Clear Creek Watershed Management Agreement

2004 Annual Report

Black Hawk/Central City Sanitation District
Central Clear Creek Sanitation District
Church Ditch Company
City of Arvada
City of Central
City of Golden
City of Idaho Springs
City of Northglenn
City of Thornton
City of Westminster
Clear Creek County
Clear Creek Ski Corporation
Colorado Dept of Transportation
Cyprus/Amax
Farmers= High Line Canal Company
Farmers= Reservoir & Irrigation Company
Georgetown
Gilpin County
Jefferson Center Metropolitan District
Jefferson County
St. Mary=s Glacier W&S District
City of Black Hawk

March 2005

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EXECUTIVE SUMMARY

Introduction

Standley Lake is an agricultural and municipal water supply reservoir located in Jefferson County Colorado that is supplied with water primarily from Clear Creek. The reservoir supplies water for agricultural use by the Farmers Reservoir and Irrigation Company (FRICO) and for municipal supply for the cities of Northglenn, Thornton, and Westminster (Standley Lake Cities). In response to a request by the Standley Lake Cities for a Rulemaking Hearing to establish water quality standards and resulting control regulations for Standley Lake, 23 entities developed and agreed to the Clear Creek Watershed Management Agreement (Agreement). This Agreement, adopted in December 1993, sought to address certain water quality issues and concerns within the Clear Creek Basin of Colorado. Specifically, issues that may affect Standley Lake (i.e. Reservoir) water quality. The parties to this Agreement are governmental agencies and private corporations having land use, water supply, and/or wastewater treatment responsibilities within the Clear Creek Basin.

For purposes of the Agreement, the Clear Creek Basin was divided into three (3) segments: the Upper Clear Creek Basin (Upper Basin), consisting of Clear Creek and its tributaries from its source to and including the headgate of the Croke Canal in Golden, Colorado; the Standley Lake Tributary Basin (Tributary Basin), consisting of the lands directly tributary to Standley Lake, the Church Ditch, Farmers High Line Canal, Croke Canal (which carry water to Standley Lake), and lands directly tributary to these Canals; and Standley Lake (Standley Lake), consisting of the Lake itself.

Narrative Standard

In accordance with the Agreement, a narrative standard for Standley Lake was adopted in lieu of a numeric standard and control regulations. The parties agreed to additional testing, monitoring, and implementation of best management practices on a voluntary basis. The narrative standard for Segment 2, Big Dry Creek, Standley Lake reads:

The trophic status of Standley Lake shall be maintained as mesotrophic as measured by a combination of common indicator parameters such as total phosphorus, chlorophyll a, Secchi depth, and dissolved oxygen. Implementation of this narrative standard shall only be by Best Management Practices and controls implemented on a voluntary basis.

Objectives

The Agreement provided that should the narrative standard not be met and substantial progress not made in reducing the nutrient loads to Standley Lake, additional measures may be required including numeric standards or effluent limitations for phosphorous and/or nitrogen in the Upper Basin, and for additional best management controls in Standley Lake.

The Agreement further provided:

- The Upper Basin parties, in consultation with all other parties to the Agreement, shall prepare a Best Management Manual for non-point sources that cover disturbed areas of 1 or more acres

- The Upper Basin parties, in consultation with all other parties to this Agreement, will examine costs and effects of nutrient removal at Upper Basin wastewater treatment plants
- The Standley Lake Cities, in consultation with all other parties to this Agreement, will develop a Standley Lake Management Plan
- The parties will jointly design, implement, and fund, in such allocations as shall be agreed, a monitoring program to evaluate nutrient loading from point and non-point sources in the Upper Basin, nutrient loadings from non-point sources in the Tributary Basin, internal Lake loadings and the effect of nutrient reduction measures implemented by the various parties on the trophic status of Standley Lake.

This report is divided into four chapters I. Monitoring Program, II. Individual reports from Upper Basin, III. Tributary Basin, and IV. Standley Lake/Canal parties, with data provided in the appendix. The individual reports describe the pollution prevention actions taken in 2004.

Monitoring data results include tabular and trend analysis of measures relevant to the trophic status of Standley Lake, as follows: 1) Nutrients 2) Dissolved oxygen 3) Secchi depth and 4) Chlorophyll a.

These measures of trophic status are referred to in the narrative standard. The *Lakewatch* computer program is used by the Standley Lake Cities to evaluate both trends and trophic status of Standley Lake. Trend analysis includes the entire period of record (1994 through 2004), while tabular data is divided into three sections (current year, previous year and all other years to 1994). Tabular data for Clear Creek and Stanley Lake are set forth in Appendix C.

Monitoring Program Summary

In 2004, 17 Upper Clear Creek Basin and eight wastewater treatment plant (WWTP) sites were monitored. Eight sampling events were conducted, one in February, April, May, June, July, August, October and December. The Standley Lake Cities (SLC) and the City of Arvada collected the samples.

After ten years of collecting data, the monitoring program was evaluated for relevancy to the goals of both the narrative standard and the SL Management Plan. Changes to the monitoring program will be implemented in 2005. These changes are outlined in the Monitoring Section of this report.

Stream Gaging & Flow Summary

To provide the needed flow data for calculating nutrient loadings, the Upper Clear Creek Watershed Association, Standley Lake Cities, United States Geological Survey, Federal Highway Authority, and the Colorado Department of Transportation continue to work on a program to maintain stream and staff gages. Flows for 2004 were slightly below normal but sufficient to allow Standley Lake to fill. Gages are located at sampling site numbers: CC10, CC20, CC26, CC35, CC40, CC50, and CC60. See the following sampling site map for these locations.

USGS Gage at Golden

	Mean Annual Value (cfs)	% of 1975 – 2002		Mean Annual Value (cfs)	% of 1975 – 2002
1975-2004	189	----	1999	257	136%
1994	129	68%	2000	183	97%
1995	324	172%	2001	169	90%
1996	220	117%	2002	71	38%
1997	271	144%	2003	199	105%
1998	210	111%	2004	127	67%

Water and Wastewater Treatment / Collection Systems Summary

- The City of Georgetown applied for a NPDES permit in 2004 to upgrade its wastewater treatment facility. Upgrades will address I&I and repeated non-compliance issues.
- Mount Vernon Country Club states it will upgrade its existing wastewater treatment plant in 2004. They do not plan to implement advance treatment at this time. As of December, 2004, no progress has been reported.
- The Black Hawk / Central City Sanitation District is constructing a new wastewater treatment plant to be completed in 2005. A more detailed record can be found in the Upper Clear Creek section, (Chapter II).
- A summary of EPA enforcement and compliance history online, (ECHO), for the upper basin wastewater treatment plants can be found in Chapter IV, page 29.
- Discussion concerning a regional wastewater treatment plant in the Upper Basin was initiated in October, 2004.
- Comments regarding a 5,000 gpd ISDS for an RV Park located South of the town of Georgetown was submitted. A decision regarding this development will be made in early, 2005.

Non Point Source Control Efforts Summary

Non point source control efforts play an important role in improving water quality. Most governmental entities in the relevant basins have adopted and are implementing non-point source control regulations.

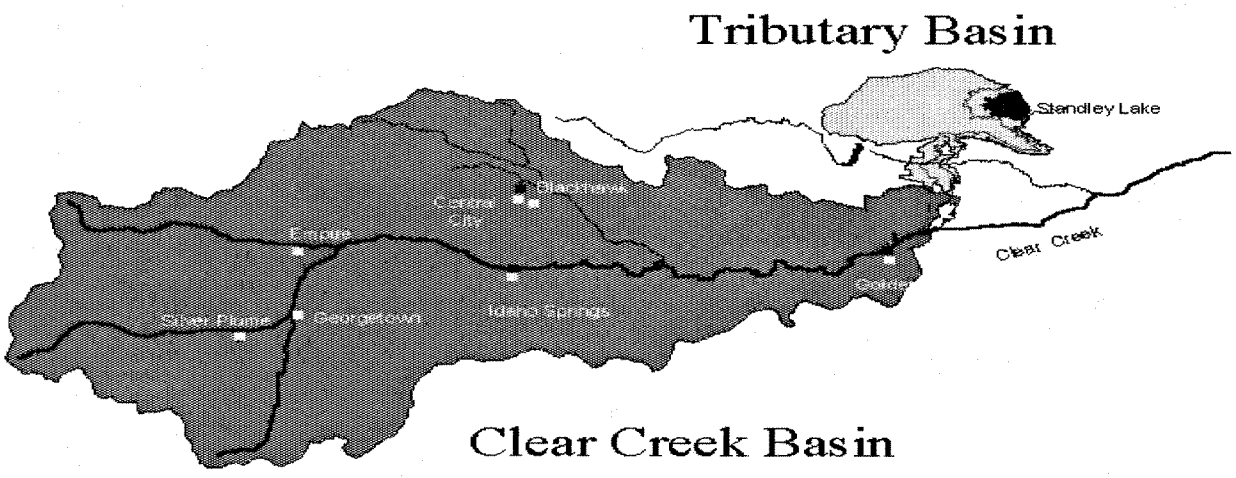
In 2003, the lower basin cities of Arvada, Golden, Northglenn, Thornton, and Westminster, submitted an application for and received coverage under a Phase II stormwater permit as required by the Clean Water Act. The cities have successfully completed identified program goals for 2004. These goals include but are not limited to the following six program areas;

- **Public Education and Outreach:** brochures, websites, school visits, utility inserts, and articles
- **Public Participation / Involvement:** public hearings and / or encouraging citizen representatives on a stormwater management panel
- **Illicit Discharge Detection and Elimination:** develop a stormwater outfall map and implement a stormwater hotline
- **Construction Site Runoff Control:** inspections, compliance and enforcement, training, and receiving comments from the public
- **Post-Construction Runoff Control:** inspections, compliance and enforcement, and maintenance of Best Management Practices (BMP)
- **Pollution Prevention / Good Housekeeping:** develop runoff control plans and train municipal staff on pollution prevention measures and techniques

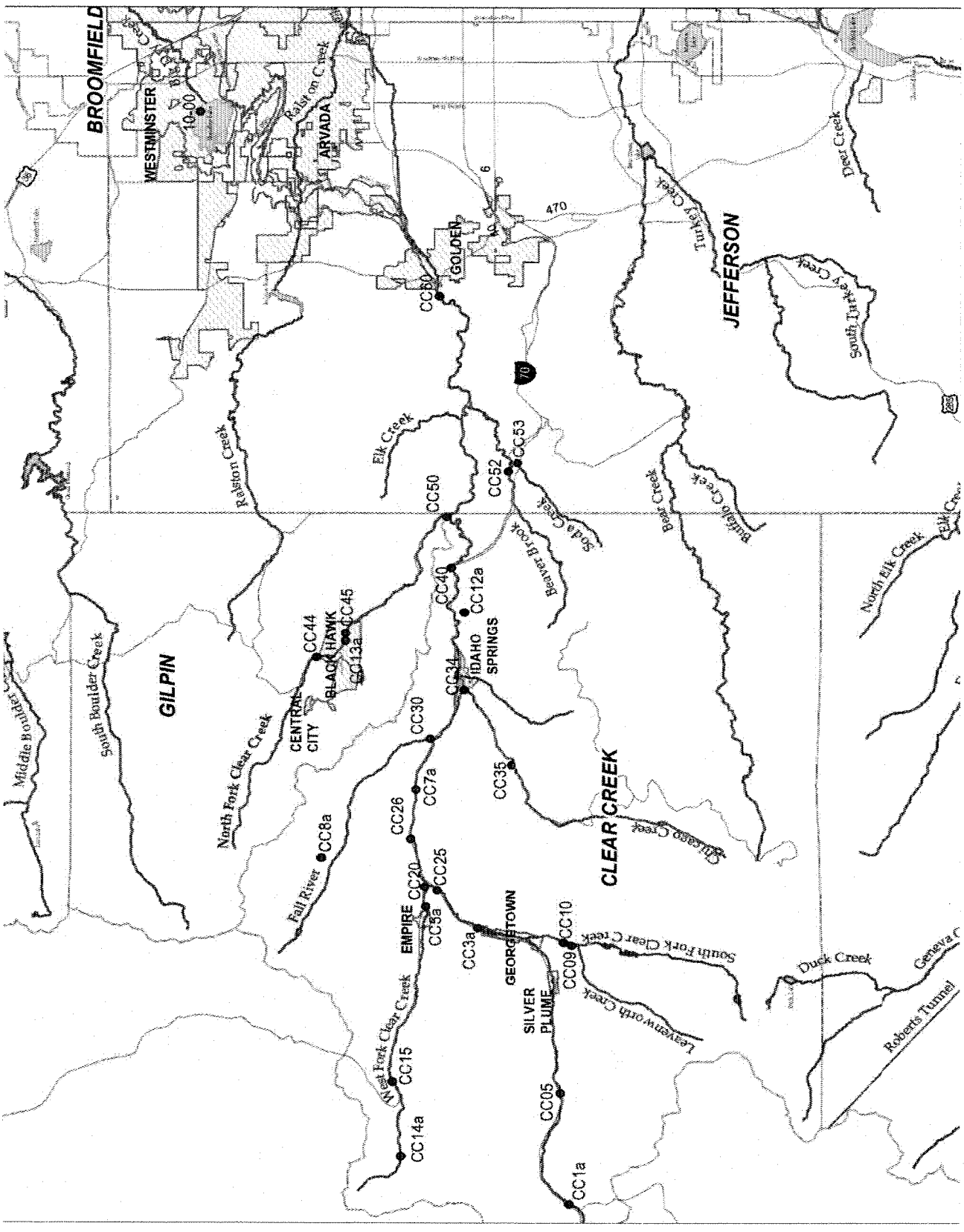
All of the lower basin cities have adopted regulations providing for erosion control during construction, permanent BMP's and illicit discharge prohibition. A complete list of adopted regulations for all signatories to the Clear Creek Watershed Agreement is in Appendix A. For specific information on completed programs call the Stormwater Coordinator for the city or county of interest. For information on Upper Basin pollution prevention/control efforts, see Section II, Upper Clear Creek Watershed Association (UCCWA).

Negotiations regarding the potential conversion of a section of the Church Ditch as a stormwater diversion structure to protect Standley Lake from pollutants entering the lake as a result of development in the tributary basin were restarted in 2003 with significant progress made in 2004. Participants include the Standley Lake Cities, the City of Arvada, Jefferson County, CDOT, and developers in the Standley Lake Tributary basin.

Standley Lake Watershed



Sampling Site Map



I. CLEAR CREEK / STANDLEY LAKE MONITORING PROGRAM

A copy of the Clear Creek Watershed Management Agreement is contained in Appendix B. Section II, paragraph 4, provides for joint design, implementation, and funding of a monitoring program to evaluate nutrient loading from point and non-point sources in the Upper Basin, nutrient loadings from non-point sources in the Tributary Basin, internal Lake loadings and the effect of nutrient reduction measures implemented by the various parties on the trophic status of Standley Lake.

Upper Clear Creek Basin Monitoring in 2004

Seventeen Clear Creek sites and eight wastewater treatment plants were monitored under the program in 2004. Eight sampling events were conducted, one in February, April, May, June, July, August, October and December. Two sampling teams collected the samples. Results can be found in Appendix C of this report.

Four samples were collected at each stream site. The samples were kept in coolers on ice and transported by the sampling teams to the City of Golden Environmental Services Laboratory One set of the twenty-four (24) samples and quality control samples was delivered to Northglenn and one set to Westminster. Analysis was performed as follows:

Entity	Parameter/Analyte	Sample Type
Northglenn	TP & Ortho P	Grab
Westminster	TN, NO3 & Ammonia	Grab
Thornton	TSS & VSS	Grab
EPA	Metals	Grab
Golden	Metals for EMC	Grab
Arvada	Splits/Spikes for TP & TN	Grab

Field parameters, including, pH, temperature, conductivity, and dissolved oxygen were analyzed at each site and for sampling event.

2005 Monitoring Program

After ten years of collecting data, the monitoring program was evaluated for relevancy to the goals of both the narrative standard and the SL Management Plan. Taking into consideration staffing efficiencies the watershed was divided into three sub-basins: upper Clear Creek where anthropomorthic influences are minimal (CC05) middle watershed, moderate anthropormorphic influences, (a new site that will be established just downstream of CC40 but above the confluence of North Fork), the North Fork itself (CCC50), and essentially at the ditch headgates in Golden (CC61, USGS gage in Golden). This site represents the culmination of anthropormorphic effects on Clear Creek before diversions to Standley Lake. In 2005, the Cities of Golden, Arvada, the SLC will set up autosamplers at the middle, North Fork, and Golden stations, collecting a 48 hour/flow weighted, composite sample. This allows better characterization of loadings from stormwater flows as well as, over the entire hydrograph. Autosamplers will be phased in as time and money allows starting with the most downstream site. During the evaluation process, it was discovered that the monitoring program lacks sufficient information on storm event/runoff data. The program has been updated to include 48 hour/flow weighted composites, storm event samples, and grab samples. The new program is outlined as follows

2005 Monitoring Program (cont.)

All creek and tributary sites will be analyzed for phosphorus, nitrogen, TSS/VSS, TOC and field parameters; Wastewater Treatment Plants (WWTP) will be analyzed for phosphorus, nitrogen, TSS/VSS and field parameters. Metals samples will be collected in May and October

Two times per year in low-flow and high-flow conditions, 17 main-stem and tributary sites and 8 waste water treatment plant sites will be monitored as grab samples. These two sampling events will occur in Late May and Mid October. The sites included are as follows:

CC-05 Mainstem of Clear Creek (CC) at Bakerville
CC-09 Leavenworth Creek
CC-10 South Fork of CC at Leavenworth Creek
CC-15 West Fork of CC below Berthoud
CC-20 West Fork of CC below Empire
CC-25 Mainstem of CC above West Fork
CC-26 Mainstem of CC at Lawson gage
CC-30 Fall River above mainstem of CC
CC-34 Mainstem of CC upstream of Chicago Creek
CC-35 Chicago Creek above Idaho Springs Water Treatment Plant
CC-40 Mainstem of CC below Idaho Springs WWTP
CC-44 North Fork of CC above Black Hawk/Central City WTP intake
CC-45 North Fork of CC above Black Hawk/Central City WWTP
CC-50 North Fork of CC above confluence of mainstem of CC
CC-52 Beaver Brook
CC-53 Soda Creek
CC-60 Mainstem of CC at Church Headgate
Loveland (CC1a)
Georgetown (CC3a)
Empire (CC5a)
Central Clear Creek (CC7a)
St Mary's WWTP (CC8a)
Idaho Springs (CC12a)
Black Hawk/Central City WWTP (CC13a)
Henderson Mine (CC14a)

Six times per year, four major sites will be monitored using grab samples. These sites are CC26 (to characterize the West Fork and the mainstem above Empire), CC40 (to characterize the main stem including Idaho Springs), CC50 (to characterize the North Fork), and CC60 (final site before City of Golden). Also, the four major waste water contributors will be sampled; these include Georgetown, Central Clear Creek, Idaho Springs, and Black Hawk. The sampling events will occur in Early February, Early April, Mid June, Mid July, Mid August, and Early December.

Monitoring Schedule – grab samples

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
CC05					x					x		
CC09					x					x		
CC10					x					x		
CC15					x					x		
CC20					x					x		
CC25					x					x		
CC26		x		x	x	x	x	x		x		x
CC30					x					x		
CC34					x					x		
CC35					x					x		
CC40		x		x	x	x	x	x		x		x
CC44					x					x		
CC45					x					x		
CC50		x		x	x	x	x	x		x		x
CC52					x					x		
CC53					x					x		
CC60		x		x	x	x	x	x		x		x
CC1a					x					x		
CC3a		x		x	x	x	x	x		x		x
CC5a					x					x		
CC7a		x		x	x	x	x	x		x		x
CC8a					x					x		
CC12a		x		x	x	x	x	x		x		x
CC13a		x		x	x	x	x	x		x		x
CC14a					x					x		

Composite sampling will occur on a monthly basis, year-round as a 48-hour composite at a new site, CC61. CC61 is located downstream of the Church ditch diversion at the USGS gage. CC50 and CC49 (just above the confluence of North Fork of the mainstem) will be set up to sample as early in the year as possible (late March) and sampled until November. Automatic samplers will be used at these sites. A turbidity triggered storm sampling unit will be set up to allow automatic sampling during storm events. Composite and storm event samples will be analyzed for phosphorus, nitrogen, TSS/VSS, TOC and field parameters.

In the future the new site, CC49, upstream of the confluence of the North Fork will serve as an "Early Warning System" for the downstream water supply.

Quality Assurance / Quality Control

Quality control samples were collected, prepared, and analyzed in 2004. For each monitoring event, one 2-liter sample was randomly selected out of the 17 Clear Creek samples for preparation of both the spike and duplicate. The laboratories received the following quality control samples:

- Northglenn – spike and duplicate for Total Phosphorus (TP)
- Westminster – spike and duplicate for Total Nitrogen (TN)

- Arvada using Chadwick Ecological Services- spike and duplicate for both TP and TN

The spike recovery and relative percent difference data obtained from the quality control samples provides validation that the monitoring program data are acceptable. Results are in Appendix B.

Standley Lake Supply Canal Monitoring - Croke and Farmers High Line

Two canals, the Croke and Farmers' High Line, are sampled as a part of the monitoring program. One of the two canals was sampled normally within seven (7) days following each Upper Clear Creek Basin sampling event. There were three (3) sampling sites on each canal: the headgates, midpoints and inlets to Standley Lake. See Appendix C for results.

Thornton operated two auto-samplers at the headgates, Arvada at the midpoints, and Northglenn at the lake inlets. The auto-samplers were set up to draw one sample every hour for a 24-hour composite. The midpoint auto-sampler was set to start 4-6 hours after the headgate sampler and the lake inlet auto-sampler was set to start 4-6 hours after the midpoint auto-sampler. The delay in start times was varied based on flow velocity.

Northglenn performed ortho phosphorus and total phosphorus analysis on the canal samples. Thornton performed suspended solids, volatile suspended solids and TOC analysis, and Westminster performed total nitrogen, nitrate, ammonia, conductivity and turbidity analyses on the canal samples. Arvada collected splits of the canal midpoint samples and sent them to a contract laboratory for analysis of total nitrogen and total phosphorus.

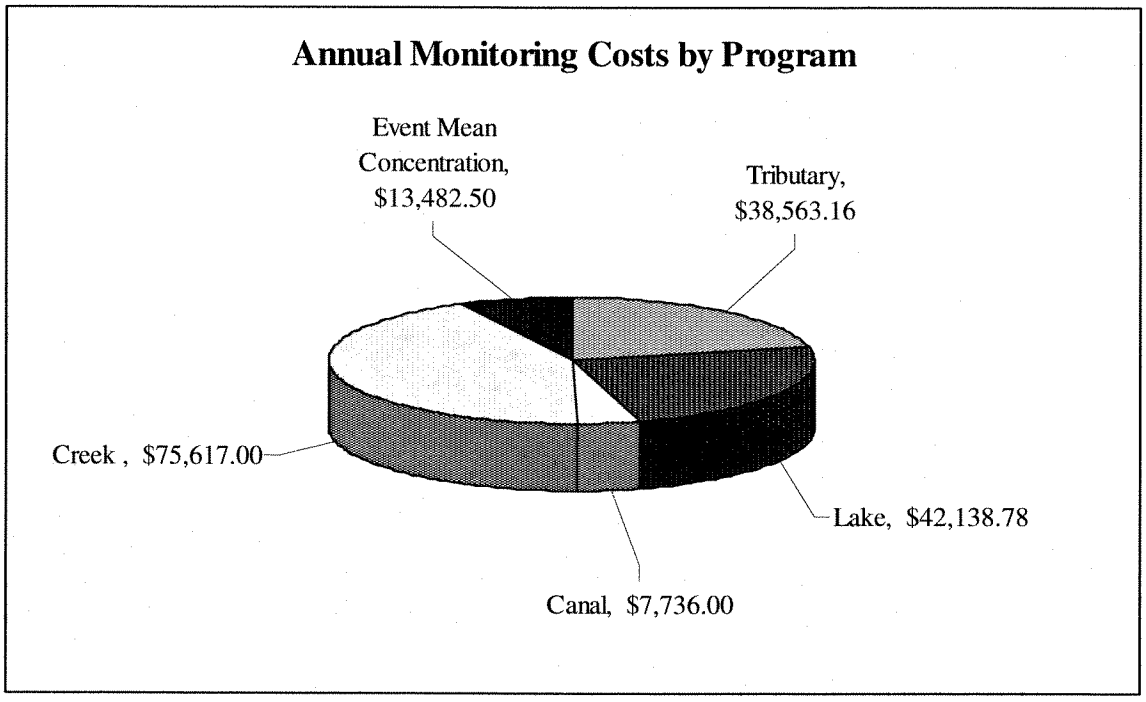
Standley Lake Monitoring

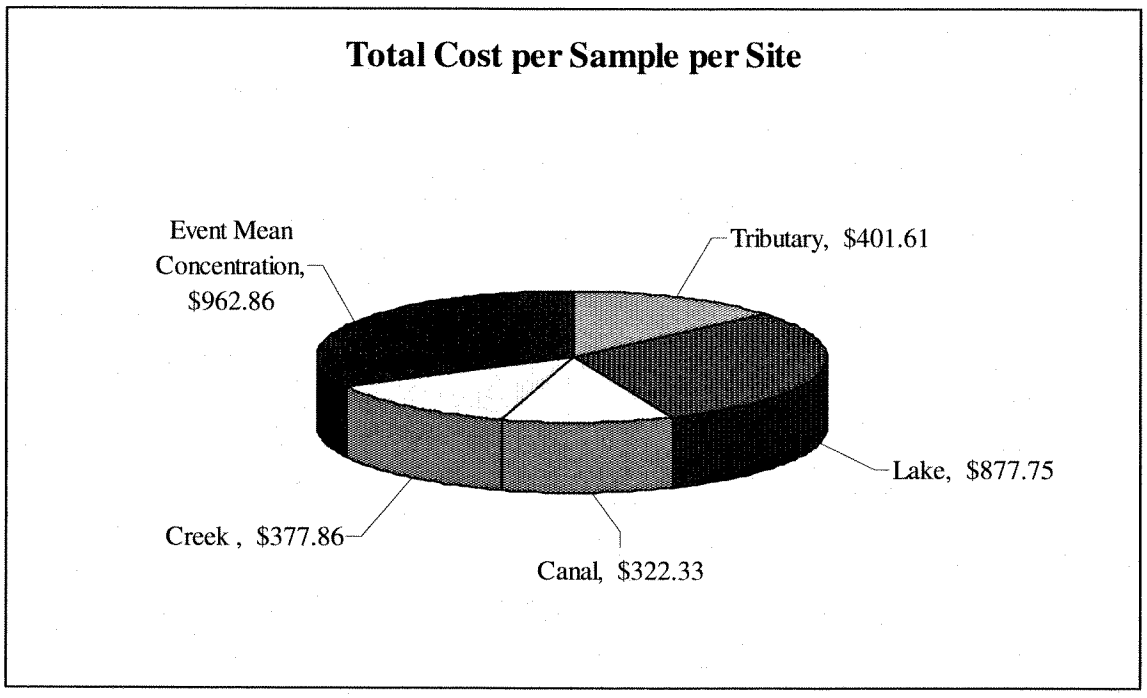
In 2004, Westminster Laboratory staff sampled Standley Lake from a boat on 21 dates from January 13th through December 21st at site 10, on the east side of the lake near the dam. At this location, samples were collected at up to three levels: the surface, the photic zone (twice the secchi depth) and five feet from the bottom. When weather permitted, samples were collected twice a month in an attempt to accurately assess algal growth, the period of hypolimnetic anoxia, and lake turnover. Westminster measured the secchi depth in the lake to determine clarity and define the photic zone. A multi-parameter sonde with sensors to measure temperature, specific conductance, pH, ORP, turbidity, chlorophyll-a and dissolved oxygen was lowered through the water column to take readings at 1-meter intervals. Westminster also performed total nitrogen, nitrate and ammonia analyses. Northglenn performed total phosphorus and ortho-phosphorus analyses. Thornton performed coliform analyses, solids analyses, algae count, algae identification and chlorophyll a analyses. Arvada collected split samples from 9 of the sampling events and sent them to Perkins Limnological Laboratory or Chadwick Ecological Services for total phosphorus, total nitrogen and chlorophyll-a analyses. Other parameters that were collected on an intermittent basis included metals (quarterly), gross alpha and beta (6 samples) and TOC, (6 samples). Additionally, five samples were collected at the boat ramp for BTEX analysis.

The Remote Underwater Sampling Station (RUSS) unit was deployed on Standley Lake on March 15th, 2004 and remained on the lake until December 21st, 2004. Two YSI 6600 sondes were alternately placed on board the profiler approximately every other week. Both sondes carried sensors for temperature, specific conductance, pH, ORP, turbidity, chlorophyll-a and dissolved oxygen. During the deployment period, the RUSS executed at least one full-column profile on 281 separate days. At the time the buoy was removed from the lake, it was discovered

that gale-strength winds had destroyed the western perimeter buoy and compromised the anchoring system. The RUSS buoy itself was undamaged, but a new set of anchors and anchor lines may need to be set in spring 2005.

Monitoring Costs





Costs include administrative time for data entry, quality control and report writing at $30/hour. No costs for instrumentation are included. Commercial laboratory rate/sample was used when available.

Event description	#Sampling Sites	# Sampling Events	Total # of samples
Event Mean Concentration (EMC)	2	7	14
Creek	25*	8	200
Tributary	8	12	96
Canal	3	8	24
Lake	3	16	48

* 17 creek sites + 8 WWTF

The EPA participates in an ancillary metals monitoring program where the watershed sampling teams collected the samples in conjunction with the routine monitoring program. The analytic costs were approximately $14,000 in 2004.

Monitoring Program Contributions

Arvada

- X Operated one auto-sampler for canal sampling
- X Coordinated and funded independent quality control laboratory services
- X Provided sampling personnel for Clear Creek and canal sampling
- X Provided funding for consultant to monitor Southern Access Road BMP's

Golden

- X Provided funding for EMC sampling
- X Metals analysis for EMC
- X Prepared quality control samples
- X Administered the Clear Creek / Standley Lake database
- X Provided laboratory for field testing
- X Printed Chain of Custody forms
- X Provided staff for Clear Creek sampling several times

Northglenn

- X Provided funding for EMC sampling
- X Performed phosphorus analysis (total and ortho-)
- X Provided one auto-sampler and staff for canal sampling
- X Coordinated canal sampling program
- X Conducted and coordinated the tributary sampling program
- X Provided funding for consultant to monitor Southern Access Road BMP's
- X Funded Watershed Management Model update
- X Funded Lake Model update

Thornton

- X Provided funding for EMC sampling
- X Provided field testing instrumentation and analyzes
- X Coordinated overall Clear Creek monitoring program
- X Coordinated delivery of Clear Creek samples to laboratory

X Routinely provided personnel for Clear Creek sampling
X Routinely provided personnel for Tributary sampling

Thornton (cont.)

X Delivered sample bottles to sampling teams
X Provided one auto-sampler plus assistance with collection and delivery of canal samples
X Performed algae counts and identification, chlorophyll a, TSS/VSS, TOC & *E. coli* analyzes
X Provided funding for consultant to monitor Southern Access Road BMP's
X Funded Watershed Management Model update
X Funded Lake Model update

Upper Clear Creek Watershed Association

X Provided funding for EMC sampling
X The City of Idaho Springs provided personnel for several sampling events on Clear Creek

Westminster

X Provided funding for EMC sampling
X Conducted Standley Lake sampling program
X Provided boat and field testing equipment
X Routinely provided sampling personnel for Clear Creek sampling
X Performed total nitrogen, nitrite/nitrate and ammonia analyzes
X Contributed $ for consultant to monitor Southern Access Road BMP's
X Funded Watershed Management Model update
X Funded Lake Model update
X Maintains RUSS equipment and RUSS database
X Database peer review and data distribution

Monitoring Results

In an effort to understand spacial and temporal changes and also in support of the narrative standard on Standley Lake, nutrient comparisons for 2004 were made against the 1994 through 2003 sample data. The three sites chosen are all on the mainstem of Clear Creek. In site order upstream or most pristine, downstream to the headgate of Church Ditch in Golden, Colorado the sites are:

CC05: I-70 at Bakerville. Anthropomorphic influences include CDOT's Loveland Pass wastewater facility, septic systems, and stormwater runoff from roadways.

CC40: USGS gage at Kermit's Restaurant, below the confluences of West Fork, Leavenworth Creek, Chicago Creek, Fall River, and South Fork, upstream of the confluence with North Fork. Anthropomorphic influences include multiple wastewater treatment plants, septic systems, abandoned mines, and stormwater runoff from towns and roadways.

CC60: At the Church Ditch Headgate, below the confluences of North Fork, Beaver Brook, Soda Creek and Elk Creek. Anthropomorphic influences include multiple wastewater treatment plants, septic systems, abandoned mines, rock/gravel mines, and stormwater runoff from towns

and roadways.

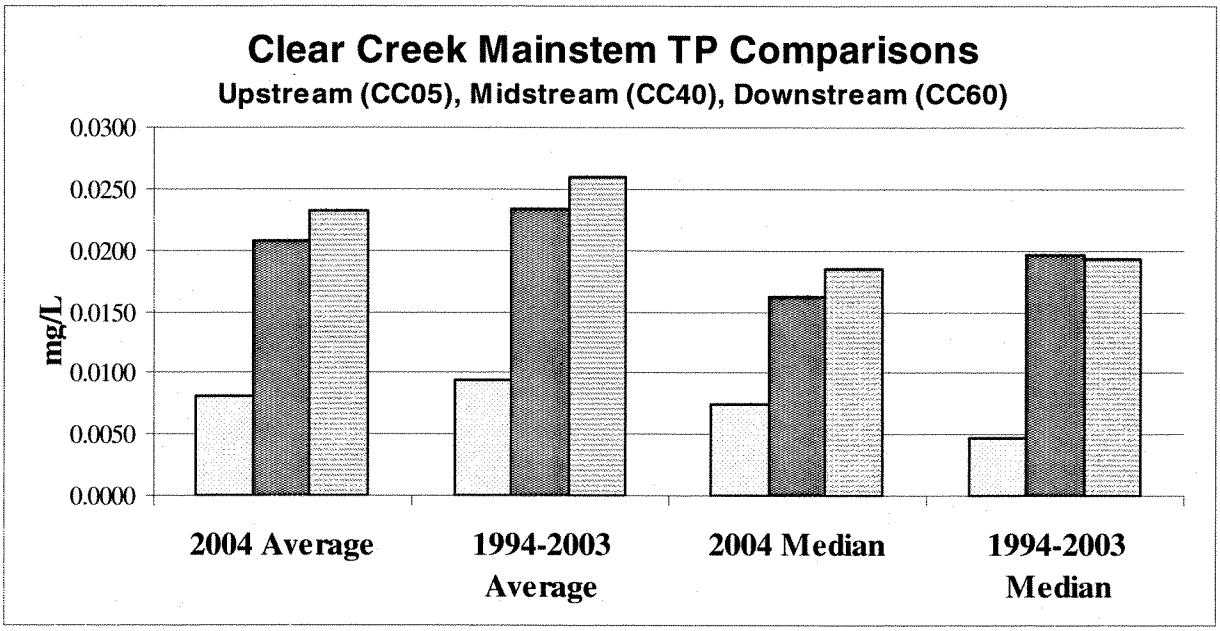


Figure 1.1: Current year with previous year's comparison of total phosphorus averages and means by sample site.

Averages for 2004, all sites, were double digit reductions over the 1994 to 2003 time period averages. The median at CC05 saw a 60% increase in 2004 over the same time period. Medians for CC40 and CC60 saw reductions.

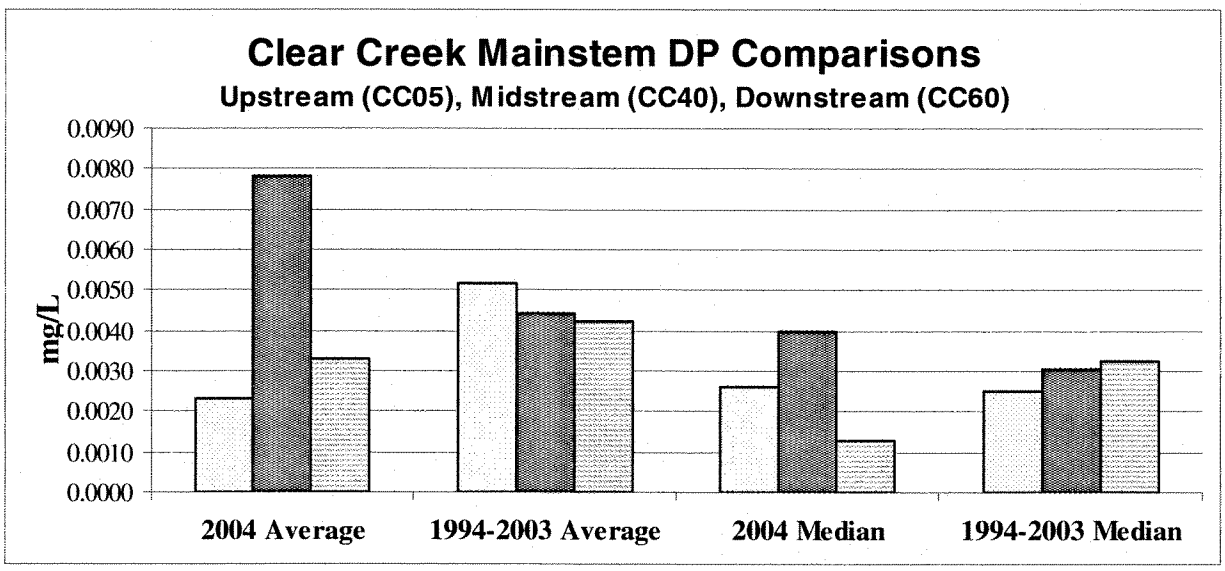


Figure 1.2: Current year with previous year's comparison of dissolved phosphorus averages and means by sample site.

Two sites, CC05 and CC60 saw double digit reductions over the 1994 to 2003 time period averages. Site CC40 saw a 77% increase in average DP over previous years. The median at CC40 increased 29% and CC05 a 5% increase over the same time period while CC60 saw double digit reduction in its median.

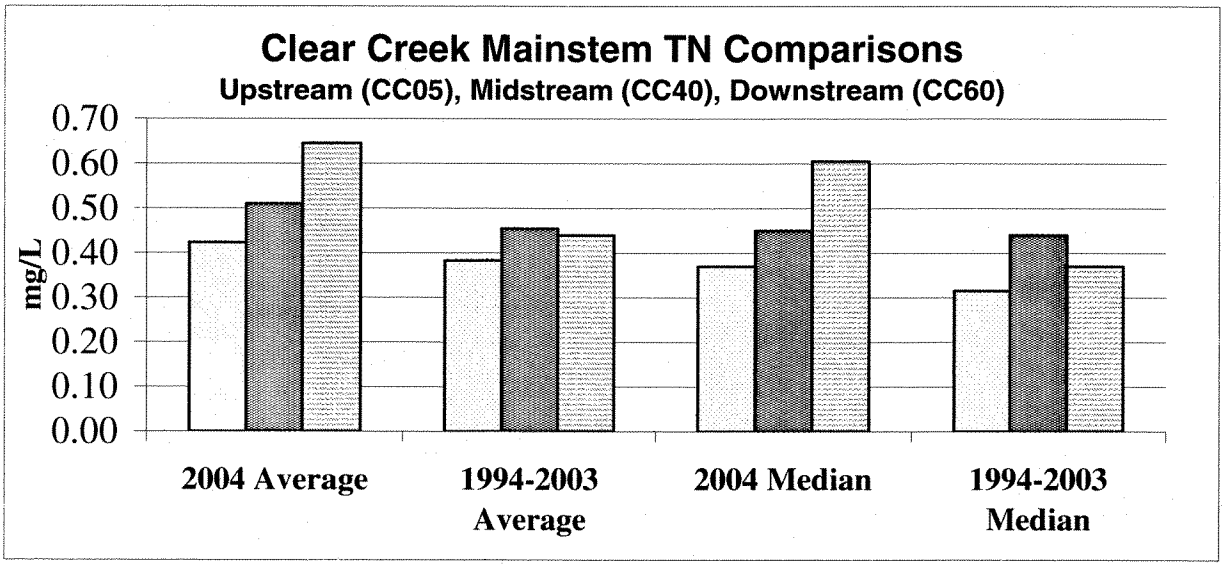


Figure1.3: Current year with previous year's comparison of total nitrogen averages and means by sample site.

Average total nitrogen for all sites showed double digit increases in 2004 over the 1994 to 2003 time period averages. Site CC60 showed the greatest average increase at 48% over the previous years. Medians for all sites saw double digit increases in 2004 over the 1994 to 2003 time period. The median at CC60 saw a 65% increase over the same time period.

Clear Creek Summary Table Results

The highest total suspended solids reading occurred on 10/6/2004 at siteCC52, Confluence of Soda Creek & Beaver Brook. The reading was 600 mg/L. Note that the period of record for this station is four years.

The lowest total suspended solids reading occurred on multiple dates and locations (see Appendix C). The reading was less than 1mg/L.

The highest turbidity reading occurred on 10/6/2004 at site CC50, N. Fork just above confluence with mainstem. The reading was 838 NTU. The N. Fork also had the highest turbidity reading in 2003.

The lowest turbidity reading occurred on 12/1/2004 at site CC30, Fall River immediately above confluence with mainstem. The reading was 0.39 NTU.

The highest total phosphorus reading occurred on 10/6/2004 at site CC50,N. Fork just above confluence with mainstem. The reading was 0.2431 mg/L.

The lowest total phosphorus reading occurred on multiple days and sites See Appendix (C). The reading was <0.0025mg/L.

The highest dissolved phosphorus reading occurred on 10/6/2004 at site CC52, Confluence of Soda Creek and Beaver Brook. The reading was 0.0.0277 mg/L. Note that the period of record for this station is four years.

The lowest dissolved phosphorus reading occurred on multiple dates and locations (see Appendix C). The reading was <0.0025 mg/L.

The highest total nitrogen reading occurred on 2/2/2004 at site CC50, N. Fork at confluence with mainstem. The reading was 1.97 mg/L. Site CC50 also had the highest total nitrogen reading, Winter of 2003.

The lowest total nitrogen reading occurred on at CC45, N. Fork immediately above Black Hawk/Clear Creek wastewater treatment plant. The reading was 0.08 mg/L.

Standley Lake Trophic Parameters

The narrative standard on Standley Lake was adopted in 1994. It specifies measurable indicators or parameters that are commonly used to determine a lake's trophic level. Collecting and evaluating this data requires a tremendous amount of staff time and monetary resources. The Standley Lake Cities are committed to continuing monitoring the water quality of Standley Lake and evaluating the data.

In 2004, ten years after the adoption of the narrative standard, the Standley Lake Cities strengthened the SL Management Plan, adding a statement of basis and purpose, setting goals, objectives, tasks, and setting a timeline for completing the tasks. The monitoring program is guided by this set of documents. The mission statement reads:

To protect the quality of Standley Lake as a drinking water supply through the application of scientifically based and fiscally responsible management techniques. Optimize the health of Standley Lake and its watershed for current and future generations.

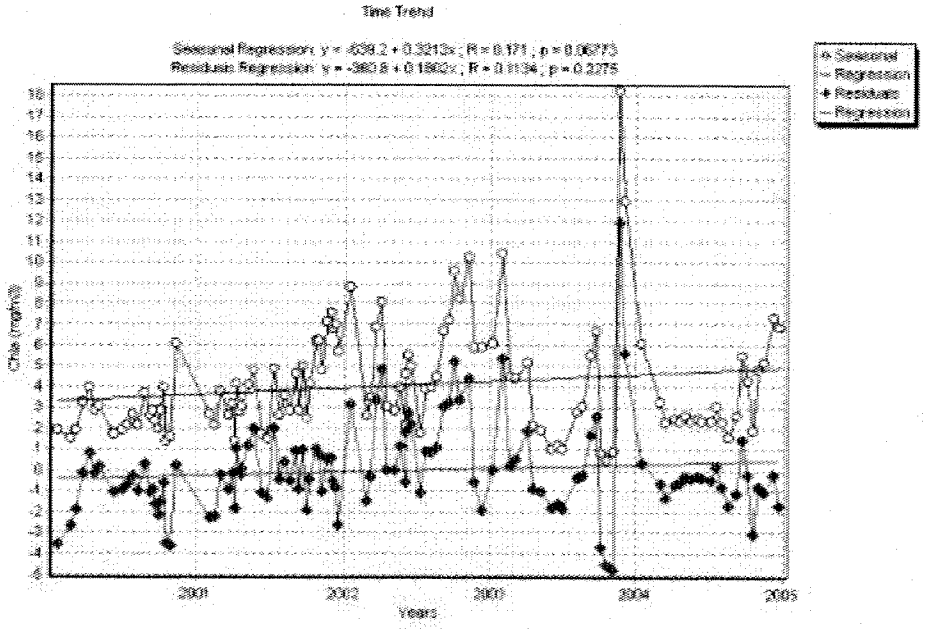
The word health and ecological condition are interchangeable in the statement. Health should be thought of as an over arching state of the lake which includes parameters not listed in the narrative standard. Parameters such as algal species diversity, bacteria counts, toxic materials, in addition to typical, trophic status variables. While this report does not include discussion on this broader topic the SLC feel that it is important to consider trends in these parameters and integration of findings when making lake management decisions.

Lakewatch is a trending software program used by the SLC to evaluate monitoring program data. Dr. Noel Burns, renowned limnologist, is the developer of Lakewatch. Dr. Burns suggests that selecting an appropriate time period is crucial for trend detection. "It is important not to extend trend lines from years where a particular trend is evident to other years where the trend no longer exists." Dr. Burns also cautions that a minimum of three years data are required to determine a trend. Upon review of the Carlson Trophic State Index Values and Trends a clear change in water quality occurred between 1999 and 2000. Therefore, the time period of 2000 thru 2004, five years, were selected for trend analysis. The following sets of graphs were generated using the Lakewatch program. All indicators were measured at site SL10, near the dam face. Standley

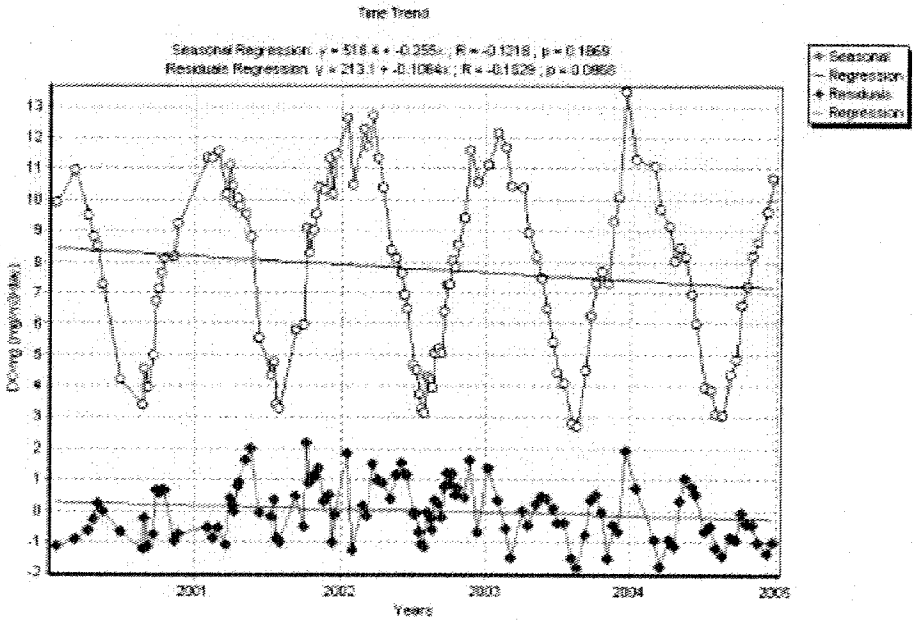
Lake was sampled from a boat on 21 dates from January through December. Samples were collected twice a month (weather permitting).

The top regression line shows observed data, the bottom regression line, plotted as residuals, is deseasonalized data, i.e. data from which seasonal variation has been removed. Residual values are calculated using the polynomial (from the seasonal trend analysis) subtracted from the measured data. Regression lines using least square regressions are calculated for both sets of data. A low p-value correlates to a low probability that the fit of the line is attributable to chance, i.e. there is a high probability of a trend.

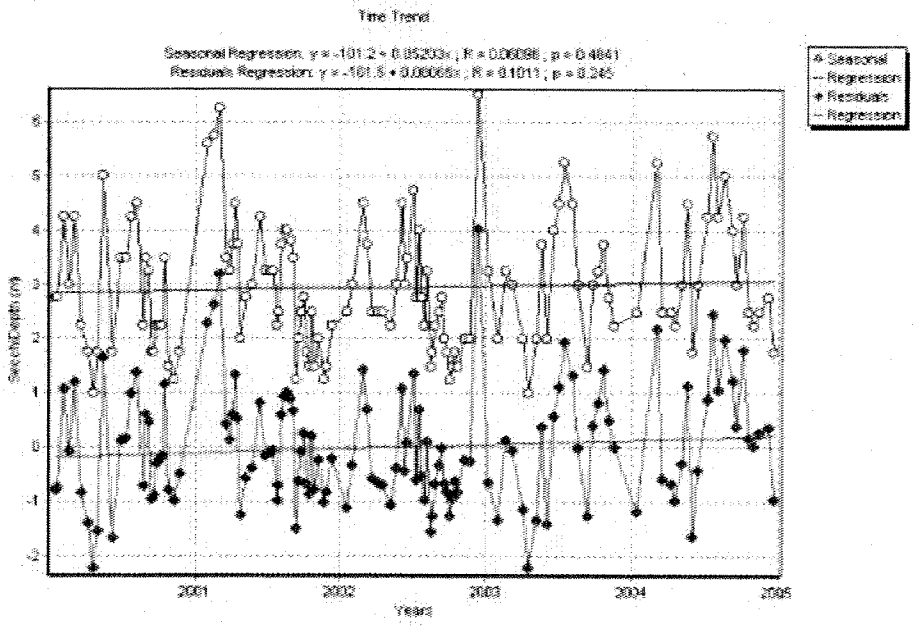
The following graph generated by the Lakewatch software program indicates that uncorrected chlorophyll a is trending upward but that the trend is not significant.



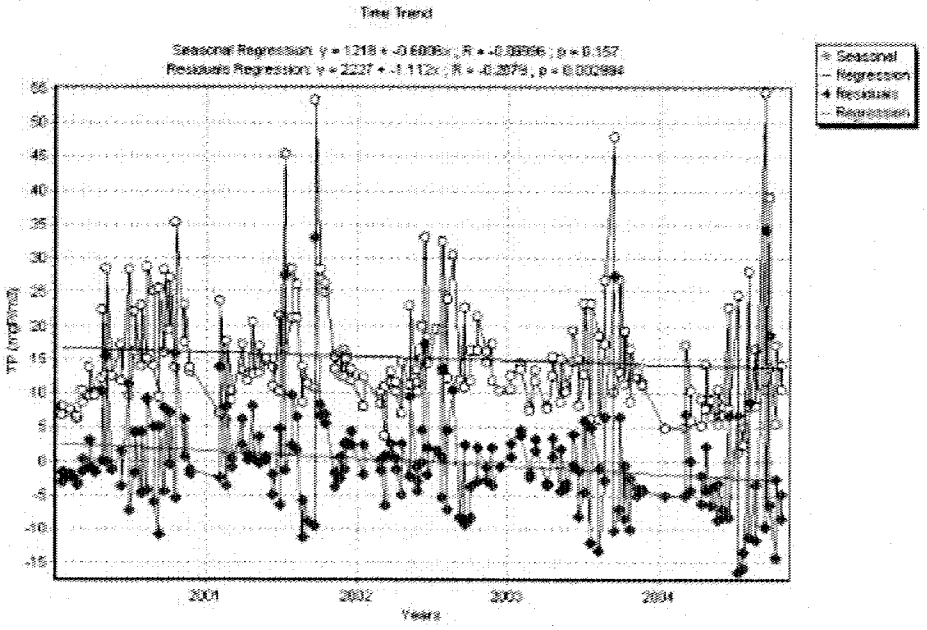
The following graph generated by the Lakewatch software program indicates that total dissolved oxygen levels are trending downward but that the trend is not significant..



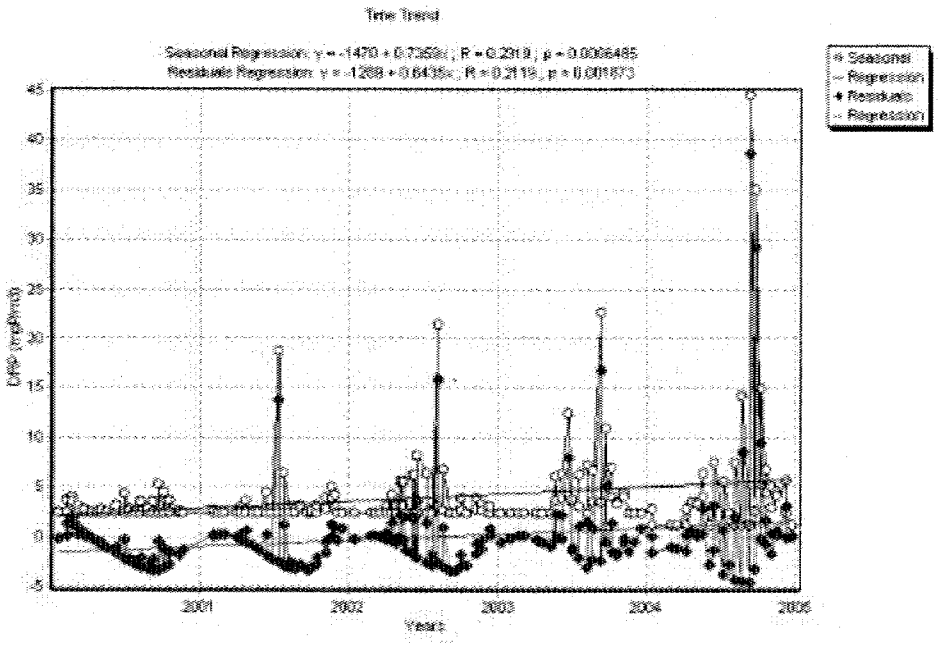
The following graph generated by the Lakewatch software indicates Secchi depth is trending upward but that the trend is not significant. The photic zone is the depth to which light can penetrate, and is calculated by doubling secchi depth.



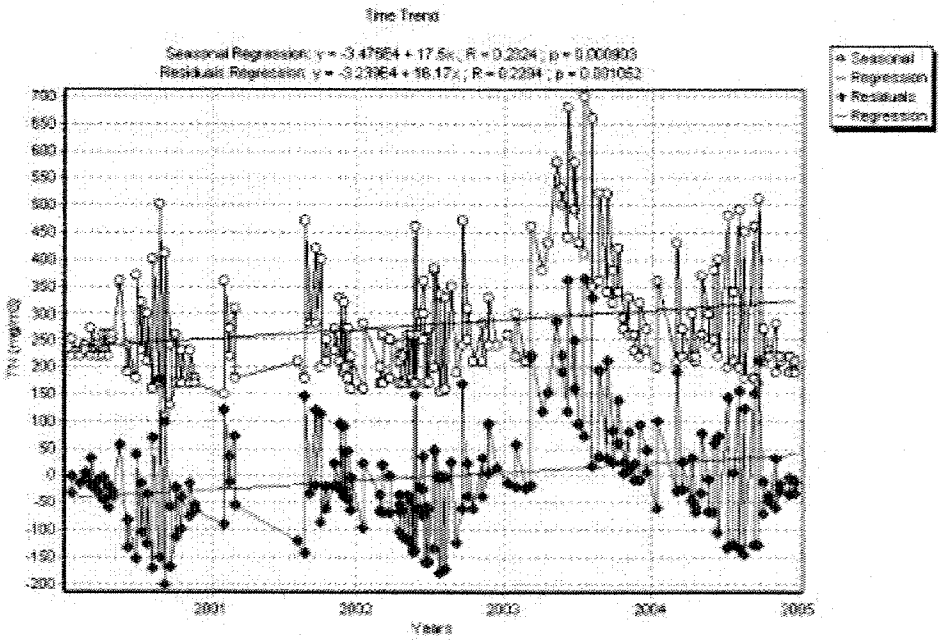
The following graph generated by the Lakewatch software indicates that total Phosphorous is trending downward at a rate of 0.0011mg/L/year. The trend is significant.



The following graph generated by the Lakewatch software indicates that dissolved phosphorus is trending upward at a rate of 0.0006 mg/L/year. and that the trend is significant.



The
following graph generated by the Lakewatch software indicates that total Nitrogen is trending upward at a rate of 0.0162 mg/L/year.



To further characterize water quality in Standley Lake, a mass balance loading calculation was performed. The results are in the table below.

Standley Lake Mass Loading Summary, 1994 through 2004 (BDL=MDL)

Year	Total Phosphorus (lbs)			Dissolved Phosphorus (lbs)			Nitrate + Nitrate (lbs)			Ammonia (lbs)		
	Inflow Load	Outflow Load	Net Reservoir Loading	Inflow Load	Outflow Load	Net Reservoir Loading	Inflow Load	Outflow Load	Net Reservoir Loading	Inflow Load	Outflow Load	Net Reservoir Loading
1994	1,974	2,949	(975)	772	783	(10)	17,507	14,269	3,238	2,507	4,831	(2,324)
1995	8,166	2,611	5,555	1,201	773	427	35,473	27,865	7,608	5,168	2,413	2,755
1996	4,283	1,834	2,448	793	666	127	26,550	18,416	8,135	3,322	4,339	(1,017)
1997	6,177	1,934	4,243	1,202	381	820	33,188	16,493	16,695	4,077	4,058	20
1998	10,304	1,761	8,543	978	2,191	(1,213)	39,148	20,598	18,551	3,377	3,188	189
1999	8,179	2,601	5,579	944	179	764	47,687	25,090	22,597	4,778	2,441	2,337
2000	28,798	12,558	16,240	650	674	(24)	13,865	6,625	7,240	1,405	1,188	217
2001	11,535	2,270	9,265	898	444	454	27,240	12,457	14,783	1,905	5,417	(3,512)
2002	1,827	1,629	198	395	485	(90)	14,605	4,562	10,043	1,160	2,156	(996)
2003	5,116	1,526	3,590	1,197	623	574	45,161	26,223	18,938	2,014	1,844	170
2004	3,902	1,146	2,756	626	625	1	21,283	10,799	10,484	1,144	2,039	(895)

Note: Parentheses indicate a negative value.

Nitrogen and phosphorus net reservoir loadings for 1999 and 2000 support the observed changes in Trophic State Index Values and the subsequent selection of the 2000 thru 2004 time period for trend analysis.

There are four principal ditches that deliver water to Standley Lake. They are: Croke Canal (Croke), Farmers Highline (FHL), Kinnear Ditch Pipeline (KDPL), and Church Ditch (WC Church). Understanding diversion seasons assists in the characterization of pollutant sources. For example, the Croke season is generally October 31st through April 14th. These waters are predominately low flows and influenced by waste water facilities and stormwater runoff. To characterize nutrient loadings from each of these ditches the loading inflows by ditch were divided by the acre feet of water diverted yielding pounds per acre foot of water diverted. This exercise indicates the presence or absence of seasonal variation, and assists with identifying potential nutrient source(s). The table below summarizes nutrient inflows by ditch for 2004:

BDL=MDL

Ditch	Diversion Season	TP	Dissolved P	TN	% of Total
		#/acre ft	#/acre ft	#/acre ft	2004 Diversions
Croke Canal	10/31 to 4/14	0.22	0.02	1.52	33%
FHL	4/14 to 10/31	0.05	0.02	0.90	53%
KDPL	Year round*	0.06	0.02	1.18	11%
WC Church	4/14 to 10/31	0.18	0.04	1.04	2%

* Multiple water sources are delivered through the KDPL allowing diversions essentially year round.
The total percentage does not add up to 100% due to rounding.

II. THE UPPER CLEAR CREEK WATERSHED ASSOCIAATION

City of Black Hawk

The City continues to require the use of Urban Drainage and Flood Control District Volume III Best Management Practices (BMPs) on projects in its jurisdiction. Construction projects are also required to obtain stormwater permits from the State. The City's BMPs for its Lower Main Street project were inspected by the State in 2004, and found to be in compliance with State requirements.

The City continues to implement its sand and sediment detention pond clean-out program.

Black Hawk/Central City Sanitation District

The District spent 2004 working on finishing construction of its new $22 million regional wastewater treatment facility. The new facility will include biological nutrient removal (BNR), filtration, and ultraviolet disinfection. Start-up is currently scheduled for mid-2005. With the new construction, the existing Total gas station just downstream will be connected to the wastewater plant, thus eliminating its septic system. Planning and design has been completed for the pipeline to connecting to the Total station, and part of the pipeline has been laid.

The District's existing wastewater treatment plant continues to be in compliance with permit limits, and continues to remove phosphorus and nitrogen using the BNR process.

Clear Creek County

Environmental Services issued 53 ISDS permits in 2004 and conducted 289 inspections of ISDS systems.

Clear Creek County revised the ISDS requirements associated with the Saddleback development. ISDS constructed for homes in the development need to meet a phosphorus limit of 8 mg/l; all ISDS must be constructed with a sample port between the treatment unit and leach field; and the sewer district will monitor individual ISDS at least annually. Sampling continues at the two groundwater monitoring wells required downgradient of the subdivision, and no impacts have been seen to date.

Clear Creek County also participated in the Virginia Canyon Project; see below.

Clear Creek High School

Temporary trucking of sewage from the high school to Central Clear Creek Sanitation District's wastewater treatment plant ended on February 1, 2004, when the high school's xenon membrane filtration plant came on line.

Climax Molybdenum Company

Urad Minesite: Climax spent $125,000 in 2004 to upgrade the stormwater diversion around the lower tailings impoundment in the Urad Valley. The reconstructed diversion should eliminate any potential contamination of stormwater with mine waste and decrease suspended solids discharging into Woods Creek.

Henderson

Climax installed two flumes to measure flows in the watershed. One is located in the West Fork of Clear Creek and the other in Woods Creek. The flumes are equipped with satellite communications and the data is available on-line.

Colorado Department of Transportation

CDOT has continued its Highway Stormwater Monitoring project along I-70. This includes data on snowmelt and runoff events. The Department is in the midst of the I-70 Corridor PEIS process. Water quality impacts are among those being evaluated; mitigation will be identified in the PEIS for all significant impacts.

CDOT is also exploring water quality stream impacts in its Gaming Area EIS, covering portions of Gilpin County.

Water quality monitoring continues on the Berthoud Pass improvements project. (The Berthoud Pass East project received an award from the International Erosion Control Association in 2003.)

CDOT worked cooperatively with UCCWA to conduct a preliminary evaluation of the levels of phosphorus in magnesium chloride used in the watershed. It was concluded that mag chloride was an insignificant contributor of phosphorus, compared to other sources.

In 2004, CDOT repaired a corroded culvert on Floyd Hill, which helped reduce localized erosion into Johnson Gulch.

CDOT also completed a design for the Colorado Boulevard project, for drainage and water quality improvements; see further discussion under "Idaho Springs" below.

Coors Brewing Company

Coors Brewing Company has been working cooperatively with the Colorado Division of Wildlife over the past year on a habitat assessment for portions of lower Clear Creek. In 2004, two intensive habitat surveys using EPA's EMAP protocol were completed; additional work is planned for 2005.

The facility continues to implement stormwater BMPs on site, and diverts certain designated stormwater collection areas to its wastewater plant for treatment.

Coors Brewing Company also conducts water quality monitoring, including nutrients, on lower Clear Creek, and shares this data with the State and UCCWA.

Town of Empire

The Town of Empire and Empire West have negotiated an agreement that would allow the residents and businesses in Empire West to discharge into Empire's wastewater treatment plant. Residents of Empire West are now seeking funding to implement this change. Once completed, between 40 and 50 septic systems would be eliminated.

Town of Georgetown

Georgetown's NPDES permit went through the renewal process this past year. A draft was issued, which included some more restrictive limits. A final permit has not yet been issued.

Georgetown addressed infiltration/inflow issues in the sewer line on Rose Street by slip lining the sewer. I/I activities budgeted for 2005 include installing a sump line on Rose Street so that basement sumps can be discharged to the storm sewer instead of into the sanitary sewer, and repair of the sewer line on Argentine Street.

Gilpin County

Gilpin County formed a new Public and Environmental Health Services Department, and hired a new employee, whose responsibilities include ISDS. The County continues to require pretreatment on new ISDS installations for lot sizes less than 2 acres, and for situations where there is less than 200 feet between the leach field to the well. The use of these advanced pretreatment units significantly decreases the amount of nitrate that is discharged to the groundwater. The County is also instituting a new tracking system for all advanced pretreatment systems, so that the County can have personal contact with all pretreatment system owners, and ensure that the lifetime maintenance requirements are met. To date, the County has identified about 200 advanced pretreatment units; the County expects the full list to be completed in early 2005.

The County continues to implement its IGA with Central City and Black Hawk, which identified growth areas for each jurisdiction, and identifies areas that are to sewer up to the Black Hawk/Central City Sanitation District's wastewater treatment plant.

City of Golden

Water Quality

- In 2004, as part of the long term water quality monitoring program for the Fossil Trace Golf Course, the City participated in a macro-invertebrate study in conjunction with the Colorado Department of Wildlife. The study focused on wetlands and drainage ways in and adjacent to the golf course.

Watershed / Other Activities

- $2,000 to the fifth phase of the Event Mean Concentration (EMC) Study performed by Clear Creek Consultants, Inc. In addition, the City provided metals analysis for samples taken in 2004.
- Active participation in and a $2,850 annual contribution to the Upper Clear Creek Watershed Association.
- $5,888 annual contribution to the Rooney Road Recycling Center including participation as a board member.

Stormwater Program

In 2004, the City continued activities in accordance with its Municipal Stormwater Permit under the Colorado Discharge Permit System.

- Two new public education events were added to the program. These included a city-wide Earth Day celebration held in conjunction with Shelton Elementary and a dog run and swim held at the Splash Aquatic Park.

- The Environmental Services Division responded to 26 illicit discharges or spills to the storm sewer system.

- The construction site runoff control program managed 51 stormwater quality permits for construction site activities, conducted 961 erosion and sediment control inspections, and issued 22 compliance orders and 3 stop work orders.

- The long-term stormwater management program conducted 1,478 maintenance inspections of storm sewer systems including inlets, manholes and structural BMPs.

- The City created a new full time Stormwater Utilities Supervisor position to oversee and implement the stormwater maintenance plan.

- Five additional staff received Erosion and Sediment Control Supervisor Certification.

Drainage and Stormwater Capital Projects

- The City contracted Wright Water Engineers to study Arapahoe Gulch to determine the current flood carrying capacity of the channel and areas needing improvement.

- Installation of two new box culverts in Kinney's run on the south side of Golden and minor erosion control work to Tucker Gulch and Kinney's Run including grading and installation of rip rap controls.

City of Idaho Springs

In 2004, the City installed a new bar screen with pressure wash at its wastewater treatment plant. The bar screen is expected to be operational by the end of the first quarter 2005. In addition, a pH adjustment system for corrosion control was also installed at the water treatment plant (which will help the wastewater treatment plant comply with its metals limits). The City continues to implement its infiltration/inflow program to reduce inflows to the wastewater treatment plant; an RFP for major I/I work will be issued in 2005. The wastewater treatment plant was in compliance with all permit limits throughout 2004. Ammonia nitrogen levels are consistently below 0.5 mg/l NH_3-N.

Idaho Springs is an active participant in discussions for a regional wastewater facility; see below.

CDOT, CDPHE, and Idaho Springs cooperatively pursued the Colorado Boulevard Infrastructure Project in 2004. A main impetus of the Colorado Boulevard project is to improve drainage and water quality. The project is currently designed to include sediment capture and clean-out features. Concurrently, Idaho Springs will install a new sewer line. The Big 5 Tunnel project (to convey tunnel discharges to the Argo Treatment Plant) will also be part of this project. The project was bid in 2004. Responsive bids were too high, and the project is being rescoped.

Jefferson County

In 2004, Jefferson County adopted a Stormwater Utility, and began charging fees of its users. The money will be used to ensure compliance with the County's Phase II CDPS Stormwater Permit, and to construct capital projects for both water quality and water quantity control.

The County also revised its grading regulations to be compliant with its Phase II Stormwater Permit. As a part of this program, the County approved the hiring of one new person to conduct plan review and enforcement activities, and one additional person to conduct stormwater inspections.

The County also adopted a storm sewer inlet marking program, placing decals on inlets.

Mount Vernon Country Club

Planned modifications to Mount Vernon's wastewater treatment plant moved through the site application and utilities planning process in 2004. UCCWA provided comments on the site application, concerning the need to comply with the requirements of the Standley Lake Agreement. Mount Vernon Country Club joined the Upper Clear Creek Watershed Association as a member.

St. Mary's Glacier Water and Sanitation District

Previous upgrades and operational adjustments have exceeded expectations. St. Mary's now discharges TSS, BOD, and ammonia at levels below detection.

Shwayder Camp

Shwayder Camp continues to operate its 5,000 gallon per day recirculating sand filter during the summer camp season. BMPs are also used to control erosion at the Camp.

Town of Silver Plume

Silver Plume eliminated the use of a salt/sand mixture for winter road maintenance. They replaced this mixture with ¾" gravel, significantly reducing salt and sand in stormwater.

Silver Plume has taken a lead role in initiating and hosting the discussion of wastewater plant regionalization in Clear Creek County; see discussion below.

Silver Plume completed repairs to sewer lines to reduce infiltration/inflow into the Georgetown plant by 60,000 – 80,000 gallons per day.

Additional Projects

Regional Wastewater Treatment Plant: Three meetings have been held to date to investigate the possibility of constructing a regional wastewater treatment plant in Clear Creek County. In addition to a new plant, physical connections of existing plants and shared maintenance and operational responsibility have also been discussed.

Virginia Canyon: A significant effort, by a coalition if interested parties, took place in Virginia Canyon in 2004. Clear Creek County undertook a substantial effort to move and improve culverts, construct catch basins and sediment basins to reduce the impacts of solids and erosion during storm events. The Clear Creek Watershed Foundation constructed a waste consolidation area at the Gem Mine, including stormwater controls and a sedimentation basin, and used the new facility to move the Little Six pile. The Colorado Department of Public Health and Environment installed a groundwater cut-off wall and is working to upgrade the Argo Treatment Plant so that metal impacted groundwater from Virginia Canyon can soon be treated at the Argo Plant.

Dial-Down System: Clear Creek County hired a full time coordinator in its Office of Emergency Management, updated its dial down list for spills into Clear Creek, and coordinated with Golden's dispatch to establish procedures for initiating the EPN. The system has performed as designed since it was put into place.

319 Grant: In 2004, UCCWA applied for and received a $25,000 Section 319 grant, which will be used, in part, to develop the first 5 components of a Watershed-Based Plan for the Upper Clear Creek Watershed.

III. TRIBUTARY BASIN ENTITIES REPORT

Tributary Basin Area

The Standley Lake watershed consisting of the Clear Creek basin above Golden and including the tributary basin (see map on page 4) consists of approximately 282,000 acres. The tributary basin consist of approximately 20,750 acres, at the end of 2004 approximately 13,000 acres or 63% of the total Tributary Basin is separated from the canals and Standley Lake and therefore do not drain into the canals or Standley Lake. What does this mean?

In 2004 Arvada continued to work with developers and the Farmers Highline Company (FHLC) to install bypass structures for the development at Westwood's Center located in the Ryan Gulch / Hyatt Lake drainage basin. The completion of all planned structures is this sub basin is scheduled for 2005.

Installation of the various BMP's including three Vortech stormwater inlet structures along 86th Parkway prior to discharging to Standley Lake was completed in 2004.

The plans with Arvada, the FHLC, and U.S. Fish and Wildlife regarding bypassing the drainage above Two Ponds Wildlife Refuge, from the FHLC continued. The project would include a new stormwater bypass pipe under the FHLC and Croke Canals as well as realignment of the FHLC to allow for a stormwater detention basin upstream of the canals. The Two Ponds drainage area includes portions of the City of Arvada that have been developed.

Standley Lake Status

The Statement of Basis and Purpose for the narrative standard for Standley Lake adopted by the Water Quality Control Commission in 1994 stated: "Data collected over the last eleven years for chlorophyll *a* for Standley Lake indicates that the lake has been mesotrophic over that period. The trophic status of Standley Lake is based on the average magnitude of trophic state indicators measured during the period from March 1 through November 30."

The Tributary Basin Entities continue to believe that Standley Lake was mesotrophic during 1994 – 2003 and that the trophic status of the reservoir did not change in 2004. The opinion of the Tributary Basin Entities that the reservoir was mesotrophic during the 1994-2004 period is based on the fact that the average values for the most commonly used trophic state indicators of secchi depth, total phosphorus, and chlorophyll *a* are similar from 1994-2004, and place the reservoir well within the mesotrophic range. Based on this data and the data available for previous years for Standley Lake has been mesotrophic for the past 19 years.

City of Arvada

Source Control

- Arvada has continued to enforce its ordinance prohibiting unlawful discharges to its stormwater facilities. This ordinance was adopted in 1993.

- Arvada worked with an Eagle Scout to place 47 medallions with the message "Dump-no-Waste Drains to Creek" over a three miles of roads. The scouts received program

about water quality, and how disposing of waste in the storm drain is detrimental to the environment. The students place the medallions on the drain inlets and distribute 600 door hangers to area residences with information about protecting the creeks and streams. The information is in the form of a door hanger. This program and or similar ones with schools will continue in 2005.

Erosion Control During Construction

- Arvada has continued to enforce its existing ordinance concerning erosion and sediment control during construction. Arvada's existing erosion control ordinance was adopted in 1993 and incorporates by reference the criteria for erosion and sediment control during construction specified in the Urban Drainage and Flood Control District Criteria Manual, Volume 3 - Best Management Practices. Arvada's erosion control ordinance is consistent with the requirements of the Tributary Basin Management Plan.

Permanent Stormwater Quality Control for New Development or Significant Redevelopment

- Arvada continues to enforce the requirements that the owner or developer of a new development or a significant redevelopment must provide and maintain reasonable structural best management practices for permanent stormwater quality control within the development and it incorporates the criteria for permanent stormwater quality control specified in the Urban Drainage and Flood Control District Criteria Manual, Volume 3 - Best Management Practices.

- Arvada, Westminster, Northglenn and Thornton continued their discussions concerning the feasibility of using a portion of the Church Ditch beyond Little Dry Creek as a dedicated stormwater conveyance facility around Standley Lake.

Hazardous Substance Spills

In 2004 there were 31 spills to the storm drain system that required response by City personnel. None of the spills resulted in contamination to any waterways. The spill were for such items as used oil, paint and concrete rinse, and fertilizer and grease cleaner.

Central City Southern Access Road

In 2003 the City along with the Standley Lake City's hired a consultant to assist in the review of construction BMP's and inform parties of potential water quality impacts from the construction of the Central City by-pass road project (Central City Southern Access Road). The Standley Lake Cities and Canal companies have a complete write-up on the Southern Access Road on pages 36. Now that the construction activities have been completed the potential exists for future downstream water quality degradation associated with long-term stormwater management. Continued monitoring / inspection of the road project will continue.

Other Activities

- With limited water supply from Clear Creek Arvada was only able to collected limited water quality data from the Arvada Reservoir sedimentation basins. The limited data shows the benefits of settling canal water before it enters a drinking water reservoir.

In 2004 the following results were documented: Jim, it would be good to know number of samples

Parameter	% Reduction
TP (ppb)	26%
TN (ppb)	26%
TSS	34%
Pb	20%

- Arvada is an active member of the Rooney Road Recycling Center, which provides a very effective program for the recycling or safe disposal site for household hazardous wastes, including pesticides, herbicides, automotive products, electronic waste and a recycling program for tree and shrubs.

Jefferson County

Activities for Jefferson County are included in Chapter II – Upper Clear Watershed Association, page 24.

IV. STANDLEY LAKE CITIES AND CANAL COMPANIES

Outstanding notice(s) of exceedence(s) in 2004:

The Standley Lake Cities completed a review of State discharge monitoring reports and EPA enforcement and compliance history online, (ECHO), for the upper basin wastewater treatment facilities. The following wastewater treatment facilities in the Upper Clear Creek Basin received or have outstanding notices of exceedence in 2004:

Facility Identifier	Exceedence Date	Parameter
Black Hawk/Central City SD	2nd quarter	Chorine, Total residual
Clear Creek School District	6/2004 and 11/2004	Non-receipt of DMR, Flow-effluent
Clear Creek Ski Corp	2nd quarter	Not received, 1st report of progress
Clear Creek Ski Corp	2nd quarter	Not received, implement plan
Clear Creek Ski Corp	2nd quarter	Not received, Compliance schedule design report
Eisenhower Tunnel WWTF	1st quarter	Flow, in conduit or thru treatment plant
Eisenhower Tunnel WWTF	1st quarter	BOD, 5-day % removal
Eisenhower Tunnel WWTF	2nd quarter	Coliform, Fecal general
Empire, Town of	1st quarter	BOD, 5-day % removal
Empire, Town of	1st quarter	Solids, suspended, % removal
Georgetown, Town of	2nd quarter	Nitrogen, Ammonia as N
Henderson Mine (Climax)	2nd quarter	Not received, Complete plans and specs
Henderson Mine (Climax)	2nd quarter	Achieved late, special study
Idaho Springs, City of	1/2004 to date	Not received, monitoring program design
Idaho Springs, City of	2nd quarter	Achieved late, 1st report of progress
St. Mary's Glacier W&SD	2nd quarter	Not received, submit I/I report #3
Swayder Camp WWTF	3rd quarter	BOD, 5-Day Mthly
Swayder Camp WWTF	3rd quarter	BOD, 5-Day NMth
Swayder Camp WWTF	3rd quarter	BOD, 5-Day % removal
Swayder Camp WWTF	3rd quarter	Solids, Suspended % Removal

The table is a sobering reminder that greater than 80% of permitted wastewater treatment plants in the upper basin are in violation of their permits. While incomplete or partial paperwork violations would appear minor, actual water quality impacts to Clear Creek could be occurring and being ignored or hidden by failure to report. The SLC are deeply concerned with the multi year violations of several of the WWTF.

Standley Lake Status

The Statement of Basis and Purpose for the narrative standard for Standley Lake adopted by the Water Quality Control Commission in 1994 stated: "Data collected over the last eleven years for chlorophyll a for Standley Lake indicates that the lake has been mesotrophic over that period. The trophic status of Standley Lake is based on the average magnitude of trophic state indicators measured during the period from March 1 through November 30."

Based on the preceding statement the Standley Lake Cities believe that Standley Lake was mesotrophic during 1994 through 2003, and that the trophic status of the reservoir did not change in 2004. However, the Standley Lake Cities do not believe that the time period of March 1 through November 30 accurately reflects the relevant time period over which the lake should be evaluated.

The cities are concerned with the upward trend in chlorophyll a, dissolved phosphorus and total nitrogen as well as the downward trend in dissolved oxygen. The Standley Lake Cities believe it will be important to observe the water quality trends closely and take further corrective action should it appear that water quality is deteriorating.

DITCH INFLOWS to STANDLEY LAKE

Farmers High Line Canal & Reservoir Company

Van Bibber, Ralston, Leyden and Little Dry Creek drainages continue to be by-passed over/under the Farmers High Line Canal (FHLC). The spill gate at the Little Dry Creek structure, which can be operated remotely, provides the last line defense for protecting Standley Lake from stormwater or hazardous spills contamination.

The FHLC has continued to work with City of Arvada developers on the Westwoods Center development located in the Ryan Gulch/Hyatt Lake drainage basin. The FHLC is currently negotiating a cost sharing arrangement with the developer on construction of the bypass pipe for Ryan Gulch that will discharge to Hyatt Lake.

The FHLC submitted comments on the proposed Home Depot store near 64th and McIntyre highlighting the FHLC's policy of not accepting storm water from developed areas.

The FHLC, Arvada and U.S. Fish and Wildlife continue to have discussions regarding bypassing the Two Ponds Wildlife Refuge drainage, which also includes drainage from portions of Arvada that are developed. The project would include a new stormwater bypass pipe under the FHLC and Croke Canals as well as realignment of the FHLC to allow for a stormwater detention basin upstream of the canals. FHLC completed a site plan, drilling/borrow area investigation and wetlands mapping in 2004. Public comments are still being addressed by U.S. Fish and Wildlife. It is anticipated construction can begin in 2005.

The FHLC worked with the Mountain Vista developers in Arvada near 80th and Kipling on removal of stormwater from the canal and installation of stormwater BMP's as part of the development.

The FHLC has been working with the City of Arvada and adjacent property owners on canal bank repairs, some of which were cause by encroaching development. The heavy rains of the summer of 2004 caused some canal bank sloughing in several areas in Arvada.

The FHLC worked with the developer of two developments in Jefferson County near 50th and McIntyre. The developments will include stormwater BMP's and retention facilities. The FHLC has been working with a property owner below Leyden Reservoir regarding access to the canal and ceasing grazing activity within the canal easement.

The City of Golden and Coors are working on providing more containment around a Golden sanitary sewer overflow point near the FHLC. The sanitary sewer overflowed in the FHLC during the heavy rains last summer however the contaminated water was spilled at Little Dry Creek prior to reaching Standley Lake. The FHLC has also been in discussions with the City of Golden on preventing sheet flow runoff from entering the FHLC near the ball fields on Salvia Street.
Approximately 3 miles of the FHLC were cleaned in 2004. The spoils were placed below the canal bank and were graded to drain away from the canal.

The first flush of the canal was diverted around Standley Lake to avoid contamination from trash and debris, sediment, and other contaminants that accumulate in the canal over the winter.

Croke Canal Farmers Reservoir & Irrigation Company and Standley Lake Operating Committee (FRICO/SLOC)

The major drainages continue to be bypassed over the Croke Canal, including Van Bibber, Ralston, Leyden and Little Dry Creeks. Repairs were made by FRICO/SLOC to the Van Bibber bypass pipes after deterioration of the existing pipes was discovered. The replacement pipes will bypass minor storm events in the Van Bibber basin but are meant to be a temporary fix of the structure. Larger storm events will still enter the Croke Canal and may cause damage or flooding adjacent to the canal. FRICO has requested financial participation from Urban Drainage Flood Control District and Jefferson County for completion of this stormwater project. Land ownership issues also need to be resolved prior to commencement of construction.

Arvada and developers began construction on the 86th Avenue widening project. Various BMP's including Vortech stormwater inlet structures are being installed to help treat the stormwater from 86th Avenue prior to discharging to Standley Lake. Construction is expected to be completed in 2005.

FRICO/SLOC has been working with the Westridge development near 80th and Alkire in Jefferson County on a stormwater bypass pipe crossing. The Cottonwood Lane development in Jefferson County near 55th and Indiana installed a stormwater bypass pipe over the canal prior to obtaining a license from FRICO. As built information has been requested from the developer.

Approximately 5 miles of the Croke Canal were cleaned, restoring capacity to the canal. The spoils were placed below the canal bank and were graded to drain away from the canal.

The first flush of the canal was bypassed around Standley Lake to avoid contamination from trash, debris, sediment, and other contaminants.

Construction of the Standley Lake Dam Renovation Project was completed in October 2004. The new water delivery tunnels, pipeline, multi-level intakes, and valve house began operating in April 2004. Withdrawals to the water treatment plants can be made from two levels allowing flexibility in dealing with algae blooms and taste and odor events.

Church Ditch Company

The Church Ditch Water Authority was created in 2004 giving the ditch company more authority to enforce the Northglenn Watershed Protection Ordinance. Five watershed violations were issued.

The Little Dry Creek Bypass structure design was completed. This structure will bypass spills and contaminated runoff from Standley Lake.

A box culvert was constructed in Golden enclosing 3,000 feet of ditch. This will reduce sediment and contaminants from bank erosion.

A flush gate was installed at Tucker Gulch providing an additional diversion point to protect Standley Lake from spills and contaminated stormwater.

The Church Ditch head gate structure was repaired to eliminate leakage.

A new 400 foot access road was completed near 49th and Easley Road enhancing maintenance access.

A new flush structure was constructed at Ralston Creek providing additional spill diversion flexibility.

Approximately 600 feet of failing iron pipe was replaced with 60" high density plastic pipe in the Golden area. This will reduce flooding potential and prevent the influx of sediment and contaminants.

At 77th Drive, the potential for contamination from bank sloughing was reduced by bentonite lining of a fifty foot section of ditch.

Woman Creek Reservoir Authority

The silt basin from Church Ditch in Big Dry Creek was cleaned out.
The Department of Energy irrigation laterals were cleaned out.
Much effort was devoted to the removal of noxious weeds.

Kinear Ditch Pipeline

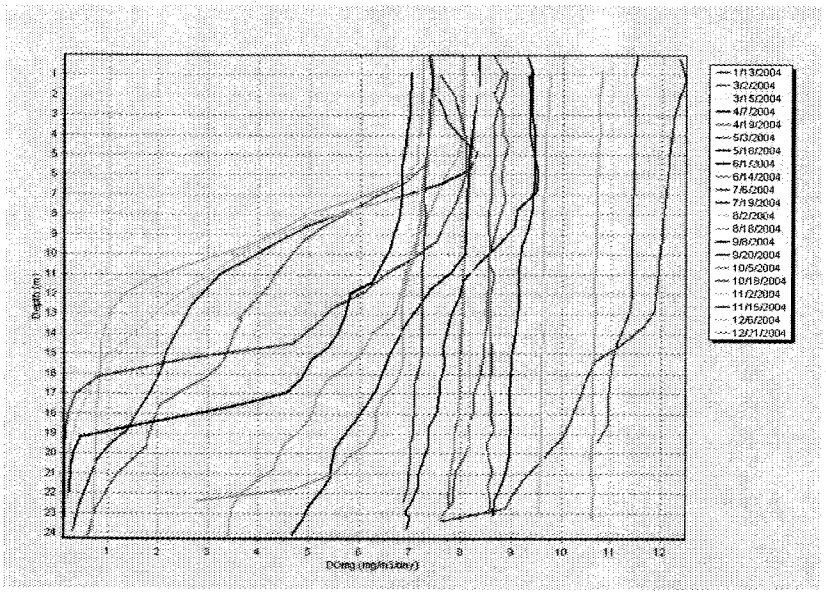
Noxious weeds were removed from the Coal Creek intake.
Weed removal was performed along the pipeline totaling an area of approximately one acre.

Berthoud Pass Ditch

The erosion renovation project was completed on Hoop Creek. A 250 foot section of pipe in a ditch tunnel was replaced. The old pipe was corroded and collapsing allowing infiltration of sediment and contaminants. A 300 foot section of ditch was cleaned at the flume.

Standley Lake

Below is a chart of the DO profiles for 2004. They indicate that the Lake went anoxic (DO <2.0 mg/L) in early July. Typically, in years past, the Lake has gone anoxic in mid July. Andy, are there any conversion concerns (m3 to L)?



Eurasian Watermilfoil

Eurasian Watermilfoil (EWM), *Myriophyllum spicatum L,* is a non-native, aquatic, noxious weed that grows rapidly and to a depth of 35 feet. EWM can grow in dense mats that severely interfere with recreation and provide a substrate for blue-green algae growth. Blue-green algae blooms can ultimately cause taste and odor events in drinking water supplies. EWM was first observed in Standley Lake in 1998. It was positively identified in 2000.

After co-sponsoring a conference on EWM in July 2001, the Standley Lake Cities decided to initiate a two-year test period to evaluate the effectiveness of the milfoil weevil, *Eurhrychiopsis lecontei* in controlling the spread of EWM. The milfoil weevil burrows into the stalk of the plant to lay eggs. The larva, once hatched, feed on the internal portion of the stalk preventing the passage of nutrients and growth of the plant, and loss of buoyancy. Three test sites were selected for the introduction of the weevil, which were introduced to the test sites in the summer of 2002.

A follow up survey performed in May of 2003 turned into a hunt for milfoil since the drought of 2002 had severely damaged the milfoil beds. Two surveys were performed, one using an underwater video camera, and the second using scuba divers. Neither survey found any significant beds of milfoil. In the late fall of 2003 however; significant milfoil beds reemerged on the South side of the lake in small clumps and intermittently dispersed.

In early summer 2004, EnviroScience performed a reconnaissance survey to gauge the quantity and distribution of Eurasian watermilfoil. The results of the survey revealed that milfoil was once again becoming more abundant and was spreading through large areas of the lake. Based on this, a recommendation was made to proceed with large scale stocking.

On July 20-21, 46,000 weevil eggs and larvae were stocked in two locations in the preserve area on the west side of Standley Lake. These sites were resurveyed on September 16, 2004. At the time of the resurvey, numerous adult weevils and significant weevil damage were noted in both of the stocked sites, indicating that the newly stocked weevils were actively reproducing. A follow-up survey in the summer of 2005 will determine if the weevils can successfully over winter.

E. Coli Monitoring

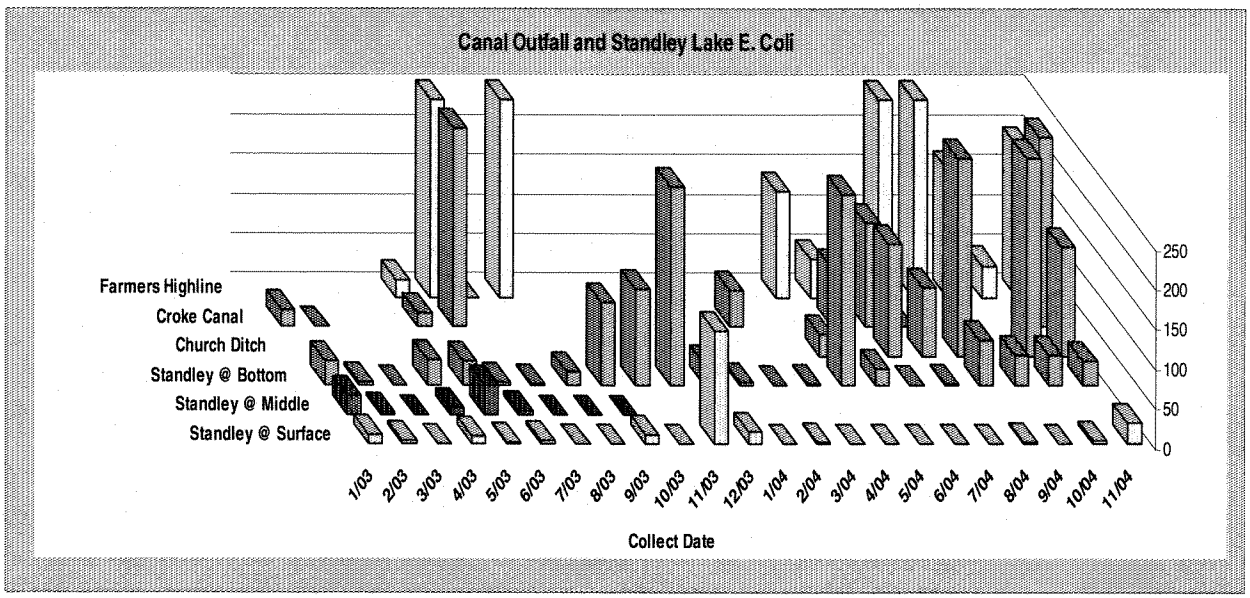
In 2000, the City of Thornton observed higher than normal E. Coli values at the intake to their Thornton Water Treatment Plant. While neither the narrative standard on Standley Lake, nor the Clear Creek Watershed Agreement address E. Coli as a pollutant of concern, the increase in coliform levels in Standley Lake is a concern for the Stanley Lake Cities. The increase in coliform may be an indicator of impacts from development, wastewater treatment plants, and stormwater.

When Thornton observed increased E. Coli values at the intake of their treatment plant [direct pipeline from Standley Lake] the intakes to the Northglenn and Westminster water treatment plants were tested for comparison. The E. Coli values were very similar at all three city's plants. The trends also tracked very closely. Brittney, can we state this more positively...,E. Coli sampling began in 2000 and continues to date creating a five year data set that is jointly shared between the SLC. Although there is not a good data base for the three plant intakes prior to 2000, data from the Thornton Treatment Plant showed values increasing in the winter months from non-detectable to as high as 200 counts per 100 ml.

Based on these data the Standley Lake Cities decided to initiate an E. Coli Monitoring Program in 2001to include the treatment plant intakes, Standley Lake inlets from Farmers High Line Canal, and Croke Canal. Samples were also taken of the water column at the normal lake sampling location near the dam at the surface, mid level and 5 feet from the bottom. Samples were taken monthly and analyzed for E. Coli by the Thornton Lab.

The data in 2004 again verified increased E. Coli values at the three plant intakes and the data at all three plants was very comparable in concentration and trend. Water for all three plants is taken from the bottom of Standley Lake. The following graph shows the plant intake and the lake bottom E. Coli data. The top-level samples were generally much lower in concentration then the mid and bottom samples except during fall turn over when the lake was well mixed. The bottom level data best represents the concentration and trend observed at the water plant intakes. The data does not indicate any definite trends, however, the data generally shows higher values at the lake bottom (and plant intakes) when the lake intake values spike.

Based on the observed E. Coli data at the canal outfalls to the lake, the monitoring program has been expanded to include the canal outfalls. The following graph indicates E. Coli spikes entering the lake. These spikes have not been compared to hydrological data to examine correlation with storm events. Brittney, if we only include 2004 data the graph is easier to read and the inputs more understandable. You will loose the dramatic increase over 2003 however.



To determine E. Coli source, the monitoring program will be expanded to include the canal head gates and canal mid points. The expanded program may help determine the source of the [redacted] spikes at the canal outfalls to the lake.

Standley Lake Management Plan

The Standley Lake Management Plan was updated in 2004 and the following Mission Statement was adopted:

> To protect the quality of Standley Lake as a drinking water supply through the application of scientifically based and fiscally responsible management techniques. To optimize the health of Standley Lake and its watershed for current and future generations.

See Appendix D for the complete version of the Standley Lake Management Plan.

The Standley Lake Management Plan, developed in accordance with the original CCWA, addresses internal nutrient loading as well as loading from the Tributary Basin. The plan directs the operations of water supply, recreation, and activities in the watershed that may contribute nutrients to Standley Lake.

Standley Lake raw water supply operation practices continue to include lake bypass of canal first flushes, initial flows from spring runoff (is this true? If it is, we may want to reconsider advertising it as this can have a tremendously negative effect on our water rights yield not to mention give the upper basin an easy out), and to the extent possible, storm events (is this also true or are we simply working with the tributary basins to remove stormwater inputs?). Raw water supply operations also include a spill notification call down system to ensure prompt notification of spills to allow for preventative measures to prevent spill from reaching Standley Lake.

The Standley Lake Cities continue to conduct a cooperative water quality monitoring program of Standley Lake and its tributaries. Sampling and analysis are performed for (include a short list of parameters). The Standley Lake Cities also conduct separate water quality monitoring programs of Standley Lake water at the intakes to their respective water treatment plants.

The Standley Lake Cities share a WEB database with each of the respective cities input laboratory analysis result. The Laboratory Information Management System (LIMS) Tribal calls it a Laboratory Data Management System (LDMS) allows each of the cities to query water quality data from Clear Creek, tributaries, canals, and Standley Lake samples.

Near normal flows occurred in 2004. Data indicates that Standley Lake filled on May 29, 2004. This is a volume of 42,150 acre-feet. At the end of the water year (October 31, 2003) the lake level was at 91.80 feet or 37,816 acre-feet of water.

Standley Renovation

The Standley Lake Dam Renovation project was completed in 2004. The project was completed within 26 months, well ahead of the 30-month schedule allowed by the contract. The $32.5 million construction finished on budget with construction change orders at only 3 percent. The Standley Lake cities shared the construction cost equally. The new spillway, new tunneled intakes,(outflow structures)? new valve house and stability berm will provide a reliable, safe dam for water storage that should last well into the future. On November 3, 2004, a dedication ceremony was held in celebration of the successful completion of the Standley Lake Dam Renovation Project. A dedication plaque was mounted to a large rock recovered from the project site.

Household Hazardous Waste Management

Northglenn currently participates in the Adams County Household Chemical Roundup. The program is offered at least twice a year and allows residents to drop off household cleaners, paints, pesticides, motor oil, batteries, and other items at no charge. The City also provides the solid waste services for our citizens. In addition to typical household waste being collected once per week, standard pickups include such materials as used oil, antifreeze, vehicle batteries, tires, empty and dry paint cans, bulk materials and Freon containing appliances. Residents are encouraged to take yard waste to our maintenance facility at Eastlake for recycling into mulch, which is then available to our residents. Recycling of newspapers, office papers, metals, and plastics are encouraged at selected locations within the City.

Thornton's program includes residential curbside trash collection and curbside recycling of newspaper, plastic, glass, and aluminum containers, motor oil, antifreeze, and auto batteries. Thornton participates in a regional household chemical roundup that includes three drop-off dates per year in which residents can properly dispose of their unwanted items.

Westminster offers a free curbside household hazardous waste pick-up program to Westminster residents. The program removes such items as fertilizers, pesticides, herbicides, oil, automotive batteries, and latex and oil based paints. Citizens' simply schedule a pickup day and upon identification of materials for disposal, a special disposal kit is sent to them via US Mail. On the day of pick-up, residents leave the materials by their front or garage door before 7 a.m. and the materials will be picked-up. Special assistance is provided to disabled and elderly residents who are unable to pack their materials or remove them from their home. This program allows more participation across the range of residential homeowners at cost less than previous programs.

Central City Southern Access Road

The Central City Southern Access road project completed on November 20, 2004 is a four lane paved highway from the Hidden Valley Exit 243 on I-70 to Central City. Ames Construction Company constructed about 8.6 miles of new road. Construction involved excavation and fill of

approximately 6 million cubic yards of rock and dirt. This construction activity resulted in very massive exposed cut rock slopes and deep cross drainage fills, which include stormwater diversion systems. A new access bridge crosses Clear Creek at the Hidden Valley exit.

Independent monthly site visits occurred from November 2003 through December 2004 with a field report for each visit. These independent field visits were not part of any compliance monitoring for the issued stormwater permit. Rather these visits focused on existing or potential water quality degradation. Observational notes focused on water quality implications from the shot-term to the long-term. This type of observational monitoring is distinct from permit compliance monitoring and can lead to a different interpretation on the success or failure of permanent best management practice. A central observational focus of each site visit was to answer the question, *"will this project cause any long-term downstream water quality problems?"* Monitoring and site visits by the Colorado Water Quality Control Division determined compliance with stormwater permit conditions. The WQCD issued a "cease and desist" order to Ames Construction for failure to comply with terms of the permit. Concerns raised by the WQCD were legitimate issues and Ames had opportunities to address WQCD concerns prior to issuance of the notice of violation. Although Ames made concerted efforts to address and fix stormwater and erosion control problems identified by the WQCD from earlier inspections, they were negligent in not being proactive in meeting permit conditions.

The potential for long-term water quality impairment to Clear Creek from the Central City Southern Access road is minimal. The project has sufficient permanent best management practices that significantly reduce measurable downstream affects. Off-site sediment transport into downstream waterways from the roadway system or caused by runoff from the roadway will be limited. Chemical components from the roadway maintenance program should have no measurable affect on downstream water quality. This is not to say that the project has no long-term water quality issues or concerns, rather these concerns will remain localized.

The highway has very extensive velocity control stormwater structures in place along roadway shoulders with >3,000 permanent velocity control structures, including rock barriers, rock spillways, rock lined ditches, check dams, contoured steps, guardrail flow stops, ponding basins, and detention structures. These velocity control structures are critical to protecting off-site water quality and the maintenance of these structures is important in the long-term protection of downstream water quality. All cut and fill slopes had extensive hydromulching activities. While some slopes showed some good revegetation, not all slopes revegetated and many areas did not reseed. Additional revegetation will be necessary in the 2005 growing season and probably over the next ten years. Clearly, many rock dominated cut and fill slopes will never have extensive revegetation

Cut and fill slopes are subject to rill (small erosion features caused by active runoff usually less than six inches deep) and gully erosion (larger erosion features over six inches and sometimes several feet across and/or deep) during stormwater runoff events. The deeper and more problematic gully erosion will be limited to a few cut and slightly more fill slopes where there is a mix of finer sediments and rock. Rill erosion will remain problematic until slopes revegetate. However, with good maintenance rill and gully erosion should not be a major concern along most of the roadway. Stormwater conveyance devices are functional at all cross-drainage areas. Most of the upstream fine sand/silt/mud mixture flushes through culverts into downstream receiving waters, with some deposition on the upstream side of several culvert systems. Old waste rock pile, sealed mine audits and mineralized zones occur along the roadway, particularly toward the Central City end. Acid mine drainage from the Quartz Hill mine is discharged under

the roadway. The waste rock piles above the Nevada Gulch area along the roadway need monitoring for stability. The road base did incorporate mineralized materials in a number of areas. The chance for runoff leachate from this mineralization is a possibility and a water quality baseline is necessary.

The Cities of Arvada, Northglenn, Thornton and Westminster make three recommendations:

1. Central City should develop, distribute and implement a maintenance and operation program for the roadway.

2. Conduct a semi-annual inspection of the roadway system for the next five years. Make copies of inspection reports available to the Upper Clear Creek Watershed Association and downstream interests. These inspections should include all cross-drainage structures, effectiveness of permanent management practices, potential water quality concerns, runoff system effectiveness and quantification of sedimentation and erosion attributable to the roadway system.

3. Obtain a baseline water quality sample set (single year) during three runoff events to characterize runoff quality (temperature, pH, specific conductance, total suspended sediments, total dissolved solids, nitrate, and total phosphorus) from stormwater conveyance, on-site flows, off-site flows, tailings areas and areas with mineralized road base.

EXHIBIT A

Clear Creek / Standley Lake

Watershed Agreement

AGREEMENT

The undersigned parties hereto agree as follows:

I. Preamble.

This Agreement seeks to address certain water quality issues and concerns within the Clear Creek Basin of Colorado, and specifically, such issues as they affect the water quality of Standley Reservoir, an agricultural and municipal water supply reservoir located in Jefferson County Colorado, which is supplied with water primarily from Clear Creek. For purposes of this Agreement, the Clear Creek Basin is divided into three (3) areas of segments: the Upper Clear Creek Basin ("Upper Basin"), consisting of Clear Creek and its tributaries from its source to and including the headgate of the Croke Canal in Golden, Colorado; the Standley Lake Tributary Basin ("Tributary Basin"), consisting of the lands directly tributary to Standley Lake, the Church Ditch, the Farmers High Line Canal, the Croke Canal, and lands directly tributary to these Canals; and Standley Lake ("Standley Lake"), consisting of the Lake itself.

The parties to this Agreement are governmental agencies and private corporations having land use, water supply, and/or wastewater treatment responsibilities within the Clear Creek Basin. The parties are: (1) UCCBA; (2) City of Golden; (3) City of Arvada; (4) Jefferson County; (5) Jefferson Center Metropolitan District; (6) City of Westminster; (7) City of Northglenn; (8) City of Thornton; (9) City of Idaho Springs; (10) Clear Creek County; (11) Gilpin County; (12) Black Hawk/Central City Sanitation District; (13) Town of Empire; (14) City of Black Hawk; (15) City of Central; (16) Town of Georgetown; (17) Town of Silverplume; (18) Central Clear Creek Sanitation District; (19) Alice/St. Mary's Metropolitan District; (20) Clear Creek Skiing Corporation; (21) Henderson Mine; (22) Coors Brewing Company; (23) Church Ditch Company; (24) Farmers High Line Canal and Reservoir Company; and (25) Farmers Reservoir and Irrigation Company. For purposes of this Agreement, the parties can be divided into four (4) functional groups, as follows: The Upper Basin Entities ("Upper Basin Users" or "UCCBA"), consisting of the members of the Upper Clear Creek Basin Association (generally representing entities with jurisdiction over land use and wastewater treatment activities in the Upper Basin that can affect water quality in the Upper Basin); the Tributary Basin Entities ("Tributary Basin Entities"), consisting of the Cities of Golden, Arvada, and Westminster, and the County of Jefferson and the Jefferson Center Metropolitan District (generally representing entities with jurisdiction over land use activities that can affect water quality in the Tributary Basin); the Standley Lake Cities ("Standley Lake Cities"), consisting of the Cities of Westminster, Northglenn, and Thornton, (representing the municipal water users from Standley Lake); and the three canal companies (the "Canal Companies"), consisting of the Church Ditch Company, the Farmers High Line Canal and Reservoir Company, and the Farmers Reservoir and Irrigation Company (representing the entities that own and operate canals through which water is conveyed to Standley Lake for municipal and agricultural use).

In accordance with the geographical and functional divisions, this Agreement generally sets out rights and obligations with respect to certain water quality matters within the Clear Creek Basin (as above defined) by area or segment and by functional group.

II. Agreement.

1. The parties will submit a joint alternative proposal to the Water Quality Control Commission ("WQCC") in the matter captioned "For Consideration of Revisions to the Water Quality Classifications and Standards, Including Adoption of a Narrative Standard, for Segment 2, Standley Lake, of Big Dry Creek, in the South Platte Basin, and Adoption of a Standley Lake Control Regulation" on or before December 23, 1993. Said alternative proposal shall contain the following points:

a. Request the WQCC to adopt a narrative standard only for Standley Lake at this time, with further consideration of any control regulation or numeric criteria for implementation of the standard at or after the triennial review of the South Platte River to be held in 1997. The narrative standard shall require maintenance of Standley Lake in a mesotrophic state, as measured by a combination of relevant indicators, as recommended by the parties' consultants prior to December 23, 1993.

b. Request language in the Rule and in the Statement of Basis and Purpose for the regulation explaining that during the next triennium ending in 1997 ("triennium") the parties hereto will be conducting additional testing and monitoring, as well as implementing certain best management practices and controls on a voluntary basis, the results of which will be reported to the WQCC on an annual basis, and that point-source discharge permits written during the triennium shall not include any new or more stringent nutrient effluent limitations or wasteload allocations to meet the narrative standard. The proposed language will also refer to the intention of the parties and the Commission that should the narrative standard not be met at the end of the triennium, and substantial progress has not been made in reducing the nutrient loads to Standley Lake, additional measures may be required, including numeric standards or effluent limitations for phosphorous and/or nitrogen in the Upper Basin, and for additional best management controls in Standley Lake to be considered.

2. Should the WQCC fail to approve and adopt the substance of the proposed alternative described in paragraphs 1.a. and 1.b. above, this agreement shall automatically terminate and the parties shall be released from all other obligations and rights hereunder.

3. At or after the triennial review in 1997, the UCCBA and Standley Lake Cities agree that if substantial progress has not been made by the UCCBA in reducing its portion of nutrient loading and in developing controls to maintain appropriate reductions in nutrient loads to Standley Lake sufficient to maintain the narrative standard, they

will jointly petition the Commission to adopt a control regulation for Standley Lake containing the following points:

a. Total Phosphorous effluent limitation of 1.0 mg/l as P as a thirty (30) day average at the Upper Clear Creek Wastewater Treatment Plants, or such other numeric standard(s) or effluent limitations (s) for phosphorous or nitrogen, or in combination, with opportunity for point to point source and nonpoint source to point source trading among the entities that operate the UCCBA treatment plants, as has been determined will be effective in achieving and maintaining the narrative standard for Standley lake. Such numeric standard(s) or effluent limitation(s) shall be implemented over a three year period to allow time for the affected entities to fund, design and construct improvements necessary to meet the standards.

b. In-lake treatment to reduce internal phosphorous loading by 50% from the 1989-90 measured loadings in the 1993 USGS report by Mueller and Ruddy, or such other standards for reduction of internal phosphorous and nitrogen loading as has been determined will be effective in achieving and maintaining the narrative standard for Standley Lake, within three (3) years.

4. The UCCBA, in consultation with the Standley Lake Cities and Tributary Basin Entities will prepare a Best Management Practices Manual by December 31, 1994 for nonpoint sources that will cover disturbed areas of 1 acre or more and use its best efforts to have it approved and adopted for implementation by all jurisdictions within the Upper Basin by July 1, 1995. This Manual will be prepared to deal with the geologic, topographic and weather conditions existing within the Upper Basin to facilitate the reduction of nutrient loading from the various activities of the Upper Basin. This Manual will be coordinated with the Standley Lake Cities and Tributary Basin entities. The plan will include a program for monitoring representative results, to be included in the overall basin monitoring plan. For purposes of development of BMPs, Jeffco will not be considered to be part of the UCCBA.

5. The UCCBA, in consultation with the Standley Lake Cities and the Tributary Basin Entities, will examine the costs and effects of nutrient removal at UCCBA wastewater treatment plants, including operational controls or modifications which would decrease nutrient loads. Recommendations of such review shall be furnished to all the parties hereto by June 30, 1994. The UCCBA will use its best efforts to have its members implement operational modifications which can be implemented without significant capital improvements as quickly as reasonably practical.

6. The Standley Lake Cities, in consultation with the other parties, will develop a Standley Lake Management Plan by December 31, 1994 which will address in-lake nutrient loading and potential nutrient loading from lake activities, water supply operations, recreational activities, and activities in the watershed. The Standley Lake Cities will use their best efforts to implement the Lake Management Plan by June,

1995. It is understood that the water rights implications of the plan must be considered.

7. The parties will jointly design, implement, and fund in such allocations as they shall agree a monitoring program to evaluate (1) nutrient loadings from point sources; (2) nutrient loadings from non-point sources in the Upper Basin; (3) nutrient loadings from non-point sources in the Tributary Basin; (4) internal Lake loading; and (5) the effect of nutrient reduction measures implemented by the various parties on the trophic status of Standley Lake. The results of the monitoring program will be provided to the Water Quality Control Commission for informational purposes annually. A description of the monitoring program will be included with the Annual Reports.

8. The Tributary Basin Entities and the Standley Lake Cities, in consultation with the other parties, will develop Best Management Practices (BMPs) for each of their jurisdictions by December 31, 1994, and shall use their best efforts to have them adopted as regulations by July, 1995. The BMPs will be designed to remove pollutants to the maximum extent practical considering the costs and benefits of possible measures; provided, however that no retro-fitting of existing construction or development will be required.

9. The Tributary Basin Entities, the Standley Lake Cities and the Canal Companies will develop a Management Plan for the Tributary Basin, addressing stormwater quality and quantity, hazardous substance spills, canal flushing, crossing permits, the Canal Companies' stormwater concerns, and the water rights implications of the above by December, 1994, and use their best efforts to achieve adoption of the portions of the Plan under the control of each entity by July, 1995. If not all affected parties adopt the agreed measures, then the parties that have adopted such measures will determine whether or not to implement the Plan despite such non-adoption by one or more parties.

10. Each functional group (The UCCBA, The Tributary Entities, The Standley Lake Cities, and the Canal Companies) shall provide each other group with semi-annual reports detailing the progress made on the implementation of its responsibilities herein, including development of any BMPs, nutrient reduction programs or controls, or other items required by this agreement, beginning in June, 1994. The parties shall also meet periodically after each report is completed to discuss progress by the parties. It is anticipated that the various functional groups may assign or appoint task groups or committees to address specific tasks or areas of concern (e.g. BMPs; ISDS; Wastewater Plant operational changes; monitoring, etc). If so, then the task groups shall provide the appropriate reports and participate in follow-up meetings.

11. This agreement may be enforced as a contract according to the laws of the State of Colorado; however, this agreement shall not create any right to claim or recover monetary damages for a breach thereof.

12. It is anticipated that other regional agencies with land use and/or water quality responsibilities or impacts within the Clear Creek Basin (as above defined) may join in the parties' monitoring and other efforts pursuant to this Agreement.

13. This Agreement may be executed in counterparts.

CLEAR CREEK WATERSHED MANAGEMENT

MONITORING PROGRAM

Upper Clear Creek Basin
Standley Lake Supply Canals
Standley Lake

Prepared by Clear Creek Watershed/Standley Lake
Monitoring Committee
2004

TABLE of CONTENTS

INTRODUCTION

An agreement between the Upper Clear Creek Watershed Association, the "Tributary Basin" entities and the Standley Lake Cities was developed to address certain issues and concerns as might affect the water quality of Standley Lake (see appendix A for the agreement including a listing of parties to the agreement). Part of the agreement was to design and implement a Monitoring Program and is intended to be applied throughout its duration. The Clear Creek Watershed/Standley Lake Monitoring Committee (members representing the parties to the agreement) annually evaluate the results of the monitoring and make changes to the program as appropriate. The Monitoring Program with any changes or additions/deletions is documented in the annual report to the Colorado Water Quality Control Commission (WQCC).

Based on the agreement, a monitoring program was established to evaluate the following:

- Nutrient loadings from point sources in the Upper Clear Creek Basin.
- Nutrient loadings from non-point sources in the Upper Clear Creek Basin.
- Nutrient loadings from non-point sources in the Tributary Basin.
- Internal loadings on Standley Lake.
- Effects of nutrient reduction measures on the trophic status of Standley Lake.

After the agreement had been finalized an additional component was added to evaluate the effect of organic material from Clear Creek on the dissolved oxygen concentrations in Standley Lake, primarily during the spring/summer runoff period.

MONITORING SITES *

Clear Creek Monitoring Sites/Rationale

The sampling sites in the Upper Basin were selected to divide the stream into sections that would identify point and non-point contributions. These sites were selected as part of an initial sampling program in 1992-93 and where possible are consistent with the sites used in the Super Fund sampling program. The Super Fund sites were selected because of the potential to use the existing database in stream model calibrations. Stream flow monitoring stations were installed at the following corresponding sites: CC-10, CC-20, CC-25, CC-26, CC-35, CC-40, CC-50 and CC-60. Flows are also recorded at the Golden gage.

CC-05 Mainstem of Clear Creek (CC) at Bakerville
CC-09 Leavenworth Creek Added for 1999
CC-10 South Fork of CC at Leavenworth Creek
CC-15 West Fork of CC below Berthoud
CC-20 West Fork of CC below Empire
CC-25 Mainstem of CC above West Fork
CC-26 Mainstem of CC at Lawson gage Added 4/98
CC-30 Fall River above mainstem of CC
CC-34 Mainstem of CC upstream of Chicago Creek Added 2/03
CC-35 Chicago Creek above Idaho Springs Water Treatment Plant
CC-40 Mainstem of CC below Idaho Springs Wastewater Treatment Plants (WWTP)
CC-44* North Fork of CC above Black Hawk/Central City WTP intake
CC-45 North Fork of CC above Black Hawk/Central City WWTP
CC-50 North Fork of CC above confluence of mainstem of CC
CC-52 Beaver Brook Added in 2001
CC-53 Soda Creek Added in 2001
CC-54 Confluent of Soda Creek and Beaver Brook dropped for 2001
CC-60 Mainstem of CC at Church Headgate
*Original sampling site is CC-45. CC-44 added in 1999.

Wastewater Treatment Plant Monitoring Sites

15. Loveland (CC1a)
16. Georgetown (CC3a)
17. Empire (CC5a)
18. Central Clear Creek (CC7a)
19. St Mary's WWTP (CC8a) - added in 2001
20. Idaho Springs (CC12a)
21. Black Hawk / Central City (CC13a)
22. Henderson Mine (CC14a)

* Eisenhower Tunnel (CC15a) – not monitored. Data received from DMR

MONITORING SITES (cont.)

Canal Monitoring Sites

The canal sampling sites were selected to assess the relative loadings to the canals from Jefferson County, portions of Golden and portions of Arvada.

22. Church Ditch at Headgate on Mainstem of CC (TO1-AS or T01-GR)
23. Farmers High Line at Headgate on Mainstem of CC (TO2-AS or T02-GR)
24. Croke Canal at Headgate on Mainstem of CC (TO3-AS or T03-GR)
25. Church Ditch at 64th (T34-AS or T34-GR)
26. Farmer High Line Canal at 64th (T33-AS or T33-GR)
27. Croke Canal at 64th (T31-AS or T31-GR)
28. Church as it enters Standley Lake (T09-AS or T09-GR)
29. Farmer High Line Canal as it enters Standley Lake (T11 –AS or T-11GR)
30. Croke Canal as it enters Standley Lake (T04-AS or T04-GR)

Standley Lake

The site over the outlet was selected for monitoring because this is the site with the most historic data and is the area from which the water is drawn into the filter plants. By having one site, more samples over time can be taken for the same analytical effort and therefore, provide more data to assess the condition of Standley Lake. Monitoring locations are:

1. 10-0 – Surface (Secchi depth recorded only)
2. 10-70 – 5 feet from bottom
3. 10-PZ – Photic Zone (2X Secchi depth)

*Monitoring sites are contained in Table 1 and in the narrative description (pages 8, 9 and 10).

MONITORING SCHEDULE

Sampling dates for wastewater treatment plants and stream sites were selected to correspond to seasonally varying flow conditions in Clear Creek. Canal composites are collected within seven days of the stream sampling. Laboratory constants require that all sampling be conducted on a Monday, Tuesday, Wednesday, or a Thursday. Each year, sampling is done on approximately the same schedule.

1. Early February (Monday)
2. Early April (Tuesday)
3. Late May (Thursday)
4. Mid June (Wednesday)
5. Mid July (Monday)
6. Mid August (Tuesday)
7. Mid October (Wednesday)
8. Early December (Thursday)

During the spring / summer runoff period, generally mid-May to mid July, the Farmer Highline or Croke Canals, which ever is flowing greater, will be monitored. Standley Lake will be monitored every two weeks from March through November. This regularly spaced and frequent sampling is necessary to provide adequate data to evaluate the trophic status of Standley Lake.

MONITORING PROGRAM VARIABLES (with some limits noted)*

Stream Variables	Reporting Limits
Total Nitrogen	100 ug/L
Nitrate + Nitrite, Ammonia	10 ug/L
Total Phosphorus	2.5 ug/L
Diss. Ortho Phosphorus	2.5 ug/L
Suspended Solids, Total and Volatile	1 mg/L
Physical Properties: Temperature, pH, Specific Conductance and Turbidity	See SOP's

Canal Variables	Reporting Limits
Total Nitrogen	100 ug/L
Nitrate + Nitrite, Ammonia	10 ug/L
Total Phosphorus	2.5 ug/L
Diss. Ortho Phosphorus	2.5 ug/L
Suspended Solids, Total and Volatile	1 mg/L
Physical Properties: Temperature, pH, Specific Conductance and Turbidity	See SOP's

Lake Variables	Reporting Limits
Total Nitrogen	100 ug/L
Nitrate + Nitrite, Ammonia	10 ug/L
Total Phosphorus	2.5 ug/L
Diss. Ortho Phosphorus	2.5 ug/L
Suspended Solids, Total and Volatile	1 mg/L
Physical Properties: Temperature, pH, DO, Specific Conductance, Turbidity, Secchi depth (feet)	See SOP's
Chlorophyll a, algae count and identification	See SOP's

Wastewater Treatment Plant Variables	Reporting Limits
Total Nitrogen	100 ug/L
Nitrate + Nitrite, Ammonia	10 ug/L
Total Phosphorus	2.5 ug/L
Diss. Ortho Phosphorus	2.5 ug/L
Suspended Solids, Total and Volatile	1 mg/L
Physical Properties: Temperature, pH, Specific Conductance, Turbidity	See SOP's

* SOP's and QA/QC for these variables are contained in Appendix D, 1-3.

SAMPLE COLLECTION *

Stream All samples are grab samples.

Wastewater Treatment Plants All samples are grab samples.

Canals Samples are 24-hour time composite samples when possible. For the samples collected in conjunction with the upper basin stream and wastewater treatment plant monitoring component, a time delay in the downstream direction will be estimated so the same water is sampled from Golden to Standley Lake. The length of the delay will depend on the flow rate in each canal. If a composite sample is not available, a grab sample will be collected and analyzed in place of the composite sample.

Lake 10- PZ samples are a composite taken with a column tube through the photic zone (2X secchi depth). 10-70 samples are grabs samples.

*Standard Operating Procedures for sampling are contained in Appendix C, 1-3.

QUALITY ASSURANCE / QUALITY CONTROL PROGRAM*

Summary

Split and spike quality control samples are prepared for selected stream and lake parameters and are analyzed by three laboratories.

Laboratories
- Perkins Limnology Laboratory (formerly analyzed at the University of Missouri Limnological Laboratory) changed in 1999
- Northglenn
- Westminster

Variables
- Stream sampling- TP and TN
- Lake sampling – TP, TN, suspended and volatile solids, chlorophyll a

Discussion

Spike and split quality control samples are prepared for each of the 8 upper basin stream surveys by the City of Golden at their laboratory on the day of sampling. There are also 32 splits from the Lake sampling prepared by Westminster and sent to the University of Missouri for TP, TN, suspended and volatile solids and chlorophyll a analyses. Samples from the wastewater treatment plants will not be regularly included in the split/spike portion of the QA/QC program because of the anticipated higher concentrations.

For purposes of this report, only the spike and duplicate results on the selected upper basin stream samples are reported.

Preparation of Stream QC Samples

For each of the eight sampling surveys, there will be one split and one spike distributed to each laboratory. A different site is randomly selected each time. Samples are distributed as follows:

1. Split to UMLL for TP, TN
2. Split to Westminster for TN
3. Split to Northglenn for TP
4. Spike to UMLL for TP, TN
5. Spike to Westminster for TN
6. Spike to Northglenn for TP

*Quality Assurance and Quality Control Procedures for spike/duplicate preparation and sample handling for all laboratories are contained in Appendix D, 1-4.

DATA MANAGING and REPORTING

The City of Golden is responsible for collecting all monitoring data from the field and different laboratories and compiling this data in a spreadsheet format (EXCEL).

In 2003, the Standley Lake Cities spent approximately $20,000 on a joint Laboratory Information System (LIMS) that is hosted through the internet. This LIMS system is used to enter all of the Upper Clear Creek, Tributary, and Standley Lake data. All three cities have access to the LIMS system through a host. Each city shares a portion of the hosting costs of $3600 per year. Each city enters their own data and has a representative that is on a committee for peer review of the data. Each quarter, the data is peer reviewed, downloaded, and given to the City of Golden to compile into a spreadsheet format.

Data results of this program, along with other reporting requirements as stated in the Joint Agreement, will be reported on annual basis to the Colorado Water Quality Control Commission. Only data collected during the normal sampling schedule will be included in the Annual Monitoring Report. This data will be reported in tabular and graphic form. Data interpretation will not be a part of the Annual Monitoring Report. Following each regularly scheduled sampling event tabulated data reports will be sent to the Upper Clear Creek Watershed Association, Tributary Basin entities and the Standley Lake Cities.

APPENDIX B: SAMPLING POINTS NARRATIVE DESCRIPTIONS

Upper Clear Creek Basin

POINT	DIRECTIONS AND DESCRIPTION OF LOCATION and Latitude/Longitude
CC05	1-70 westbound to Exit 221 (Bakerville) Exit; go south back over Interstate (left) Park at call box. Take sample upstream of parking area, read gage located downstream. [STAFF GAGE] (39-41-31N/105-48-15W)
CC09	Begin at intersection of 6th and Rose in Georgetown. Go 2.2 miles up Guanella Pass Road (go past the first lake). On left side of road, there is a drive marked "Silver Dale Post" that continues west parallel with Guanella Pass. Continue approximately 200 yards. Sample from the USGS recording gage at this site. [RECORDING GAGE] (39-41-11N/105-42-00W)
CC10	Travel back down Guanella Pass Road to the lake inlet. Park on right hand side of road. Sample from stream above lake inlet point. [RECORDING GAGE] (39-41-11N/105-42-00W)
CC15	Travel west on US 40 through Empire. Begin at Empire Dairy King and continue 6.0 miles west on US 40. There is a large pullout on the creek side of highway with a large tree in the middle of the pullout. Sample directly below the tree at the creek. Staff gage is along the north bank of stream next to a tree at the stream's edge. [STAFF GAGE] (39-46-05N/105-47-36W)
CC20	Returning back through Empire eastbound, travel along the road\ramp from US 40 to Westbound I-70. Immediately after turning onto road/ramp, there is a large open space on right side of road\ramp. Park in open space and cross road to the Colorado Dept. of Transportation (CDOT) fence enclosing their maintenance yard. Enter fence and sample approx. 100 feet downstream of bridge at recording gage. [RECORDING GAGE] (39-45-23N/105-39-34W)
CC25	There are two ways to access this sampling location 1) Travel along road/ramp from US40 to Westbound 1-70, Approximately 200 yards after passing bridge to frontage road and Easter Seals Handicamp facilities - pull off onto the right side. Walk down hill to the creek. Sample immediately downstream of the box culvert across from the recording gage.

CC25 (cont.)

Or 2) Travel west of 1-70 approx. 0.8 miles west of mile-marker 232.
Pull off interstate on right side immediately beyond guardrail for the bridge structure. Walk down hill to the creek. Sample immediately downstream of the box culvert across from the recording gage.
[RECORDING GAGE] (39-45-07N/105-39-41W)
THIS IS THE RECOMMENDED SAMPLING POINT FOR CC25.

CC26 Travel east from Georgetown and exit at Lawson. Travel frontage road through Lawson and go under 1/70 overpass. Immediately to your left is a parking area. Sample creek at gage and USGS sampling station by bridge. [RECORDING GAGE] (39-45-57N/105-37-32W)

CC30 From 1-70 (either direction) Exit 238 (Fall River Road/St. Mary's Glacier) Approx. 100 yards up Fall River Road, there is a small turnout on right by a wooden support wall. Cross road and sample creek at staff gage. [STAFF GAGE] (39-45-23N/105-33-20W)

CC34 From I-70 (either direction) Exit 240 (Mt. Evans). Pull of in the small parking area on the other side of the bridge. Sample the mainstem of Clear Creek across from the Forest Service building (upstream of Chicago Creek) from the pedestrian bridge. (39-44-26N/105-31-17W)

CC35 From 1-70 (either direction) Exit 240 (Chicago Creek)
Continue approx. 3.7 miles on Hwy 103.
Pull off on right shoulder just past green roofed house that looks like a barn. (on the left) Cross road and sample creek at recording gage. [RECORDING GAGE] (39-42-58N/105-34-15W)

CC40 Travelling eastbound on I-70 take US 6 exit. Pull off in parking area just east of the off ramp. (Kermit's Restaurant is across the road) Sample approx. 100 yards east of stop sign below recording gage.
[RECORDING GAGE] (39-44-47N/105-26-08W)

CC44 From the Black Hawk intersection travel westbound approx 1 mile on Hwy 119. There is a small wooden house and parking area on the left side of the road. This is the Black Hawk water intake. Walk approx. 100 feet upstream and sample at staff gage. [STAFF GAGE] (39-44-56N/105-23-57W)

CC50 Travel Hwy 119 eastbound toward US 6. Approximately 6.7 miles downstream of the Black Hawk/Central City WWTP and ¼ mile upstream from intersection is a pullout area to the right immediately before the junction. Sample at the recording gage. [RECORDING GAGE] (39-44-56N/105-23-57W)

CC52 Exit I-70 eastbound at Beaver Brook/Floyd Hill (Exit #247). Turn Left to north frontage road (US Hwy 40). Travel east approx. 2.4 miles. Pull off to the side of road and sample Beaver Brook at this point. (39-43-7N/105-22-44W)

CC53 Continue travelling east bound 0.3 miles and cross second white bridge. Exit immediately on the right to Soda Creek Drive. Park on right. Sample Soda Creek upstream of bridge. (39-42-50N/105-21-42W)

CC54 Exit I-70 eastbound at Beaver Brook/Floyd Hill (Exit # 247). Turn left to north frontage road (US Hwy. 40). Travel east approx. 2.4 miles. Pull off to left side before first white bridge. Walk down hill on north side of road and sample Beaver Brook at this point. Continue travelling east bound 0.3 miles and cross second white bridge. Exit immediately on the right to Soda Creek Drive. Park on right. Sample Soda Creek upstream of bridge. *These sites originally numbered 52 and 53 but were combined at a single site (CC54) starting May 1999 and sampled through 2000. It has been abandoned for 2001.* Beaver Brook (39-41-34N/105-26-18W)
Soda Creek Junction (39-41-33N/105-26-19W)

CC55 Mainstem of Clear Creek east bound past tunnel 2 and past bridge. Pull off to right at mile marker 267. Go down "path" CAREFULLY. Sample at this point. THIS SAMPLE POINT ABANDONED IN 1999.

CC60 Approximately 1 mile west of intersection of Hwy. 58 and US 6. Park in pullout on south side of highway and walk down (or drive) downhill to Church Ditch diversion structure. Go across bridge on structure and sample from mainstem of Clear Creek. Do not sample from Church Ditch. (39-45-11N/105-14-40W)

APPENDIX B: MONITORING SITES

TABLE 1 – MONITORING SITES/FLOW GAGES

Clear Creek Monitoring Sites	Flow Monitoring Gages - USGS
1. Mainstem of CC at Bakerville (CC-05)	Staff gage
2. Leavenworth Creek (CC-09)	Recording gage
3. South Fork of CC at Leavenworth (CC10)	Recording gage
4. West Fork of CC below Berthoud (CC-15)	Staff gage
5. West Fork of CC below Empire (CC-20)	Recording gage
6. Mainstem of CC above West Fork (CC-25)	Recording gage
7. Mainstem of CC at Lawson gage (CC-26)	Recording gage
8. Fall River above mainstem of CC (CC-30)	Staff gage
9. Chicago Creek above Idaho Spgs WTP (CC-35)	Recording gage
10. Mainstem of Clear Creek upstream of Chicago Creek (CC-34)	none
11. Mainstem of CC below Idaho Spgs WWTP (CC-40)	Recording gage
12. North Fork of CC above BH/CC WTP (CC-44*)	Staff gage
13. North Fork of CC below BH/CC WTP (CC-45*)	none
14. North Fork of CC above confluence with CC (CC-50)	Recording gage
15. Beaver Brook (CC52)	none
16. Soda Creek (CC53)	none
17. Mainstem of CC at Church Headgate (CC-60)	Recording gage

*re-numbered in 1999

APPENDIX C

Sampling Results, included are:

Clear Creek

Wastewater Treatment Plants

Canals

- Clear Creek
- Mid-way to Standley Lake
- Intake to Standley Lake

Standley Lake

- photic zone composite
- 10 feet from the bottom
- photic zone composite split sample results

STANDLEY LAKE MANAGEMENT PLAN Revised 3-2005

I. Background

In December of 1993, in response to a request by the Standley Lake Cities for a Rulemaking Hearing for the establishment of water quality standards and resulting control regulations, a number of local governmental entities and private parties entered into the Upper Clear Creek Watershed Management Agreement ("WMA"), which provides a framework for water quality management in the upper Clear Creek Watershed. The WMA, in addition to other provisions, provided for:

1. The adoption of a narrative standard for Standley Lake that required maintenance of Standley Lake in a mesotrophic state as measured by a combination of relevant indicators;

2. The parties to conduct additional testing and monitoring; and

3. The parties to implement certain best management practices and controls on a voluntary basis, the results of which will be reported to the Colorado Water Quality Control Commission on an annual basis.

Pursuant to paragraph six of the WMA, the Standley Lake Cities, in consultation with other parties, agreed to develop a Standley Lake Management Plan by December 1994, to address in-lake nutrient loading and potential nutrient loading from lake activities, water supply operations, recreational activities, and activities in the watershed. The Standley Lake Cities implemented the plan in February 1995 as agreed.

This update of the Standley Lake Management Plan is intended to further address the requirements of paragraph six of the WMA and incorporate the Mission Statement and Goals of the Standley Lake Cities.

II. Discussion

Standley Lake, denominated Segment 2 of Big Dry Creek in the South Platte River Basin, is a terminal water storage reservoir providing municipal water supply to approximately 280,000 people in the water service areas of the Standley Lake Cities. Standley Lake also provides irrigation water supply for farmers under the Standley Division of the Farmers Reservoir and Irrigation Company ("FRICO"). The reservoir is located in the northwest metropolitan Denver area, in a drainage basin that is fed directly by Woman Creek and Upper Big Dry Creek. The majority of its water supply, however, is supplied by Clear Creek through three canals: The Church Ditch, the Farmers Highline Canal, and the Croke Canal. These canals draw water from Clear Creek above the City of Golden, and flow generally northward approximately 16 to 25 miles across a series of drainages to Standley Lake.

In the late 1970s and early 80s, the Standley Lake Cities became increasingly concerned over the water quality in Standley Lake due to issues surrounding upstream wastewater discharges and several incidents of taste and odor in the drinking water treated from Standley Lake. In addition, Standley Lake has experienced extended periods of severe oxygen depletion (anoxia) in the hypolimnion (lower cold water portion) of the lake during the period of summer stratification. Such anoxia can result in the release of various metals, as well as the recirculation of nutrients from the sediments in the lake's bottom. These releases create the potential for violations of drinking water standards, aesthetic concerns and higher water treatment costs.

Dr. Alex Horn, a consultant to the Standley Lake Cities, reviewed data from the Standley Lake Cities' lake monitoring programs and the USGS 1989-1990 study of Standley Lake. Dr. Horn believes that the cause of the summer anoxia in the hypolimnion is the die-off and decomposition of the spring algae bloom in the lake. As the algae decompose, oxygen is depleted in the lower layer of the lake. This oxygen depletion, in turn, can result in releases, as noted above, of various nuisance metals as well as nutrients from sediments in the lake bottom. Dr. Horn believes that the episodic taste and odor problems experienced in the fall have resulted from algae blooms that are encouraged by the recirculation, after lake turnover in the fall, of nutrients released from the decomposition of the spring algae bloom during the summer, as well as from nutrients released into the water column from the lake sediments during the period of anoxia in the summer. The spring bloom, Dr. Horn believes, results from the addition of highly bioavailable nutrients in the winter inflows to the reservoir. This analysis led the Standley Lake Cities to request the Rulemaking Hearing which in turn lead to the WMA, the Standley Lake Management Plan, and the Mission Statement and Goals of the Standley Lake Cities.

III. Scope of Plan

The following items detail the key actions that the Standley Lake Cities have implemented or will attempt to implement as part of the Standley Lake Management Plan in accordance with the WMA and Mission Statement and Goals of the Standley Lake Cities.

1. Standley Lake Eutrophication Model, Hydrosphere Resource Consultants, 1997:

   A. Development of a nutrient food chain model for the reservoir to explicitly simulate autochthonous carbon production in the system. This would allow one to assess the impact of settling and decomposing algae on hypolimnetic oxygen concentrations;

   B. Development of a mechanistic sediment oxygen demand ("SOD") model to simulate SOD as a function of the flux of organic carbon to the sediments.

   C. Conclusions of Standley Lake Eutrophication Model (Version 2, 2000, Hydrosphere):

1) Allochthonous Particulate Organic Matter ("POC") (external sources) shows a decrease in contribution to the SOD.
2) SOD is a function of settling organic matter in the reservoir. Eight percent of the overall SOD can be attributed to allochthonous POC, the rest is from settling algae and particulate matter.
3) The model under predicts hypolimnetic nitrate during the stratification period. Possible strong nitrate gradients in the hypolimnion during the summer may be the reason that the average hypolimnetic nitrate concentrations predicted by the SLEM do not match the values taken near the bottom of the reservoir.
4) Reservoir hydrology can play a significant role on the period of anoxia.
5) The reservoir is phosphorus limited. External phosphorus loadings represent over 90% of the total phosphorus loading to the reservoir. The remaining loading is a result of sediment releases during periods of anoxic conditions.

D. This model is scheduled to be updated in 2004-2005.

2. Regional Park IGA, 1994

A. The Standley Lake Cities entered into an IGA addressing recreational use of Standley Lake as a regional park.

B. The IGA includes the following controls as assurance that water quality will not be impacted from the users:

1) Water supply operations and water quality protection take precedence over recreation.
2) Allowed boat permits not to exceed 550, with limits for the maximum number of boats on the lake at any one time (150).
3) No personal watercraft (jet skis, etc.) allowed.
4) A permanent system for sanitary facilities.
5) No wake areas at 10-foot water depths.
6) All developed areas in the park will be drained away from the lake.
7) Recreation activities impacting water quality must be eliminated unless impacts can be mitigated.
8) No pre-1971 outboard motors will be allowed.

3. Stormwater Inflow Management

A. Canal Companies Bypass Policies. The Standley Lake Cities will support continuation of the Canal Company policies concerning stormwater structures.

B. Stormwater inflows entering Standley Lake will be bypassed under the following circumstances:

1) Standley Lake has not yet filled for the year, but snow-pack is at or above normal, senior calls are not in effect and not anticipated to be in effect so as to prevent Standley Lake from filling. Standley lake is therefore, reasonably certain to fill.
2) Standley Lake remains full and the water supply outlook for Clear Creek, published June 1st by the Soil Conservation Service ("SCS") shows water supplies at or above average and Clear Creek flows have been above average.

C. If the Canal Companies, after consultation with the Standley Lake Cities, determine to take Tributary Basin stormwater that otherwise would be bypassed by means of structures constructed by the Tributary Basin Entities, then the Tributary Basin Entities shall not be responsible for the quality of water so accepted into the canal as long as permanent BMPs are in place.

D. If it is determined that particulate matter within Clear Creek and the diversion canals contain significant oxygen demand, the Standley Lake Cities will support the adoption by the Canal Companies of a policy of monitoring water supply conditions and sediment loads in Clear Creek. This policy may forego diversion for several days during the peak sediment loading in Clear Creek during spring run-off provided snow-pack conditions, weather conditions, river calls, and the June 1st SCS water supply outlook make it certain that foregone diversions will not adversely affect water yield.

E. The Canal Companies will continue the current canal flushing practices that bypass Standley Lake. The Standley Lake Cities and the Canal Companies acknowledge the potential for loss of usable yield, but will accept such reasonably minimal losses.

4. Monitoring

A. The Standley Lake Cities began monitoring the water quality in Standley Lake in 1980 in response to taste and odor problems and concerns about water quality impacts from upstream wastewater discharges. The monitoring program has been modified over time and includes in-lake sampling at several points and a Remote Sensoring System.

B. Part one of the Standley Lake Monitoring Program includes sampling of the lake at four different points (10-00, 10-35, 10-70, 10-PZ) and the Water Treatment Plant intakes. Analysis, frequency, and criteria are displayed in *Table 1*.

Table 1.

ANALYSIS	FREQUENCY	CRITERIA
Profile (field measurements)	**All events**	
Metals (Soluble and acid extractable)	4/year	Winter,Runoff,Low DO,& After DO
F.Coliform & E.Coliform	1/month	
Gross Alpha/Beta	4/year	Winter,Runoff,Low DO,& After DO
Nutrients	2/month -> Every 2 wks->	December-February March-November
Suspended Solids (total and volatile)& T.Hardness	1/month -> Every 2 wks>	December-February March-November
Chlorophyll a (uncorrected) & Algae (count & ID)	All events	
BTEX	1/month	April-September
TOC	1/month	

C. Part two of the Standley Lake Monitoring Program is the Remote Underwater Sensoring System ("RUSS"). The RUSS contains water quality probes for pH, Conductivity, Dissolved Oxygen, Temperature, Turbidity and Chlorophyll-a. A profile is done with the RUSS twice per day of all parameters. The RUSS is deployed before run-off and removed in November.

5. Hypolimnetic Withdrawals

A. For one year, water will be withdrawn from Standley Lake at the higher of the two intakes for treatment. The next year, water will be withdrawn from the lower of the two intakes. The data will then be complied and evaluated. After the two years, the water resources, water quality, and water treatment personnel will develop an "action plan" for withdrawing water into the treatment plants. In the event that water

quality is not of the highest or causing treatment issues, the intakes can be changed pursuant to the action plan.

B. The action plan for withdrawals will be in place by 2006.

6. External Loadings

A. Each year water quality data from the inflows into Standley Lake will be evaluated for nutrients and metals. Loadings from these analytes will be calculated and compared to previous years.

B. In the event that any of the analytes show considerable increase in loadings, an action plan will be developed to determine the cause of these significant loadings.

C. A stormwater sampling program will be developed by spring of 2005 to determine loadings from storm events. This program will include several automatic samplers at various points in the basin and at the inflows to Standley Lake.

7. Eurasian Water Milfoil Integrated Pest Management Plan

A. Eurasian Water Milfoil (EWM) was discovered in Standley Lake in 1998. EWM is an invasive noxious weed that takes over and crowds out native species in the lake.

B. The Standley Lake Cities evaluated several different methods of controlling EWM. An ecologically safe and non-disruptive method was chosen in 2001. The method involves adding EWM weevils. These weevils will burrow in the stems and ultimately kill the plant. Although the weevils will not completely rid Standley Lake of EWM, they will keep it under control and minimize the overall mass.

C. This is a several tiered project that will last several years at a significant cost. The project was started in 2002, and in 2004, it was reported that the weevils were surviving and starting to make an impact on the milfoil.

D. Part of this plan includes water quality monitoring and determining the affects of EWM on water quality.

8. Water Quality Action Plan

A. Current and past lake data will be evaluated for trends. These trends will then be used to determine future conditions in the lake and avoid potentially negative impacts to the lake.

B. A comparison of algae, loadings, and in-lake concentrations also will be evaluated to determine causes of algal growth and anoxia.

C. If certain indicators are shown to cause significant degradation in the lake, the Standley Lake Cities will evaluate possible causes of impacts and resolve the problems through remediation or legislation.

9. Lakewatch and Trophic Status

A. In 2001, the City of Westminster purchased trending software called Lakewatch. This software was developed by Noel Burns, a consultant and limnologist from New Zealand. The purpose of this software is to evaluate trends in the lake and determine trophic status from several different components.

B. This software has been used for several years and has become an accepted tool for trending in Standley Lake by the Standley Lake Cities.

C. Continued evaluation of this data and software is being conducted on a yearly basis with the assistance and guidance of Noel Burns.

D. An accepted method to determine trophic status is continually being evaluated and studied. A model to determine Trophic Status specific to Standley Lake is being considered.

10. Quality Assurance Project Plan ("QAPP")

A. A QAPP for Standley Lake will be completed by 2006.

IV. Activities/Capital Improvements

1. Dam Renovation Project and Spillway

A. The construction phase of project began in August of 2002 and was completed in late summer of 2004.

B. The project included dam stability, new outlet works, new valve house and a new spillway. The cost of this project was approximately 35 million.

2. Crossing Permits

A. The Standley Lake Cities will continue to support the Canal Companies' current policy of seeking to address current and future pollution problems and issues related to stormwater and flooding controls when the opportunity arises in issuance of crossing permits or through other forms.

3. Watershed Protection Ordinances

   A. The Standley Lake Cities will evaluate, pursuant C.R.S. § (1) (b), watershed protection ordinances to address watershed activities with potential nutrient-loading effects. On December 8, 1994, the City of Northglenn adopted CB-1196 (Ordinance 1115), establishing a Watershed Protection Area and Permit Program.

4. Church Ditch By-Pass Project

   A. Negotiations regarding the potential conversion of a 4.92 mile section of the Church Ditch as a stormwater diversion structure to protect Standley Lake from pollutants entering the lake as a result of development in the tributary basin were restarted in 2003. Negotiations continued in 2004 with a potential ditch conversion in 2005 commensurate with the Mountain Shadow development. Participants include the Standley Lake cities, the City of Arvada, Jefferson County, CDOT, and developers in the Standley Lake Tributary basin. Basic overview of plan:

      - 4.92 miles of ditch to be used as a bypass structure
      - requires new SL delivery structure for all three cities (joint structure proposed)
      - Capacity of stormwater flows approximately 100cfs
      - Flows above 100cfs to be diverted into SL
      - Discharged to BDC
      - Area of ditch to become stormwater bypass is on West side of SL

V. Consulting

1. There are some tasks/studies that the Standley Lake Cities' staff may not have the expertise to accomplish. In those cases, consultants whose areas of expertise are required will be hired to complete some of the water quality tasks/studies for Standley Lake.

2. These consultants will be under contract through the Standley Lake IGA and will report findings directly to the IGA.

3. Several studies can be ongoing at one time and results will be made available, if possible, at the Standley Lake Cities' request.

VI. Water Quality Studies

1. Arbor and Associates Lake Studies, 1981-1988
2. USGS Lake Study, 1989-1990
3. Alex Horn, Standley Lake Evaluation, 1993
4. RBD/CDM, Clear Creek/Standley Lake Watershed Management Study, 1994
5. CDM Updates to Watershed Management Study, 1994

6. RBD Data Report, 1994
7. Hydrosphere Standley Lake Eutrophication Model, Version 1, 1997
8. Hydrosphere Standley Lake Eutrophication Model, Version 2, 2000
9. Noel Burns Trophic Status Study, 2002
10. CDM Updates to Watershed Management Study, 2004-2005
11. Hydrosphere Standley Lake Eutrophication Model Updates, 2004-2005