Tot. NH3-N	NO3-NO2-N	TIN	Tot. NH3-N	NO3-NO2-N	TIN	Tot. NH3-N	NO3-NO2-N	TIN
5/3/2007				12	54	66	11	49	60
6/7/2007				13	78	91	6	53	59
7/12/2007				9	55	64	11	43	54
8/2/2007				7	135	142	10	105	115
9/6/2007	8	113	121	8	107	115	14	91	105
10/4/2007	5	132	137	15	133	148	8	96	104
	Site 3a			Site 4a			Site 5		
	Tot. NH3-N	NO3-NO2-N	TIN	Tot. NH3-N	NO3-NO2-N	TIN	Tot. NH3-N	NO3-NO2-N	TIN
5/3/2007	15	76	91	28	84	112	17	191	208
6/7/2007	11	50	61				15	42	57
7/12/2007	11	24	35	11	14	25	11	16	27
8/2/2007	9	84	93	16	61	77	19	64	83
9/6/2007	16	92	108	23	71	94	32	74	106
10/4/2007	16	87	103	53	69	122	55	74	129
	Site 6			Site 7			Site 8a		
	Tot. NH3-N	NO3-NO2-N	TIN	Tot. NH3-N	NO3-NO2-N	TIN	Tot. NH3-N	NO3-NO2-N	TIN
5/3/2007	16	189	205	22	194	216	33	214	247
6/7/2007	10	90	100	19	66	85	13	77	90
7/12/2007	12	19	31	11	26	37	22	48	70
8/2/2007	19	61	80	33	68	101	25	66	91
9/6/2007	29	76	105	42	271	313	17	247	264
10/4/2007	47	76	123	63	274	337	62	364	426
	Site 9			Site 10			Site 11		
	Tot. NH3-N	NO3-NO2-N	TIN	Tot. NH3-N	NO3-NO2-N	TIN	Tot. NH3-N	NO3-NO2-N	TIN
5/3/2007	23	219	242	17	216	233	17	234	251
6/7/2007	5	75	80	17	75	92	8	80	88
7/12/2007	15	62	77	20	66	86	14	79	93

8/2/2007	17	83	100	17	83	100	13	86	99
9/6/2007	19	235	254	15	229	244	15	165	180
10/4/2007	22	240	262	20	215	235	12	232	244
	Site 12			Site 13a			Site 14a		
	Tot. NH3-N	NO3-NO2-N	TIN	Tot. NH3-N	NO3-NO2-N	TIN	Tot. NH3-N	NO3-NO2-N	TIN
5/3/2007	30	255	285	24	283	307	38	305	343
6/7/2007	13	113	126	5	114	119	7	90	97
7/12/2007	13	129	142	13	140	153	11	89	100
8/2/2007	25	111	136	12	102	114	15	87	102
9/6/2007	14	222	236	13	160	173	17	128	145
10/4/2007	13	294	307	20	313	333	11	306	317
	Site 15a			Site 16a			Site 17a		
	Tot. NH3-N	NO3-NO2-N	TIN	Tot. NH3-N	NO3-NO2-N	TIN	Tot. NH3-N	NO3-NO2-N	TIN
5/3/2007	16	371	387	12	522	534	14	436	450
6/7/2007	14	139	153	16	241	257	8	280	288
7/12/2007	14	209	223	9	300	309	15	77	92
8/2/2007	19	256	275	8	667	675	15	20	35
9/6/2007	11	404	415	24	510	534	10	5	15
10/4/2007	18	892	910	8	588	596	13	3	16
	Site 18			Site 19					
	Tot. NH3-N	NO3-NO2-N	TIN	Tot. NH3-N	NO3-NO2-N	TIN			
5/3/2007	14	42	56	12	423	435			
6/7/2007	28	30	58	6	197	203			
7/12/2007	15	32	47	13	100	113			
8/2/2007	22	12	34	16	69	85			
9/6/2007	13	25	38	8	170	178			
10/4/2007	20	2	22	10	3	13			

	Site 1a			**Site 3a**			**Site 4a**		
	NH3-N	**NO3+NO2-N**	**TIN**	**NH3-N**	**NO3+NO2-N**	**TIN**	**NH3-N**	**NO3+NO2-N**	**TIN**
Date	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**
5/8/2008		93			2			0	
6/11/2008	6	101	107	8	43	51	13	36	49
7/10/2008	5	67	72	7	36	43	23	22	45
8/7/2008	10	88	98	5	40	45	30	11	41
9/4/2008	7	120	127	10	76	86	19	3	22
10/8/2008	6	128	134	7	65	72	19	2	21
11/13/2008	12	170	182	4	103	107			
	Site 5			**Site 7**			**Site 8a**		
	NH3-N	**NO3+NO2-N**	**TIN**	**NH3-N**	**NO3+NO2-N**	**TIN**	**NH3-N**	**NO3+NO2-N**	**TIN**
Date	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**
5/8/2008		91			256			272	
6/11/2008	14	52	66	11	154	165	9	128	137
7/10/2008	11	24	35	14	184	198	23	192	215
8/7/2008	18	10	28	16	10	26	56	67	123
9/4/2008	11	5	16	47	20	67	75	44	119

10/8/2008	8	3	11	8	164	172	9	492	501
11/13/2008	25	36	61	81	158	239	205	375	580
	Site 9			**Site12**			**Site 13a**		
	NH3-N	**NO3+NO2-N**	**TIN**	**NH3-N**	**NO3+NO2-N**	**TIN**	**NH3-N**	**NO3+NO2-N**	**TIN**
Date	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**
5/8/2008		202			170			117	
6/11/2008	8	131	139	14	160	174	10	111	121
7/10/2008	19	130	149	22	206	228	19	188	207
8/7/2008	11	44	55	10	303	313	9	179	188
9/4/2008	23	53	76	12	230	242	14	224	238
10/8/2008	7	200	207	6	360	366	10	426	436
11/13/2008	43	213	256	10	392	402	8	499	507
	Site 14a			**Site 18**			**Site 19**		
	NH3-N	**NO3+NO2-N**	**TIN**	**NH3-N**	**NO3+NO2-N**	**TIN**	**NH3-N**	**NO3+NO2-N**	**TIN**
Date	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**
5/8/2008		65						339	
6/11/2008	10	100	110	11	3	14	10	64	74
7/10/2008	15	146	161	6	27	33	6	5	11
8/7/2008	14	205	219	26	3	29	11	100	111
9/4/2008	8	98	106	17	5	22	8	10	18
10/8/2008	6	416	422	8	64	72	7	2	9
11/13/2008	11	588	599	7	11	18	11	118	129
	Site 25			**Site 26**			**Site 28**		
	NH3-N	**NO3+NO2-N**	**TIN**	**NH3-N**	**NO3+NO2-N**	**TIN**	**NH3-N**	**NO3+NO2-N**	**TIN**
Date	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**
5/8/2008		12		8	207	215	135	31	166
7/10/2008	9	24	33						
8/7/2008	12	51	63						
9/4/2008	17	40	57						
10/8/2008	9	66	75						
11/13/2008	6	82	88						
	Site 32			**Site 34**					
	NH3-N	**NO3+NO2-N**	**TIN**	**NH3-N**	**NO3+NO2-N**	**TIN**			
Date	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**			
7/10/2008	7	341	348	11	214	225			

	WWTP Site 23			
	NH3-N	**NO3-N**	**NO2-N**	**TIN**
Date	**ug/L**	**ug/L**	**ug/L**	**ug/L**
05/01/08	88	3200	8000	11288
05/08/08	5	4100	5000	9105
05/15/08	110	2800	8000	10910
05/22/08	170	3400	9000	12570
05/29/08	235	3500	7000	10735
06/05/08	173	3600	5000	8773
06/12/08	233	2800	5000	8033
06/19/08	296	2900	4000	7196
06/26/08	149	4800	6000	10949
07/10/08	135	3600	3000	6735

Date	WWTP Site 23			
	NH3-N	NO3-N	NO2-N	TIN
	ug/L	ug/L	ug/L	ug/L
07/17/08	110	3300	2000	5410
07/24/08	131	3600	2000	5731
07/31/08	257	3200	4000	7457
08/07/08	50	2000	1000	3050
08/14/08	30	2000	2000	4030
08/21/08	175	2500	2000	4675
08/28/08	138	3500	1000	4638
09/11/08	141	4850	1500	6491
09/18/08	114	2400	2000	4514
09/25/08	187	1830	4000	6017
10/02/08	133	2130	1000	3263
10/16/08	123	4630	2000	6753
10/23/08	136	4930	6000	11066
10/30/08	96	4130	8000	12226

Site #	Site Location	Lat	Long
Site 1a	Lost & Found (Singin' River Ranch)	39.6234	105.4451
Site 1b	Above Singin' River Ranch-Williams property	39.6264	105.4282
Site 2	Above Evergreen Lake at Clear Creek County line	39.6368	105.3972
Site 3a	Above Evergreen Lake at CDOW Site	39.6331	105.3372
Site 4a	Evergreen Lake Surface, Profile Station	39.6314	105.3231
Site 5	Above EMD WWTP, at CDOW downtown site	39.6327	105.3183
Site 7	Below EMD WWTP effluent	39.6377	105.3141
Site 8a	Bear Creek Cabins at CDOW Site	39.6428	105.308
Site 9	O'Fallon Park, west end at CDOW Site	39.6567	105.2895
Site 12	Lair o' the Bear Park, at CDOW site	39.6672	105.2587
Site 13a	Below Idledale, Shady Lane at CDOW site	39.6626	105.2409
Site 14a	Morrison Park west end of town, at CDOW Site	39.6529	105.2003
Site 15a	Bear Creek Segment 1b, near USGS gage in BC Park	39.6522	105.1731
Site 16a	N. Turkey Creek within BC Park at old USGS (Maint. Bldg.)	39.6394	105.161
Site 17a	Near confluence of N. & S. Turkey Creeks, in N. Turkey Creek	39.578	105.2193
Site 18	South Turkey Creek Aspen Park Metropolitan District	39.5461	105.2708
Site 19	North Turkey Creek Conifer Metropolitan District	39.542	105.3155
Site 20	EMD WWTP Effluent	39.6376	105.3148
Site 21	WJCMD WWTP Effluent	39.6622	105.3352
Site 22	KSWD WWTP Effluent	39.6585	105.2869
Site 23	GWSD WWTP Effluent	39.673	105.2711
Site 24	Morrison WWTP Effluent	39.6541	105.1796
Site 25	Mt. Evans Wilderness drainage	39.6322	105.4558
Site 26	Cub Creek, Upstream of Hwy 73 bridge, south of EMD WTP	39.6312	105.3221
Site 28	Parmalee Gulch, near Hwy 285	39.6157	105.2342
Site 32	Troublesome Gulch, at mouth before BC confluence	39.6546	105.3065
Site 34	Mt. Vernon drainage, above Bear Creek, near Main St. Morrison	39.6538	105.1919

Appendix B: Summary Bear Creek Watershed 2007-2008 Monitoring Program

Executive Summary

2007-2008 Off-Season

The Off-Season program locations included eight sites situated from above Evergreen Lake to the west end of Morrison in the Bear Creek Watershed and Turkey Creek just above Bear Creek Reservoir (Figure 1). The program began in early November 2007 and ended in March 2008. The 2007-2008 Off-Season special stream-monitoring program in Bear Creek Watershed showed no evidence of temperature impairment. (The Sites were neither sampled nor field-monitored---only temperature dataloggers were utilized.)

- 100% of the 2007-2008 Off-Season recorded temperature values would be consistent with a proposed underlying temperature standard of 9°C Weekly Average Temperature (WAT).
- 100% of the recorded temperature values complied with an interim temperature standard of 20°C Maximum Weekly Average Temperature (MWAT).
- 100% of the calculated temperature values complied with a proposed underlying temperature standard of 13°C Daily Maximum (DM).
- For all five WWTP effluents, Daily Average Temperatures equaled 8.6°C and Weekly Average Temperatures equaled 8.6°C.

2008 Seasonal

The Seasonal program locations included twenty-one sites in Segment 1a and 1b (including five total at the Evergreen Lake profile station) and four sites in the Turkey Creek drainage, for a total of twenty-five sites. Additionally, the five major wastewater treatment plants discharging into Segment 1a and 1b (Morrison) were monitored. The 2008 Seasonal program began on May 1, 2008 and concluded on October 31, 2008. The 2008 Seasonal special stream-monitoring program in the Bear Creek Watershed (Segment 1a and Turkey Creeks) showed minor impairment.

- 100% of the recorded temperature values complied with an interim temperature standard of 20°C MWAT.
- Impact of temperature on the stream fishery remains controversial.
- 93% of the 2008 Seasonal recorded temperature values meet a proposed underlying temperature standard of 18.2°C WAT. A stream standard of 18.2°C WAT cannot be consistently achieved during the growing season.
- 100% of the recorded temperature values would be consistent with a proposed underlying temperature standard of 23.8°C DM. An acute stream standard of 23.8°C DM may consistently be achieved during the growing season.
- Analysis of all in-stream measurements (91 for pH and 91 for dissolved oxygen) at seventeen locations results in 100% compliance with pH and 98% compliance with Dissolved Oxygen stream standards.
- Total Ammonia analyses indicate a range of 4ug/L-205ug/L with an average of 19 ug/L throughout the seventeen locations sampled in the watershed. All indications are that these values comply with a calculated TVS for Total Ammonia.

- Analysis of all in-stream sampling results (92 measurements) from seventeen locations for Nitrate+Nitrite produced 100% compliance for the stream standard for Nitrate.

- For all five WWTP effluents, Daily Average Temperatures equaled 16.5°C and Weekly Average Temperatures equaled 16.5°C.

- 100% of the WWTP effluent pH, Total Ammonia and Total Phosphorous values met permit limits.

Off-Season Data Summaries

Temperature Datalogger Results

48,112 individual temperature data points were obtained from the eight datalogger Sites within the Watershed. The evaluating criteria used to determine potential impairment of stream temperature is the proposed, seasonal underlying 9°C Weekly Average Temperature (WAT), the proposed, seasonal underlying 13°C Daily Maximum Temperature (DM) 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 138 weekly averages calculated for the program period. There were no exceedances of the evaluating criteria (9°C WAT) at any of the eight Sites within the Watershed. **This results in 100% compliance with the proposed underlying standard of 9°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 seven-day average temperature of all measurements collected in seven consecutive days, beginning with the first day of data collection. There were 138 weekly averages calculated for the Study period. There were no exceedances of the evaluating criteria (20°C MWAT), at any of the eight Sites within the Watershed. **This results in 100% compliance with the interim standard of 20°C as an MWAT.**

The third applicable evaluating criteria used to determine potential impairment of stream temperature in the proposed underlying 13°C Daily Maximum Temperature (DM). The DM is calculated by averaging temperature measurements recorded in a two-hour period and determining the maximum of these values in one day. 12,021 two-hour blocks were evaluated and 990 Daily Maximum values were calculated. There were no exceedances of the proposed underlying criteria (DM 13°C), at any of the eight Sites within the Watershed. **This results in 100% compliance with the proposed underlying standard of 13°C as a DM.**

28,008 individual temperature data points were obtained from the five dataloggers located in the WWTP effluents that discharge into Segments 1a and 1b. Recognizing that there are no permit temperature limits, the following data summary is presented. **Daily Average Temperatures for all five effluents was 8.6°C and Weekly Average Temperatures for all effluents was 8.6°C.**

Sampling and Monitoring Parameter Results

There were no Watershed sampling and monitoring events performed during the 2007-2008 Off-Season program. WWTP effluent measurements and samples taken as necessary according to discharge permit requirements. Process control measurements were taken during the normal course of plant operations. Although pH, Temperature, Dissolved Oxygen and other effluent parameters were compiled, they are not presented in this report.

Temperature and Water Quality Compliance

The 30-minute temperature datalogger measurements recorded in the Watershed at eight Sites from just above Evergreen Lake to the west end of Morrison and Turkey Creek 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 100% compliance of the evaluating criteria of 9°C WAT, utilizing the 85th%-tile qualifier, as a proposed underlying standard for class 1 cold waters. This proposed underlying standard was met this Off-Season Program period. **100% of the temperature values calculated would be consistent with a proposed underlying standard of 9°C WAT.**

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 Off-Season Program period, the assumption should not be made that this will always be the case. **100% of the 20°C MWAT temperature values calculated would comply with an interim standard of 20°C MWAT.**

The 30-minute temperature measurements that are used to calculate the DM values result in full compliance of the evaluating proposed underlying standard criteria of 13°C DM, utilizing the 85th%-tile qualifier. Although this proposed limit was met during this Off-Season Program period, the assumption should not be made that this will always be the case. **100% of the temperature values calculated would be consistent with a proposed underlying standard of 13°C DM.**

The 30-minute temperature datalogger measurements recorded in the five WWTP effluents that discharge into Bear Creek in Segment 1a and 1b do not indicate that a stream temperature problem exists as a result of any WWTP effluent. **Since there are no temperature effluent limits for the five-wastewater plants, the Daily Average Temperature and Weekly Average Temperatures were calculated. For all five WWTP effluents, Daily Average temperatures equaled 8.6°C. For all five WWTP effluents, Weekly Average Temperatures equaled 8.6°C.**

The 2007-2008 Off-Season special stream monitoring program in the Bear Creek Watershed showed no evidence of impairment. Comparisons with the interim temperature standards resulted in compliance. The interim Maximum Weekly Average Temperature (MWAT) of 20ºC, proposed underlying standard Weekly Average Temperature (WAT) of 9ºC and proposed underlying standard Daily maximum (DM) of 13ºC were met with full compliance at all monitoring Sites. The calculated MWAT values met this year.

All five wastewater treatment plants met discharge limits stated in their Colorado Discharge Pollutant Elimination System (CDPES) permit for pH and Ammonia during the Program period and showed no evidence of thermal pollution. Wastewater treatment plant effluents had no detrimental effect on the water quality of Segment 1a and 1b. There were no observed impairment issues or temperature issues in the Watershed during the Program.

Off-Season Data Tables

The following applies to all Off-Season data tables: Existing stream standards: Table Value Standard (TVS) for Total Ammonia (NH3-N), chronic; pH 6.5-9.0 SU; DO 6.0 mg/L; Threshold to Evaluate Potential Temperature Impairment: 20°C MWAT (Maximum Weekly Average Temperature, Interim Standard), 9°C WAT (Weekly Average Temperature, Underlying Standard), 13°C DM (Daily Maximum Temperature, Underlying Standard); 2-HR Avg. Temperature data are estimates used to evaluate against DM Underlying Standard.

Table 14 Above Evergreen Lake, at CDOW site (Site 3a)

Datalogger Temperature Data					
All Temperatures in °C	30-Min Temp.	MWAT (20°C)	WAT (9°C)	2-HR Avg. Temp.	DM (13°C)
Min	-0.14	-0.06	-0.06	-0.09	-0.06
Max	3.93	1.69	1.69	3.91	3.91
Avg	0.11	0.12	0.12	0.11	0.25
Std. Dev.	0.63	0.49	0.49	0.63	0.91
# of measurements	6000	17	17	1500	125
# of 20°C MWAT exceeded		0			
% Compliance MWAT		100			
# of 18.2°C WAT exceeded			0		
% Compliance WAT			100		
# of 23.8°C DM exceeded					0
% Compliance DM					100

[Monitoring station/Datalogger ID: ALKDOW GPS Coordinates: 39.6331°N, 105.3372°W; Sampling /monitoring site in Bear Creek above Evergreen Lake, at the CDOW fish survey site.]

Table 15 Downtown Evergreen, at CDOW site (Site 5)

Datalogger Temperature Data					
All Temperatures in °C	30-Min Temp.	MWAT (20°C)	WAT (9°C)	2-HR Avg. Temp.	DM (13°C)
Min	-0.09	0.10	0.10	-0.09	0.14
Max	4.45	3.75	3.75	4.40	4.40
Avg	1.07	1.10	1.10	1.07	1.46
Std. Dev.	1.14	1.12	1.12	1.14	1.18
# of measurements	5895	17	17	1473	123
# of 20°C MWAT exceeded		0			
% Compliance MWAT		100			
# of 18.2°C WAT exceeded			0		
% Compliance WAT			100		
# of 23.8°C DM exceeded					0
% Compliance DM					100

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

Table 16 Bear Creek Cabins (Site 8a)

Datalogger Temperature Data					
All Temperatures in °C	30-Min Temp.	MWAT (20°C)	WAT (9°C)	2-HR Avg. Temp.	DM (13°C)
Min	-0.17	-0.09	-0.09	-0.15	-0.14
Max	6.41	3.97	3.97	6.13	6.13
Avg	0.99	1.00	1.00	0.99	2.06
Std. Dev.	1.35	1.15	1.15	1.34	1.62
# of measurements	5903	17	17	1475	123
# of 20°C MWAT exceeded		0			
% Compliance MWAT		100			
# of 18.2°C WAT exceeded			0		
% Compliance WAT			100		
# of 23.8°C DM exceeded					0
% Compliance DM					100

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

Table 17 O'Fallon Park (Site 9)

Datalogger Temperature Data					
All Temperatures in °C	30-Min Temp.	MWAT (20°C)	WAT (9°C)	2-HR Avg. Temp.	DM (13°C)
Min	-0.20	-0.14	-0.14	-0.16	-0.14
Max	8.69	3.88	3.88	8.36	6.82
Avg	0.85	0.80	0.80	0.85	1.55
Std. Dev.	1.56	1.13	1.13	1.55	2.09
# of measurements	6626	19	19	1654	125
# of 20°C MWAT exceeded		0			
% Compliance MWAT		100			
# of 18.2°C WAT exceeded			0		
% Compliance WAT			100		
# of 23.8°C DM exceeded					0
% Compliance DM					100

[Monitoring station/Datalogger ID: OFPDOW GPS Coordinates: 39.6564°N, 105.2917°W; Sampling/ monitoring site north side of the creek above ETU restoration site, at the CDOW fish survey site.]

Table 18 Lair o' the Bear (Site 12)

Datalogger Temperature Data					
All Temperatures in °C	30-Min Temp.	MWAT (20°C)	WAT (9°C)	2-HR Avg. Temp.	DM (13°C)
Min	-0.09	-0.03	-0.03	-0.07	-0.03
Max	6.38	3.85	3.85	6.33	6.33
Avg	0.68	0.64	0.64	0.68	1.16
Std. Dev.	1.35	1.09	1.09	1.34	1.75
# of measurements	6001	17	17	1500	125
# of 20°C MWAT exceeded		0			
% Compliance MWAT		100			
# of 18.2°C WAT exceeded			0		
% Compliance WAT			100		
# of 23.8°C DM exceeded					0
% Compliance DM					100

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

Table 19 Idledale (Shady Lane-Site 13a)

Datalogger Temperature Data					
All Temperatures in °C	30-Min Temp.	MWAT (20°C)	WAT (9°C)	2-HR Avg. Temp.	DM (13°C)
Min	-3.09	-0.41	-0.41	-3.04	-0.19
Max	6.31	3.82	3.82	6.16	6.16
Avg	0.54	0.52	0.52	0.54	1.05
Std. Dev.	1.40	1.11	1.11	1.39	1.86
# of measurements	5896	17	17	1473	123
# of 20°C MWAT exceeded		0			
% Compliance MWAT		100			
# of 18.2°C WAT exceeded			0		
% Compliance WAT			100		
# of 23.8°C DM exceeded					0
% Compliance DM					100

[Monitoring station/Datalogger ID: Idledale GPS Coordinates: 39.6621°N, 105.2406°W; Sampling/ monitoring site in Bear Creek at the CDOW fish survey site.]

Table 20 West End of Morrison (Site 14a)

Datalogger Temperature Data					
All Temperatures in °C	30-Min Temp.	MWAT (20°C)	WAT (9°C)	2-HR Avg. Temp.	DM (13°C)
Min	-0.09	-0.05	-0.05	-0.08	-0.06
Max	6.46	4.03	4.03	6.38	6.38
Avg	0.65	0.63	0.63	0.65	1.12
Std. Dev.	1.41	1.12	1.12	1.41	1.78
# of measurements	5895	17	17	1473	123
# of 20°C MWAT exceeded		0			
% Compliance MWAT		100			
# of 18.2°C WAT exceeded			0		
% Compliance WAT			100		
# of 23.8°C DM exceeded					0
% Compliance DM					100

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

Table 21 Turkey Creek (Site 16a)

Datalogger Temperature Data					
All Temperatures in °C	30-Min Temp.	MWAT (20°C)	WAT (9°C)	2-HR Avg. Temp.	DM (13°C)
Min	-0.09	0.55	0.55	-0.09	0.33
Max	9.56	7.00	7.00	9.52	9.52
Avg	2.17	2.13	2.13	2.17	3.45
Std. Dev.	2.07	1.70	1.70	2.07	2.17
# of measurements	5896	17	17	1473	123
# of 20°C MWAT exceeded		0			
% Compliance MWAT		100			
# of 18.2°C WAT exceeded			0		
% Compliance WAT			100		
# of 23.8°C DM exceeded					0
% Compliance DM					100

[Monitoring station/Datalogger ID: TURK2 GPS Coordinates: 39.6394°N, 105.161°W; Sampling/ monitoring site in Turkey Creek, inside Bear Creek Lake Park, at the maintenance shop site.]

Off-Season Data Tables-WWTP Effluent Temperature

Datalogger temperature measurements of plant effluent obtained at the identical frequency of the in-stream dataloggers (30-minute intervals). The datasheets listed in a downstream direction, as the effluents enter Bear Creek, from the EMD WWTP to the Morrison WWTP.

Table 22 Evergreen Metropolitan District (Site 20)

EMD WWTP Effluent November, 2007 - March, 2008			
Datalogger Temperature Data			
All Temperatures in °C	30-Min Temp.	Daily Avg.Temp.	Weekly Avg. Temp.
Min	6.6	6.6	6.8
Max	12.9	12.6	12.4
Avg	8.3	8.4	8.4
Std. Dev.	1.7	1.7	1.7
# of measurements	5670	118	16

[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.]

Table 23 West Jefferson County Metropolitan District (Site 21)

WJCMD WWTP Effluent November, 2007 - March, 2008			
Datalogger Temperature Data			
All Temperatures in °C	30-Min Temp.	Daily Avg.Temp.	Weekly Avg. Temp.
Min	5.8	8.2	8.8
Max	14.8	14.0	13.7
Avg	10.2	10.2	10.3
Std. Dev.	1.5	1.5	1.5
# of measurements	5624	117	16

[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.]

Table 24 Kittredge Sanitation and Water District (Site 22)

KSWD WWTP Effluent November, 2007 - March, 2008			
Datalogger Temperature Data			
All Temperatures in °C	30-Min Temp.	Daily Avg.Temp.	Weekly Avg. Temp.
Min	-0.6	0.8	1.7
Max	10.2	8.5	7.7
Avg	4.0	4.1	3.9
Std. Dev.	1.8	1.7	1.5
# of measurements	5667	118	16

[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.]

Table 25 Genesee Water and Sanitation District (Site 23)

GWSD WWTP Effluent November, 2007 - March, 2008			
Datalogger Temperature Data			
All Temperatures in °C	30-Min Temp.	Daily Avg.Temp.	Weekly Avg. Temp.
Min	9.42	9.74	9.80
Max	14.85	14.69	14.39
Avg	11.38	11.40	11.43
Std. Dev.	1.55	1.56	1.55
# of measurements	5525	115	16

[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.]

Table 26 Town of Morrison (Site 24)

Morrison WWTP Effluent November, 2007 - March, 2008			
Datalogger Temperature Data			
All Temperatures in °C	30-Min Temp.	Daily Avg.Temp.	Weekly Avg. Temp.
Min	6.2	6.4	6.7
Max	13.7	13.5	13.2
Avg	8.8	8.8	8.8
Std. Dev.	1.7	1.7	1.7
# of measurements	5522	115	16

[Datalogger ID: MORR12 GPS Coordinates: 39.6541°N, 105.1796°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.]

Seasonal Data Summaries

Temperature Datalogger Results

185,507 individual temperature data points were obtained from the twenty-two datalogger Sites within the Watershed (Segment 1a, 1b and Turkey Creek). (These locations include a profile station in Evergreen Lake with five dataloggers at different depths.) The evaluating criteria used to determine potential impairment of stream temperature is the proposed underlying 18.2°C Weekly Average Temperature (WAT), the proposed underlying 23.8°C Daily Maximum Temperature (DM) 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 549 weekly averages calculated for the Program period. There were 37 exceedances of the evaluating criteria (18.2°C WAT) at eleven of the twenty-two Sites monitored. **This results in 7% noncompliance with the proposed underlying standard of 18.2°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 was 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 549 weekly averages calculated for the Program period. There were no exceedances of the evaluating criteria (20°C MWAT), at any of the twenty-two Sites monitored. **This results in 100% compliance with the interim standard of 20°C as an MWAT.**

The third applicable evaluating criteria used to determine potential impairment of stream temperature is the proposed underlying 23.8°C Daily Maximum Temperature (DM). The DM is calculated by averaging temperature measurements recorded in a two-hour period and determining the maximum of these values in one day. 46,367 two-hour blocks were evaluated and 3,887 Daily Maximum values were calculated. There were no exceedances of the proposed underlying criteria (DM 23.8°C), at all of the twenty-two Sites monitored. **This results in 100% compliance with the proposed underlying standard of 23.8°C as a DM.**

44,030 individual temperature data points were obtained from the five dataloggers located in the WWTP effluents that discharge into Segments 1a and 1b. Recognizing that there are no permit related temperature limits, the following summary is presented: **Daily Average Temperatures for all five effluents was 16.5°C and Weekly Average Temperatures for all effluents was 16.5°C.**

Monitoring Parameter Results

Monthly monitoring measurements were obtained from seventeen Sites in the Watershed (Segment 1a and Turkey Creek) over 7 months. (These locations include the surface Site of the Evergreen Lake profile station. Below –surface Sites were neither sampled nor monitored.) 91 total measurements of temperature were obtained from the Sites mentioned above. Since these were monthly monitoring events, the evaluating criteria mentioned above were not considered. **The Maximum Temperature value at any location did not exceed 18.92°C and the average of all monthly Maximum Temperatures for these locations was 15.42°C.**

91 total measurements of pH were obtained at seventeen Sites noted above. The pH stream standard range is 6.5 – 9.0. **100% of the monthly pH values were in compliance.**

91 total measurements of Dissolved Oxygen were obtained at seventeen Sites noted above. The minimum Dissolved Oxygen stream standard is 6.0 mg/L. Two values recorded exceeded the stream standard at Sites 18 (Below Aspen Park Metro District) and 28 (Parmalee Gulch near Hwy. 285). Another value was exceedingly high, also recorded at the Site below Aspen Park Metro District WWTP effluent, but confirmed to be accurate. The measurements result in **2% noncompliance of the monthly Dissolved Oxygen measurements.**

Monthly grab samples were taken for Total Ammonia at seventeen Sites noted above. 80 samples were analyzed. Although the Associations Table Value Standard (TVS) calculations for Total Ammonia have not been confirmed by the Water Quality Control Division at the time of completion of this Report, individual results of Total Ammonia analyses indicate a range of 4ug/L-205ug/L with an average of 19ug/L throughout the seventeen Sites sampled in the Watershed. **All indications are that these values comply with a calculated TVS for Total Ammonia.**

Monthly grab samples taken for Nitrate+Nitrite at seventeen Sites noted above. The stream standard for Nitrate is 10 mg/L. 92 samples were analyzed and results reported. **There were no values reported that exceeded the stream standard for Nitrate.**

Monthly results were calculated for Total Inorganic Nitrogen (TIN) at seventeen Sites noted above. There is no Total Inorganic Nitrogen stream standard. **80 results were calculated and reported for Total Inorganic Nitrogen.**

Monthly grab samples were taken for Total Phosphorous at seventeen Sites noted above. There is no Total Phosphorous stream standard. **92 samples were analyzed and reported for Total Phosphorous.**

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. 734 total measurements of Temperature were obtained at the five WWTP effluents during the Program. None of the five WWTP discharge permits has limits for temperature. **Since these measurements were obtained once daily, no analysis of data was performed.**

752 total measurements of pH were obtained at the five WWTP effluents monitored during the program. The discharge permit pH range is 6.5 – 9.0. **100% of pH values were in compliance.**

546 total measurements of Dissolved Oxygen were obtained at the five WWTP effluents monitored during the Program. None of the five WWTP discharge permits has limits for Dissolved Oxygen. 108 Total Ammonia samples were analyzed during the Program period. **100% of the effluent analysis results for Total Ammonia for each permit limit were in compliance.**

None of the five WWTPs has a discharge limit for Nitrate. **47 Nitrate samples were analyzed and reported during the Program period.**

127 Total Phosphorous samples were analyzed during the Program period. Each individual WWTP has specific discharge limits for Total Phosphorous. **100% of the effluent analysis results for Total Phosphorous for each permit limit were in compliance.**

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, June, July and August, and slightly lower in September and October than the historic averages. The stream gages above Morrison and within Bear Creek Lake Park somewhat followed the Evergreen Gage values. The gage above Morrison recorded significantly lower flows (as compared to monthly historic averages) in May, June, July, August and September, and

slightly lower flows in October. The USGS gage within Bear Creek Lake park recorded significantly lower flows in May through August and slightly lower to September through October.

Even with the higher than average precipitation in May, the stream flows remained well below to slightly below monthly historic averages throughout the Program period. From May 26 through June 8, daily average flows recorded above Evergreen Lake ran above 70 to 100 cfs. Not even with the precipitation events of August 15-18, did the stream exceed 70 cfs during the remainder of the program.

Measurable precipitation was recorded on 12 days in May, 4 days in June, 9 days in July, 11 days in August, 8 days in September and 7 days in October. Precipitation was significantly above monthly historical averages in May, significantly lower than monthly historic averages in June and July, slightly higher than historical average in August and September and slightly lower than historical average in October.

The Average Monthly Mean temperatures were slightly lower than the historical data for May, June and September, and slightly higher in July, August and October. The Average Monthly Maximum temperatures were slightly higher than historical averages in June and July, and slightly lower than historical averages in May, August through October. However, the Average Daily Minimum temperatures were slightly higher or equal to historical averages in all months. This equates to higher overnight temperatures and less overnight cooling. The Average Monthly Maximum temperatures were the highest in June and July, which coincided with the significantly lower precipitation. The Average Monthly temperatures were unremarkable, except for July, which resulted in almost 3 degrees higher than historical average. With higher air temperatures and significantly lower precipitation, stream temperatures naturally increase as flows decrease. The almost immediate lowering of stream temperatures typically coincides with the period of measurable precipitation, higher stream flows and lowered air temperatures.

Temperature and Water Quality Compliance

The 30-minute temperature datalogger measurements recorded in the Watershed at twenty-two Sites from well above Evergreen Lake to just upstream of Bear Creek Reservoir and Turkey Creek 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 93% compliance of the evaluating criteria of 18.2°C WAT, utilizing the 85th%-tile qualifier, as a proposed underlying standard for class 1 cold waters. This limit isn't regularly achievable. In year that doesn't include more typical precipitation events and more average minimum and maximum air temperatures, this limit could prove difficult to meet. **93% of the recorded values would meet the underlying standard of 18.2°C WAT temperatures. A stream standard of 18.2°C WAT won't be consistently achieved during the growing season**.

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 Program period, the assumption should not be made that this will always be the case. **100% of the 20°C MWAT temperature values complied with an interim standard of 20°C MWAT.**

The 30-minute temperature datalogger measurements recorded in the Watershed at twenty-two locations from well above Evergreen Lake to just upstream of Bear Creek Reservoir and Turkey Creek do not indicate that a problem exists, either man-induced or natural. The 30-minute temperature measurements that are used to calculate the DM values result in 100% compliance of the evaluating criteria of 23.8°C DM, utilizing the 85th%-tile qualifier, as a proposed underlying standard for class 1 cold waters. Although this proposed limit was met during this Program period and this limit may be regularly achieved, during a Program period that does not include more typical precipitation events and more average minimum and maximum air temperatures, this limit could prove difficult to meet. **100% of the recorded values would be consistent with a proposed underlying standard of 23.8°C DM, which supports the supposition that an underlying standard of 23.8°C DM should be achieved during most of the growing season**.

Monthly in-stream monitoring measurements recorded in the Watershed at seventeen Sites from well above Evergreen Lake to Bear Creek Reservoir and Turkey Creek, 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 (7 months, seventeen locations) in-stream measurements (91 for pH and 91 for Dissolved Oxygen) resulted in 100% compliance for pH and 2% noncompliance for Dissolved Oxygen.**

Monthly in-stream Ammonia sampling results and calculations obtained in the Watershed at seventeen Sites from well above Evergreen Lake to just above Bear Creek Reservoir and Turkey Creek, 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. Although the Association's Table Value Standard (TVS) calculations for Total Ammonia have not been confirmed by the Water Quality Control Division at the time of completion of this Report, individual results of Total Ammonia analyses indicate a range of 4ug/L-205ug/L with an average of 19ug/L throughout the seventeen Sites sampled in the Watershed. **All indications are that these values comply with a calculated TVS for Total Ammonia.**

Monthly in-stream Nitrate+Nitrite sampling results and calculations obtained in the Watershed at seventeen Sites from well above Evergreen Lake to just above Bear Creek Reservoir and Turkey Creek, do not indicate that a problem exists, either man-induced or natural, that results in the non-compliance of stream standards for Nitrate, utilizing the 85th%-tile qualifier. **Analysis of all in-stream sampling results (92 measurements) results in 100% compliance for the stream standard of 10.0 mg/L Nitrate.**

The 30-minute temperature datalogger measurements recorded in the five WWTP effluents that discharge into Bear Creek in Segment 1a and 1b do not indicate that a stream temperature problem exists as a result of any WWTP effluent. **Since there are no temperature effluent limits for the five-wastewater plants, the Daily Average Temperature and Weekly Average Temperatures were evaluated. For all five WWTP effluents, Daily Average temperatures equaled 16.5°C and Weekly Average Temperatures equaled 16.5°C.**

The daily WWTP Process Control measurements recorded in the five WWTP effluents that discharge into Bear Creek in Segment 1a and 1b do not indicate that a problem exists in any WWTP effluent that results in the non-compliance of any pH, Temperature, Dissolved Oxygen or Ammonia stream standard. It is important to note that there were no permit violations for any WWTP with respect to pH, Total Ammonia or Total Phosphorous during the Program period. None of the WWTP discharge permits has Temperature or Dissolved Oxygen limits. **100% of the effluent pH, Total Phosphorous and Total Ammonia values met permit limits.**

Weather records and stream gage readings indicated that the 2008 Program period was warmer and drier, especially in July, and this probably contributed to exceedances of the proposed 18.2ºC WAT in Bear Creek. Stream gage measurements recorded at all three gaging stations mentioned above showed significantly lower flows from May through July, as compared to historic monthly averages.

Especially notable was July, which recorded higher than average air temperatures and significantly lower precipitation. Also important to note is the fact that daily maximum air temperatures were slightly higher and precipitation was significantly lower than historical averages in June. It can be surmised that these two months led to the 31 exceedances of the proposed 18.2ºC WAT. The exceedances begin at the Evergreen Lake surface Site and encompass all the Sites downstream to Morrison Park, only during the timeframe of July 16 through August 13. (Any resulting WAT exceedances dated July 16 included temperature values calculated from July 9.) During the timeframe of August 15 through August 18, 2.03 inches of rain fell and daily maximum temperatures averaged 60ºF. These events ended any further exceedances of the proposed 18.2ºC WAT for the remainder of the program period. **Higher than average maximum air temperatures and significantly lower than average precipitation in June and July seem to have been the direct cause of the 31 exceedances of the proposed 18.2ºC WAT during the Program.**

The 2008 special stream monitoring program in the Bear Creek Watershed, including Bear Creek Segment 1a, 1b and Turkey Creek showed minor 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. Underlying standards of 18.2ºC WAT were calculated to 93% compliance and 23.8ºC DM were calculated to 100% compliance at all monitoring locations. A comprehensive temperature data collection effort, summarized in 185,507 30-minute measurements at twenty-two in-stream Sites throughout the Segment 1a, 1b and Turkey Creek, provided the data for analyses.

There were no compliance issues regarding Ammonia stream standards during the Program period. Total Ammonia results from seventeen Sites throughout the Watershed, indicate that these values comply with a calculated TVS for Total Ammonia. A surprising factor in the 2008 Program was the lack of impact that snow pack run-off had on stream flows. From May 26 through June 8, daily average flows recorded above Evergreen Lake ran above 70 to 100 cfs. Not even with the precipitation events of August 15-18, did the stream exceed 70 cfs during the remainder of the program.

A comprehensive temperature data collection effort, summarized in 44,030 30-minute measurements in five wastewater treatment plant effluents that discharge into Bear Creek Segment 1a and 1b, showed no evidence of thermal pollution. Similarly, there were no Ammonia, Phosphorous or pH exceedances during the typical operation of these plants. All five plants met discharge limits stated in their Colorado Discharge Pollutant Elimination System (CDPES) permit for pH, Ammonia and Phosphorous during the Program period.

There were no observed impairment issues in the Watershed or any permit violations in wastewater plant effluents during the Program. With the exception of naturally occurring, weather-related stream warming, there were no observed temperature issues in the Watershed. There were no observed Ammonia issues in the Watershed. Wastewater effluent had no detrimental effect on the water quality of the Watershed. Lack of snow pack run-off, warmer air temperatures and lack of precipitation in June and July resulted in exceedances of the 18.2ºC WAT, while proposed MWAT and DM criteria were not exceeded. 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.

Seasonal Data Tables

The following applies to all Seasonal Data tables: Existing stream standards: Table Value Standard (TVS) for Total Ammonia (NH3-N), chronic; 10 mg/L (10,000 ug/L) Nitrate (NO3-N), chronic; pH 6.5-9.0 SU; DO 6.0 mg/L; Threshold to Evaluate Potential Temperature Impairment: 20°C MWAT (Maximum Weekly Average Temperature, Interim Standard), 18.2°C WAT (Weekly Average Temperature, Underlying Standard), 23.8°C DM (Daily Maximum Temperature, Underlying Standard); 2-HR Avg. Temperature data are estimates used to evaluate against DM Underlying Standard

Table 27 Lost & Found (Singin' River Ranch-Site 1a)

7 Monthly Sampling/Monitoring Events May 1-Nov 13, 2008								
Monthly Parameter Results	pH, SU	Temp, °C	D. O., mg/L	Sp. Cd., mS/cm	Total NH3-N, ug/L	NO3+NO2-N, ug/L	TIN, ug/L	Total P, ug/L
Min	6.64	0.00	8.03	0.040	5	67	72	2
Max	7.09	11.60	12.52	0.046	12	170	182	27
Avg	6.90	5.04	10.16	0.043	8	110	120	7
Std. Dev.	0.17	3.75	1.39	0.002	2	31	34	8
# of measurements	7	7	7	7	6	7	6	7

Datalogger Temperature Data May 1-Oct 31, 2008					
All Temperatures in °C	30-Min Temp.	MWAT (20°C)	WAT (18.2°C)	2-HR Avg. Temp.	DM (23.8°C)
Min	-0.06	1.71	1.71	-0.04	0.49
Max	16.80	13.44	13.44	16.65	16.65
Avg	8.57	8.67	8.67	8.57	10.48
Std. Dev.	3.89	3.44	3.44	3.88	3.81
# of measurements	8783	26	26	2196	184
# of 20°C MWAT exceeded		0			
% Compliance MWAT		100			
# of 18.2°C WAT exceeded			0		
% Compliance WAT			100		
# of 23.8°C DM exceeded					0
% Compliance DM					100

[Monitoring station/Datalogger ID: L&F GPS Coordinates: 39.6234 °N, 105.4451 °W; Sampling /monitoring site is in Bear Creek, above Lost & Found (old Singin' River Ranch)]

Table 28 Above Evergreen Lake, at Clear Creek County line (Site 2)

Datalogger Temperature Data May 1-Oct 31, 2008					
All Temperatures in °C	30-Min Temp.	MWAT (20°C)	WAT (18.2°C)	2-HR Avg. Temp.	DM (23.8°C)
Min	-0.06	3.32	3.32	-0.05	3.95
Max	20.77	15.20	15.20	20.47	20.47
Avg	10.39	10.49	10.49	10.39	13.32
Std. Dev.	4.20	3.51	3.51	4.19	3.79
# of measurements	8784	26	26	2196	184
# of 20°C MWAT exceeded		0			
% Compliance MWAT		100			
# of 18.2°C WAT exceeded			0		
% Compliance WAT			100		
# of 23.8°C DM exceeded					0
% Compliance DM					100

[Monitoring station/Datalogger ID: ALKCC GPS Coordinates: 39.6368 °N, 105.3972 °W; Sampling /monitoring site in Bear Creek near the Clear Creek County line, on Upper Bear Creek Road.]

Table 29 Above Evergreen Lake, at CDOW site (Site 3a)

7 Monthly Sampling/Monitoring Events May 1-Nov 13, 2008								
Monthly Parameter Results	pH, SU	Temp, °C	D. O., mg/L	Sp. Cd., mS/cm	Total NH3-N, ug/L	NO3+NO2-N, ug/L	TIN, ug/L	Total P, ug/L
Min	7.30	1.52	8.00	0.049	4	2	43	5
Max	8.18	14.24	12.22	0.076	10	103	107	12
Avg	7.59	7.45	9.87	0.059	7	52	67	7
Std. Dev.	0.30	4.14	1.25	0.008	2	30	23	2
# of measurements	7	7	7	7	6	7	6	7

Datalogger Temperature Data May 1-Oct 31, 2008					
All Temperatures in °C	30-Min Temp.	MWAT (20°C)	WAT (18.2°C)	2-HR Avg. Temp.	DM (23.8°C)
Min	-0.12	3.38	3.38	-0.07	3.25
Max	21.06	16.13	16.13	20.92	20.92
Avg	11.04	11.15	11.15	11.04	13.45
Std. Dev.	4.30	3.69	3.69	4.29	4.22
# of measurements	8784	26	26	2196	184
# of 20°C MWAT exceeded		0			
% Compliance MWAT		100			
# of 18.2°C WAT exceeded			0		
% Compliance WAT			100		
# of 23.8°C DM exceeded					0
% Compliance DM					100

[Monitoring station/Datalogger ID: ALKDOW GPS Coordinates: 39.6331 °N, 105.3372 °W; Sampling /monitoring site in Bear Creek above Evergreen Lake, at the CDOW fish survey site.]

Table 30 Evergreen Lake, at surface, near dam (Site 4a)

6 Monthly Sampling/Monitoring Events May 1-Oct 31, 2008								
Monthly Parameter Results	pH, SU	Temp, °C	D. O., mg/L	Sp. Cd., mS/cm	Total NH3-N, ug/L	NO3+NO2-N, ug/L	TIN, ug/L	Total P, ug/L
Min	7.04	8.20	6.75	0.057	13	0	21	4
Max	7.50	17.56	9.78	0.091	30	36	49	18
Avg	7.24	11.86	8.37	0.066	21	12	36	10
Std. Dev.	0.19	3.59	1.22	0.012	6	13	12	5
# of measurements	6	6	6	6	5	6	5	6

Datalogger Temperature Data May 1-Oct 31, 2008					
All Temperatures in °C	30-Min Temp.	MWAT (20°C)	WAT (18.2°C)	2-HR Avg. Temp.	DM (23.8°C)
Min	-1.51	4.89	4.89	-1.51	6.12
Max	21.71	19.20	19.20	21.24	21.24
Avg	14.19	14.36	14.36	14.19	15.27
Std. Dev.	3.87	3.60	3.60	3.86	3.46
# of measurements	7973	24	24	1993	167
# of 20°C MWAT exceeded		0			
% Compliance MWAT		100			
# of 18.2°C WAT exceeded			5		
% Compliance WAT			79.2		
# of 23.8°C DM exceeded					0
% Compliance DM					100

[Monitoring station/Datalogger ID: EMD2A GPS Coordinates: 39.6314 °N, 105.3231 °W; Sampling /monitoring site in Evergreen Lake near the dam, on the surface, near the EMD WTP intake.]

Table 31 Evergreen Lake, 1.0m below surface, near dam (Site 4b)

Datalogger Temperature Data May 1-Oct 31, 2008					
All Temperatures in °C	30-Min Temp.	MWAT (20°C)	WAT (18.2°C)	2-HR Avg. Temp.	DM (23.8°C)
Min	5.40	7.71	7.71	5.40	5.81
Max	20.57	18.87	18.87	20.29	20.29
Avg	13.64	13.91	13.91	13.64	14.47
Std. Dev.	3.58	3.33	3.33	3.58	3.60
# of measurements	8462	25	25	2115	177
# of 20°C MWAT exceeded		0			
% Compliance MWAT		100			
# of 18.2°C WAT exceeded			4		
% Compliance WAT			84		
# of 23.8°C DM exceeded					0
% Compliance DM					100

[Monitoring station/Datalogger ID: EMD2B GPS Coordinates: 39.6314 °N, 105.3231 °W; Monitoring site in Evergreen Lake near the dam, 1.0m below surface, near the EMD WTP intake.]

Table 32 Evergreen Lake, 2.0m below surface, near dam (Site 4c)

Datalogger Temperature Data May 1-Oct 31, 2008					
All Temperatures in °C	30-Min Temp.	MWAT (20°C)	WAT (18.2°C)	2-HR Avg. Temp.	DM (23.8°C)
Min	5.40	7.46	7.46	5.40	5.81
Max	19.81	17.55	17.55	19.71	19.71
Avg	12.75	12.99	12.99	12.76	13.57
Std. Dev.	3.21	2.97	2.97	3.20	3.27
# of measurements	8462	25	25	2115	177
# of 20°C MWAT exceeded		0			
% Compliance MWAT		100			
# of 18.2°C WAT exceeded			0		
% Compliance WAT			100		
# of 23.8°C DM exceeded					0
% Compliance DM					100

[Monitoring station/Datalogger ID: EMD2C GPS Coordinates: 39.6314 °N, 105.3231 °W; Monitoring site in Evergreen Lake near the dam, 2.0m below surface, near the EMD WTP intake.]

Table 33 Evergreen Lake, 3.0m below surface, near dam (Site 4d)

Datalogger Temperature Data May 1-Oct 31, 2008					
All Temperatures in °C	30-Min Temp.	MWAT (20°C)	WAT (18.2°C)	2-HR Avg. Temp.	DM (23.8°C)
Min	5.40	7.15	7.15	5.40	5.81
Max	19.42	16.47	16.47	19.42	19.42
Avg	11.95	12.16	12.16	11.96	12.53
Std. Dev.	2.91	2.72	2.72	2.90	2.88
# of measurements	8462	25	25	2115	177
# of 20°C MWAT exceeded		0			
% Compliance MWAT		100			
# of 18.2°C WAT exceeded			0		
% Compliance WAT			100		
# of 23.8°C DM exceeded					0
% Compliance DM					100

[Monitoring station/Datalogger ID: EMD2D GPS Coordinates: 39.6314 °N, 105.3231 °W; Monitoring site in Evergreen Lake near the dam, 3.0m below surface, near the EMD WTP intake.]

Table 34 Evergreen Lake, 4.0m below surface, near dam (Site 4e)

Datalogger Temperature Data May 1-Oct 31, 2008					
All Temperatures in °C	30-Min Temp.	MWAT (20°C)	WAT (18.2°C)	2-HR Avg. Temp.	DM (23.8°C)
Min	5.81	7.01	7.01	5.91	6.22
Max	16.38	15.07	15.07	15.72	15.72
Avg	11.13	11.29	11.29	11.13	11.57
Std. Dev.	2.48	2.34	2.34	2.47	2.45
# of measurements	8462	25	25	2115	177
# of 20°C MWAT exceeded		0			
% Compliance MWAT		100			
# of 18.2°C WAT exceeded			0		
% Compliance WAT			100		
# of 23.8°C DM exceeded					0
% Compliance DM					100

[Monitoring station/Datalogger ID: EMD2E GPS Coordinates: 39.6314 °N, 105.3231 °W; Monitoring site in Evergreen Lake near the dam, 4.0m below surface, near the EMD WTP intake.]

Table 35 Downtown Evergreen, at CDOW site (Site 5)

7 Monthly Sampling/Monitoring Events May 1-Nov 13, 2008								
Monthly Parameter Results	pH, SU	Temp, °C	D. O., mg/L	Sp. Cd., mS/cm	Total NH3-N, ug/L	NO3+NO2-N, ug/L	TIN, ug/L	Total P, ug/L
Min	6.94	2.71	6.64	0.064	8	3	11	6
Max	7.80	17.83	11.44	0.110	25	91	66	14
Avg	7.47	11.35	8.59	0.076	15	32	36	11
Std. Dev.	0.26	4.98	1.39	0.015	6	29	21	3
# of measurements	7	7	7	7	6	7	6	7

Datalogger Temperature Data May 1-Oct 31, 2008					
All Temperatures in °C	30-Min Temp.	MWAT (20°C)	WAT (18.2°C)	2-HR Avg. Temp.	DM (23.8°C)
Min	4.97	5.94	5.94	5.00	6.22
Max	20.41	18.91	18.91	20.34	20.34
Avg	13.46	13.56	13.56	13.46	14.33
Std. Dev.	3.90	3.74	3.74	3.90	3.86
# of measurements	8780	26	26	2195	184
# of 20°C MWAT exceeded		0			
% Compliance MWAT		100			
# of 18.2°C WAT exceeded			4		
% Compliance WAT			84.7		
# of 23.8°C DM exceeded					0
% Compliance DM					100

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

Table 36 Below EMD WWTP effluent (Site 7)

7 Monthly Sampling/Monitoring Events May 1-Nov 13, 2008								
Monthly Parameter Results	pH, SU	Temp, °C	D. O., mg/L	Sp. Cd., mS/cm	Total NH3-N, ug/L	NO3+NO2 -N, ug/L	TIN, ug/L	Total P, ug/L
Min	7.04	3.24	6.99	0.068	8	10	26	5
Max	7.88	18.14	11.24	0.120	81	256	239	18
Avg	7.47	11.62	8.64	0.092	30	135	145	10
Std. Dev.	0.28	4.94	1.29	0.016	26	82	74	5
# of measurements	7	7	7	7	6	7	6	7

Datalogger Temperature Data May 1-Oct 31, 2008					
All Temperatures in °C	30-Min Temp.	MWAT (20°C)	WAT (18.2°C)	2-HR Avg. Temp.	DM (23.8°C)
Min	4.87	6.31	6.31	4.93	7.29
Max	20.96	18.90	18.90	20.67	20.67
Avg	13.55	13.66	13.66	13.56	14.66
Std. Dev.	3.85	3.67	3.67	3.85	3.72
# of measurements	8783	26	26	2195	184
# of 20°C MWAT exceeded		0			
% Compliance MWAT		100			
# of 18.2°C WAT exceeded			4		
% Compliance WAT			84.7		
# of 23.8°C DM exceeded					0
% Compliance DM					100

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

Table 37 Bear Creek Cabins (Site 8a)

7 Monthly Sampling/Monitoring Events May 1-Nov 13, 2008								
Monthly Parameter Results	pH, SU	Temp, °C	D. O., mg/L	Sp. Cd., mS/cm	Total NH3-N, ug/L	NO3+NO2- N, ug/L	TIN, ug/L	Total P, ug/L
Min	7.14	3.86	6.79	0.075	9	44	119	8
Max	8.20	18.45	11.35	0.124	205	492	580	23
Avg	7.69	11.86	8.75	0.097	63	224	279	14
Std. Dev.	0.34	4.91	1.39	0.018	68	153	189	5
# of measurements	7	7	7	7	6	7	6	7

Datalogger Temperature Data May 1-Oct 31, 2008					
All Temperatures in °C	30-Min Temp.	MWAT (20°C)	WAT (18.2°C)	2-HR Avg. Temp.	DM (23.8°C)
Min	4.01	6.03	6.03	4.06	7.03
Max	22.25	18.80	18.80	21.87	21.87
Avg	13.42	13.52	13.52	13.42	15.19
Std. Dev.	3.97	3.70	3.70	3.96	3.88
# of measurements	8783	26	26	2195	184
# of 20°C MWAT exceeded		0			
% Compliance MWAT		100			
# of 18.2°C WAT exceeded			3		
% Compliance WAT			88.5		
# of 23.8°C DM exceeded					0
% Compliance DM					100

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

Table 38 O'Fallon Park (Site 9)

7 Monthly Sampling/Monitoring Events May 1-Nov 13, 2008								
Monthly Parameter Results	pH, SU	Temp, °C	D. O., mg/L	Sp. Cd., mS/cm	Total NH3-N, ug/L	NO3+NO2-N, ug/L	TIN, ug/L	Total P, ug/L
Min	7.98	3.91	6.71	0.080	7	44	55	8
Max	8.92	18.72	12.36	0.135	43	213	256	39
Avg	8.32	11.67	9.53	0.107	19	139	147	20
Std. Dev.	0.28	5.02	1.77	0.019	12	65	70	11
# of measurements	7	7	7	7	6	7	6	7

Datalogger Temperature Data May 1-Oct 31, 2008					
All Temperatures in °C	30-Min Temp.	MWAT (20°C)	WAT (18.2°C)	2-HR Avg. Temp.	DM (23.8°C)
Min	3.04	5.78	5.78	3.06	6.79
Max	23.45	18.55	18.55	23.18	23.18
Avg	13.25	13.35	13.35	13.25	15.84
Std. Dev.	4.13	3.69	3.69	4.12	4.09
# of measurements	8784	26	26	2195	184
# of 20°C MWAT exceeded		0			
% Compliance MWAT		100			
# of 18.2°C WAT exceeded			2		
% Compliance WAT			92.3		
# of 23.8°C DM exceeded					0
% Compliance DM					100

[Monitoring station/Datalogger ID: OFPDOW GPS Coordinates: 39.6564°N, 105.2917°W; Sampling/ monitoring site 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.]

Table 39 Lair o' the Bear (Site 12)

7 Monthly Sampling/Monitoring Events May 1-Nov 13, 2008								
Monthly Parameter Results	pH, SU	Temp, °C	D. O., mg/L	Sp. Cd., mS/cm	Total NH3-N, ug/L	NO3+NO2-N, ug/L	TIN, ug/L	Total P, ug/L
Min	7.75	4.23	6.21	0.095	6	160	174	10
Max	8.67	18.60	11.49	0.150	22	392	402	28
Avg	8.03	11.44	8.93	0.124	12	260	288	17
Std. Dev.	0.28	4.85	1.60	0.019	5	86	80	6
# of measurements	7	7	7	7	6	7	6	7

Datalogger Temperature Data May 1-Oct 31, 2008					
All Temperatures in °C	30-Min Temp.	MWAT (20°C)	WAT (18.2°C)	2-HR Avg. Temp.	DM (23.8°C)
Min	1.15	5.33	5.33	1.30	5.46
Max	23.57	18.68	18.68	23.26	23.26
Avg	13.27	13.38	13.38	13.28	15.97
Std. Dev.	4.37	3.80	3.80	4.36	4.34
# of measurements	8784	26	26	2195	184
# of 20°C MWAT exceeded		0			
% Compliance MWAT		100			
# of 18.2°C WAT exceeded			3		
% Compliance WAT			88.5		
# of 23.8°C DM exceeded					0
% Compliance DM					100

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

Table 40 Idledale (Site 13a)

7 Monthly Sampling/Monitoring Events May 1-Nov 13, 2008								
Monthly Parameter Results	pH, SU	Temp, °C	D. O., mg/L	Sp. Cd., mS/cm	Total NH3-N, ug/L	NO3+NO2-N, ug/L	TIN, ug/L	Total P, ug/L
Min	7.70	4.30	6.30	0.094	8	111	121	8
Max	8.42	18.92	11.52	0.169	19	499	507	25
Avg	7.89	11.66	8.92	0.131	12	249	283	16
Std. Dev.	0.23	4.85	1.58	0.026	4	141	139	5
# of measurements	7	7	7	7	6	7	6	7

Datalogger Temperature Data May 1-Oct 31, 2008					
All Temperatures in °C	30-Min Temp.	MWAT (20°C)	WAT (18.2°C)	2-HR Avg. Temp.	DM (23.8°C)
Min	1.24	5.35	5.35	1.39	5.22
Max	23.71	18.82	18.82	23.60	23.60
Avg	13.38	13.49	13.49	13.38	16.01
Std. Dev.	4.42	3.83	3.83	4.41	4.39
# of measurements	8784	26	26	2195	184
# of 20°C MWAT exceeded		0			
% Compliance MWAT		100			
# of 18.2°C WAT exceeded			3		
% Compliance WAT			88.5		
# of 23.8°C DM exceeded					0
% Compliance DM					100

[Monitoring station/Datalogger ID: IDLEDALE GPS Coordinates: 39. 6621°N, 105. 2406°W; Sampling/ monitoring site at the Shady Lane bridge, at the CDOW fish survey site.]

Table 41 West End of Morrison (Site 14a)

7 Monthly Sampling/Monitoring Events May 1-Nov 13, 2008								
Monthly Parameter Results	pH, SU	Temp, °C	D. O., mg/L	Sp. Cd., mS/cm	Total NH3-N, ug/L	NO3+NO2-N, ug/L	TIN, ug/L	Total P, ug/L
Min	7.48	4.60	6.49	0.093	6	65	106	2
Max	8.02	18.49	11.14	0.193	15	588	599	57
Avg	7.73	11.79	8.87	0.134	11	231	270	22
Std. Dev.	0.17	4.74	1.38	0.033	3	182	182	18
# of measurements	7	7	7	7	6	7	6	7

Datalogger Temperature Data May 1-Oct 31, 2008					
All Temperatures in °C	30-Min Temp.	MWAT (20°C)	WAT (18.2°C)	2-HR Avg. Temp.	DM (23.8°C)
Min	1.86	5.35	5.35	1.97	4.19
Max	22.71	18.90	18.90	22.59	22.59
Avg	13.51	13.62	13.62	13.52	15.70
Std. Dev.	4.33	3.83	3.83	4.33	4.28
# of measurements	8784	26	26	2195	184
# of 20°C MWAT exceeded		0			
% Compliance MWAT		100			
# of 18.2°C WAT exceeded			3		
% Compliance WAT			88.5		
# of 23.8°C DM exceeded					0
% Compliance DM					100

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

Table 42 Bear Creek in Bear Creek Park, at the USGS gage (Site 15a)

Datalogger Temperature Data May 1-Oct 31, 2008					
All Temperatures in °C	30-Min Temp.	MWAT (20°C)	WAT (18.2°C)	2-HR Avg. Temp.	DM (23.8°C)
Min	2.18	5.79	5.79	2.24	4.69
Max	22.82	19.35	19.35	22.74	22.74
Avg	13.91	14.02	14.02	13.92	15.86
Std. Dev.	4.27	3.83	3.83	4.26	4.19
# of measurements	8784	26	26	2196	184
# of 20°C MWAT exceeded		0			
% Compliance MWAT		100			
# of 18.2°C WAT exceeded			5		
% Compliance WAT			81		
# of 23.8°C DM exceeded					0
% Compliance DM					100

[Monitoring station/Datalogger ID: MORR11 GPS Coordinates: 39.6522 °N, 105.1731 °W; Monitoring site in Bear Creek near USGS gage in Bear Creek Park.]

Table 43 Turkey Creek within Bear Creek Park, near Maint. Bldg. (Site 16a)

Datalogger Temperature Data May 1-Oct 31, 2008					
All Temperatures in °C	30-Min Temp.	MWAT (20°C)	WAT (18.2°C)	2-HR Avg. Temp.	DM (23.8°C)
Min	4.92	9.03	9.03	5.01	8.91
Max	22.82	18.38	18.38	22.79	22.79
Avg	13.87	14.02	14.02	13.85	15.82
Std. Dev.	3.32	2.79	2.79	3.31	3.59
# of measurements	8561	25	25	2128	180
# of 20°C MWAT exceeded		0			
% Compliance MWAT		100			
# of 18.2°C WAT exceeded			1		
% Compliance WAT			96		
# of 23.8°C DM exceeded					0
% Compliance DM					100

[Monitoring station/Datalogger ID: TURK2 GPS Coordinates: 39.6394 °N, 105.161 °W; Monitoring site on Turkey Creek, within Bear Creek Park, near Maintenance Bldg.]

Table 44 Near confluence of N. & S. Turkey Creeks, on N. Turkey Creek (Site 17a)

Datalogger Temperature Data May 1-Oct 31, 2008					
All Temperatures in °C	30-Min Temp.	MWAT (20°C)	WAT (18.2°C)	2-HR Avg. Temp.	DM (23.8°C)
Min	1.29	6.35	6.35	1.45	5.49
Max	24.34	16.35	16.35	24.02	24.02
Avg	12.54	12.59	12.59	12.54	15.94
Std. Dev.	4.12	3.16	3.16	4.10	4.18
# of measurements	4343	13	13	1085	91
# of 20°C MWAT exceeded		0			
% Compliance MWAT		100			
# of 18.2°C WAT exceeded			0		
% Compliance WAT			100		
# of 23.8°C DM exceeded					0
% Compliance DM					100

[Monitoring station/Datalogger ID: TURK1 GPS Coordinates: 39.578 °N, 105.2193 °W; Monitoring site near confluence of N. & S. Turkey Creeks, in N. Turkey Creek.]

Table 45 Aspen Park Metropolitan District, South Turkey Creek (Site 18)

6 Monthly Sampling/Monitoring Events May 1-Nov 13, 2008								
Monthly Parameter Results	pH, SU	Temp, °C	D. O., mg/L	Sp. Cd., mS/cm	Total NH3-N, ug/L	NO3+NO2-N, ug/L	TIN, ug/L	Total P, ug/L
Min	7.03	2.84	3.93	0.777	6	3	14	28
Max	7.79	15.10	20.37	1.674	26	64	72	307
Avg	7.40	10.14	11.08	1.203	13	19	31	98
Std. Dev.	0.32	3.91	5.06	0.266	7	22	19	102
# of measurements	6	6	6	6	6	6	6	6

Datalogger Temperature Data May 1-Oct 31, 2008					
All Temperatures in °C	30-Min Temp.	MWAT (20°C)	WAT (18.2°C)	2-HR Avg. Temp.	DM (23.8°C)
Min	3.88	5.98	5.98	3.99	5.71
Max	20.44	15.48	15.48	20.06	20.06
Avg	11.98	12.03	12.03	11.98	13.54
Std. Dev.	3.26	2.72	2.72	3.25	3.63
# of measurements	8036	24	24	2009	169
# of 20°C MWAT exceeded		0			
% Compliance MWAT		100			
# of 18.2°C WAT exceeded			0		
% Compliance WAT			100		
# of 23.8°C DM exceeded					0
% Compliance DM					100

[Monitoring station/Datalogger ID: APMD1 GPS Coordinates: 39.5461°N, 105.2708°W; Sampling/ monitoring site in South Turkey Creek downstream of the APMD WWTP.]

Table 46 Conifer Metropolitan District, North Turkey Creek (Site19)

7 Monthly Sampling/Monitoring Events May 1-Nov 13, 2008								
Monthly Parameter Results	pH, SU	Temp, °C	D. O., mg/L	Sp. Cd., mS/cm	Total NH3-N, ug/L	NO3+NO2-N, ug/L	TIN, ug/L	Total P, ug/L
Min	7.55	1.38	7.11	0.225	6	2	9	3
Max	8.60	14.38	12.78	1.314	11	339	129	18
Avg	7.90	9.61	8.95	0.556	9	91	59	11
Std. Dev.	0.35	4.65	1.85	0.334	2	110	49	6
# of measurements	7	7	7	7	6	7	6	7

Datalogger Temperature Data May 1-Oct 31, 2008					
All Temperatures in °C	30-Min Temp.	MWAT (20°C)	WAT (18.2°C)	2-HR Avg. Temp.	DM (23.8°C)
Min	-0.03	2.89	2.89	-0.01	1.60
Max	23.26	15.42	15.42	22.99	22.99
Avg	10.25	10.47	10.47	10.22	14.56
Std. Dev.	4.81	3.58	3.58	4.77	4.35
# of measurements	8562	25	25	2128	180
# of 20°C MWAT exceeded		0			
% Compliance MWAT		100			
# of 18.2°C WAT exceeded			0		
% Compliance WAT			100		
# of 23.8°C DM exceeded					0
% Compliance DM					100

[Monitoring station/Datalogger ID: CMD1 GPS Coordinates: 39.542°N, 105.3155°W; Sampling/ monitoring site in North Turkey Creek downstream of the CMD WWTP.]

Table 47 Mt. Evans Wilderness Drainage, Vance Creek (Site 25)

6 Monthly Sampling/Monitoring Events May 1-Nov 13, 2008								
Monthly Parameter Results	pH, SU	Temp, °C	D. O., mg/L	Sp. Cd., mS/cm	Total NH3-N, ug/L	NO3+NO2-N, ug/L	TIN, ug/L	Total P, ug/L
Min	6.78	0.80	7.70	0.066	6	12	33	5
Max	7.66	11.73	11.87	0.077	17	82	88	26
Avg	7.25	5.86	9.80	0.072	11	46	63	14
Std. Dev.	0.29	4.31	1.57	0.004	4	24	18	7
# of measurements	5	5	5	5	5	6	5	6

Datalogger Temperature Data May 1-Oct 31, 2008					
All Temperatures in °C	30-Min Temp.	MWAT (20°C)	WAT (18.2°C)	2-HR Avg. Temp.	DM (23.8°C)
Min	-0.06	2.85	2.85	-0.06	2.95
Max	19.91	14.44	14.44	19.73	19.73
Avg	9.58	9.67	9.67	9.58	13.29
Std. Dev.	4.42	3.34	3.34	4.40	3.93
# of measurements	8783	26	26	2196	184
# of 20°C MWAT exceeded		0			
% Compliance MWAT		100			
# of 18.2°C WAT exceeded			0		
% Compliance WAT			100		
# of 23.8°C DM exceeded					0
% Compliance DM					100

[Monitoring station/Datalogger ID: ALKMEL GPS Coordinates: 39.6322°N, 105.4558°W; Sampling/ monitoring site in Vance Creek.]

Table 48 Little Cub Creek, above Bear Creek confluence (Site 26)

1 Monthly Sampling/Monitoring Events May 1-Oct 31, 2008								
Monthly Parameter Results	pH, SU	Temp, °C	D. O., mg/L	Sp. Cd., mS/cm	Total NH3-N, ug/L	NO3+NO2-N, ug/L	TIN, ug/L	Total P, ug/L
Min	7.63	6.55	9.38	0.154	8	207	215	19
Max	7.63	6.55	9.38	0.154	8	207	215	19
Avg	7.63	6.55	9.38	0.154	8	207	215	19
Std. Dev.	0.00	0.00	0.00	0.000	0	0	0	0
# of measurements	1	1	1	1	1	1	1	1

Datalogger Temperature Data May 1-Oct 31, 2008					
All Temperatures in °C	30-Min Temp.	MWAT (20°C)	WAT (18.2°C)	2-HR Avg. Temp.	DM (23.8°C)
Min	-0.14	3.61	3.61	-0.14	2.91
Max	19.37	15.47	15.47	19.22	19.22
Avg	10.56	10.66	10.66	10.56	13.12
Std. Dev.	4.22	3.62	3.62	4.21	3.89
# of measurements	8784	26	26	2195	184
# of 20°C MWAT exceeded		0			
% Compliance MWAT		100			
# of 18.2°C WAT exceeded			0		
% Compliance WAT			100		
# of 23.8°C DM exceeded					0
% Compliance DM					100

[Monitoring station/Datalogger ID: LTLCUB GPS Coordinates: 39.6312°N, 105.3221°W; Sampling/ monitoring site in Little Cub Creek above Bear Creek confluence.]

Table 49 Parmalee Gulch, Near Hwy 285 (Site 28)

1 Monthly Sampling/Monitoring Events May 1-Oct 31, 2008								
Monthly Parameter Results	pH, SU	Temp, °C	D. O., mg/L	Sp. Cd., mS/cm	Total NH3-N, ug/L	NO3+NO2-N, ug/L	TIN, ug/L	Total P, ug/L
Min	7.31	13.97	3.70	0.997	135	31	166	246
Max	7.31	13.97	3.70	0.997	135	31	166	246
Avg	7.31	13.97	3.70	0.997	135	31	166	246
Std. Dev.	0.00	0.00	0.00	0.000	0	0	0	0
# of measurements	1	1	1	1	1	1	1	1

[Monitoring station/Datalogger ID: NA GPS Coordinates: 39.6157°N, 105.2342°W; Sampling/ monitoring site in Parmalee Gulch, near Hwy 285.]

Table 50 Troublesome Gulch, above Bear Creek confluence (Site 32)

1 Monthly Sampling/Monitoring Events May 1-Oct 31, 2008								
Monthly Parameter Results	pH, SU	Temp, °C	D. O., mg/L	Sp. Cd., mS/cm	Total NH3-N, ug/L	NO3+NO2-N, ug/L	TIN, ug/L	Total P, ug/L
Min	8.19	15.46	6.84	0.709	7	341	348	127
Max	8.19	15.46	6.84	0.709	7	341	348	127
Avg	8.19	15.46	6.84	0.709	7	341	348	127
Std. Dev.	0.00	0.00	0.00	0.000	0	0	0	0
# of measurements	1	1	1	1	1	1	1	1

[Monitoring station/Datalogger ID: NA GPS Coordinates: 39.6546°N, 105.3065°W; Sampling/ monitoring site in Troublesome Gulch above Bear Creek confluence.]

Table 51 Mt. Vernon Drainage, above Bear Creek confluence (Site 34)

1 Monthly Sampling/Monitoring Events May 1-Oct 31, 2008								
Monthly Parameter Results	pH, SU	Temp, °C	D. O., mg/L	Sp. Cd., mS/cm	Total NH3-N, ug/L	NO3+NO2-N, ug/L	TIN, ug/L	Total P, ug/L
Min	7.84	12.43	8.55	1.440	11	214	225	12
Max	7.84	12.43	8.55	1.440	11	214	225	12
Avg	7.84	12.43	8.55	1.440	11	214	225	12
Std. Dev.	0.00	0.00	0.00	0.000	0	0	0	0
# of measurements	1	1	1	1	1	1	1	1

[Monitoring station/Datalogger ID: NA GPS Coordinates: 39.6538°N, 105.1919°W; Sampling/ monitoring site in Mt. Vernon drainage above Bear Creek confluence.]

Seasonal Data Tables-WWTP Effluent

These data tables summarize the wastewater effluent quality for dischargers into Bear Creek Segment 1a and 1b. Data 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 used. There were no additional requirements requested of plant operators for the Program. Datalogger temperature measurements of plant effluent obtained at the identical frequency of the in-stream dataloggers (30-minute intervals). The datasheets listed in a downstream direction, as the effluents enter Bear Creek, from the EMD WWTP to the Morrison WWTP.

Table 52 Evergreen Metropolitan District (Site 20)

EMD WWTP Effluent May 1-October 31, 2008							
Process Control and Permit Sampling and Monitoring							
Parameter	pH, SU	Temp, °C	D. O., mg/L	Total NH3-N, ug/L	NO3-N, ug/L	Total P, ug/L	Flow, MGD
Min	6.51	10.90	3.24	30	1500	30	0.3820
Max	7.13	20.10	5.10	2350	8300	290	0.6785
Avg	6.81	16.66	4.03	504	5000	110	0.5100
Std. Dev.	0.10	2.60	0.29	527	2699	60	0.0584
# of Measurements	132	121	121	27	6	27	184

Datalogger Temperature Data			
All Temperatures in °C	30-Min Temp.	Daily Avg.Temp.	Weekly Avg. Temp.
Min	10.6	10.6	10.8
Max	20.2	19.8	19.8
Avg	16.2	16.2	16.3
Std. Dev.	2.6	2.6	2.6
# of measurements	8828	184	26

[Datalogger ID: EMD5 GPS Coordinates: 39.6376°N, 105.3150°W; Sampling/monitoring site is the EMD WWTP effluent. The datalogger in the UV channel just upstream of the outfall. Effluent flows directly from the UV building to Bear Creek.] 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 October-4,200; pH 6.5-9.0

Table 53 West Jefferson County Metropolitan District (Site 21)

WJCMD WWTP Effluent May 1-October 31, 2008							
Process Control and Permit Sampling and Monitoring							
Parameter	pH, SU	Temp, °C	D. O., mg/L	Total NH3-N, ug/L	NO3-N, ug/L	Total P, ug/L	Flow, MGD
Min	6.56	11.90	2.45	19	500	50	0.3271
Max	6.96	19.50	3.85	578	6500	590	0.6389
Avg	6.79	16.51	3.02	83	3017	207	0.4743
Std. Dev.	0.08	2.08	0.35	104	1845	124	0.0502
# of Measurements	131	125	125	27	6	27	184

Datalogger Temperature Data			
All Temperatures in °C	30-Min Temp.	Daily Avg.Temp.	Weekly Avg. Temp.
Min	9.0	11.2	11.6
Max	23.6	19.4	19.1
Avg	16.2	16.2	16.2
Std. Dev.	2.1	2.1	2.1
# of measurements	8829	184	26

[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.] 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 October-6,500; pH 6.5-9.0

Table 54 Kittredge Sanitation and Water District (Site 22)

KSWD WWTP Effluent May 1-October 31, 2008							
Process Control and Permit Sampling and Monitoring							
Parameter	pH, SU	Temp, °C	D. O., mg/L	Total NH3-N, ug/L	NO3-N, ug/L	Total P, ug/L	Flow, MGD
Min	6.70	2.64	0.75	260	3700	120	0.0379
Max	7.40	20.60	6.26	8710	14000	650	0.0898
Avg	6.93	14.76	2.76	1057	8000	356	0.0519
Std. Dev.	0.15	2.92	1.70	1709	4044	144	0.0094
# of Measurements	126	124	124	25	6	16	184

Datalogger Temperature Data			
All Temperatures in °C	30-Min Temp.	Daily Avg.Temp.	Weekly Avg. Temp.
Min	6.6	7.5	8.2
Max	40.1	18.7	18.3
Avg	14.6	14.6	14.6
Std. Dev.	2.9	2.7	2.6
# of measurements	8829	184	26

[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.] 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 October-2,600; pH 6.5-9.0

Table 55 Genesee Water and Sanitation District (Site 23)

GWSD WWTP Effluent May 1-October 31, 2008									
Process Control and Permit Sampling and Monitoring									
Parameter	pH, SU	Temp, °C	D. O., mg/L	Total NH3-N, ug/L	NO3-N, ug/L	NO2-N, ug/L	TIN, ug/L	Total P, ug/L	Flow, MGD
Min	6.67	11.0	6.40	5	1130	1000	3050	100	0.028
Max	7.31	20.00	8.10	296	6230	9000	13230	660	0.456
Avg	7.01	16.6	7.16	141	3213	4288	7830	294	0.251
Std. Dev.	0.12	2.2	0.31	65	1154	2497	2987	126	0.034
# of Measurements	179	180	176	27	29	26	26	30	179

Datalogger Temperature Data			
All Temperatures in °C	30-Min Temp.	Daily Avg.Temp.	Weekly Avg. Temp.
Min	11.7	11.8	12.0
Max	20.2	19.9	19.7
Avg	16.8	16.8	16.8
Std. Dev.	2.3	2.3	2.3
# of measurements	8829	184	26

[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.] 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 October-6,500; pH 6.5-9.0

Table 56 Town of Morrison (Site 24)

Morrison WWTP Effluent May 1-October 31, 2008							
Process Control and Permit Sampling and Monitoring							
Parameter	pH, SU	Temp, °C	D. O., mg/L	Total NH3-N, ug/L	NO3-N, ug/L	Total P, ug/L	Flow, MGD
Min	6.5	14.0	NA	<800	NA	300	0.06
Max	7.8	25.6	NA	4700	NA	1000	0.20
Avg	7.3	20.4	NA	947	NA	530	0.09
Std. Dev.	0.2	3.1	NA	<736	NA	170	0.02
# of Measurements	184	184	NA	27	NA	27	184

Datalogger Temperature Data			
All Temperatures in °C	30-Min Temp.	Daily Avg.Temp.	Weekly Avg. Temp.
Min	12.5	12.8	13.3
Max	23.6	23.3	22.8
Avg	18.7	18.7	18.8
Std. Dev.	2.8	2.8	2.7
# of measurements	8715	184	26

[Datalogger ID: MORR12 GPS Coordinates: 39.6541°N, 105.1796°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.] Notes: Discharge permit limits for Total Ammonia (NH3-N), in ug/L are as follows: May-8,600 June-20,000 July-30,000 August-28,000 September-28,000 October-16,000; pH 6.5-9.0

USGS Stream Flow Data Tables

During the Program, stream flows for Bear Creek were tracked using three gaging stations. The stations are the USGS station above Evergreen Lake, the DWR/U.S. Army COE station above Morrison and the USGS station within Bear Creek Lake Park (Segment 1b). Weekly downloads of flow graphs were printed to document flows. Downloads were obtained at www.waterdata.usgs.gov. The available historic record for the gage above Evergreen Lake is 24 years. The available historic record for the gage above Morrison is 89 years (1899-2006— however, permanent reliable data was recorded from 1919). The available historic record for the USGS gage in Bear Creek Lake Park is 23 years. For the 2008 Program period, historical Minimum, Maximum and Average were calculated. A Deviation from Historic averages was also calculated; however, when both the Minimum and Maximum values for Deviation from Historic were negative, these values are interchanged to reflect the desired interpretation.

Table 57 2008 May Bear Creek Evergreen vs. Historic Bear Creek Flow

Date	Daily Mean Flow (cfs) May 2008	Historic Daily Mean Flow (cfs) 24 Years for May	Deviation from Historic Flow (cfs)
1	34	73	-39
2	24	73	-49
3	25	73	-48
4	26	74	-48
5	24	78	-54
6	27	81	-54
7	28	82	-54
8	30	82	-52
9	30	83	-53
10	31	85	-54
11	26	85	-59
12	29	83	-54
13	42	84	-42
14	35	87	-52

Date	Daily Mean Flow (cfs) May 2008	Historic Daily Mean Flow (cfs) 24 Years for May	Deviation from Historic Flow (cfs)
15	44	89	-45
16	40	91	-51
17	44	94	-50
18	55	94	-39
19	63	99	-36
20	77	101	-24
21	88	101	-13
22	83	101	-18
23	66	98	-32
24	59	98	-39
25	57	107	-50
26	74	109	-35
27	86	108	-22
28	77	106	-29
29	81	107	-26
30	84	106	-22
31	84	102	-18
MIN	24	73	-13
MAX	88	109	-59
AVG	51	91	-41

USGS 06710385 GPS Coordinates: 39.6228°N, 105.3361°W

Table 58 2008 June Bear Creek Evergreen vs. Historic Bear Creek Flow

Date	Daily Mean Flow (cfs) June 2008	Historic Daily Mean Flow (cfs) 24 Years for June	Deviation from Historic Flow (cfs)
1	89	104	-15
2	90	100	-10
3	87	99	-12
4	87	98	-11
5	100	99	1
6	81	98	-17
7	74	102	-28
8	78	99	-21
9	64	106	-42
10	59	104	-45
11	61	98	-37
12	54	98	-44
13	49	99	-50
14	44	97	-53
15	47	97	-50
16	50	98	-48
17	51	99	-48
18	50	101	-51
19	50	93	-43
20	50	91	-41
21	48	89	-41
22	47	88	-41
23	47	84	-37
24	49	80	-31
25	46	77	-31
26	45	78	-33
27	43	75	-32
28	42	74	-32
29	42	74	-32

Date	Daily Mean Flow (cfs) June 2008	Historic Daily Mean Flow (cfs) 24 Years for June	Deviation from Historic Flow (cfs)
30	40	71	-31
MIN	40	71	1
MAX	100	106	-53
AVG	59	92	-34

USGS 06710385 GPS Coordinates: 39.6228°N, 105.3361°W

Table 59 2008 July Bear Creek Evergreen vs. Historic Bear Creek Flow

Date	Daily Mean Flow (cfs) July 2008	Historic Daily Mean Flow (cfs) 24 Years for July	Deviation from Historic Flow (cfs)
1	40	67	-27
2	41	63	-22
3	42	61	-19
4	39	60	-21
5	36	60	-24
6	39	59	-20
7	51	60	-9
8	50	62	-12
9	41	68	-27
10	35	65	-30
11	33	61	-28
12	32	59	-27
13	32	60	-28
14	31	56	-25
15	30	53	-23
16	28	52	-24
17	26	57	-31
18	31	53	-22
19	34	54	-20
20	30	53	-23
21	28	53	-25
22	28	50	-22
23	29	53	-24
24	37	53	-16
25	33	52	-19
26	31	53	-22
27	28	49	-21
28	27	51	-24
29	28	52	-24
30	26	52	-26
31	24	51	-27
MIN	24	49	-9
MAX	51	68	-31
AVG	34	57	-23

USGS 06710385 GPS Coordinates: 39.6228°N, 105.3361°W

Table 60 2008 August Bear Creek Evergreen vs. Historic Bear Creek Flow

Date	Daily Mean Flow (cfs) August 2008	Historic Daily Mean Flow (cfs) 24 Years for August	Deviation from Historic Flow (cfs)
1	23	52	-29
2	22	52	-30
3	22	54	-32
4	22	57	-35
5	23	61	-38
6	23	59	-36

Date	Daily Mean Flow (cfs) August 2008	Historic Daily Mean Flow (cfs) 24 Years for August	Deviation from Historic Flow (cfs)
7	25	56	-31
8	25	54	-29
9	28	52	-24
10	29	54	-25
11	28	53	-25
12	24	51	-27
13	21	51	-30
14	20	49	-29
15	23	47	-24
16	59	48	11
17	66	48	18
18	45	47	-2
19	35	49	-14
20	30	45	-15
21	28	44	-16
22	25	43	-18
23	27	45	-18
24	32	47	-15
25	31	43	-12
26	28	42	-14
27	25	40	-15
28	24	41	-17
29	24	40	-16
30	23	39	-16
31	23	37	-14
MIN	20	37	18
MAX	66	61	-38
AVG	28	48	-20

USGS 06710385 GPS Coordinates: 39.6228°N, 105.3361°W

Table 61 2008 September Bear Creek Evergreen vs. Historic Bear Creek Flow

Date	Daily Mean Flow (cfs) September 2008	Historic Daily Mean Flow (cfs) 24 Years for September	Deviation from Historic Flow (cfs)
1	24	39	-15
2	22	38	-16
3	22	36	-14
4	21	36	-15
5	21	35	-14
6	21	34	-13
7	20	34	-14
8	19	34	-15
9	19	34	-15
10	19	35	-16
11	20	35	-15
12	40	36	4
13	32	34	-2
14	25	32	-7
15	23	32	-9
16	21	30	-9
17	20	30	-10
18	20	28	-8
19	21	29	-8
20	21	29	-8
21	21	29	-8

Date	Daily Mean Flow (cfs) September 2008	Historic Daily Mean Flow (cfs) 24 Years for September	Deviation from Historic Flow (cfs)
22	20	29	-9
23	18	28	-10
24	18	28	-10
25	17	27	-10
26	17	27	-10
27	18	27	-9
28	18	27	-9
29	17	27	-10
30	17	27	-10
MIN	17	27	4
MAX	40	39	-16
AVG	21	32	-10.5

USGS 06710385 GPS Coordinates: 39.6228°N, 105.3361°W

Table 62 2008 October Bear Creek Evergreen vs. Historic Bear Creek Flow

Date	Daily Mean Flow (cfs) October 2008	Historic Daily Mean Flow (cfs) 24 Years for October	Deviation from Historic Flow (cfs)
1	17	28	-11
2	17	28	-11
3	17	28	-11
4	17	30	-13
5	18	29	-11
6	---	29	
7	---	29	
8	17	29	-12
9	17	29	-12
10	17	29	-12
11	17	28	-11
12	23	27	-4
13	22	26	-4
14	20	27	-7
15	19	26	-7
16	20	26	-6
17	19	26	-7
18	19	25	-6
19	18	25	-7
20	18	26	-8
21	19	25	-6
22	18	25	-7
23	15	25	-10
24	19	25	-6
25	17	25	-8
26	17	25	-8
27	15	24	-9
28	17	25	-8
29	16	23	-7
30	16	23	-7
31	15	24	-9
MIN	15	23	-4
MAX	23	30	-13
AVG	18	26	-8

USGS 06710385 GPS Coordinates: 39.6228°N, 105.3361°W

Table 63 2008 May Bear Creek Morrison vs. Historic Bear Creek Flow

Date	Daily Mean Flow (cfs) May 2008	Historic Daily Mean Flow (cfs) 89 Years for May	Deviation from Historic Flow (cfs)
1	43.3	119	-75.7
2	36.8	118	-81.2
3	33.1	118	-84.9
4	35.3	118	-82.7
5	31.7	124	-92.3
6	32.5	136	-103.5
7	33.3	152	-118.7
8	36.5	150	-113.5
9	35.7	147	-111.3
10	37.6	148	-110.4
11	32.3	147	-114.7
12	31.1	147	-115.9
13	52.5	145	-92.5
14	46.0	145	-99
15	64.0	144	-80
16	55.9	149	-93.1
17	55.1	152	-96.9
18	63.6	151	-87.4
19	74.4	155	-80.6
20	84.6	157	-72.4
21	88.2	156	-67.8
22	82.4	157	-74.6
23	72.1	155	-82.9
24	63.5	154	-90.5
25	60.7	156	-95.3
26	69.5	155	-85.5
27	87.8	154	-66.2
28	79.1	151	-71.9
29	78.0	151	-73
30	75.7	150	-74.3
31	77.2	148	-70.8
MIN	31.1	118	-66.2
MAX	88.2	157	-118.7
AVG	56.4	145	-89

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

Table 64 2008 June Bear Creek Morrison vs. Historic Bear Creek Flow

Date	Daily Mean Flow (cfs) June 2008	Historic Daily Mean Flow (cfs) 89 Years for June	Deviation from Historic Flow (cfs)
1	78.3	147	-68.7
2	79.6	147	-67.4
3	77.1	149	-71.9
4	76.4	150	-73.6
5	97.3	156	-58.7
6	81.6	151	-69.4
7	71.3	151	-79.7
8	73.9	150	-76.1
9	63.8	153	-89.2
10	60.3	155	-94.7
11	58.1	155	-96.9
12	54.7	148	-93.3
13	50.3	149	-98.7
14	46.1	145	-98.9

Date	Daily Mean Flow (cfs) June 2008	Historic Daily Mean Flow (cfs) 89 Years for June	Deviation from Historic Flow (cfs)
15	45.9	142	-96.1
16	48.8	138	-89.2
17	49.4	135	-85.6
18	48.2	134	-85.8
19	47.7	128	-80.3
20	48.2	123	-74.8
21	46.4	121	-74.6
22	44.2	126	-81.8
23	43.8	117	-73.2
24	44.9	110	-65.1
25	43.9	106	-62.1
26	40.5	105	-64.5
27	38.1	99	-60.9
28	38.2	95	-56.8
29	36.4	93	-56.6
30	35.0	93	-58
MIN	35	93	-56.6
MAX	97.3	156	-98.9
AVG	55.6	132	-77

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

Table 65 2008 July Bear Creek Morrison vs. Historic Bear Creek Flow

Date	Daily Mean Flow (cfs) July 2008	Historic Daily Mean Flow (cfs) 89 Years for July	Deviation from Historic Flow (cfs)
1	36.5	89	-52.5
2	37.2	84	-46.8
3	39.6	81	-41.4
4	35.2	78	-42.8
5	34	77	-43
6	36	75	-39
7	45.1	79	-33.9
8	48.5	75	-26.5
9	38.7	77	-38.3
10	32.4	75	-42.6
11	29.7	72	-42.3
12	26.7	72	-45.3
13	25.5	68	-42.5
14	24.6	67	-42.4
15	23.9	66	-42.1
16	22.9	65	-42.1
17	21.2	65	-43.8
18	23	66	-43
19	26	67	-41
20	23.8	66	-42.2
21	21.7	65	-43.3
22	22.8	68	-45.2
23	23.3	67	-43.7
24	28.8	66	-37.2
25	26.8	66	-39.2
26	26.1	67	-40.9
27	22.4	64	-41.6
28	20.7	66	-45.3
29	20.8	66	-45.2
30	21.7	65	-43.3

Date	Daily Mean Flow (cfs) July 2008	Historic Daily Mean Flow (cfs) 89 Years for July	Deviation from Historic Flow (cfs)
31	18.9	67	-48.1
MIN	18.9	64	-26.5
MAX	48.5	89	-52.5
AVG	28.5	71	-42

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

Table 66 2008 August Bear Creek Morrison vs. Historic Bear Creek Flow

Date	Daily Mean Flow (cfs) August 2008	Historic Daily Mean Flow (cfs) 89 Years for August	Deviation from Historic Flow (cfs)
1	16.6	68	-51.4
2	15.5	69	-53.5
3	15.2	71	-55.8
4	16.3	75	-58.7
5	17.7	73	-55.3
6	18.6	73	-54.4
7	18.0	70	-52
8	21.6	69	-47.4
9	25.5	68	-42.5
10	24.2	65	-40.8
11	25.8	62	-36.2
12	22.6	63	-40.4
13	18.8	62	-43.2
14	16.8	62	-45.2
15	19.6	61	-41.4
16	58.5	60	-1.5
17	78.7	62	16.7
18	52.3	62	-9.7
19	40.3	62	-21.7
20	32.9	62	-29.1
21	30.0	64	-34
22	25.3	62	-36.7
23	25.4	60	-34.6
24	31.8	59	-27.2
25	31.3	59	-27.7
26	27.3	57	-29.7
27	24.7	55	-30.3
28	23.4	54	-30.6
29	22.7	53	-30.3
30	21.1	56	-34.9
31	20.8	52	-31.2
MIN	15.2	52	16.7
MAX	78.7	75	-58.7
AVG	27.1	63	-36

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

Table 67 2008 September Bear Creek Morrison vs. Historic Bear Creek Flow

Date	Daily Mean Flow (cfs) September 2008	Historic Daily Mean Flow (cfs) 89 Years for September	Deviation from Historic Flow (cfs)
1	23.7	50	-26.3
2	21.1	56	-34.9
3	21	53	-32
4	19.9	51	-31.1
5	19.4	49	-29.6
6	20.4	47	-26.6

Date	Daily Mean Flow (cfs) September 2008	Historic Daily Mean Flow (cfs) 89 Years for September	Deviation from Historic Flow (cfs)
7	18.7	48	-29.3
8	17.9	49	-31.1
9	18.3	47	-28.7
10	17.2	48	-30.8
11	17.3	49	-31.7
12	44.1	47	-2.9
13	36.8	43	-6.2
14	27.4	43	-15.6
15	23.8	41	-17.2
16	21.5	40	-18.5
17	19.9	40	-20.1
18	18.6	38	-19.4
19	18.8	37	-18.2
20	20.4	37	-16.6
21	21.7	37	-15.3
22	20.6	37	-16.4
23	18.2	37	-18.8
24	17.5	36	-18.5
25	16.8	36	-19.2
26	16.8	36	-19.2
27	16.4	36	-19.6
28	17	35	-18
29	16.9	35	-18.1
30	16.4	34	-17.6
MIN	16.4	34	-2.9
MAX	44.1	56	-34.9
AVG	20.8	42	-21.6

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

Table 68 2008 October Bear Creek Morrison vs. Historic Bear Creek Flow

Date	Daily Mean Flow (cfs) October 2008	Historic Daily Mean Flow (cfs) 89 Years for October	Deviation from Historic Flow (cfs)
1	15.8	34	-18.2
2	16.1	33	-16.9
3	15.9	33	-17.1
4	15.2	34	-18.8
5	15.9	33	-17.1
6	18.8	33	-14.2
7	16.5	32	-15.5
8	15.5	32	-16.5
9	15.2	31	-15.8
10	15.6	31	-15.4
11	17.5	30	-12.5
12	20.3	30	-9.7
13	22.5	30	-7.5
14	20.3	31	-10.7
15	19.5	31	-11.5
16	18.5	31	-12.5
17	17.7	31	-13.3
18	17.6	31	-13.4
19	19.1	31	-11.9
20	17.5	30	-12.5
21	19.4	29	-9.6
22	19.5	29	-9.5

Date	Daily Mean Flow (cfs) October 2008	Historic Daily Mean Flow (cfs) 89 Years for October	Deviation from Historic Flow (cfs)
23	16.7	29	-12.3
24	18.4	29	-10.6
25	18.9	29	-10.1
26	17.7	29	-11.3
27	16.1	29	-12.9
28	16.1	29	-12.9
29	16.8	29	-12.2
30	15.7	28	-12.3
31	15.4	28	-12.6
MIN	15.2	28	-7.5
MAX	22.5	34	-18.8
AVG	17.5	31	-13

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

Table 69 2008 May Bear Creek Above BC Reservoir vs. Historic BC Flow

Date	Daily Mean Flow (cfs) May 2008	Historic Daily Mean Flow (cfs) 23 Years for May	Deviation from Historic Flow (cfs)
1	30	101	-71
2	18	98	-80
3	12	98	-86
4	13	95	-82
5	8.3	102	-93.7
6	7.5	108	-100.5
7	13	113	-100
8	15	111	-96
9	12	109	-97
10	14	109	-95
11	8.3	107	-98.7
12	11	105	-94
13	36	101	-65
14	29	103	-74
15	56	103	-47
16	48	110	-62
17	46	122	-76
18	52	119	-67
19	67	129	-62
20	77	131	-54
21	82	130	-48
22	77	125	-48
23	63	117	-54
24	54	115	-61
25	49	132	-83
26	60	135	-75
27	81	133	-52
28	69	126	-57
29	68	129	-61
30	65	126	-61
31	67	118	-51
MIN	7.5	95	-47
MAX	82.0	135	-100.5
AVG	42.2	115	-73

USGS 06710605 GPS Coordinates: 39.6522°N, 105.1731°W

Table 70 2008 June Bear Creek Above BC Reservoir vs. Historic BC Flow

Date	Daily Mean Flow (cfs) June 2008	Historic Daily Mean Flow (cfs) 23 Years for June	Deviation from Historic Flow (cfs)
1	68	119	-51
2	69	114	-45
3	65	109	-44
4	64	105	-41
5	79	107	-28
6	55	108	-53
7	43	114	-71
8	46	102	-56
9	41	119	-78
10	44	123	-79
11	43	111	-68
12	39	107	-68
13	34	107	-73
14	29	102	-73
15	28	97	-69
16	31	96	-65
17	33	96	-63
18	33	99	-66
19	32	91	-59
20	32	88	-56
21	30	84	-54
22	28	80	-52
23	28	76	-48
24	29	72	-43
25	27	66	-39
26	23	66	-43
27	20	64	-44
28	20	63	-43
29	20	66	-46
30	18	65	-47
MIN	18.0	63	-28
MAX	79.0	123	-79
AVG	38.4	94	-56

USGS 06710500 GPS Coordinates: 39.6522°N, 105.1731°W

Table 71 2008 July Bear Creek Above BC Reservoir vs. Historic BC Flow

Date	Daily Mean Flow (cfs) July 2008	Historic Daily Mean Flow (cfs) 23 Years for July	Deviation from Historic Flow (cfs)
1	18	59	-41
2	19	51	-32
3	22	46	-24
4	19	44	-25
5	15	43	-28
6	18	43	-25
7	27	44	-17
8	30	49	-19
9	20	52	-32
10	11	52	-41
11	9.8	46	-36.2
12	8.5	44	-35.5
13	7	42	-35
14	7.8	40	-32.2
15	9.1	39	-29.9

Date	Daily Mean Flow (cfs) July 2008	Historic Daily Mean Flow (cfs) 23 Years for July	Deviation from Historic Flow (cfs)
16	9.1	36	-26.9
17	7.3	41	-33.7
18	9.6	36	-26.4
19	14	34	-20
20	11	33	-22
21	8.5	32	-23.5
22	8.7	31	-22.3
23	9.1	35	-25.9
24	14	33	-19
25	13	31	-18
26	9.8	31	-21.2
27	4.8	28	-23.2
28	4.2	31	-26.8
29	5.4	32	-26.6
30	6.6	33	-26.4
31	3.5	32	-28.5
MIN	3.5	28	-17
MAX	30.0	59	-41
AVG	12.3	39	-27

USGS 06710500 GPS Coordinates: 39.6522°N, 105.1731°W

Table 72 2008 August Bear Creek Above BC Reservoir vs. Historic BC Flow

Date	Daily Mean Flow (cfs) August 2008	Historic Daily Mean Flow (cfs) 23 Years for August	Deviation from Historic Flow (cfs)
1	1.8	32	-30.2
2	1.8	31	-29.2
3	2.2	32	-29.8
4	3.5	41	-37.5
5	5.8	46	-40.2
6	6.8	45	-38.2
7	5.3	42	-36.7
8	10	39	-29
9	14	36	-22
10	12	37	-25
11	10	37	-27
12	4.5	34	-29.5
13	3.9	33	-29.1
14	5.7	32	-26.3
15	9.6	31	-21.4
16	47	35	12
17	54	34	20
18	17	33	-16
19	16	34	-18
20	16	30	-14
21	13	27	-14
22	11	28	-17
23	9.9	33	-23.1
24	15	36	-21
25	15	30	-15
26	12	29	-17
27	9.4	27	-17.6
28	8.1	27	-18.9
29	8.1	27	-18.9
30	7.3	26	-18.7

Date	Daily Mean Flow (cfs) August 2008	Historic Daily Mean Flow (cfs) 23 Years for August	Deviation from Historic Flow (cfs)
31	6.7	24	-17.3
MIN	1.8	24	20
MAX	54.0	46	-40.2
AVG	11.7	33	-21

USGS 06710500 GPS Coordinates: 39.6522°N, 105.1731°W

Table 73 2008 Sept. Bear Creek Above BC Reservoir vs. Historic BC Flow

Date	Daily Mean Flow (cfs) September 2008	Historic Daily Mean Flow (cfs) 23 Years for September	Deviation from Historic Flow (cfs)
1	10	24	-14
2	7.1	23	-15.9
3	6.8	22	-15.2
4	5.9	21	-15.1
5	5.8	21	-15.2
6	7.6	20	-12.4
7	6.1	21	-14.9
8	5.6	21	-15.4
9	6.3	20	-13.7
10	4.9	20	-15.1
11	5.5	19	-13.5
12	35	21	14
13	27	20	7
14	17	19	-2
15	11	17	-6
16	10	15	-5
17	9.4	15	-5.6
18	8.1	15	-6.9
19	9.4	15	-5.6
20	9.5	16	-6.5
21	9.4	17	-7.6
22	8.5	16	-7.5
23	5.6	15	-9.4
24	4.8	15	-10.2
25	4	14	-10
26	4.4	15	-10.6
27	4.6	15	-10.4
28	5.4	14	-8.6
29	5.6	15	-9.4
30	5	16	-11
MIN	4.0	14	14
MAX	35.0	24	-15.9
AVG	8.8	18	-9.1

USGS 06710500 GPS Coordinates: 39.6522°N, 105.1731°W

Table 74 2008 October Bear Creek Above BC Reservoir vs. Historic BC Flow

Date	Daily Mean Flow (cfs) October 2008	Historic Daily Mean Flow (cfs) 23 Years for October	Deviation from Historic Flow (cfs)
1	3	17	-14
2	1.7	17	-15.3
3	2.3	17	-14.7
4	2.2	16	-13.8
5	2.3	17	-14.7
6	5.9	18	-12.1
7	6	17	-11

Date	Daily Mean Flow (cfs) October 2008	Historic Daily Mean Flow (cfs) 23 Years for October	Deviation from Historic Flow (cfs)
8	6.6	17	-10.4
9	8.7	18	-9.3
10	10	18	-8
11	13	17	-4
12	16	16	0
13	19	16	3
14	17	17	0
15	16	16	0
16	15	16	-1
17	14	16	-2
18	14	16	-2
19	15	14	1
20	14	17	-3
21	16	16	0
22	16	15	1
23	13	16	-3
24	14	16	-2
25	16	17	-1
26	14	17	-3
27	12	18	-6
28	13	18	-5
29	13	17	-4
30	12	17	-5
31	11	17	-6
MIN	1.7	14	3
MAX	19.0	18	-15.3
AVG	11.3	17	-5

USGS 06710605 GPS Coordinates: 39.6522°N, 105.1731°W

Weather Data

Local weather data 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 1961 through 2006. Historical weather data obtained from the National Oceanographic and Atmospheric Administration/National Weather Service, High Plains Climate Center.

Maximum and minimum air temperature values along with precipitation measurements recorded each morning. Daily readings entered into a NWS software program. Local weather statistics summarized, comparing 2008 monthly maximum, minimum and mean air temperatures and monthly precipitation to 45-year (1961-2006) historical data.

Table 75 Weather Data May-October 2008 Summary

Monthly Weather Data	May 2008	June 2008	July 2008	August 2008	September 2008	October 2008
Air Temp Low Max (°F)	45	47	55	54	51	49
Air Temp High Max (°F)	79	84	91	93	82	75
Air Temp High Avg (°F)	62	76	84	78	69	61
Total Precip (in.)	2.97	0.56	0.35	2.79	1.54	1.02
Days of Precip.	13	6	10	11	10	8

Table 76 2008 Weather Data vs. Historical Weather Data (45 years 1961-2006)

	Avg Daily Min (°F)	Avg Daily Max (°F)	Avg Mon. Mean (°F)	Precip (in.)
May 2008	34	62	48	2.97
May Hist	33.7	65.3	49.5	2.56
% Deviation	0.8%	-5.3%	-3.1%	16%
June 2008	41	76	58	0.56
June Hist	41	75.3	58.2	2.19
% Deviation	0%	0.9%	-0.3%	-74.4%
July 2008	49	84	67	0.35
July Hist	46.5	81.6	64.1	2.24
% Deviation	5.1%	2.8%	4.3%	-84.3%
August 2008	47	78	63	2.79
August Hist	45.2	79.4	62.4	2.35
% Deviation	3.8%	-1.8%	0.9%	18.7%
Sept. 2008	37	69	53	1.54
Sept. Hist	37	72.3	54.6	1.49
% Deviation	0%	-4.8%	-3.0%	3.3%
Oct. 2008	33	61	47	1.02
Oct. Hist	26.7	62.5	44.7	1.22
% Deviation	19%	-2.4%	4.9%	-16.4%

Stream Flow Vs. Local Weather

Stream flows, 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 stream flows measured above Evergreen Lake.

Table 77 2008 May Bear Creek Evergreen vs. Weather Data

Date	May 2008 Daily Mean Flow (cfs)	May 2008 Daily Air Max Temp (°F)	May 2008 Precip. (in.)
1	34	73	0.01
2	24	39	0.31
3	25	34	0
4	26	54	0
5	24	59	0
6	27	67	0
7	28	70	0.01
8	30	60	0.05
9	30	60	0
10	31	58	0.25
11	26	50	T
12	29	71	0
13	42	74	0.91
14	35	43	0.14
15	44	57	0.62
16	40	57	0.18
17	44	63	0.01
18	55	69	0
19	63	76	0
20	77	79	0
21	88	75	0
22	83	79	0
23	66	61	0
24	59	61	0

Date	May 2008 Daily Mean Flow (cfs)	May 2008 Daily Air Max Temp (°F)	May 2008 Precip. (in.)
25	57	60	0
26	74	68	0.21
27	86	47	0.27
28	77	49	0
29	81	66	0
30	84	76	0
31	84	72	0
MIN	24	34	0
MAX	88	79	0.91
AVG	51	62	0.25
TOTAL			2.97

USGS 06710385 GPS Coordinates: 39.6228°N, 105.3361°W Daily Mean flows were obtained from the USGS gaging station above Evergreen Lake. Weather data obtained from the NWS reporting station located at the EMD WWTP.

Table 78 2008 June Bear Creek Evergreen vs. Weather Data

Date	June 2008 Daily Mean Flow (cfs)	June 2008 Daily Max Air Temp (°F)	June 2008 Precip (in.)
1	89	74	0
2	90	76	0
3	87	81	0
4	87	73	0
5	100	73	0.42
6	81	59	0.08
7	74	77	0
8	78	77	0.04
9	64	67	0
10	59	71	0
11	61	84	0
12	54	67	T
13	49	65	0
14	44	74	0
15	47	84	0
16	50	82	0
17	51	71	0
18	50	81	0
19	50	81	0
20	50	74	0
21	48	74	0
22	47	79	0
23	47	81	0
24	49	78	0
25	46	83	T
26	45	84	0.02
27	43	84	0
28	42	82	0
29	42	78	0
30	40	76	0
MIN	40	59	0.02
MAX	100	84	0.42
AVG	59	76	0.14
TOTAL			0.56

USGS 06710385 GPS Coordinates: 39.6228°N, 105.3361°W Daily Mean flows were obtained from the USGS gaging station above Evergreen Lake. Weather data obtained from the NWS reporting station located at the EMD WWTP.

Table 79 2008 July Bear Creek Evergreen vs. Weather Data

Date	July 2008 Daily Mean Flow (cfs)	July 2008 Daily Max Air Temp (°F)	July 2008 Precip (in.)
1	40	83	0
2	41	83	0.02
3	42	79	0.01
4	39	81	0
5	36	87	0
6	39	88	0.01
7	51	76	0.08
8	50	74	0.15
9	41	80	0.01
10	35	83	0
11	33	88	0
12	32	90	0
13	32	75	0
14	31	85	0
15	30	86	0
16	28	85	0
17	26	88	0
18	31	81	0.01
19	34	84	0
20	30	89	0
21	28	90	0
22	28	86	0
23	29	87	0
24	37	83	0.04
25	33	85	0.02
26	31	85	0
27	28	84	0
28	27	88	0
29	28	85	0
30	26	83	T
31	24	91	0
MIN	24	74	0.01
MAX	51	91	0.15
AVG	34	84	0.04
TOTAL			0.35

USGS 06710385 GPS Coordinates: 39.6228°N, 105.3361°W Daily Mean flows were obtained from the USGS gaging station above Evergreen Lake. Weather data obtained from the NWS reporting station located at the EMD WWTP.

Table 80 2008 August Bear Creek Evergreen vs. Weather Data

Date	August 2008 Daily Mean Flow (cfs)	August 2008 Daily Max Air Temp (ºF)	August 2008 Precip (in.)
1	23	89	0
2	22	93	0
3	22	89	0
4	22	86	0
5	23	85	0.04
6	23	76	0
7	25	81	0.15
8	25	70	0
9	28	79	0.16
10	29	78	0.05
11	28	74	0.1
12	24	81	0

Date	August 2008 Daily Mean Flow (cfs)	August 2008 Daily Max Air Temp (ºF)	August 2008 Precip (in.)
13	21	84	0
14	20	84	0
15	23	74	0.18
16	59	49	0.89
17	66	56	0.95
18	45	63	0.01
19	35	72	0
20	30	78	0
21	28	83	0
22	25	86	0
23	27	82	0.2
24	32	73	0.06
25	31	80	0
26	28	82	0
27	25	86	0
28	24	87	0
29	24	71	0
30	23	78	0
31	23	83	0
MIN	20	49	0.01
MAX	66	93	0.95
AVG	28	78	0.25
TOTAL			2.79

USGS 06710385 GPS Coordinates: 39.6228°N, 105.3361°W Daily Mean flows were obtained from the USGS gaging station above Evergreen Lake. Weather data obtained from the NWS reporting station located at the EMD WWTP.

Table 81 2008 September Bear Creek Evergreen vs. Weather Data

Date	September 2008 Daily Mean Flow (cfs)	September 2008 Daily Max Air Temp (ºF)	September 2008 Precip (in.)
1	24	82	0.16
2	22	79	0
3	22	59	0
4	21	66	0.01
5	21	69	0
6	21	47	0
7	20	64	0
8	19	71	0.02
9	19	71	0
10	19	78	0
11	20	72	0.03
12	40	53	1.15
13	32	53	0.08
14	25	70	0.05
15	23	56	0
16	21	68	0
17	20	75	0
18	20	76	0
19	21	71	0
20	21	69	0
21	21	71	0.04
22	20	70	0
23	18	76	T
24	18	69	0
25	17	73	0

Date	September 2008 Daily Mean Flow (cfs)	September 2008 Daily Max Air Temp (ºF)	September 2008 Precip (in.)
26	17	79	0
27	18	79	T
28	18	68	0
29	17	76	0
30	17	72	0
MIN	17	47	0.01
MAX	40	82	1.15
AVG	21	69	0.19
TOTAL			1.54

USGS 06710385 GPS Coordinates: 39.6228°N, 105.3361°W Daily Mean flows were obtained from the USGS gaging station above Evergreen Lake. Weather data obtained from the NWS reporting station located at the EMD WWTP.

Table 82 2008 October Bear Creek Evergreen vs. Weather Data

Date	October 2008 Daily Mean Flow (cfs)	October 2008 Daily Max Air Temp (ºF)	October 2008 Precip (in.)
1	17	74	0
2	17	74	0
3	17	74	0.07
4	17	72	0
5	18	64	0
6	---	63	0.15
7	---	60	0
8	17	71	0
9	17	73	0
10	17	58	0
11	17	45	T
12	23	37	0.22
13	22	35	0.1
14	20	46	0
15	19	51	0
16	20	56	0
17	19	68	0
18	19	71	0
19	18	75	0
20	18	75	0
21	19	56	0.25
22	18	64	0.22
23	15	35	0.01
24	19	53	0
25	17	58	0
26	17	66	0
27	15	52	0
28	17	69	0
29	16	68	0
30	16	72	0
31	15	70	0
MIN	15	35	0.01
MAX	23	75	0.25
AVG	18	61	0.15
TOTAL			1.02

USGS 06710385 GPS Coordinates: 39.6228°N, 105.3361°W Daily Mean flows were obtained from the USGS gaging station above Evergreen Lake. Weather data obtained from the NWS reporting station located at the EMD WWTP.

Appendix C Temperature Standard Evaluation

Table 83 Temperature Exceedances 2002-2008

	Interim Std. # Exceedances MWAT 20C	Underlying Standard April-October	
		Brown/Rainbow chronic # Exceedances WAT 18.2C	Brown/Rainbow acute # Exceedances DM 23.8C
2002			
Site 6	1	8	18
Site 10	0	3	16
Site 11	0	4	15
Site 13b	1	6	27
Site 14b	2	6	19
2003			
Site 6	0	2	0
Site 10	0	3	0
Site 11	0	1	0
Site 13b	0	3	0
Site 14c	0	4	1
2004			
Site 6	0	0	0
Site 10	0	0	0
Site 11	0	0	0
Site 13b	0	0	0
Site 14c	0	0	0
2005			
Site 6	0	2	0
Site 10	0	2	2
Site 11	0	1	0
Site 13a	0	1	0
Site 14a	0	2	0
2006			
Site 6	0	5	0
Site 10	0	4	2
Site 11	0	4	1
Site 13a	0	4	1
Site 14a	0	4	0
2007			
Site 6	0	0	0
Site 10	0	1	0
Site 11	0	1	0
Site 13a	0	1	0
Site 14a	0	2	0
2008			
Site 1a	0	0	0
Site 2	0	0	0
Site 3a	0	0	0
Site 4a	0	5	0
Site 4b	0	4	0
Site 4c	0	0	0
Site 4d	0	0	0
Site 4e	0	0	0
Site 5	0	4	0
Site 7	0	4	0
Site 8a	0	3	0
Site 9	0	2	0
Site 12	0	3	0
Site 13a	0	3	0
Site 14a	0	3	0
Site 15a	0	5	0
Site 16a	0	1	0
Site 17a	0	0	0
Site 18	0	0	0
Site 19	0	0	0
Site 25	0	0	0
Site 26	0	0	0

Table 84 Temperature Site Location and Notes (Supports Table 80)

Year	BCWA Site ID	Site/Logger Identifier	Site Location	Notes
2002	Site 6	EMD3	Above EMD WWTP Eff	Frequency: 72/day
	Site 10	KSWD7	Above KSWD WWTP Eff	Missing data due to malfunctions, lost logger, logger not submerged
	Site 11	GWSD9	Above GWSD WWTP Eff	Missing data due to logger not submerged
	Site 13b	EMD5	Below Idledale at Baker Bridge	
	Site 14b	MORR10	Above Morrison at USGS gage	
2003	Site 6	EMD4	Above EMD WWTP Effluent	Frequency: 6/day DM of 6 values/day
	Site 10	KSWD7	Above KSWD WWTP Effluent	DM of 6 values/day
	Site 11	GWSD9	Above GWSD WWTP effluent	DM of 6 values/day
	Site 13b	EMD5A	Below Idledale at Baker Bridge	DM of 6 values/day
	Site 14c	MORR10	Above Harriman Diversion	DM of 6 values/day
2004	Site 6	EMD4	Above EMD WWTP Effluent	Frequency: 24/day
	Site 10	KSWD7	Above KSWD WWTP Effluent	
	Site 11	GWSD9	Above GWSD WWTP effluent	
	Site 13b	EMD5A	Below Idledale at Baker Bridge	
	Site 14c	MORR10	Above Morrison at USGS gage	
2005	Site 6	EMD4	Above EMD WWTP Effluent	Frequency: 24/day
	Site 10	KSWD7	Above KSWD WWTP Effluent	
	Site 11	GWSD9	Above GWSD WWTP effluent	
	Site 13b	EMD5A	Below Idledale at Baker Bridge	
	Site 14a	MORR10	Above Morrison at USGS gage	
2006	Site 6	EMD4	Above EMD WWTP Effluent	Frequency: 48/day
	Site 10	KSWD7	Above KSWD WWTP Effluent	
	Site 11	GWSD9	Above GWSD WWTP effluent	
	Site 13b	EMD5A	Below Idledale at Baker Bridge	
	Site 14a	MORR10	Above Morrison at CDOW Site	
2007	Site 6	EMD4	Above EMD WWTP Effluent	Frequency: 48/day
	Site 10	KSWD7	Above KSWD WWTP Effluent	
	Site 11	GWSD9	Above GWSD WWTP effluent	
	Site 13a	IDLE	Idledale at CDOW Site	
	Site 14a	MORR10	Above Morrison at CDOW Site	
2008	Site 1a	L&F	Lost & Found (Singin' River Ranch)	Frequency: 48/day
	Site 2	ALKCC	Clear Creek County line	
	Site 3a	ALKDOW	Above Evergreen Lake at CDOW Site	
	Site 4a	EMD2A	Evergreen Lake Surface, Profile Station	
	Site 4b	EMD2B	Evergreen Lake Profile Station, 1-m	
	Site 4c	EMD2C	Evergreen Lake Profile Station,2-m	
	Site 4d	EMD2D	Evergreen Lake Profile Station, 3-m	
	Site 4e	EMD2E	Evergreen Lake Profile Station, 4-m	
	Site 5	LTLBAR	Above EMD WWTP, downtown site	
	Site 7	EMD3	Below EMD WWTP effluent	
	Site 8a	BCCDOW	Bear Creek Cabins at CDOW Site	
	Site 9	OFPDOW	O'Fallon Park, west end at CDOW Site	
	Site 12	LOBDOW	Lair o' the Bear Park, at CDOW site	
	Site 13a	IDLE	Idledale at CDOW Site	
	Site 14a	MORR10	Above Morrison at CDOW Site	
	Site 15a	MORR11	In Bear Creek Park at USGS gage	
	Site 16a	TURK2	N. Turkey Creek, near BCP Maint. Bldg.	

Year	BCWA Site ID	Site/Logger Identifier	Site Location	Notes
	Site 17a	TURK1	Near confluence N.&S. Turkey Creeks, in NTC	Pulled on 7/31, no flow
	Site 18	APMD1	South Turkey Creek Aspen Park Metropolitan District	
	Site 19	CMD1	North Turkey Creek Conifer Metropolitan District	
	Site 25	ALKMEL	Mt. Evans Wilderness drainage	
	Site 26	LTLCUB	Cub Creek, Upstream of Hwy 73 bridge, south of EMD WTP	