

# Bear Creek Watershed Association



## 2009 Annual Report for the Water Quality Control Commission



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*The Bear Creek Watershed Association protects & restores water & environmental quality within the Bear Creek Watershed from the effects of land use*

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## Bear Creek Watershed Control Regulation

The Bear Creek Watershed (Figure 1) as recognized by the Denver Regional Council of Governments in the *Metro Vision 2020 Clean Water Plan* (DRCOG 1998) is a specific geographic area requiring special water quality management. The watershed includes all tributary water flows that discharge into Bear Creek Reservoir. The watershed extends from the Mount Evans Wilderness on the western end to the Town of Morrison on the eastern end. The two major tributaries are Bear Creek and Turkey Creek. Water quality in Bear Creek Reservoir and its watershed is managed through implementation of requirements defined in the Bear Creek Watershed Control Regulation (Regulation #74, 5 CCR 1002-74) (Control Regulation). The Control Regulation uses the geographic area of the Bear Creek Watershed as shown in Figure 1. The goal of the Control Regulation is to attain site-specific water quality standards through control of total phosphorus and chlorophyll. The Bear Creek Watershed Association (Association) oversees implementation of the Control Regulation.

## Bear Creek Watershed Association

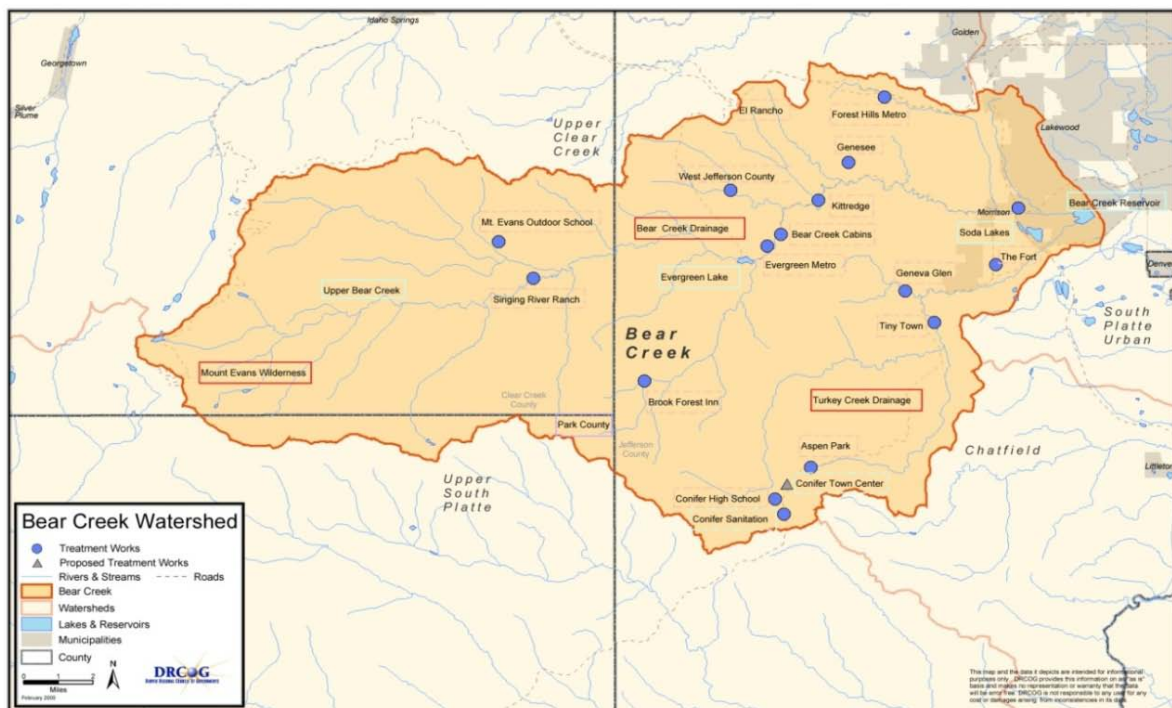
The Association is the local water quality agency responsible for implementation of monitoring and tracking water quality in the Bear Creek Watershed (Figure 1). The Association membership includes counties, local general-purpose governments, special districts (wastewater dischargers), associate agencies, and local citizen groups (Table 1). The Association membership monitors point sources and tracks nonpoint source practices, programs and loadings within the watershed. The Association management and implementation programs are at a watershed level.

The Association provides watershed reporting as posted on the Association website [www.bearcreekwatershed.org](http://www.bearcreekwatershed.org), which serves to keep federal, state, and local governments and others informed on the state of the watershed. The Control Regulation defines specific reporting requirements, which helps the Association keep the Water Quality Control Commission and Water Quality Control Division staff updated on progress of the Association in implementing the Control Regulation.

**Table 1 Association Membership, Dischargers and 2009 Meeting Attendance**

Members and Associates	Wastewater Discharger	2009 Program Participation	2009 Meeting Attendance
<u>Counties</u>			
Jefferson County		Active	60%
Clear Creek County		Active	75%
Park County		No Dues, Not Active	0%
<u>City and Towns</u>			
City of Lakewood		Active	100%
Town of Morrison	Yes	Active	33%
<u>Water &amp; Sanitation Districts</u>			
Aspen Park Metropolitan District	Yes	Active	75%
Bear Creek Cabins	Yes	No Dues, Not Active	0%
Brook Forest Inn	Yes	Dues Paid, Not Active	8%
Conifer Sanitation Association	Yes	Active	75%
Conifer Metropolitan District	Yes	Active	75%
Evergreen Metropolitan District	Yes	Active	100%
Forrest Hills Metropolitan District	Yes	Dues Paid, Not Active	0%
Genesee Water & Sanitation District	Yes	Dues Paid, Not Active	8%
Geneva Glen	Yes	Dues Paid, Not Active	0%

Members and Associates	Wastewater Discharger	2009 Program Participation	2009 Meeting Attendance
Jefferson County School District (Conifer High School & Evans Outdoor School)	Yes	Dues Paid, Not Active	8%
Kittredge Water & Sanitation District	Yes	Active	100%
Singing River Ranch	Yes	Dues Paid, Not Active	0%
The Fort Restaurant	Yes	No Dues, Not Active	0%
Tiny Town Foundation, Inc.	Yes	Dues Paid, Not Active	0%
West Jefferson County Metropolitan District	Yes	Active	100%
<u>Associate Agencies</u>			
Aspen Park Homeowners Association		Active	92%
Colorado Department of Transportation		Not Active	0%
Denver Regional Council of Governments		Not Active	0%
Department of Public Health & Environment		Not Active	8%
Jefferson County Health Department		Not Active	0%
Natural Resources Conservation Service		Active	25%
U.S. Army Corps of Engineers		Active	42%



**Figure 1 Bear Creek Watershed**

### Control Regulation Requirements

The Control Regulation (Regulation #74; 5 CCR 1002-74) identifies the Association's annual reporting requirements for presentation to the Water Quality Control Commission. The Association also produces reports on additional activities. The remainder of this report addresses these reporting requirements: 1) Summarize status of water quality in the watershed for the previous calendar year. 2)

Information on the wastewater treatment facilities loading and compliance with permit limitations. 3) The nonpoint source loading and appropriate best management practices. 4) In-stream and reservoir data analyses that indicate whether water quality goals and standards for the watershed are being met. 5) Information about water quality projects planned or implemented in the watershed. 6) Information on phosphorus trading programs.

## **Status of Water Quality in the Reservoir and Watershed**

### **Monitoring Program Updated**

The monitoring plan details the 2009 reservoir and watershed monitoring programs as approved by the BCWA Board and accepted by the Water Quality Control Division staff (WQCD). This monitoring plan serves as a supplement to the adopted Association Quality Assurance Project Plan (Bear Creek Watershed Association, 2006). The 2009 monitoring program (version 2009.02) included modifications resulting from changes to Bear Creek Control Regulation #74, and updated standards and classifications in Regulation #38. The major changes included:

- Maintain temperature data logger locations by segments with seasonal monitoring periods, and two additional temperature sites for new stream segments.
- Recognize growing season for data collection as July, August and September. Adjust watershed chemistry analyses to focus only on the period of July to September, beginning 2010. 2009 watershed chemistry and field measurements monitoring completed in September.
- New monitoring sites added in 2009 for Summit Lake in the Mount Evans Wilderness, in upper segment 7 below Summit Lake for the July, August and September months.
- Increase monitoring for Evergreen Lake chemistry to obtain samples at -1 meter and +1 meter in water column, and adjust position of temperature data loggers in water column. Track temperature against new standard and DO compliance in central pool of Evergreen Lake.
- Closely monitors dissolved oxygen in water column and adjust the operation of the reservoir aeration system on a weekly basis to maintain DO standards, while minimizing aeration operations.
- Establish sediment and nutrient internal loading studies in Bear Creek Reservoir by September 2009.
- Establish photographic points for critical segments and conditions. Document dewatering of Bear Creek Segment 1b below both the Arnett-Harriman and Ward ditches.
- Update listing of 2009 monitoring sites with the BCWA site identifiers, data logger location and chemistry-monitoring sites by new stream segment descriptions. Identify reference sites for segments. Maintain larger scale maps maintained by Association on Web site.

The routine monitoring program (P1) focuses on Turkey Creek drainage and Bear Creek drainage inputs, and discharge from Bear Creek Reservoir (Figure 2) into lower Bear Creek with a central pool characterization of the reservoir near the dam (BCWA site 40). As shown in Figure 2, the outlet structure is near BCWA site 41 with Bear Creek inflow near BCWA site 44 and Turkey Creek inflow near BCWA site 43. The reservoir chemistry and biological characterization monitoring occurs at BCWA site 40. Vertical probe samples for specific conductance, temperature, Dissolved Oxygen, and



pH measured at 1-meter intervals at all reservoir sites. The current monitoring program optimizes data generation to evaluate reservoir inflow loading, trophic state changes within the reservoir, and reservoir outflow; while minimizing monitoring cost. The aeration sites are visible in Figure 2. Figure 3 shows all monitoring stations within Bear Creek Park. A map of recent sampling sites and wastewater treatment plants shown in Figure 4.

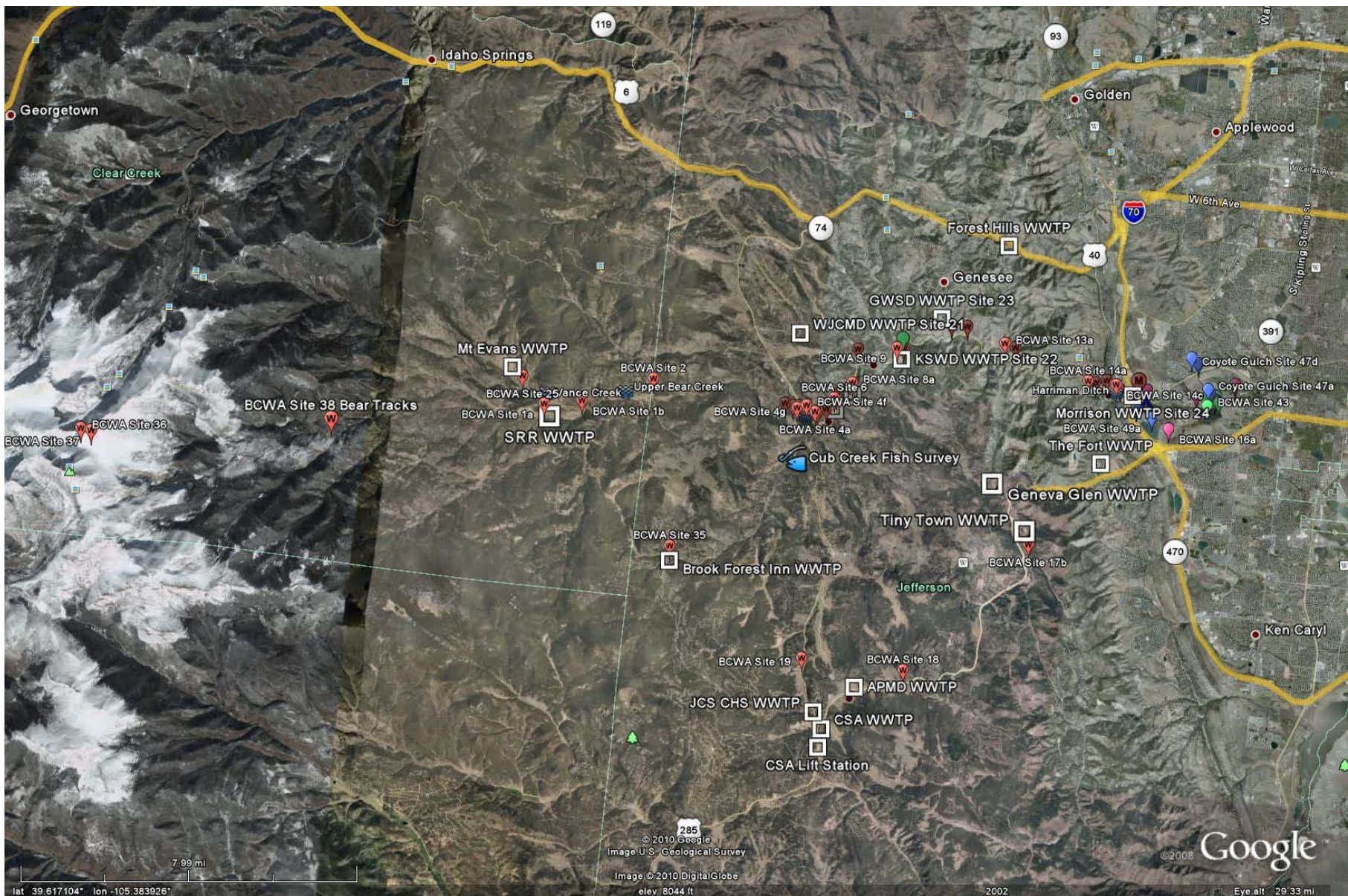


**Figure 2 Reservoir Monitoring Stations; Site 2 is the Routine P1 Station**



**Figure 3 Monitoring Station in Bear Creek Park**







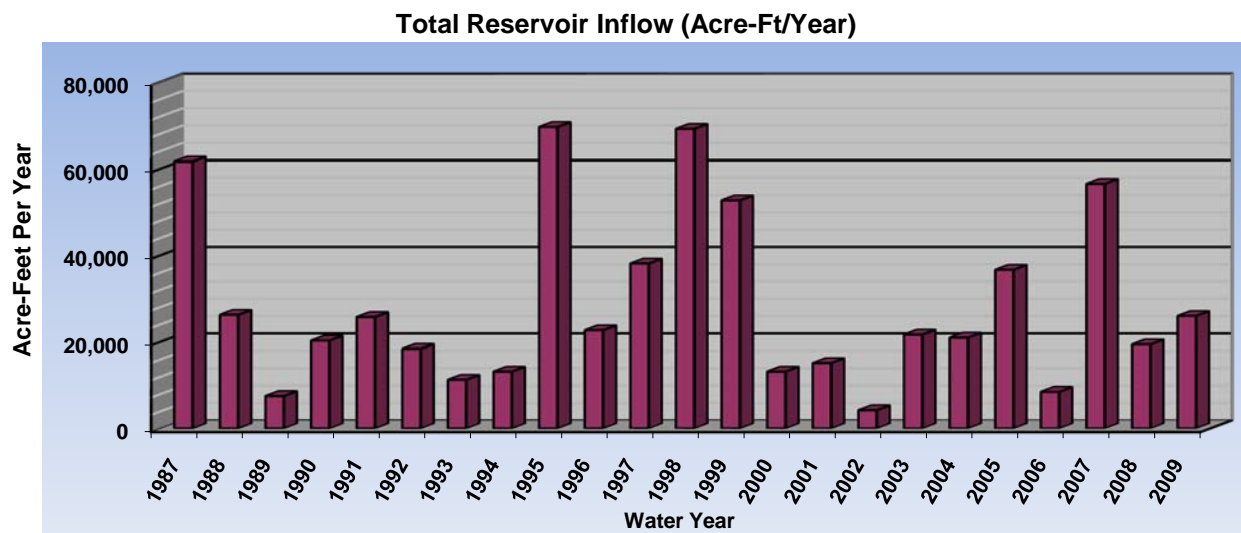
## 2009 Hydrology

Evaluation of water quality in the reservoir includes examination of the basin hydrology, as well as chemistry. Figure 5 shows the Association estimated 1987-2009 total annual flow discharge into Bear Creek Reservoir. In 2009, the total estimated annual discharge into Bear Creek Reservoir was about 25,950 acre-feet (Figure 5). Bear Creek flow diverts at the Harriman Ditch in Morrison, and a portion of the Turkey Creek flow diverts for water uses. Bear Creek flow diverts into the Arnett- Harriman during the irrigation season. The Association analyzed diversion data at both the Arnett-Harriman and Ward diversion points from 199-2007. The Arnett-Harriman ditch reduces flows in lower Bear Creek below 10 cfs in the operational season about 31% of the time (Table 2). The ditch systems can completely dewatered lower Bear Creek for periods of up 11 consecutive days.

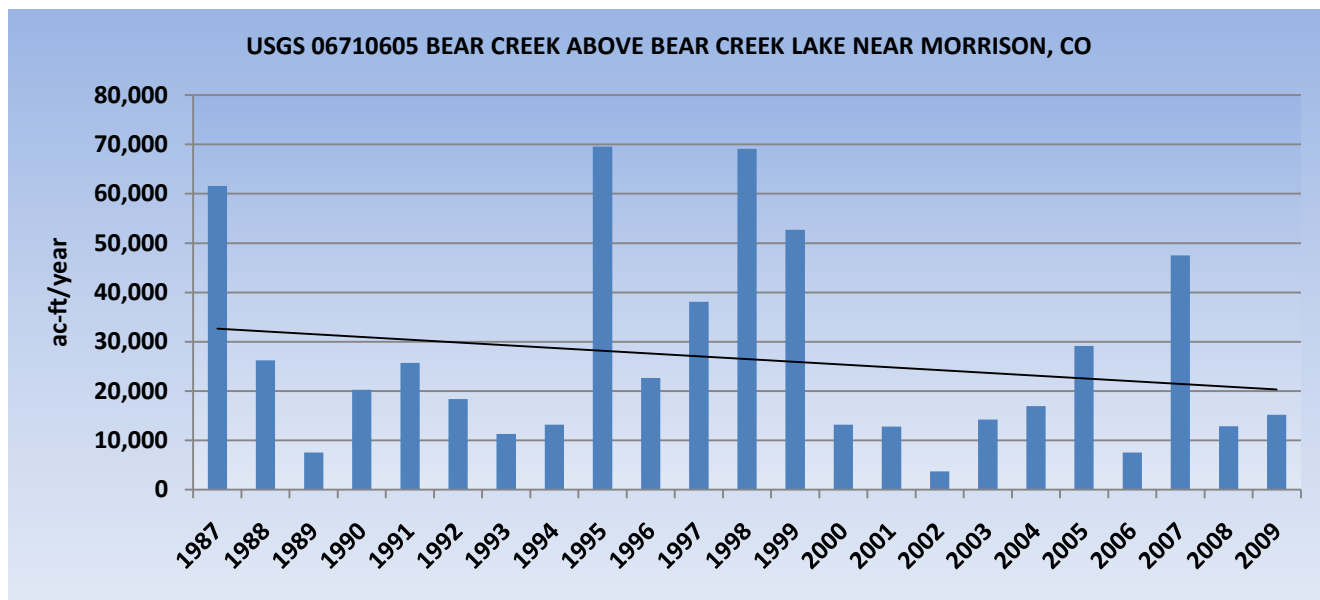
**Table 2 Diversion of Bear Creek Water by the Arnett-Harriman Ditch**

Flow Below Arnett-Harriman Diversion						
	Total Days Diversion	days below <10 cfs	days below <2.5 cfs	days below <1 cfs	days below <0 cfs	Consecutive Days <1 cfs
1999-2007	2591	813	350	172	85	Up to 11 days
		31.4%	13.5%	6.6%	3.3%	

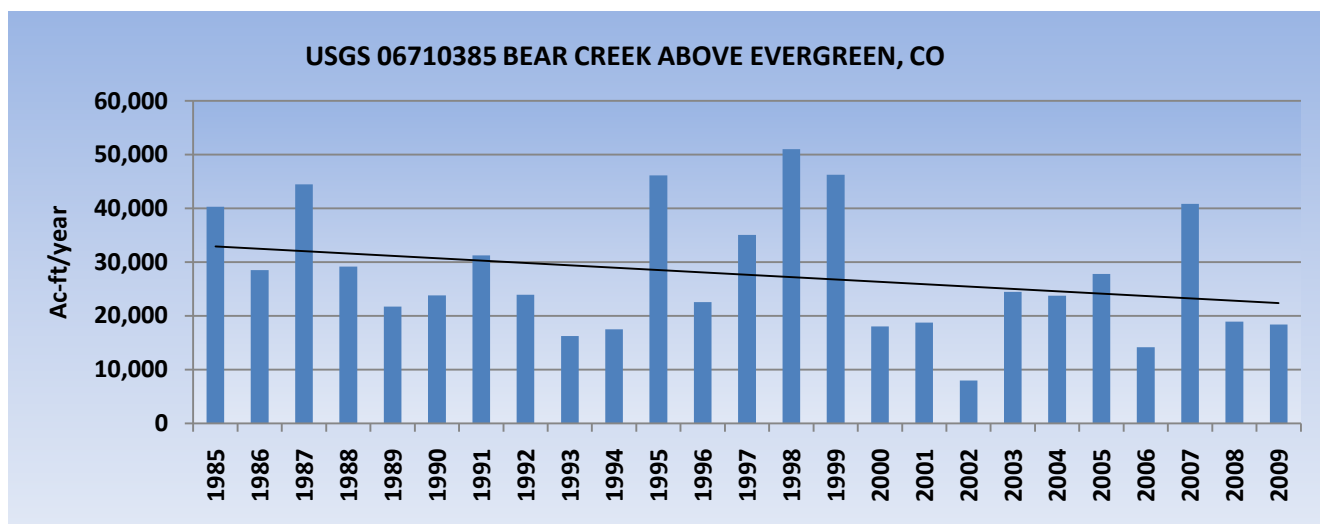
The reservoir inflow represents flows below the water diversions and is not representative of the total watershed water flows. Bear Creek flows above Bear Creek Reservoir (Figure 6) and at the Evergreen gaging station (Figure 7) provide an estimate of the amount of water diverted from the watershed before reaching the reservoir. For example, in 2009 the Bear Creek water use diversion reduced flow to the reservoir by about 3,200 ac-ft (-28 %). Additionally, the longer time trends shown in Figures 6 and 7 depict a basic linear trend of declining flow in Bear Creek. Figure 8 shows the 2009 reservoir monthly inflow and outflow estimates. Peak runoff occurred in April 2009. The historic peak runoff period is June.



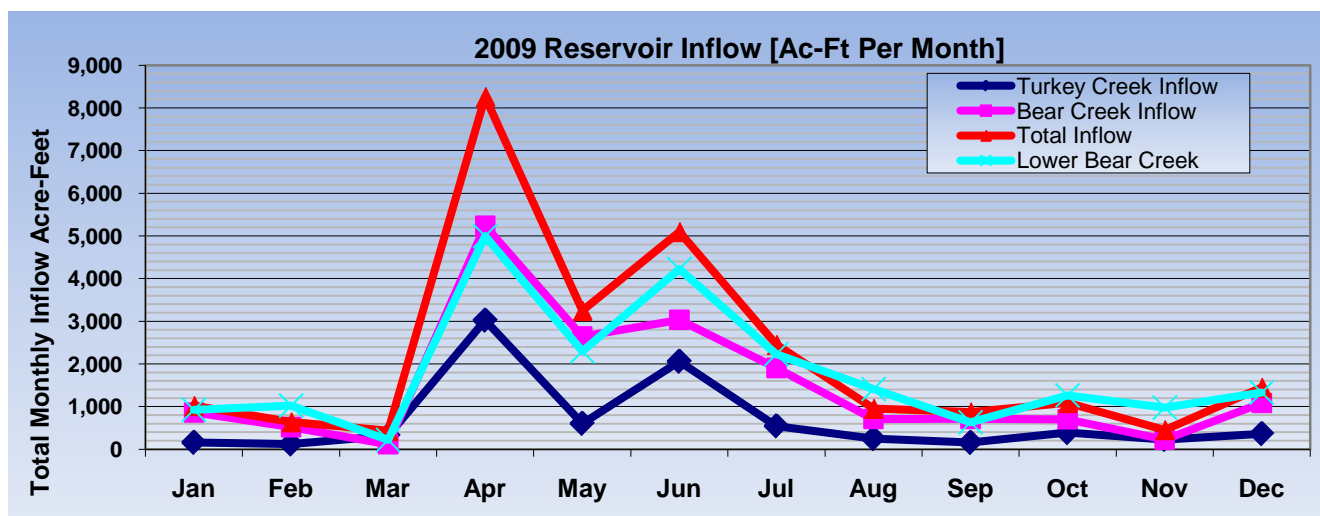
**Figure 5 Annual Flows into Bear Creek Reservoir**



**Figure 6 Bear Creek above Bear Creek Reservoir Annual Acre-feet/year Flow**



**Figure 7 Bear Creek above Evergreen Annual Acre-feet/year Flow**



**Figure 8 2009 Inflow Bear Creek Reservoir**

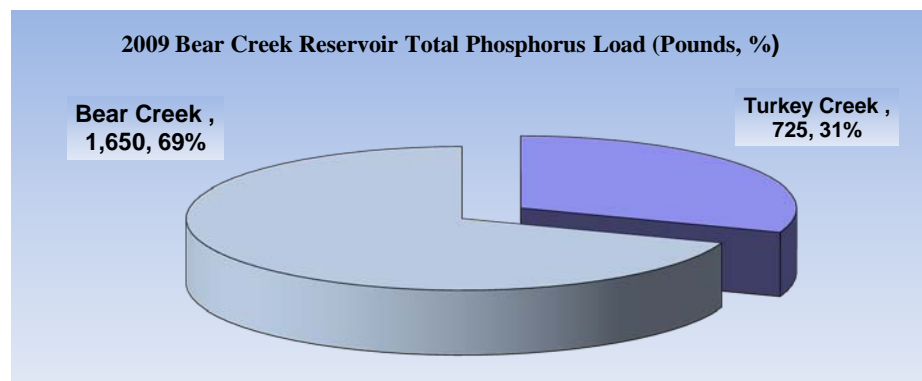
## **2009 Nutrients**

The watershed-monitoring program characterizes nutrient loading into Bear Creek Reservoir from two primary drainages: Bear Creek and Turkey Creek. The Association monitors for total phosphorus, dissolved phosphorus, and nitrate-nitrite nitrogen on a monthly basis, and for total nitrogen in the Bear Creek Reservoir from July-September.

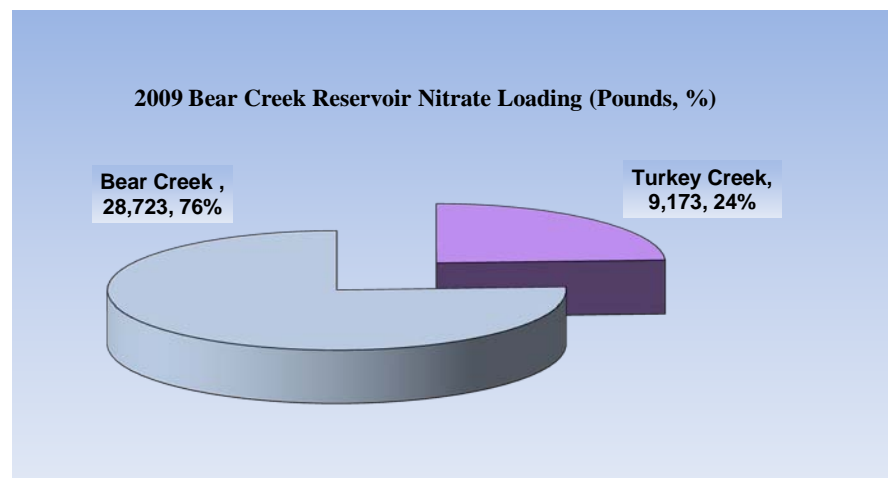
The total phosphorus load from the watershed comes from a combination of wastewater treatment plant point source loads and nonpoint sources, including runoff. The estimated total phosphorus load in 2009 from all sources reaching the reservoir was 2,375 pounds at a flow of about 25,950 acre-feet. Bear Creek drainage contributed 69% of the load (Figure 9). The nitrate loading (37,900 pounds) was typical of past lower flow conditions (Figure 10). Although the point source discharges of total phosphorus were about 1,203.6 pounds, the water diversions above the reservoir are removing a portion of this phosphorus load and inflow water before it reaches the reservoir.

Figure 11 shows the 2009 total phosphorus concentrations at the routine watershed monitoring stations. Figure 12 shows the 2009 nitrate concentration at the routine watershed monitoring stations. Figure 13 shows the summer total nitrogen in comparison with the annual reservoir nitrate concentrations.

The management program targets reduction of total phosphorus reaching the reservoir on an annual basis. Figure 14 shows the total phosphorus inflow trend. The nitrogen data has shown greater fluctuation over the years with no clear long-term trend (Figure 15).



**Figure 9** Estimated Total Phosphorus loading in 2009



**Figure 10** Estimated Nitrate loading in 2009



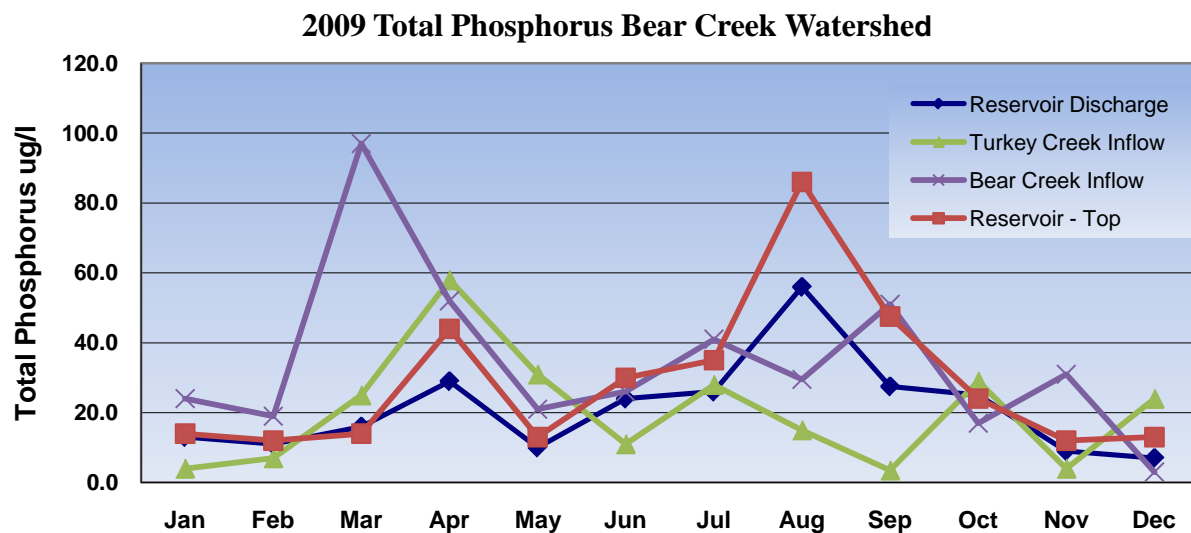


Figure 11 2009 Total Phosphorus

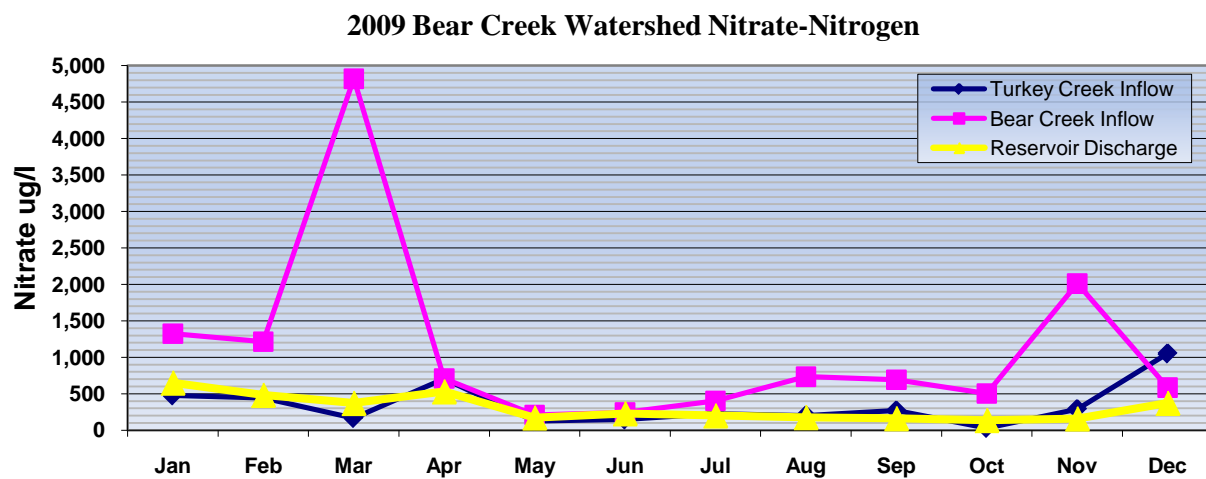


Figure 12 2009 Nitrate

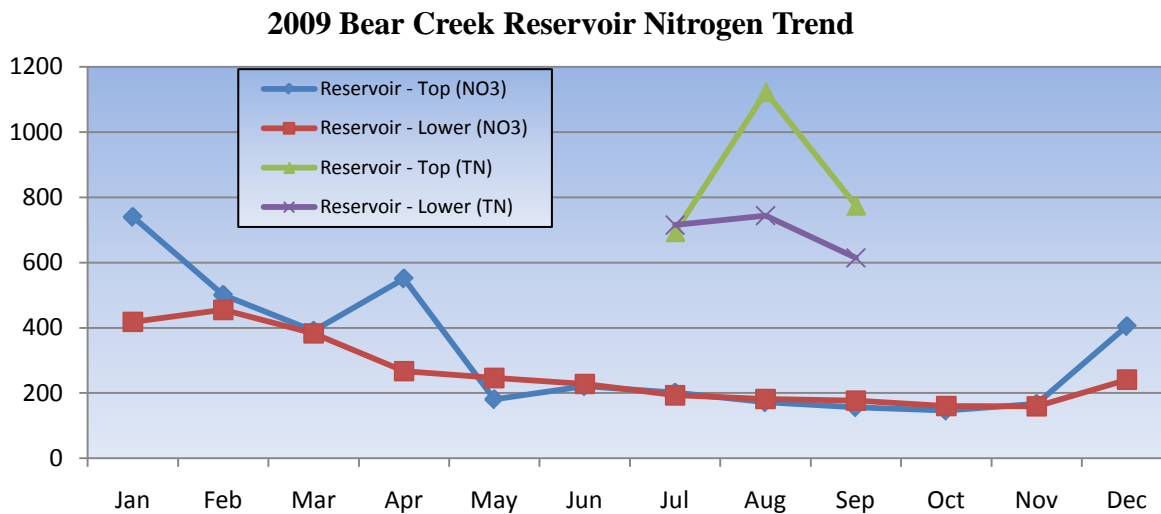


Figure 13 Bear Creek Reservoir Nitrogen Concentrations

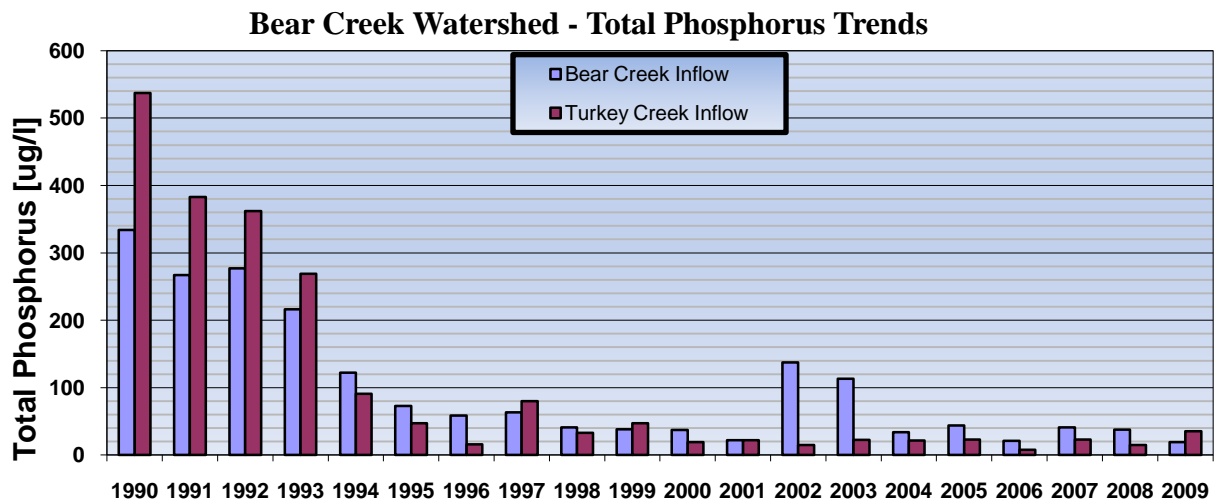


Figure 14 Annual Total Phosphorus Inflow

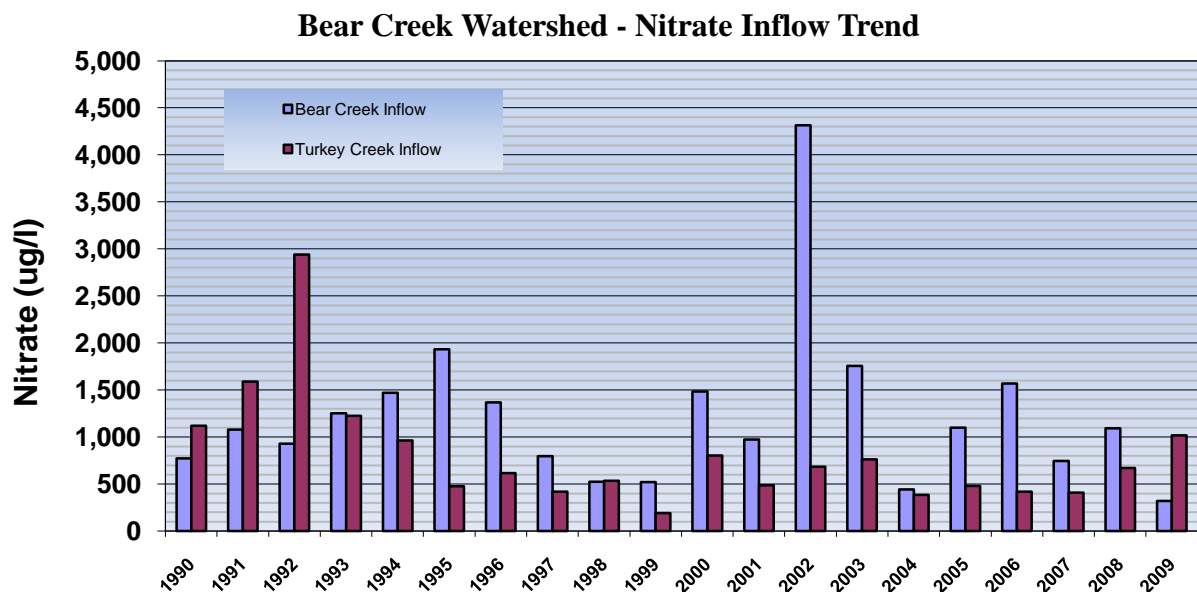


Figure 15 Annual Nitrate Inflow

### 2009 Trophic State of Reservoir

The Association's reservoir monitoring program collects samples to analyze nutrient (nitrogen and phosphorus) concentrations, chlorophyll-a, total suspended sediments and Secchi depth as trophic index variables. Table 3 presents data summaries for these Association trophic indicators. Table 4 summarizes the 2009 reservoir data compared with the long-term patterns from 1991 through 2009.

Overall, 2009 water quality improved over historic trends. Figure 16 shows the general distribution of phytoplankton species. Figure 17 shows the general clarity trend in the water column using Secchi measurements. April and July had the poorest clarity caused by phytoplankton blooms.

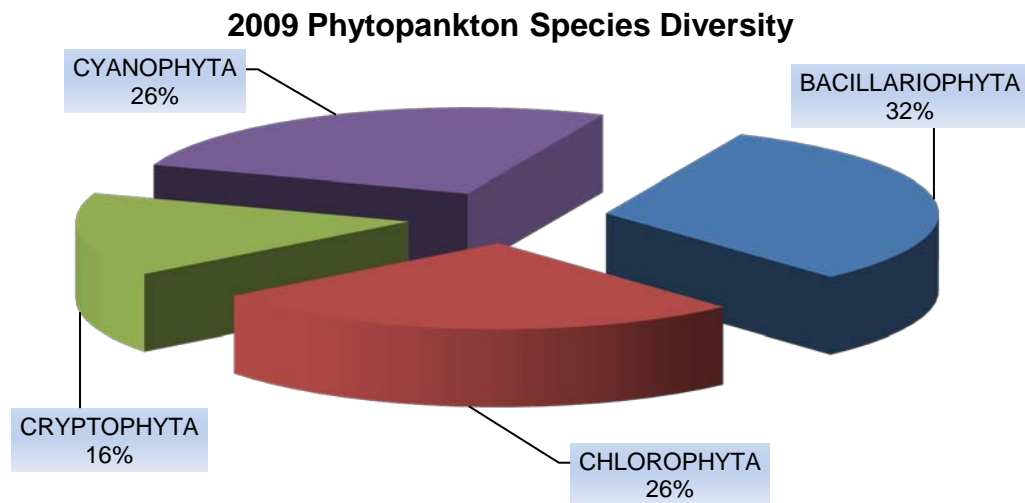
**Table 3 Bear Creek Reservoir Selected Trophic Indicators**

<b>Trophic Indicator</b>	<b>Reservoir</b>
<b>Chlorophyll</b>	
Average Growing Season Chlorophyll-a [ug/l (surface waters only)]	23.3
Average Annual Chlorophyll-a [ug/l (surface waters only)]	12.5
Peak Chlorophyll-a [ug/l]	80.4
<b>Phosphorus</b>	
Average Annual Total Phosphorus [ug/l]	34.8
Seasonal Annual Total Phosphorus [ug/l]	49.1
Peak Annual Total Phosphorus [ug/l]	131
Average Annual Ortho Phosphorus ug/l]	13
Seasonal Average Ortho Phosphorus [ug/l]	18
Peak Annual Ortho Phosphorus [ug/l]	44
<b>Nitrogen</b>	
Average Annual Nitrate-Nitrogen [ug/l]	267
Seasonal Average Nitrate-Nitrogen [ug/l]	180
Peak Annual Nitrate-Nitrogen [ug/l]	740
<b>Clarity</b>	
Average Annual Secchi Depth (meters)	2.7
Seasonal Average Secchi Depth (meters)	1.8
<b>Total Suspended Sediments</b>	
Annual Average Total Suspended Sediments [mg/l]	8.7
Seasonal Average Total Suspended Sediments [mg/l]	8.1
Peak Total Suspended Sediments [mg/l]	27.8
<b>Phytoplankton Species</b>	
<b>Phytoplankton Species Co-dominant Species</b>	<i>Anabaena sp.</i>
	<i>Anabaena flos-aquae</i>
	<i>Aphanizomenon flos-aquae</i>
	<i>Rhodomonas minuta</i>
	<i>Ankistrodesmus falcatus</i>
	<i>Schroederia sp</i>

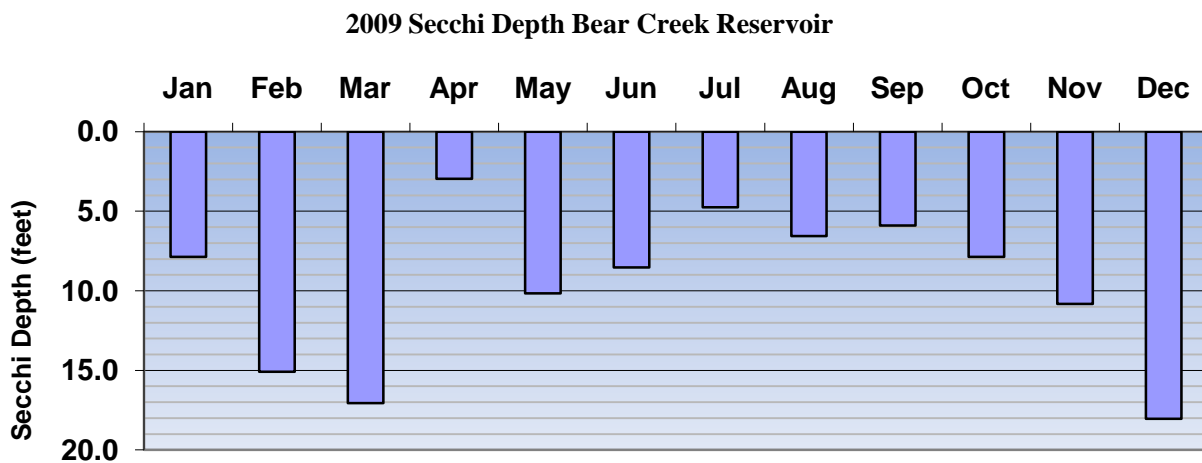
**Table 4 Reservoir Summary for Select Trend Parameters**

<b>Parameter</b>	<b>Site</b>	<b>Reservoir Annual Average Concentrations</b>	
		<b>2009</b>	<b>91-09 Mean</b>
Chlorophyll-a (ug/L)	Top	12.5	14.8
Nitrate-Nitrogen (ug/L)	Top	291	341
	Bottom	244	313.7
Total Phosphorus (ug/L)	Top	34.2	63.1
	Bottom	35.3	91.7
Total Suspended Solids (mg/L)	Top	6.9	6.5
	Bottom	10	10.6
Secchi Depth (m)	Top	2.7	2.2





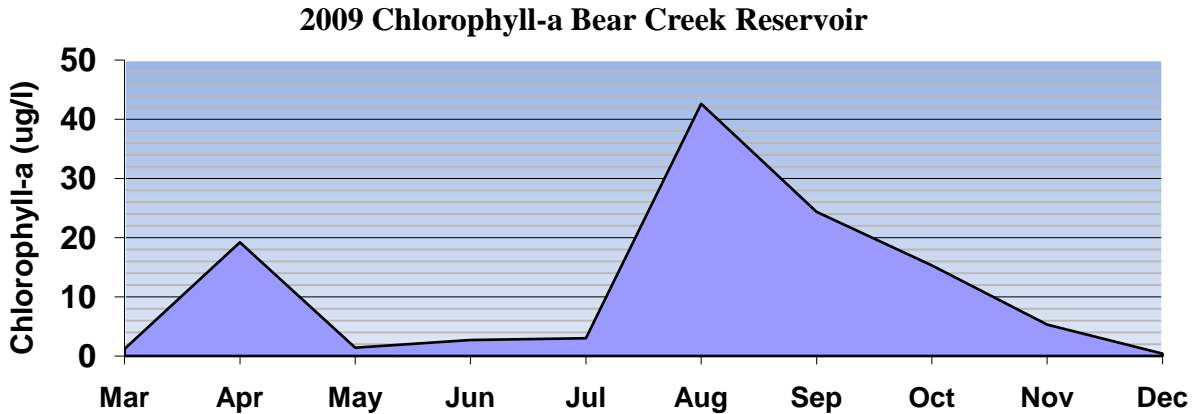
**Figure 16** 2009 Phytoplankton Diversity



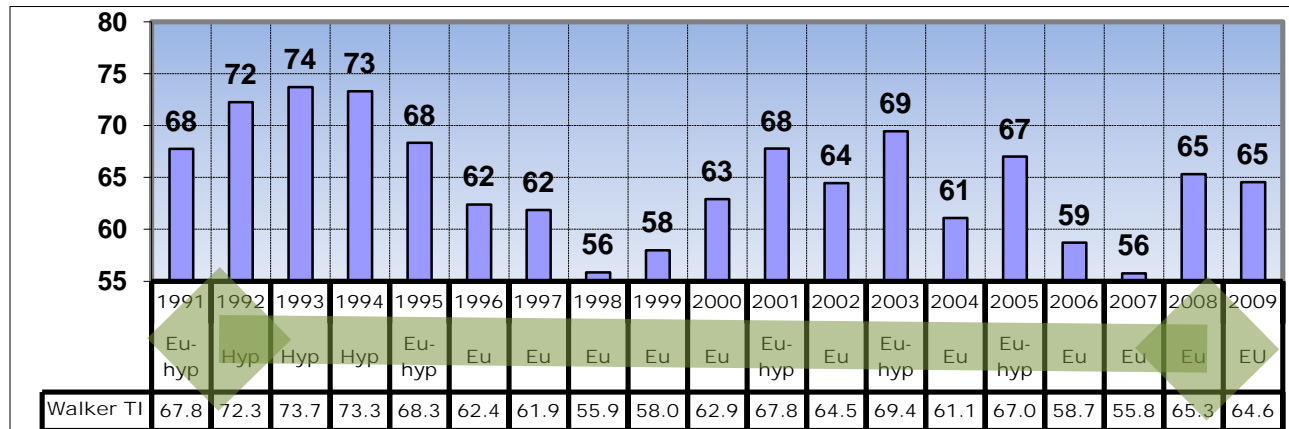
**Figure 17** 2009 Secchi Depth Bear Creek Reservoir

The reservoir had several algal blooms in 2009 as evidenced by the peak early August chlorophyll concentration of 80.4 ug/l (August average Chlorophyll was 42.6 mg/l). In 2009, bloom frequency increased in April and August, as evidenced by the surface chlorophyll concentrations (Figure 18). The peak phytoplankton density in 2009 was 4,500 cells/ml caused by a blue-green phytoplankton species. Historically, blue-green phytoplankton species are associated with major blooms in the reservoir.

The monitoring data indicates management efforts have helped shift the trophic index away from the poor hypereutrophic conditions originally monitored in the reservoir. Generally, the reservoir trophic state in 2009 was eutrophic (Walker Index, Figure 19). The Carlson Index shows a similar eutrophic trend. Although external nutrient loads were lower than historic trends, the reservoir continues to have an internal nutrient loading problem, which causes eutrophic water quality conditions.



**Figure 18 2009 Chlorophyll**



**Figure 19 Walker Trophic Index Trend Bear Creek Reservoir**

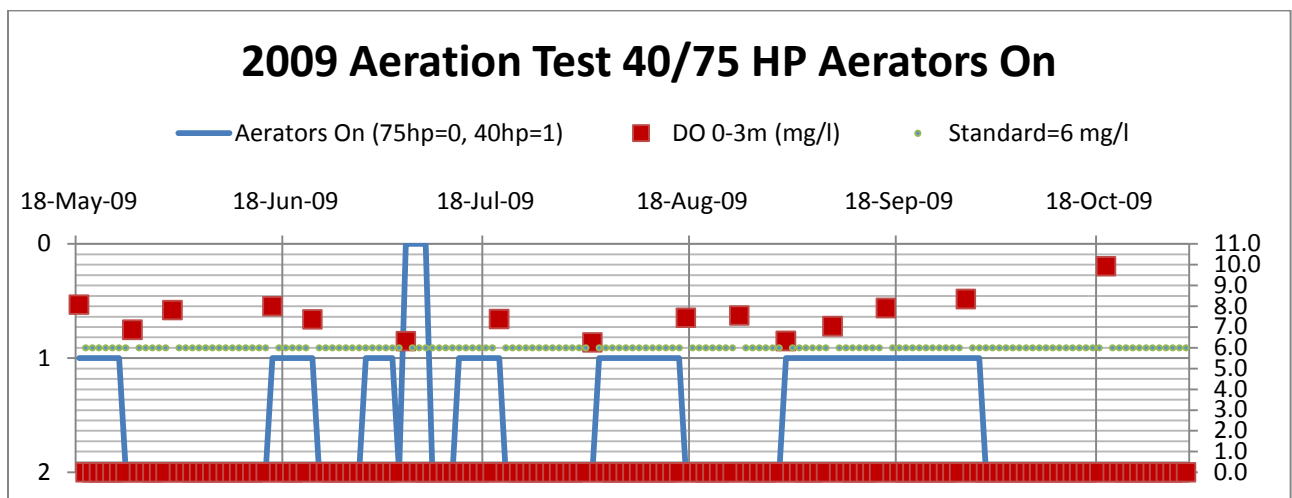
### Bear Creek Reservoir Aeration Management Practice

The reservoir aeration system reduces chlorophyll productivity, possibly through the partial control of internal nutrient loading that can trigger algal blooms. The Association adopted a policy that makes the reservoir aeration system a permanent reservoir management tool. The Association determined through ongoing monitoring that the de-stratifying aeration system in Bear Creek Reservoir is a necessary and long-term or permanent management practice necessary to protect the quality reservoir fishery (Figure 20) and prevent Dissolved Oxygen standard exceedances during summer months of June 1-September 30. Reservoir aeration is also a necessary management tool in low flow conditions.

The current aeration system has been operational since the summer of 2002 and uses a fine-bubble diffusion system with aerators distributed across the hypolimnion. In 2009, the Association and Lakewood ran operational studies to determine the effectiveness of the aeration system in oxygen transfer during phased on-off cycling (Figure 21). The aeration system can increase the Dissolved Oxygen concentrations throughout the water column by about 2 mg/l within a two-week period. The larger 75 HP blower is not more efficient than the 40 HP blower. The Association will continue operational testing in 2010.



**Figure 20** Jeremy Cassidy Knows Where the Big Fish Hide



**Figure 21** Reservoir Aeration Operational Testing

The total suspended sediment load in the reservoir has been generally constant over the historic monitoring period with periodic storm events dumping large volumes of sediment into the reservoir. The Association in 2009 noted no significant change in reservoir depth. Bottom sediments remain a mixture of fine sand, silt and mud. At reservoir monitoring site 40, bottom surface sediments as observed in 2009 were predominately a fine-grained black mud Figure 22.



**Figure 22** Jamie Anthony (CDOW) Helped Core Sediments Bear Creek Reservoir



## Wastewater Treatment Facilities Loading and Compliance

### Wasteload Compliance

The total wasteload allocation of phosphorus from all wastewater treatment facilities in the Bear Creek Watershed is 5,255 pounds per year. Table 5 lists the permitted wastewater treatment facilities. Each individual discharger in the Bear Creek Watershed is limited to an annual wasteload of total phosphorus, except as provided through trading provisions. Wastewater discharges cannot exceed a total phosphorus effluent concentration of 1.0 mg/l as a 30-day average.

All reporting facilities were in attainment with the assigned wasteload allocations (Table 5).

**Table 5 Treatment Facility Wasteload Allocations**

<b>Bear Creek Watershed Wastewater Treatment Plant</b>	<b>Phosphorus Pounds/ year</b>	<b>2009 Phosphorus Pounds/ year</b>
Evergreen Metropolitan District	<b>1,500</b>	<b>235.5</b>
West Jefferson County Metro District	<b>1,500</b>	<b>374.7</b>
Genesee Water and Sanitation District	<b>1,015</b>	<b>322.2</b>
Town of Morrison	<b>600</b>	<b>135</b>
Kittredge Sanitation and Water District	<b>240</b>	<b>63.7</b>
Forest Hills Metropolitan District	<b>80</b>	<b>56.4</b>
Conifer Metropolitan District	<b>80</b>	<b>5.1</b>
Aspen Park Metropolitan District	<b>40</b>	<b>6.4</b>
Jefferson County Schools – Mt. Evans Outdoor School	<b>20</b>	<b>1.8</b>
Jefferson County Schools - Conifer High School	<b>110</b>	<b>2.2</b>
Bear Creek Development Corp. - Tiny Town	<b>5</b>	<b>0.1</b>
Bear Creek Cabins (Bruce & Jayne Hungate)	<b>5</b>	<b>0.5</b>
Brook Forest Inn	<b>5</b>	<b>No Report</b>
<b>Total Operational Facilities</b>		<b>1203.6</b>
The Fort	<b>18</b>	<b>No Monitoring<sup>2</sup></b>
Singing River Ranch	<b>30</b>	<b>Not Operational</b>
Geneva Glen	<b>5</b>	<b>No Discharge<sup>3</sup></b>
Reserve Pool	<b>2</b>	<b>Not used</b>
<b>Total Phosphorus Wasteload</b>	<b>5,255 lbs/year</b>	

1 Forest Hills Metro District has trade agreement with West Jefferson County Metro District and complies with permit. 88.5 pounds was added into the West Jefferson County allocation, which was 286.2 pounds for a total West Jefferson County Metro District discharge of 374.7 pounds.

2 Permit; No established monitoring;

3 The Geneva Glen treatment plant is not discharging as reported to the Association.

### Permit Compliance and Plant Expansions/Actions

Table 6 shows permitted wastewater treatment facilities in the watershed, status of wastewater planning, and reported permit compliance problems. All wastewater treatment plants in the watershed are minor facilities using the WQCD permit classification system. The Association worked on planning and review efforts for Jefferson County Schools Mt. Evans Outdoor School.

**Table 6 Wastewater Planning Status**

Facility	Wastewater Utility Plan	Any Updates, Lift Station, or Amendments	Facility Upgrades [2009-2012]	Compliance Problems
Evergreen Metropolitan District	Yes	CPE complete, Structural upgrades, Odor controls	Yes	No
West Jefferson County	Yes	CPE complete, odor controls	Yes	No
Genesee	Yes	No	No	No
Kittredge	Yes	No	No	No
Morrison	Yes	Update to Utility plan in progress, planned upgrades 2010	Yes	No
Jefferson County Schools Conifer High School	Yes	No	No	No
Jefferson County Schools Mt Evan Outdoor	Yes	New facility design	Yes	Yes
Forest Hills Metropolitan District	No	No	Yes	Yes, will be corrected with plant upgrade
Conifer Sanitation Association	Yes	No	Yes	No
Aspen Park Metro District	Yes	New infiltration gallery	Yes	No
Conifer Metro District (CMD)	Yes	No	No	Chloride -3-yr window to correct problem
The Fort	Yes	Morrison Utility Plan	Yes	Unknown
Bear Creek Development	No	No	No	No
Bear Creek Cabins	No	No	Yes	Unknown
Singing River Ranch	No	Plugged Influent	No	No
Brook Forest Inn	No	No	No	Unknown
Geneva Glen	Yes	No	No	No

### **Trading Program**

The Association maintains a pollutant-trading program as defined in *Trading Guidelines* (Association 2006) and in *Bear Creek Reservoir Control Regulation #74* for total phosphorus trades specific to the Bear Creek Watershed: Point source to point source trades (regulation and permit); and Nonpoint source to point source total phosphorus trading specific to the Bear Creek Watershed (*Trading Guidelines*).

In 2009, the Association participated with EPA's evaluation program to promote water quality trading. The EPA posted survey results on the EPA web site.

The *Bear Creek Trading Guidelines* allow permitted point source dischargers (Colorado Wastewater Discharge Permits) to either receive phosphorus pounds for new or increased phosphorus wasteload allocations in exchange for phosphorus loading reductions from nonpoint source pollutant reduction or through approved point source trades. Table 7 lists all Association trades. The reserve pool remained at 2 pounds and no changes made in 2009. The trades in the watershed remain consistent with the total wasteload allocations listed in Table 5.

**Table 7 Phosphorus Trading Activity in Bear Creek Watershed**

Involved Agencies	Type of Trade	Active Trading in 2009
Forest Hills Metro District (FHMD) has trade agreement with West Jefferson County Metro District(WJCMD) <sup>1</sup>	Point Source to Point Source	Yes (reflected in WLA; see Table 5)
City of Lakewood Coyote Gulch Project	Nonpoint source trade credits	Under data collection/ review by Association; no trade credit assigned in 2009

Involved Agencies	Type of Trade	Active Trading in 2009
The Fort Restaurant	Reserve Pool to Point Source	Permit in Progress; Trade reflected in reserve pool limit previously granted by the WQCC
Jefferson County Schools (Conifer High School and Mt. Evans Outdoor School)	Point Source to Point Source	In Discharge Permits; no change in pounds; reallocation between facilities
Conifer Metropolitan District	Reserve Pool to Point Source	Trade reflected in reserve pool limit previously granted by the WQCC

<sup>1</sup>The trade agreement is between WJCMD and FHMD for phosphorus removal. FHMD is allowed to discharge PO<sub>4</sub> at a concentration of 1.0 mg/L. WJCMD agrees to remove the remainder. The calculations are as follows:

- Total lbs of PO<sub>4</sub> FHMD is allowed to discharge is calculated by Flow X 1.0 mg/L X 8.34
- mg/L is subtracted from the FHMD reported average monthly concentration
- This is the concentration of PO<sub>4</sub> WJCMD agrees to remove
- Total lbs of PO<sub>4</sub> WJCMD removes is calculated by FHMD flow X calculated concentration X 8.34
- The total lbs of PO<sub>4</sub> discharged by WJCMD is calculated by the total of WJCMD + Excess FHMD PO<sub>4</sub> pounds

### **Regulated Stormwater Management**

The City of Lakewood has a municipal separate storm sewer permit. Lakewood supports many stormwater management programs in the watershed, including the *Rooney Road Recycling Center*, which also serves as watershed prevention BMP. Lakewood collected waste products for proper disposal (includes oil, paint, antifreeze, misc. chemicals, and solid wastes) from an Evergreen area collection in 2009. This process keeps materials out of septic systems and helps reduce illegal dumping in the watershed. Lakewood regularly reports to the Association on stormwater management practices and programs.

Jefferson County also has a municipal separate storm sewer permit. Jefferson County's program includes: Public Education and Outreach; Public Participation and Involvement; Illicit Discharge Detection and Elimination; Construction Site Runoff Control; Post Construction Site Runoff Control; and Pollution Prevention/Good Housekeeping. The county provides opportunities for residents and visitors in the watershed to learn and be involved in environmental stewardship and programs that promote water quality. The county has a comprehensive storm sewer outfall map to trace sources of potential illicit discharges and illegal dumping in the watershed.

The Colorado Stormwater Council produced a NPDES stormwater education video in 2009, which received a national award. The Association was a financial sponsor of this video.

More information about municipal separate storm sewer system permittee activities provided in Appendix A.

## **Nonpoint Source Loading and Appropriate Best Management Practices**

### **Septic System Management**

In 2009, the Association continued limited discussions with Jefferson County Health Department based on previous presentations made to the Jefferson County Board of Health and the Jefferson County Commissioners. Jefferson and Clear Creek counties reviewed their septic system regulations. The Association predicts onsite wastewater systems in a number of specific areas in the Bear Creek Watershed contribute to water quality degradation. There are estimated 27,000-onsite systems in the watershed.

Jefferson County is proposing updates to its comprehensive plan. These updates address onsite issues with the intent to ensure quantity and quality of water resources are maintained in areas using septic



systems. Policies in the Comprehensive Plan note, “When well and septic are proposed, inside the Mountain Ground Water Overlay District (MGWOD), the overall gross density should not exceed 1 du/7.5 acres and the minimum lot size should be 5 acres. When well and septic are proposed, outside the MGWOD, the overall gross density should not exceed 1 du/5 acres and the minimum lot size should be 3.5 acres.”

### **Watershed Nonpoint Source Program Elements**

The management of nonpoint sources in the Bear Creek Watershed is a component of the Association planning and management programs. Phosphorus reduction from nonpoint sources is still required in the watershed. A lack of implementation authority limits the nonpoint source program. The Association does maintain a comprehensive watershed-monitoring program to determine sources of nutrient loading into waterways.

The Association will increase monitoring of stormwater loadings in select locations in the middle section of the watershed. The Association has identified a number of potential project locations requiring corrective land use controls. The Association has worked with several local businesses that caused minor nonpoint source runoff from their business sites with the implementation of runoff controls. These runoff control programs were very successful.

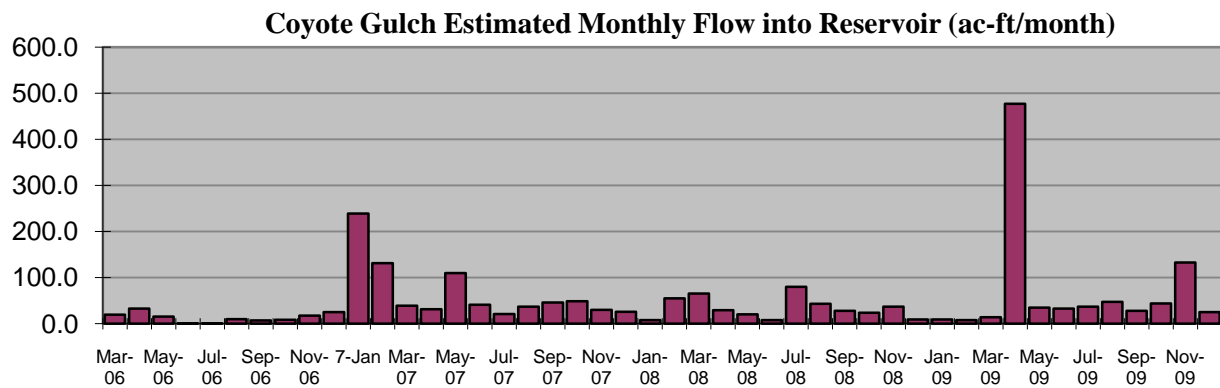
### **Association Land-Use Review**

The Association has a limited number of “policies” to help with management of the watershed program. The Association is a referral agency to land use agencies within the Bear Creek Watershed, including cities and counties. The Association reviews referral applications for consistency with local, regional and state water and environmental regulations, associated policies and the watershed management plan. To assist the Association in the referral process, a “Referral Review Guidance” (Association 2007) outlines general components of the Association land disturbance mitigation preferences, Association review and comment guidance. This guidance addresses nonpoint sediment loading before it becomes a watershed problem. Referred land use applications that cause a land disturbance and/or a potential to degrade water quality are subject to review and comment by Association.

The Association completed five referrals in 2009 that addressed issues related to erosion, manure management, land disturbance, re-zoning, water quality degradation and appropriate use of best management practices.

### **Coyote Gulch Nonpoint Source Restoration**

The Association is involved in a nonpoint source project sponsored by the City of Lakewood that restored a severely eroded section of Coyote Gulch. This project received four awards for stream restoration sustainability, drainage and flood control restoration, top regional innovative project, and best nonpoint source grant project in 2009. Coyote Gulch revegetation began in June 2007 and became well established in 2008. The Association has a paired water-sampling program, which should allow a future determination on the effectiveness of the restoration effort. The Association has monitored flow and limited chemistry since March 2006 in Coyote Gulch (Figure 23; flow record).

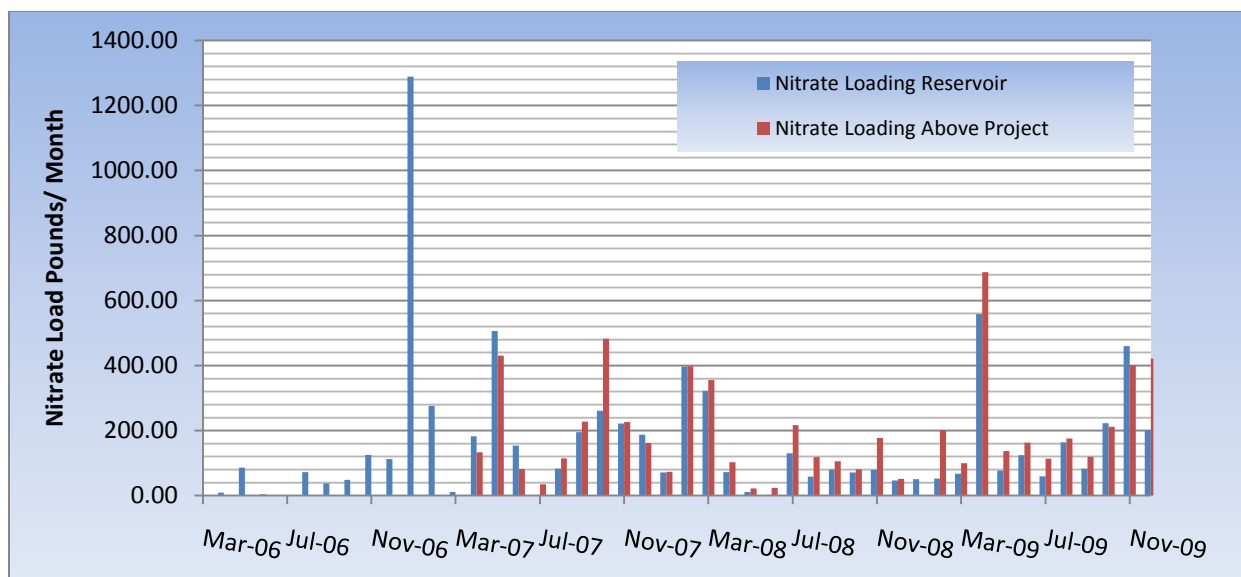


**Figure 23 Inflow in Coyote Gulch**

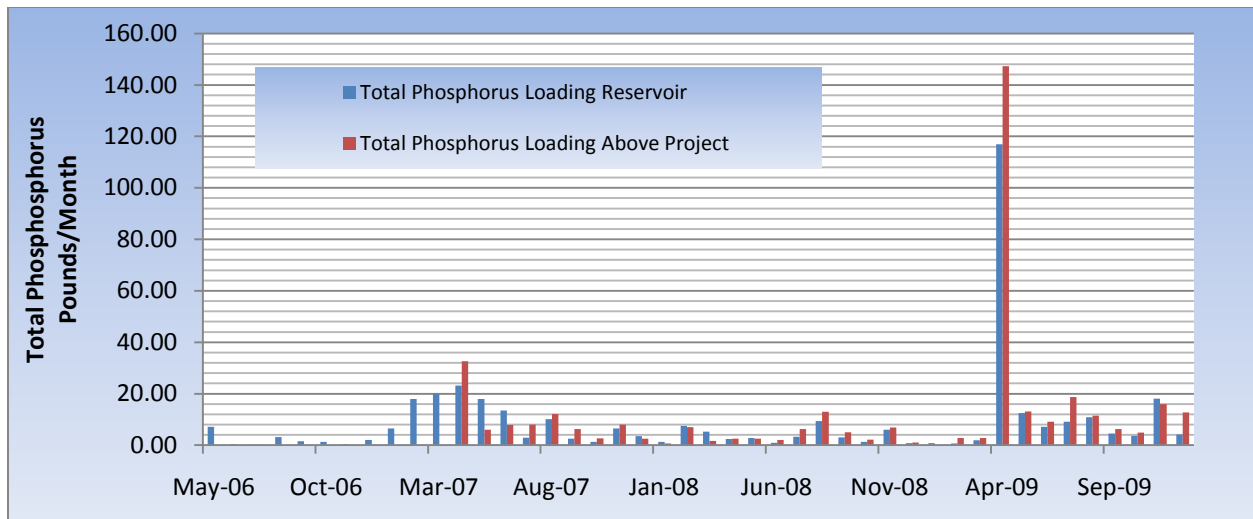
Prior to construction, the average monthly base load of total phosphorus was about 20 pounds per month with specific storm loading events that could exceed several 100 pounds (Table 8). After completion of the project, the monthly average base load reduced by about 56% (Table 8). A 2009 storm load event was monitored with dramatically reduced storm loading. Figures 24 and 25 show the 2006-2009 pre-construction and post-construction summaries. The project reduces the annual base load of total phosphorus reaching the reservoir by about 187 pounds. There are about 53 pounds of total trade phosphorus available from the project on an annual basis (based on a 2:1 trade ratio). The total project cost was about \$440,000. Consequently, the trade phosphorus has an estimated value of \$8,300 per pound. The Association and the City of Lakewood are in the process of developing a trade agreement for these total phosphorus pounds.

**Table 8 Nitrate and Phosphorus Load Estimates at Coyote Gulch**

		Reservoir		Storm Loads (1 inch/24-hrs)	
		Nitrate (lb/mo)	T Phosphorus (lb/mo)	Nitrate (lbs/event)	T Phosphorus (lbs/event)
Pre-construction Post-Construction	<b>2006-2007</b>	200.68	19.96	1290	193
	<b>2007-2008</b>	128.69	4.43		
	<b>2009</b>	176.73	15.85	95	27.1



**Figure 24 Phosphorus Loading in Coyote Gulch**



**Figure 25 Nitrate Loading in Coyote Gulch**

### **Regional Parks Recycling Efforts**

The City of Lakewood is in their 6<sup>th</sup> year of recycle and litter management at their regional parks, including Bear Creek Park. In 299 the program recycled motor oil (5 gallons), aluminum (700 pounds), steel and tin \*,5,674 pounds), glass (12 cubic yards), plastic and paper products (32 cubic yards), wood (12 cubic yards), light bulbs, all batteries, paints, and other chemical, which disposed at the Rooney Road Recycling Center. The city has begun trash clean up along Bear Creek and Turkey Creek drainages and around the reservoirs (Figure 26). In 2009, volunteers did 3,040 hours of park clean-up, trail work and vegetation management.



**Figure 26 Recycled Trash from the Banks of Bear Creek and Turkey Creek**

### **Aspen Park/ Conifer Waste Recycling Program**

The Conifer Area Council has established a “Recycling / Sustainability Committee”, which supported community-recycling efforts in 2009. Information from this committee distributed to the Association membership.

### **Invasive Species Protection Program**

In the spring of 2009, Bear Creek Lake Park joined in Colorado efforts to stop the spread of Aquatic Nuisance Species in Colorado waters. A Watercraft Inspection and Decontamination station is located in the Whitetail parking lot. All trailer and motorized boats require inspection by state certified

inspectors at the station for any aquatic invaders. Station staffed from 6am to 8pm on Fridays and the weekends, then every morning and evening during the week. During the middle of weekday, the entrance gate would call out when a boat came in and the nearest staff member would do the inspection. The lake closed from November 15, 2009 to March 15, 2010 for the first time in its history. This happens annually from now on as another step to keep infected boats out of the lake in the down season when fewer employees are present. Overall, the park did 1662 standard inspections with one high-risk inspection. This is a great start to a new program to protect our Colorado waters.

## Meeting Water Quality Goals and Standards for the Watershed

The Association believes water quality goals and standards are generally met in the watershed.

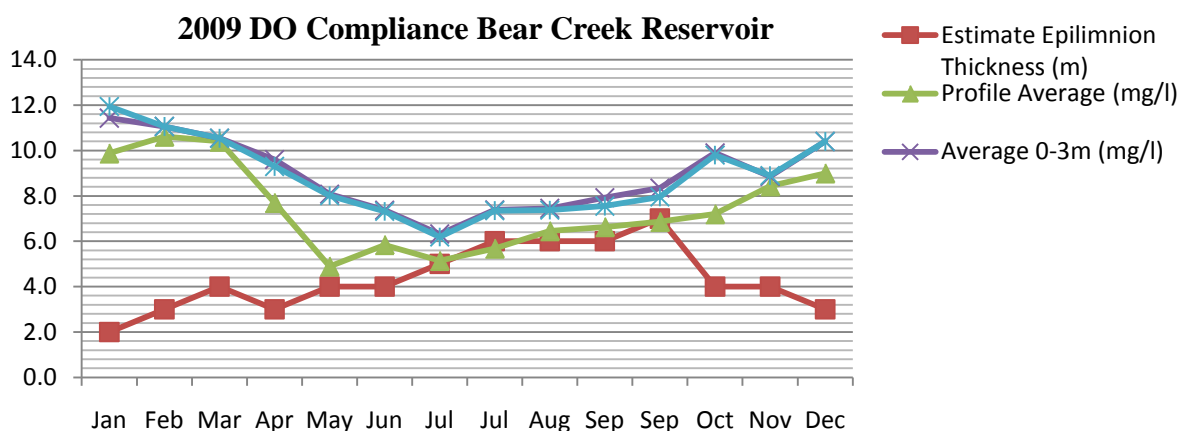
### Dissolved Oxygen Compliance in Bear Creek Reservoir

Bear Creek Reservoir is on the Colorado monitoring list for Dissolved Oxygen. As such, the Association takes multiple profile readings at five profile stations in the reservoir to determine Dissolved Oxygen compliance. The Association Dissolved Oxygen data set from 2003-2009 for Bear Creek Reservoir shows over 98% compliance with the standard for the upper water column (surface through the mixed layer). The Association noted a similar Dissolved Oxygen compliance trend in 2008-2009. The Dissolved Oxygen values in the mixed layer in 2009 were greater than 6 mg/l throughout the year (Table 9).

The summer growing season Dissolved Oxygen concentration in the reservoir is aided by an aeration system that typically operates in the growing season (Figure 27). Data collected in the 2009 growing season shows the aeration system adds a maximum of 2 mg/l dissolved oxygen to the water column when under normal operation. Generally, the aeration system increases water column dissolved oxygen by about 1 mg/l, which results in dissolved oxygen compliance within the mixed layer.

**Table 9 2009 DO Compliance in Bear Creek Reservoir**

Reservoir Site 40	2009 DO Compliance Bear Creek Reservoir													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Jul	Aug	Sep	Sep	Oct	Nov	Dec
Planar Thermocline (m)	3.0	5.0	5.5	5.0	5.0	5.0	6.5	7.0	7.0	7.0	8.0	4.0	3.0	3.0
Total Depth Profile (m)	6.5	11.0	11.2	11.2	10.9	10.8	11.0	10.9	10.7	10.6	10.8	10.9	11.0	6.5
Epilimnion Thickness (m)	2.0	3.0	4.0	3.0	4.0	4.0	5.0	6.0	6.0	6.0	7.0	4.0	3.0	3.0
Profile Average (mg/l)	9.9	10.6	10.4	7.7	4.9	5.8	5.1	5.7	6.5	6.6	6.9	7.2	8.4	9.0
Average 0-3m (mg/l)	11.4	11.1	10.6	9.6	8.1	7.4	6.3	7.4	7.5	7.9	8.4	9.9	8.9	10.4
Average Epilimnion (mg/l)	11.9	11.1	10.5	9.3	8.0	7.3	6.2	7.4	7.4	7.6	8.0	9.8	8.9	10.4



**Figure 27 2009 DO Compliance Bear Creek Reservoir**

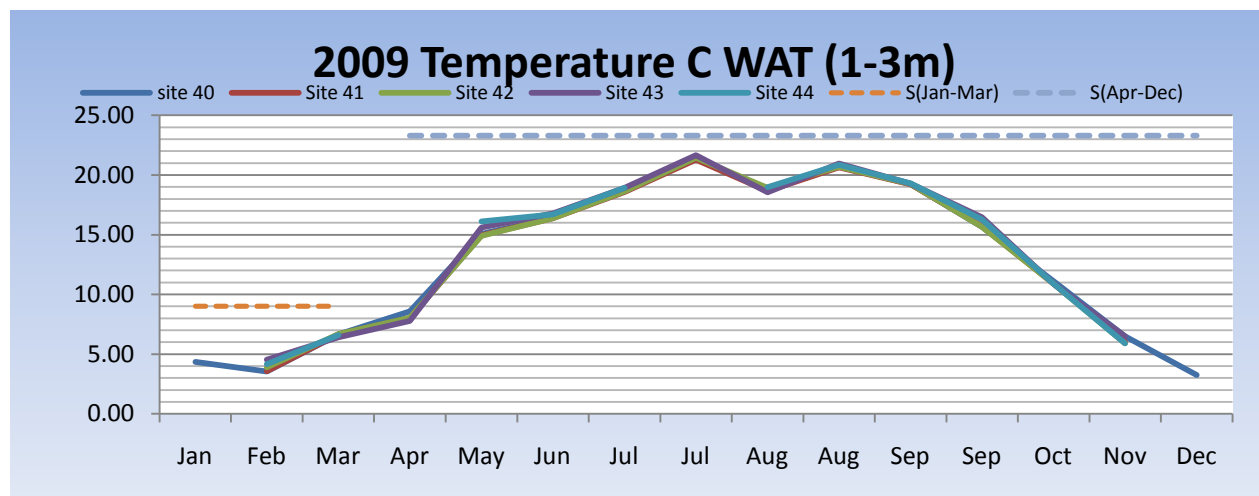


## **Bear Creek Reservoir Temperature Compliance**

New temperature standards were adopted in 2009 for Bear Creek Reservoir. As such, the Association takes multiple profile readings at five profile stations in the reservoir to determine temperature compliance. Table 10 and Figure 28 show temperature standards and the compliance record for Bear Creek Reservoir.

**Table 10 2009 Temperature Record Bear Creek Reservoir.**

Reservoir Sites	2009 Temperature C WAT (1-3 m)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Jul	Aug	Aug	Sep	Sep	Oct	Nov	Dec
Standard	9.0 (13.0)			23.3 (23.8)											
site 40	4.34	3.55	6.66	8.57	15.08	16.44	18.64	21.43	18.76	20.72	19.26	15.7	11.1	6.5	3.26
Site 41		3.58	6.64	8.01	14.96	16.37	18.59	21.29	18.67	20.63	19.21	15.7	10.9	6	
Site 42		3.90	6.69	8.04	14.9	16.37	18.63	21.44	18.92	20.70	19.25	15.7	10.9	5.9	
Site 43		4.54	6.41	7.77	15.61	16.79	18.93	21.65	18.56	20.96	19.27	16.5	10.9	6.5	
Site 44		4.15	6.60		16.12	16.71	18.93		18.98	20.87	19.29	16.3	10.9	5.9	
S(Jan-Mar)	9	9.00	9.00												
S(Apr-Dec)				23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3



**Figure 28 2009 Temperature Compliance Bear Creek Reservoir.**

## **Watershed Erosion**

The Association works with Jefferson and Clear Creek Counties to identify erosion problem areas. The Association recommends use of best management practices to reduce potential erosion problems. The Jefferson County Road and Bridge Department while fixing bridge damage added rock runoff controls to prevent erosion near the bridge structure (Figure 29).



**Figure 29 Runoff Controls Added To Bridge Repairs**

In Clear Creek County, a construction project has flagged for having a potential erosion management problem (Figure 30).



**Figure 30 Potential Erosion and Drainage Control Problem in Clear Creek County**

### **Watershed Stream and Lake Compliance**

The Association conducts special stream monitoring programs within the Bear Creek Watershed including Bear Creek, and a portion of the Turkey Creek Drainage (North and South Turkey Creek). The monitoring year divides into a warm-season period with more intense sampling and a cold-season period, designed to provide minimal winter and spring data. The Association 2009 Data Report summarizes temperature and water quality monitoring data, sampling results obtained from in-stream locations, and data from five-wastewater treatment plant effluents. The complete 20087-2009 Cold-season and 2009 Warm-season water quality data set is an electronic data report.

Stream and lake sampling and monitoring data, including pH, Temperature, Dissolved Oxygen, Specific Conductance, Ammonia, Nitrate+Nitrite, Total Inorganic Nitrogen (calculated) and Total Phosphorous was collected from May through September, at 21 sites. Stream and lake temperature dataloggers located at 24 Sites, including the Evergreen Lake profile station, excluding the five-wastewater treatment plants. Eight sites have datalogger temperatures from January 1 through September 30. The 16 remaining sites have temperature data from May through September. Manual flows measured at 16 sites during the May to September timeframe.

The warm-season temperature measurements show compliance with established standards by segments (Table 11). There appears to be a problem with the cold to warm season shoulder period, where exceedances of both the weekly average temperature and daily maximums occurred in segment 1a.

**Table 11 Watershed Temperature Compliance Summary**

Basin Segment	Cold-Season		Warm- Season	
<b>Segment 3</b>	<b>9°C WAT</b>	<b>13°C DM</b>	<b>17°C WAT</b>	<b>21.2°C DM</b>
# Exceedances	NA	NA	0	0
% Compliance	NA	NA	100%	100%
<b>Segment 1a</b>	<b>9°C WAT</b>	<b>13°C DM</b>	<b>17°C WAT</b>	<b>21.2°C DM</b>
# Exceedances	4	22	0	0
% Compliance	86.6%	90.3%	100%	100%
<b>Segment 1d</b>	<b>WAT</b>	<b>DM</b>	<b>18.2°C WAT (CLL)</b>	<b>23.8°C DM (CLL)</b>
# Exceedances	NA	NA	0	0
% Compliance	NA	NA	100%	100%
<b>Segment 1e</b>	<b>9°C WAT</b>	<b>13°C DM</b>	<b>19.3°C WAT</b>	<b>23.8°C DM</b>
# Exceedances	0	0	0	0
% Compliance	100%	100%	100%	100%
<b>Segment 1b</b>	<b>9°C WAT</b>	<b>13°C DM</b>	<b>19.3°C WAT</b>	<b>23.8°C DM</b>
# Exceedances	NA	NA	0	0

Basin Segment	Cold-Season		Warm- Season	
% Compliance	NA	NA	100%	100%
<b>Segment 5</b>	<b>9°C WAT</b>	<b>13°C DM</b>	<b>18.2°C WAT</b>	<b>23.8°C DM</b>
# Exceedances	NA	NA	0	0
% Compliance	NA	NA	100%	100%
<b>Segment 6a</b>	<b>9°C WAT</b>	<b>13°C DM</b>	<b>18.2°C WAT</b>	<b>23.8°C DM</b>
# Exceedances	NA	NA	0	0
% Compliance	NA	NA	100%	100%
<b>Segment 6b</b>	<b>9°C WAT</b>	<b>13°C DM</b>	<b>17°C WAT</b>	<b>21.2°C DM</b>
# Exceedances	NA	NA	0	1
% Compliance	NA	NA	100%	99%

Table 12 summarizes the water quality compliance in the watershed. BCWA Site 37 experienced a low pH measurement on July 7. Although the pH sensor calibrated correctly, the low value attributes to red algae noticed at the Summit Lake shoreline, near the outlet of the lake. The profile station in Evergreen Lake (Sites 4a-4e) experienced low pH values on the August 6 monitoring event at Sites 4c, 4d and 4e (2-, 3- and 4-meter down). On September 3, the profile station in Evergreen Lake experienced a low pH value at Site 4e (4 meters down). Low flows in Bear Creek (and through Evergreen Lake) on the exceedance days could be a contributing factor. The data report contains the total phosphorus and nitrogen data results.

**Table 12 Bear Creek Watershed 2009 Water Quality Compliance by Segment**

	Stream Std. pH (6.5-9 SU)	Stream Std. DO (6.0 mg/L)	Stream Std. NH3-N ug/L (TVS)	Stream Std. NO3-N (10 mg/L)*
<b>Segment 8</b>				
# Exceedances	0	0	0	0
# Measurements	3	3	2	3
% Compliance	100%	100%	100%	100%
<b>Segment 7</b>				
# Exceedances	1	0	0	0
# Measurements	4	4	3	4
% Compliance	75%	100%	100%	100%
<b>Segment 3</b>				
# Exceedances	0	0	0	0
# Measurements	5	5	5	5
% Compliance	100%	100%	100%	100%
<b>Segment 1a</b>				
# Exceedances	0	0	0	0
# Measurements	10	10	10	10
% Compliance	100%	100%	100%	100%
<b>Segment 1d</b>				
# Exceedances	3	2	0	0
# Measurements	25	5	4	8
% Compliance	88%	60%	100%	100%
<b>Segment 1e</b>				
# Exceedances	1	0	0	0
# Measurements	35	35	35	35
% Compliance	97%	100%	100%	100%
<b>Segment 1b</b>				
# Exceedances	NA**	NA	NA	NA
# Measurements	NA	NA	NA	NA
% Compliance	NA	NA	NA	NA
<b>Segment 5</b>				
# Exceedances	0	0	0	0
# Measurements	2	2	2	2

	Stream Std.	Stream Std.	Stream Std.	Stream Std.
	pH (6.5-9 SU)	DO (6.0 mg/L)	NH3-N ug/L (TVS)	NO3-N (10 mg/L)*
% Compliance	100%	100%	100%	100%
<b>Segment 6a</b>				
# Exceedances	0	1	0	0
# Measurements	5	5	5	5
% Compliance	100%	80%	100%	100%
<b>Segment 6b</b>				
# Exceedances	0	0	0	0
# Measurements	5	5	5	5
% Compliance	100%	100%	100%	100%

## **Projects/ Programs Planned or Implemented In Watershed**

The Association is assembling a comprehensive water quality, biological and physical characterization data set to define reference sites and conditions. The Association continues data collection efforts to quantify technical components necessary for watershed management. The Association planned or implemented projects include:

1. Increased Stormwater Monitoring. District watershed monitoring staff gathering data prior to, during and after storm events occurring in the watershed. Continuous monitoring of each storm event could allow up to 36 hours of data. The parameters are Temperature, Dissolved Oxygen, pH, and Conductivity. The intent is to measure changes in these parameters due to run off from adjacent properties including roadways, parking lots and open spaces.
2. Invasive Species Management Program Evergreen Lake. The Evergreen Park & Recreation District requires a permit for all personal watercraft to be on Evergreen Lake. This will be an opportunity to do the mussel inspection at the Lake House prior to launch. The Recreation District will be training their staff on proper inspection of boats and trailers. Association members will be included in this training and assist the Evergreen Park & Recreation District.
3. Invasive Species Management Program Bear Creek Reservoir. The City of Lakewood will continue program from 2009 into 2010.
4. Evergreen Park & Recreation District provides maintenance around Evergreen Lake. These efforts all aid in maintaining good water quality. Some of the projects the District does are: maintenance of the wetlands located on the west end of the lake, work on repairs and improvements to the retaining walls and rocks structure that support the road and walking paths. This work helps to minimize erosion of the area, which contributes to silt and sand accumulations in the lake. The District also contracts with a company that periodically removes rooted vegetation located on the shoreline.
5. Evergreen Metropolitan District's Collections and Distribution Department monitors and maintains a storm sewer catch basin at Evergreen Lake. The catch basin is located near the inlet to Evergreen Lake and was installed by CDOT to reduce the amount of road grit entering into Bear Creek. The BCWA will also monitor the performance of this catch basin and determine if the installation of additional catch basins along Bear Creek Canyon would of benefit to the watershed.
6. Sanitary Sewer Incentive Programs in the Evergreen Area. The Evergreen Metropolitan District is offering a 50% discount to the current sewer tap fee to property owners within the District Boundaries connected to Individual Septic Disposal Systems (ISDS) willing to connect. Tanks

must be completely drained and removed, filled or collapsed after the property connects to the public collections system. The West Jefferson County Metropolitan District is also offering a discount of \$10,000 to the current sewer tap fee to property owners within the District Boundaries connected to ISDS. Tanks must be completely drained and removed, filled or collapsed after the property connects to the public collections system.

7. Flyers sent to residential and commercial properties in the Evergreen area. An all district letter was mailed as the result of increasing amounts of residential grease being observed at the treatment plants. The letter discusses the problem and offers solutions. The second flyer focused on items not to flush.
8. Ongoing Education. Annually, the fourth grade classes at Wilmot Elementary School in Evergreen participate in a one-day class centered on the ecology of Evergreen Lake. This is a day of walking tours around the lake. Several sites around the lake are set up for each group to spend time at, including a stop at the Evergreen Metro District Water Treatment Facility. Association members are involved in numerous educational and training efforts for schools, clubs, and local agencies and are often called to assist with seminars and conferences.
9. The Association participates with Evergreen Earthday Activities and Other Education Programs - The Association provides information to the community on water quality management and environmental issues and supports educational programs.
10. Continued Monitoring of Watershed - The Association obtains water quality data at over 20 sites to determine if temperature and nutrients are potential water quality problems. The Association special monitoring efforts on Bear Creek extend from Mt Evans site in upper Bear Creek to the Harriman Ditch in Morrison. The Association expanded the temporal and spatial monitoring efforts on tributaries to Bear Creek and within the Turkey Creek drainages. The supplemental data set allows the Association to determine if water chemistry is a problem. Based on more detailed stream data analyses, the Association can determine the best location and sampling protocol to characterize the Bear Creek and Turkey Creek drainages. The Association collects nutrient data (total phosphorus and nitrate) throughout the watershed. This nutrient database will require several years to assemble.
11. Continued Routine Bear Creek Reservoir Water Quality Monitoring Program – The Association routine monitoring program at the reservoir was modified in 2009 to provide a focus on the reservoir, inputs and outputs, as supported by the Water Quality Control Division.
12. Collect Data Compatible For Modeling - The Association obtains water quality data for future stream modeling and predictions. Additional evaluation and modeling of the temperature information is necessary to determine a management strategy for the watershed. The Association collected temperature monitoring on Turkey Creek drainages in preparation for potential site-specific standards.
13. Continue Fishery and Stream Characterizations – Support Division of Wildlife fishery surveys. Characterize how trout populations respond to both natural and human induced alterations. Collect macroinvertebrate data. Conduct additional stream flow studies. Add a new fish-monitoring site in the upper portion of Bear Creek on Vance Creek. Determine fishery composition in Turkey Creek drainages. Maintain Fishery Analysis and Protocols Guidance.
14. Continued Evaluation of management strategies for watershed implementation.



15. Support Coyote Gulch Restoration Project – The City of Lakewood restored a portion of Coyote Gulch in Bear Creek Park. The Association, in cooperation with Lakewood, provides the water quality-monitoring program for this development project. The Association is developing a post-construction nutrient load estimates.
16. Community Plan Development and Development Reviews – The Association supports Jefferson County and Clear Creek County in the update and development of community plans for select portions of the watershed. The Association is an active referral agency to these counties.
17. Bear Creek Atlas Progress Report – 2009 – This atlas of breeding bird populations was done for Bear Creek Watershed by Brad A. Andres with *The Evergreen Naturalists Audubon Society, Evergreen, CO*. The report provides provide information on bird distribution, abundance, breeding status, and habitat use on public lands within the Bear Creek Watershed.
18. New Membership. The Denver Water Department initiated a watershed study in cooperation with the Association and proposes to become an active member.

### **Additional Association Annual Reporting**

The Association produces an annual data summary as a *2009 Master Data Spreadsheet (February 2009)* that includes data analyses, and raw data (Association website [www.bearcreekwatershed.org](http://www.bearcreekwatershed.org)). The Association transmits this data report to the Water Quality Control Division Staff. The watershed-monitoring program summarized in an Association data report (Bear Creek Watershed Association Data Report, April 2009). All of the Association annual reporting documents are available electronically and posted on the website. The Association provides multiple reporting documents designed to meet the multiple functions of various groups. The reporting helps member entities with reporting to their respective boards, commissions and groups. There is also a citizen interest in the watershed and reporting helps keep the public informed. Many educational groups visit the watershed and it has become a widely used outdoor classroom. The Association supplies water quality and environmental materials for these various educational uses.

### **Literature Cited**

Bear Creek Watershed Association. 2008. Bear Creek Watershed Report 2008. Prepared by RNC Consulting.

Bear Creek Watershed Association. 2007. Referral Review Guidance

Bear Creek Watershed Association. 2009. Data Report. Prepared by RNC Consulting.

Bear Creek Watershed Association. 2009. Master Data Spreadsheet. Electronic Distribution February 2009.

## **Appendix A: Overview of Program-Wide Municipal Separate Storm Sewer System Permittee Operations for 2009**

### **Lakewood**

#### **Illicit Discharges Program**

The City of Lakewood continues to implement its illicit discharges program as described in the permit application. Dry weather field screening was conducted during the previous permit period. The City presently utilizes existing ordinances and state and federal regulations to stop illicit discharges when

they are discovered. The Environmental Manager and the Police Department are authorized to cite violators. The agents work with the dischargers when possible to permanently correct the problem. When necessary, enforcement action is taken, including court actions to obtain settlements and mitigate environmental damages.

#### **Follow Up on Outfall Test**

The City implements approved procedures outlined in the permit application. When the field crews or citizens notify the City of a possible pollutant, crews begin an immediate search for the source and, when necessary, notify the Police Department's Hazardous Materials Response Unit. If required, field crews expand the search to underground piped systems. A grid sampling approach narrows the scope of the search. Immediate actions are taken to eliminate the discharge and mitigate any impacts for identified sources.

#### **Follow Up on Citizen Complaints**

The City responds as appropriate to all reports of illicit discharges and improper disposal. During 2008, there were 22 reports by citizens (or staff) of illicit discharges. Of these, 22 inspections were made with five illicit discharges found. During 2009, there were 22 inspections made of possible illicit discharges in the City with appropriate action taken. The time elapsed between reports of an illicit discharge to identification of the source, was one day or less in all cases. All five identified illicit discharges were resolved as expeditiously as the legal system allows.

#### **Notice of Violation**

The City tries to work with the source of an illicit discharge to encourage compliance with the program by stopping the discharge or ensuring the discharger obtains a CDPS permit. Where necessary, the City takes legal action to ensure compliance. During 2009, in all five cases, the City imposed rapid compliance schedules for elimination of the illicit discharges and mitigation of impacts to the storm sewer. All incidents were resolved satisfactorily and in an expeditious manner. Responding to spills with the proper equipment requires three different agencies play a role. The West Metro Fire Protection District is usually the first to respond to spills. Coordination is also required between the Public Works Department and the Lakewood Police Department Hazardous Materials Unit for the cleanup of any spill.

#### **Manholes**

The City implemented a program to promote proper management and disposal of toxic materials. Impressions in newly constructed storm sewer inlets with a metal stamp are being phased out and replaced with the same message cast into the metal portions of the inlet or inlet grate. The City feels that the uniformity and permanent message cast into the public improvements will last longer and provide a lasting benefit by educating the public. At all new development and repaired manholes within the City manhole covers imprinted with the message, "Dump No Waste, Drains to Stream", are installed. The City has adopted these criteria for the standard manhole cover detail. New construction utilizes the new standard details for inlets, manholes, etc. In addition, bilingual door hangers and environmental medallions were distributed in many neighborhoods throughout the City

#### **The Rooney Road Recycling Center**

The Rooney Road Recycling Center provides proper disposal programs for residents of Unincorporated Jefferson County and the cities and towns of, Arvada, Golden, Lakewood, Mountain View, Lakeside, Edgewater, Morrison, Westminster and Wheat Ridge, to recycle their household hazardous waste (HHW). HHW includes electronic waste, household chemicals, paints, propane cylinders and automotive products. HHW materials collected at the facility since 1994 total more than 4,129,560 lbs of potential surface water and ground water pollutants. In 2009, the HHW program serviced 3247 participants, with 2.3% of those utilizing the Door-to Door program. 793 participants were from the

City of Lakewood accounting for over 24 % of the total participation. More than 18,400 participants provided approximately 58 million pounds (74,000 cubic yards) of yard waste, construction lumber and tree limbs to be, ground, chipped and recycled into mulch and compost.

### **Construction Sites Program**

The City of Lakewood's Construction Sites Program is divided into several elements, including Procedures for Site Planning, Structural and Non-Structural Best Management Practices (BMPs), Procedures for Site Inspection and Enforcement, and Training and Education for Construction Site Operators. In 2009, the City continued to improve existing procedures for construction site inspection and enforcement. We continue to reserve the right to perform erosion control work on construction sites and bill the property owner/contractor for any expenses incurred by the City. We believe the existing program is very successful in requiring BMP installation and maintenance on construction sites. Courtesy inspections also seem to encourage some contractors and developers to address potential violations and provide sustained maintenance of BMP's. During the permit period in 2009, there were 2023 inspections of construction sites and 679 enforcement actions. Courtesy inspections also seem to encourage some contractors and developers to address potential violations and provide sustained maintenance of BMP's.

### **Jefferson County**

Jefferson County also maintains an erosion and sediment control program as part of their MS4 permit. The county maintains a small-site erosion control manual that explains the basic principles of erosion control and illustrates techniques to control sediment from small development sites. Jefferson County has an inspection program for illicit discharges, construction activities, and includes post-construction Inspections (Table 13).

**Table 13      Jefferson County Storm Water 2009 Activities and Actions**

<b>Activity</b>	<b>Inspections/ Action</b>
Illicit Discharge Verbal Notification of Violation	2
Illicit Discharge Monetary Penalty/Fine	0
Construction Sites Covered by Program	614
Construction Inspections	3,035
Enforcement Verbal Notification of Violation	495
Post-Construction Inspections	9
Storm drain marking program	Ongoing