

**APPENDIX F**

**Fountain Creek Vision Task Force  
Water Quality Working Group and Stormwater Management Group  
Meeting Summaries**

**Fountain Creek Vision Task Force  
Water Quality Working Group and Stormwater Management Group  
Meeting Summaries**

**Fountain Creek Vision Task Force  
Water Quality Working Group  
February 23, 2007  
Final Meeting Summary**

**Attendance**

Carlos de Aguilar, Carol Baker, Dan Baughn, Scott Cowan, Dennis Darrow, Mike Fink, Doug Fitzgerald, Ferris Frost, Mark Glidden, Jane Green, Terry Hart, Kim Headley, Dan Henrichs, Nancy Keller, Carole Lange, Walt Lawson, Heather Maio, Dennis Maroney, Mike McCarthy, Gene Michael, Bob Miner, Margaret Mora, Jim Munch, Harold Noonan, Jerry Pacheco, Larry Patterson, Julie Pearson, Gary Rapp, Sandy Rayl, Chip Rice, Keith Riley, Lisa Ross, Don Stoeckel (via telephone), Brian Vanden Heuvel, Wayne Vanderschuere, Alan Ward, Pat Wells, Tim Williams, Jay Winner, Chris Woodka, Heather Bergman, and Helen Littrell Smith

**Action Items**

Don Stoeckel	See what can be extracted out of today's presentation and get back to the group about distributing as much of it as possible.
Scott Cowan	Synthesize the data from today's presentations to make it more accessible to the public, and try to have something rough to share in the next month.
Carol Baker and Carole Lange	Draft together language on the top three issues for this group for the Outreach group, send it to Heather, and then Heather will circulate it to the group for review.
Rich Muzzy	Check to see if there is a link from the Watershed website to the USGS webpage that has the sampling data on it. If not, create one.
Keith Riley, Brian Vanden Heuvel, and Scott Cowan	Send materials from your presentation to Heather or Rich Muzzy for posting. Please include all handouts and study protocols, as well as your slides.
Colorado Springs Utilities	Revise the confusing language on handout about effluent originating at CSU facilities.
Keystone	Coordinate with presenters to get presentations posted on the website.

**Meeting Objectives**

- Hear presentations about current data and studies regarding e. coli in Fountain Creek
- Ask questions as needed to gain knowledge needed to move forward with group discussion about e. coli
- Begin to identify a goal for e. coli in Fountain Creek (if time permits)

**Panel Presentations: E. coli Data and Studies**

Several individuals were invited to present information on current data and studies regarding e.coli on Fountain Creek. The purpose of these presentations was to give the group a sense of what is being done on the Creek and to provide an introduction to the issues around e. coli.

Presentation 1: Don Stoeckel, U.S. Geological Survey (via telephone)

*Note: Due to USGS rules, this presentation will not be made available on the website or distributed via email. Keystone has tried to capture the key elements of this technical presentation to the best of our ability. Questions should be directed to USGS: David Mau, 719-544-7155.*

- There are two methods for measuring e. coli: library independent and library dependent; library independent has several advantages and is our preferred method.
- Basic concept of source tracking:
  - Intestinal bacteria of animal groups are expected to be different because of:
    - Basic habitat (body temperature, food supply, digestive system)
    - Natural selection (direct competition, pathogenicity factors, prior exposure to agents)
  - The process:
    - Choose source-specific targets in the feces of local source groups
    - Characterize 'reference material' (manure and sewage) from local sources
    - Test water for fecal contamination
    - Associate contamination with sources
- Library-dependent method
  - Distill gel data into a plot graph to identify source of E. coli
  - Method becomes problematic when you have a lot of isolates; the circles on the plot start to overlap and lead to ambiguity
  - Method benefit is the ability to link isolates to regulatory indicators
- Library-independent method
  - Looks for presence or absence of a molecular marker
  - Process: extract DNA, probe for marker, and look for human, cow, etc. markers
  - Method is more accurate, but can't determine what percentage of what source is there—just that it is there
- Library-dependent method
  - Susceptible to inaccurate isolate-level classifications
  - Application of a minimum-detectable percentage can enhance detection accuracy at the sample level
- Library-independent method
  - Currently semi-quantitative
  - Tends toward high sample level accuracy
  - Loosely related to fecal indicator bacteria concentration
- How to apply these tools to a Total Maximum Daily Limit (TMDL) and related efforts
  - Evaluate whether marker concentrations increase at the same rates as indicator-bacteria densities
  - Test whether sources contribute to contaminated waterways (e.g., sewer line leaks, manure lagoon seepage)
  - May ultimately contribute to quantitative microbial risk assessment models
- Not a silver bullet; still have to collect available data.

- Trends in E. coli data:
  - Densities in Fountain and Monument Creeks tend to exceed the 126 CFU/100mL criterion
    - Mostly in warm-weather months, infrequently in cold-weather months
    - During high flows
    - Upstream from Colorado Springs
    - Over the entire reach from Colorado Springs to Pueblo
- Study objective is to evaluate state-of-the-art Microbial Source Tracking (MST) data fed into a TMDL-style evaluation
- These tools are in development; they are experimental in all applications and do not represent off-the-shelf technologies
- The investigation requires extensive quality control for interpretation
- Interpretation also requires collection of supporting data (population size, precipitation, and stream flow, among others)
- EXAMPLE: Results from testing done in another watershed (NOT IN FOUNTAIN CREEK WATERSHED)
  - Upstream from waste treatment site, level was 15 CFU/100mL; downstream from waste treatment site, level was 570 CFU/100mL. Unclear if settling pond is significantly contributing to these levels.
  - In one day's work, found convincing evidence that human source of fecal contamination was present because they had access to the waste settling pond.
  - This method is more efficient than library-dependent method, in time and money.
- Study was funded by The Pueblo Area Council of Governments (PACOG)

Presentation 2: Dr. Brian Vanden Heuvel, Colorado State University, Pueblo

*Note: We expect this presentation to be posted on the Watershed Study website. Questions should be directed to Brian Vanden Heuvel at 719-549-2270.*

- Study is being funded by the Lower Arkansas Valley Water Conservancy District
- Study used library-independent methods for same reason as mentioned in first presentation (cost, time, unknowns)
- Sites include several spots on Monument Creek, Upper Fountain Creek, and Lower Fountain Creek
- There is a gap in the data because there is a 12-mile stretch of Fountain Creek where no public access is available.
- Methods
  - Sampling twice a month at all sites
    - Quantification of e. coli
  - Identification of species-specific markers
    - Human and ruminant (not human)
    - Cow, pig, dog, horse (specific ruminants)
- This is currently slated as a three-year study

Presentation 3: Scott Cowan, Pueblo City-County Health Department

*Note: We expect this presentation to be posted on the Watershed Study website. Questions should be directed to Scott Cowan, 719-583-4341.*

- This study is funded by the Pueblo City-County Health Department (PCCHD)

- E. coli monitoring program specifically looking at the level of E. coli in the Creek
- Driving factors of study: need to address community health concerns originating with sewage spills in 2005; main stem of Fountain Creek above Highway 47 is listed on the 303(d) report for E. coli; bacterial levels in segment of Fountain passing through Pueblo
- Health risks from water-borne pathogens include gastrointestinal illness and dermatitis
- Transmission usually occurs through ingestion or direct contact with open wounds
- Centers for Disease Control and Prevention report that from 2001-2004, most E. coli outbreaks occurred in treated water (public fountains, swimming pools, etc.); Colorado only had 2 outbreaks during that time
- Pathogens vs. indicators
  - Individual tests are necessary for each pathogen
  - A single test can be used to determine the relative risk of infection of multiple indicators
- E. coli is considered by the EPA as the best indicator species for water quality (associated with fecal contamination; EPA has a standard of 126 CFU/100mL for recreational water use, which translates to 8 in 1000 people becoming ill; emerging issue—may reproduce in sediments)
- The study is sampling three sites on the Arkansas River and four sites on Fountain Creek
- E. coli levels in Fountain Creek and Arkansas River from 2005-2007
  - Saw a spike in July 2005; there were large storm events in the area, a spill occurred a month before; it is likely that other factors were contributing
  - Data suggests that water flow, water temperature, and water volume impact E. coli count. Warmer weather increases count.
- Preliminary conclusions
  - Trends suggest that the greatest potential health risks will occur in summer months
  - Counts may be linked to water temperature, flow regimes, and seasonal input of stormwater runoff
  - Highest risk is to people with weakened immune systems (young children, elderly)
  - There is no health risk to people using the trails or walking along the creek (must ingest water or expose wound to water)
- PCCHD actions
  - Standing public advisory to raise awareness of public health concerns on Fountain Creek
  - Data from study is posted on a website for public access:
    - [www.pueblohealthdept.org](http://www.pueblohealthdept.org)
    - Link to surface water quality program under “Featured Topics”
  - Data is provided weekly via email to interested parties; anyone interested in receiving this data should give their contact information to Scott (719-583-4341)
  - PCCHD will continue to monitor for E. coli throughout 2007

Presentation 4: Keith Riley, Colorado Springs Utilities (CSU)

*Note: We expect this presentation to be posted on the Watershed Study website. Questions should be directed to Keith Riley at (719) 668-8677.*

- CSU paid for the study
- Data has been gathered by CSU since 7/2005

- Looked at ambient concentrations of bacteria in Fountain Creek, which does not include microbial source tracking
- Sampling done on monthly basis; shows the same trends as the studies performed by the U.S. Geological Survey (USGS) and PCCHD
  - Lower levels of E. coli in winter, concentrations rise in summer with rain events and warmer temps
- Data
  - One next step is to compare E. coli levels to the flows of the creek at the time to see how they relate
  - Planned sampling programs for the watershed

### **Questions/Discussion with Panel**

- Can we get a redacted version of the USGS presentation?
  - Don Stoeckel agreed to see what can be extracted out of the presentation and get back to the group.
- What were the quantity and location of the samples in Fountain Creek in the USGS presentation?
  - That information is on the USGS web page via the Watershed Study website ([www.fountain-crk.org](http://www.fountain-crk.org)).
- Where is the site on Fountain Creek in Pueblo?
  - It is a USGS gauge station, roughly near Highway 50
- With all the studies being done, could you report Creek temperatures and flow rates?
  - That information is already a part of the studies being done; flow rates are not available at every test site, only at USGS gauge sites.
- As data is being produced and reported, will updates be posted on the website as well?
  - That is the aim; welcome help in tracking this from the group
- Regarding the difficulty in accessing a sampling site along the 12-mile stretch of Fountain Creek, could private landowners help us gain access?
  - Jane Green and Ferris Frost offered to help out; Jane Green will talk to Jane Rhodes about this issue, and Ferris will talk to Brian Vanden Heuvel)
- Regarding the fact that children are at greater risk, is there a specific age group that is at a higher risk than others?
  - Infants are most susceptible, and risk gradually tails off as children get older. Not aware of any specific age range related to risk.
- Results indicate spikes during storm events--has there been any work done to look at sub-watersheds and impervious area in watersheds to determine how much of a spike can be contributed to runoff?
  - USGS is working with Colorado Springs Engineering on a sampling program that includes 15 tributary sites.
- Is the purpose of the studies to identify sources, see what is there, and then move to fix it?
  - Yes, that is the idea. There is a partnership being formed to perform microbial source tracking to start working towards water quality improvement. Focusing on upper Fountain Creek because it's easier to identify contamination sources there.
  - Data will be compiled and analyzed in a USGS report that will come out at the end of fiscal year 2009 with incremental updates between now and then.
  - CSU-Pueblo is a three-year study and will be completed in 2009.

- Colorado Springs Utilities study has no end date.
- The PCCHD study goes through the end of 2007.
- PCCHD funding for 2007 came from what source?
  - ¼ from general fund, ½ from Supplemental Environmental Project (SEP) funds.  
Need to identify both types of funding for 2008.
- Sampling seems regimented; is there any value to testing on an event-driven basis? I.e., major cloudburst or sewage spill, to see what impacts those events have compared to other collected data?
  - Sewage sampling being performed by Colorado Springs Utilities is event-driven and is expected to continue; not triggered by weather patterns, though.
  - The USGS study collects water-quality data during base flow and storm flow periods, and collects bacteria data at selected sites on a bi-weekly basis.
  - PCCHD does have plans in place based on volumes, but they are not weather-driven. They test until a spike goes back to normal.
- Water improvement is a lifetime commitment; we are behind in knowledge because we didn't make monitoring a priority. These studies will raise new questions that need to be addressed. Water quality monitoring needs to be a regular part of the budgets of entities across the watershed.
- Is there a way to synthesize these studies and report them to the public periodically in lay terms?
  - The Arkansas Roundtable is discussing just that; would be important not to duplicate that effort.
  - March 15 is the goal to finalize a matrix to catalogue every study that has happened and will happen. The second phase will be to make the matrix interactive on USGS website: [co.water.usgs.gov](http://co.water.usgs.gov).
- Is there any discussion on going further than that and doing some kind of distribution process—say, a periodic “state of the Fountain” message?
  - We are at the macro-level now; such a distribution is the duty of this task force.
- Scott Cowan agreed to work to synthesize the data from the presentations to make it more accessible to the public, and will aim to have something rough to share in the next month. The difficulty is in formatting the data from the different studies to look the same.
- The PCCHD website is aimed at the lay person and does show where the creek is exceeding the 126 CFU/100mL level.
- Are the presenters doing any internal communications to avoid duplication, and is there staggering going on?
  - They do interact with each other even though they don't coordinate directly, but the measures do validate each other because independent studies are yielding the same results.
  - If the public has suggestions on what they would like to see/how to sample, please send them to the respective study person.
- The studies' protocols will be posted on independent sites and the Fountain Creek website.
  - It would be beneficial to get information charts showing Colorado Springs effluent E. coli levels correlating to E. coli in the creek. Monthly or daily flow percentages (effluent percentage of creek flow) would also be useful to help find solution

- opportunities later. This is also particularly important from the recreational use perspective because the warm weather months are when the public is using the creek.
- In general, in the winter effluent is 75% of creek flow.
  - Ft. Carson will share effluent data as well.
  - City of Pueblo has done studies that go back a number of years; if anyone would like to see that historical data, email Nancy Keller at [nkeller@pueblo.us](mailto:nkeller@pueblo.us).
  - A participant stated concern about the graphs in the handout from Colorado Springs Utilities that make statements about whether flows originate from CSU plants. The participant suggested that this makes it appear that the statements are designed to convince people that Colorado Springs Utilities is not responsible for levels of E. coli.
    - A CSU representative responded that the statement is designed to say that the peaks on the graph do not seem to be contributable solely to the wastewater effluent; effluent is measured every day for fecal coliform.
    - Colorado Springs Utilities agreed to revisit and revise the language in that document. They will also address the ‘bizarre events’ that may occur to skew data (i.e., duck flock sitting around bend from sampling site).
  - Is there any opportunity to overlap these points and collect split samples on the same day to see if the labs and the sampling methods match up, to lend greater credibility to data?
    - CSU-Pueblo is interested in coordinating overlap; maybe split samples and share with other teams to test;
    - Splitting samples tests lab consistency, but not the sampling methodology consistency—testing together would test sampling methodology.
    - CSU and PCCHD agreed to coordinate one or two sampling events
  - The baseline is being studied by three different agencies. Is there a way to combine resources?
    - It’s possible; there is a great model in the South Platte Coalition for Urban River Evaluation (SPCURE).
    - Colorado Springs stormwater has a contract with USGS that accomplishes this as well. Other entities would have to decide to contract with USGS.
    - As money becomes available, that is the time to approach how to do such a program.
  - Presenters agreed to continue to coordinate and work together to bring best data from each entity to lend further credibility to the data being presented.
  - Do we have redundancy? Is there a way to save public money and avoid redundancy?
    - Think redundancy is important to keeping the data clean and credible.
    - Right now we are establishing trust in the room, and redundancy might be able to be eliminated later on in the process after trust is established.

### **Goal Identification for E. coli**

It was agreed that until more data are available, the group cannot tackle the E. coli issue in a productive way. Participants indicated an interest in learning more about urban runoff as it relates to water quality. Several reasons were provided:

- It could be expanded to a discussion on non-point source runoff, which includes urban runoff
- It has been determined that there are specific pollutants related to urban runoff in Fountain Creek; we ought to address the top of that list. We should start with general

studies that address what urban runoff tends to put into a watershed and then look for specific information in this area.

- This topic is very important and has both breadth and depth:
  - There are cities that currently capture storm runoff and treat it; it's worth talking about.
  - There is a lot of information out there already and best management practices that have been developed that we can leverage.
  - Would be interested in learning about what is currently taking place at the city and county level on this topic.
- An informative panel could include:
  - The Colorado Department of Public Health and Environment (CDPHE)
  - County stormwater and city stormwater groups from within the watershed (Pueblo, Fountain, Colorado Springs, and URS)—to provide the local information.
  - Someone from a non-point source group—consultants, engineers, etc. Bob Miner will investigate who might do that.
  - Chip Rice (El Paso County), Dennis Maroney (Pueblo), Heather Maio (PCCHD), and Lisa Ross (Colorado Springs) agreed to help set up the panel of experts.
- This working group needs to have a conversation about what its top three issues are for the outreach materials. Carol Baker and Carole Lange agreed to put a draft together, send it to Heather, and then Heather will circulate it to the group for review.

### **Next Steps**

The next Water Quality Working Group meeting will be Friday, March 9 from 1-4 p.m. The panel on runoff and water quality will give presentations, followed by a group discussion.

**Fountain Creek Vision Task Force  
Water Quality Working Group  
March 9, 2007  
Final Meeting Summary**

### **Attendance**

Carol Baker, Dan Baughn, Dan Bare, Jeff Chostner, Scott Cowan, Matt Czahor, Barbara Dallemand, Dennis Darrow, Carlos DeAguilar, Ferris Frost, Mark Glidden, Terry Hart, Kim Headley, Dan Henrichs, Nancy Keller, Irene Kornelly, Carole Lange, Heather Maio, Dennis Maroney, Mike McCarthy, Rex Miller, Jim Munch, Harold Noonan, Cynthia Peterson, Gary Rapp, Chip Rice, Keith Riley, Lisa Ross, Richard Skorman, Graham Thompson, Barbara Vidmar, Alan Ward, Pat Wells, Chris Woodka, and Heather Bergman

### **Meeting Objectives**

- Hear presentations about the effects of runoff on water quality
- Ask questions as needed to gain knowledge needed to move forward with group discussion about runoff and water quality
- Determine whether to pursue this issue and/or convene another informational panel

### **Panel Presentations: Planned Actions/Activities in the Watershed**

Several individuals were invited to present information on the effects of runoff on water quality in the Fountain Creek watershed. The purpose of these presentations was to help the group gain the knowledge that will be needed to identify strategies for addressing water quality issues.

#### Runoff and Water Quality, State Perspective

Presenter: Matt Czahor, Colorado Department of Public Health and Environment (CDPHE)

- Information about CDPHE's Stormwater Program, including guidance materials and permit applications, can be found at [www.cdphe.state.co.us/wq/PermitsUnits](http://www.cdphe.state.co.us/wq/PermitsUnits).
- The Clean Water Act (CWA) created a permitting system for water discharge (the National Pollutant Discharge Elimination System (NPDES)).
- The US Environmental Protection Agency (EPA) has authority to enforce the CWA. In Colorado, and in most states, EPA has granted the State the authority to issue and enforce NPDES permits; EPA has oversight of this authority. EPA also issues permits on tribal lands, at federal facilities, and in those states that do not have delegated CWA authority.
- The Colorado Water Quality Control Act is the state version of the CWA. The State issues permits under this Act through the Colorado Discharge Permitting System (CDPS). This makes it easier for the State to issue and enforce its own programs and insulates the State somewhat from federal politics.
- There are several types of stormwater discharge permits:
  - Stormwater general permits are for construction sites disturbing more than an acre of ground, sand and gravel operations, asphalt and concrete batch plants, and industrial facilities.
  - Stormwater municipal permits (MS4 - Municipal Separate Storm Sewer System) are for cities, counties, and special districts. Permitting is based on population and urbanization.
- As of July 2002, all construction activities that disturb one or more acres of land require a stormwater discharge permit. This means that major highway projects like COSMIX and new developments like WALMART all go through the same permitting process. CDPHE issues these permits through its Water Quality Control Division.
- To get a permit, applicants must:
  - Develop a stormwater management plan for the site that meets the State's permitting requirements and is ready to be implemented (the State has a guidance document on management plans)
  - Fill out 2-page application
  - Wait about 2 weeks to get the permit
- A stormwater management plan (SWMP) must be prepared and implemented as part of the permit requirements. The goal of SWMPs is to identify potential sources of pollution and develop and implement control measures and best management practices (BMPs).
- There are 2 kinds of best management practices (BMPs):
  - Structural BMPs include silt fences, retention basins, and inlet protections.
  - Non-Structural BMPs include seeding and mulching, grading, and maintaining existing vegetation. The State tries to focus on non-structural BMPs.

- The components of a SWMP are a site description, a site map, a narrative description of BMPs, a plan for final soil stabilization, other controls that may be used, and procedures for inspection and maintenance.
- CDPHE offers guidance on its website about how to prepare a SWMP.
- There are both specific and general terms and conditions that are attached to permits. The purpose of these terms and conditions is to keep pollutants out of Colorado's waters. Sediment and other pollutants can change the physical nature of the streambed, eliminate wildlife habitat, and add nutrients and metals to the water.
- Inspections can be performed by CDPHE, local municipalities, or EPA. There are a lot of permits throughout state, and CDPHE only has 4 staff members to do all those inspections. To address this issue, the State trains and then contracts to local health departments to do inspections on the State's behalf. This means that inspections can be done on very short notice, and it increases field presence and enforcement. If violations are found, a Notice of Violation / Cease and Desist / Clean Up Order will be issued to deter future non-compliance.
- The CWA does allow for third-party lawsuits, and these have occurred in Colorado.

#### Questions/Answers

##### ***Why doesn't the State review SWMPs with the permit application?***

There is not enough time or staff to do a detailed review and still maintain timely permitting. Plan reviews are done during inspections. We always find deficiencies in the SWMPs, but we measure the seriousness of the deficiency and only view egregious oversights as violations.

##### ***What is the process for a construction site on state property in a municipality?***

Such a site would still be subject to the state regulations, but it may not be regulated by the municipality. If it were a federal site like a military base, it would be permitted by EPA.

##### ***Is the State's Stormwater Program consistent with, or above and beyond, EPA's standards?***

The State's standards are slightly but not substantially stricter than EPA's.

##### ***Is Fort Carson a federal jurisdiction or does the State have concurrent jurisdiction there?***

Fort Carson is a federal jurisdiction regulated by EPA.

##### ***Who regulates non-standard MS4 permits within a city?***

The State can regulate non-standard MS4 permits, like those issued to school districts and hospitals, but the municipality will likely do the inspections.

##### ***Are the State's guidelines for industrial facilities the same as EPA's?***

Yes.

##### ***Why does the State put so much emphasis on construction permits?***

We do not emphasize them programmatically. We just have a large amount of construction permits to process.

#### Connecting Land Use and Water Quality for Colorado's Communities

Presenter: Cynthia Peterson, Addressing Water and Natural Resources Education (AWARE)

- AWARE Colorado aims to inform communities about the impacts of land use decisions on water quality and provide successful tools to protect water resources.
  - Planning can play a unique role in acting proactively to protect water resources.
  - Planning is the smartest, most effective way to protect water resources.
- There is a direct connection between land use and water quality. Increases in impervious surfaces affect waterway health. Impacts to waterways begin when there is less than 10% imperviousness and become very serious at only 25%. Natural systems and surfaces provide more water absorption.
- Reduced groundwater infiltration means less filtration of pollutants from water and reduced stream flows in dry seasons.
- Increased runoff caused by less infiltration means greater volume and velocity in streams and causes stream degradation.
- The increased pollutants that come from runoff from impervious surfaces include sediments, nutrients, metals, and other toxic chemicals.
- Communities can take a variety of steps to address these problems, and not all tools are appropriate for all communities. To get started, communities should:
  - Do a natural resources inventory to assess current conditions
  - Promote collaboration between governmental entities, within governmental entities, and with businesses and community organizations. (Water resources are not bound by municipal boundaries.)
- Planning and zoning strategies include:
  - Clustering development to get the same number of units on the same area but with more open space. Spreading out development to create low-density areas increases the amount of impervious infrastructure required (roads, driveways, etc.).
  - Creating riparian buffers to preserve ecological functions and minimize erosion. Set-back zones can be created to decrease impacts to riparian areas.
  - Applying specific zoning tools, like overlaying zone requirements (to require additional protective measures on top of existing zoning for certain areas without changing overall zoning codes) and doing planned unit development (to provide opportunities for creativity and flexibility in water protective strategies).
  - Minimizing impervious areas in transportation infrastructure by having narrower and shorter streets and roads and avoiding or mitigating the impervious surfaces of cul-de-sacs (by narrowing the radius and/or planting landscaped islands).
  - Thinking differently about sidewalks and trails (having sidewalks on only one side of the street, having swales instead of curbs, increasing landscaping, etc.).
  - Putting landscaping and/or gravel in parking lots, creating shared parking areas where possible, and implementing a maximum parking area requirement instead of the standard minimum parking requirement.
  - Directing roof runoff into landscaped areas instead of driveways.
  - Using porous pavers as an alternative to cement; some porous pavers can be put underneath grass to accommodate light vehicle travel.
  - Redeveloping existing areas by removing or redesigning impervious areas.
  - Using natural landscaping (native and xeric plants are acclimated to this area and have smaller water and chemical needs), saving and amending topsoil, increasing

urban tree cover, and allowing roof gardens (these are hard to maintain in Colorado but are very popular on the coasts).

- Land use does affect water quality and communities have a key role in this. AWARE has a lot of useful tools and would be happy to give presentations to government councils, commissions, etc. There are a lot of resources at [www.awarecolorado.org](http://www.awarecolorado.org).

### Questions/Answers

***If you eliminate runoff from a property, don't you change the historical use of that water and affect water rights?***

Most water rights in Colorado were established before there was so much impervious surface. Better handling of runoff now will simply duplicate historical conditions.

### El Paso County Stormwater Program

Presentation: Barbara Dallemand, Unincorporated El Paso County Stormwater

- Non-point source (NPS) pollution comes from many diffuse sources, meaning that it is without a single point of origin or not introduced into a receiving stream from a specific outlet. The pollutants are generally carried off the land by stormwater.
- Common NPSs in El Paso County include construction, city streets, urban areas, agriculture, channels, mining, land disposal, and septic systems. Other NPSs that do not exist in El Paso County are forestry, dams, and saltwater intrusion.
- There are two systems for regulating NPS pollution:
  - Total Maximum Daily Load (TMDL) is the amount of a particular pollutant that a particular stream, lake, estuary or other waterway can 'handle' without violating state water quality standards.
  - NPDES regulates point sources.
- El Paso County Stormwater has an MS4 permit under NPDES, which is a “point source permit to regulate non-point source pollution.”
- Who has to get an MS4 permit?
  - Phase I (for areas with populations of 100,000 or more) permits in Colorado have gone to Colorado Springs, Lakewood, Aurora, Denver, and the Colorado Department of Transportation.
  - Phase II permits are for urban areas with a population from 10,000 to 100,000, and non-standard Phase II permits are for agency facilities with more than 1,000 people.
  - El Paso County permit holders include Colorado Springs, Fountain, Manitou Springs, Monument, and unincorporated El Paso County.
  - Non-standard permits have been given to the universities and 5 school districts. These permits are different than most NPDES permits, because there is no discharge load. There is no need to sample water and meet a numeric limit. The concept is that we have a list of things that have to be accomplished, and the permittee chooses how to do them.
- There are 6 program areas for which each permit holder has to come up with measurable goals.
  - Public education and outreach (includes adult education, presentations, tributary name signs, etc.)

- Public participation and involvement
- Illicit discharge detection and elimination (firefighting water is excluded)
- Construction site stormwater runoff control
- Post-construction stormwater management
- Pollution prevention/good housekeeping for municipal operations
- The “recipe” for success that is being tried in El Paso County is:
  - Ingredients = 6 program areas
  - Quantities = Measurable goals in each program area
  - Bake for 5 years
  - Repeat? New Phase 2 permits will start in 2008
- Colorado counties are a special form of government and are limited to the specific powers given to them by the State legislature. This precludes the El Paso County Stormwater Program from pursuing certain actions that might be beneficial.
- Details of the MS4 permit for unincorporated El Paso County:
  - Boundary based on 2000 census
  - I-25 corridor from northern county line to Fountain
  - Some of Highway 24 west of Colorado Springs
  - Subtract incorporated areas and military bases
- An unscientific assessment of the sources of NPS pollutants in El Paso County NPS identified the following:
  - Construction – actual construction and construction support
  - Vehicles
  - Golf courses
  - People in general
  - Possibly agriculture and septic systems (to be determined by E. coli studies)
- Construction site stormwater runoff control and post-construction stormwater management are critical elements in the El Paso County program. There is an “Engineering Criteria Manual,” and the program adopted the drainage criteria used by Colorado Springs.
- Pollution prevention and good housekeeping for municipal operations are also important. The program has an environmental management system for its own facilities.
- Other activities include teaming with the Parks Department on school workshops and summer day camps, stormdrain stenciling, and newspaper and radio ads.
- The program does face several challenges:
  - Regulatory basis for illicit discharge
  - Attitudes toward the environment and toward government
  - Change is difficult
  - Residents do not see a problem in El Paso County.

### City of Pueblo Stormwater Program

Presentation: Dennis Maroney, Pueblo Stormwater Utility

- The City of Pueblo faces some of the same issues that El Paso County faces. It is hard to change residents’ and businesses’ behavioral patterns and habits.
- Our goal is to get people to recognize that there are 2 drainage systems: one that drains to the wastewater treatment system and one that drains directly to streams.

- In the City of Pueblo, we have a lot of miles of storm drains. We label our storm drains with signs reminding people that it drains to the river.
- Pueblo has a Phase II permit and has done several things to fulfill the permit requirements:
  - Education is a big component as our program. We looked at the resources in the City and worked to find whatever we could to create an educational program. We partnered with the Pueblo City and County Health Department and worked with them on some education projects.
    - One program focuses on NPS pollution and getting people to feel that they own the watershed so they should protect it. This program empowers them. It focuses on the 4<sup>th</sup> grade, junior high, and adults.
    - We have several messages that we are trying to convey, including asking people not to dump in storm drains, not to litter, and to clean up after their animals. We promote good auto maintenance and lawn care and safe disposal of household hazardous waste.
    - We have 12 models of miniature watersheds that demonstrate the workings of the system. They are excellent educational tools.
    - We do public service announcements, including year-round and seasonal messaging. We also have a few TV commercials in the works and some billboards going up soon.
    - The campaign is funded by Supplemental Environmental Projects (SEP) money through 2007.
  - The Pueblo Stormwater Utility was established in January 2004. There is a staff devoted to stormwater issues including maintenance, spill responses, street sweeping, and catch basin cleaning.
  - We are looking at ways to reduce runoff off in new developments and at ways to minimize erosion on construction sites.
- Pueblo is currently considering 2 new water projects:
  - Lake Minnequa is a large lake on the south end of Pueblo. Its surface area is 120 acres. It is a high potential detention facility for the City of Pueblo, which can use the Lake to detain water. One quarter of Pueblo drains to this one facility.
    - We know we need to address water quality issues at same time that we are doing planning at Lake Minnequa.
    - We do not have to retrofit existing facilities, but we decided to create water quality treatment ponds to collect the first flush that comes off the street, which tends to contain the most pollutants. Then we can treat the pollutants and filter that water through wetlands to improve its quality.
    - People appreciate the open space and park-like setting that we are trying to create at the Lake.
  - We are looking at building a new 4-story parking structure in Pueblo to accommodate 720 vehicles.
    - Building a parking structure with multiple levels instead of a huge parking lot is a best management practice that decreases the amount of impervious surface.

- The driveway to the parking structure is made of pervious, flexible pavement, so water that falls in the driveway can percolate and not run off. The flexible paving is made from recycled tires and aggregate.
  - The water runoff from the parking structure would be treated to separate out oil, grease, sediment, solids, and floatables. This involves building a tank that would need to be maintained.
  - We would release that water like a septic system into an infiltration gallery that is underground. This system will store the 100-year event and percolate the water. There is a lot of sand and gravel in the area naturally (it is the old Arkansas River bed), which makes the percolation easier. We would treat the water and then release it back to the aquifer.
- In Pueblo, developers are told to try to match the pre-development hydrograph as much as possible and in a manner that was historical for the development site. They need to do this to the maximum extent practical (MEP), as outlined in EPA's guidance.
  - New development approaches like this can help us decrease impacts to rivers and streams.

### Colorado Springs Stormwater Program

Brief Statement: Lisa Ross, City of Colorado Springs Stormwater Department

- Colorado Springs has a Phase I MS4 permit that was issued in 1997.
- Where possible, the City tries to assist entities with Phase II permits.
- The City does wet-weather monitoring. We contract with the US Geological Survey (USGS) to monitor water quality at 10 mainstem locations and 20 tributary locations in the watershed. We monitor for a variety of pollutants, and USGS prepares a report every 5 years on the water quality in Fountain Creek. The most recent report was written in 2001 and is available on the USGS website. The next report should be out in June.
- In our MS4 permit, we were required to analyze and retrofit existing ponds as needed.
- Legally, Colorado Springs Utilities (CSU) and the City of Colorado Springs are not the same entity, but CSU is covered by the City's stormwater discharge permit.

### Questions/Answers

#### ***Aren't polishing ponds outside Pueblo's MS4 permit?***

Not to my knowledge. We would not be holding water any differently than it is being held there today. The challenge will be to release it within the necessary 72-hour timeframe.

#### ***What frequency of storms can the ponds at Lake Minnequa handle?***

The maximum is the 100-year event.

#### ***Does the permitting process require Pueblo to improve and address existing problems?***

We are currently on the first of many permits with the State. The next permit will probably not be as lenient as this first 5-year permit. Right now, we are required to address new development but not existing development, but that might change in future years.

#### ***How specific is the regulation about meeting historic conditions in Pueblo?***

It is not very specific. It is more of a goal system, and we have not really worked out the details. The strategies for implementation are up to the staff.

***Are golf courses exempted from permitting requirements in El Paso County?***

No. As an NPS, golf courses are a relatively large number. They are areas of intense cultivation, fertilization, and pesticide use. However, well-run golf courses have been leaders in addressing NPS issues.

***Regarding volume reduction on site, are you giving some attention to what might be needed downstream?***

Not exactly. We are looking into developing a point system in which we consider if we should give credits for detention overall.

***Do you have any sense of the relative role in water quality impairment played by urban areas versus agricultural use?***

We do not have data on that.

***Are there any model stormwater regulations that can be used for reference?***

The EPA website has some information at <http://www.epa.gov/owow/nps/ordinance/index.htm>. The Colorado Water Conservation Board is working on a statewide template. AWARE also has a list of model criteria.

***How can we coordinate permitting across communities?***

The Pikes Peak Area Council of Governments (PPACG) is working on getting funding for local collaboration on permitting issues.

**Fountain Creek Vision Task Force  
Water Quality Working Group  
April 6, 2007  
Final Meeting Summary**

**Attendance**

Bill Alspach, Carol Baker, Dan Bare, Dan Baughn, Scott Cowan, Barbara Dallemand, Dennis Darrow, Pat Edelmann, Mike Fink, Doug Fitzgerald, Ferris Frost, Mark Glidden, Jane Green, Terry Hart, Irene Kornelly, Carole Lange, Walter Lawson, Dennis Maroney, Jim McGannon, Gene Michael, Rich Muzzy, Howard Noonan, Jerry Pacheco, Larry Patterson, Gary Rapp, Lisa Ross, Ken Sampley, Richard Skorman, Graham Thompson, Ross Vincent, Patrick Wells, Tim Williams, Chris Woodka, Heather Bergman, Niki Koszalka, and Helen Littrell Smith

**Action Items**

Jerry Pacheco	Look into who the property owner representative is for McCulloch Ranch, make them aware of this Task Force, and invite them to participate on it.
Richard Skorman	Work with Keystone to determine the appropriate representative from the Banning Lewis Ranch

	development to come speak to the group.
Mike Fink and Graham Thompson	Investigate what the state says about sediment standards and what kind of sediment goal this group can set and work to accomplish.
Carol Baker and Keystone	Bring the issue of what Colorado water law says about reuse to the Water Quantity Working Group for exploration.
Carol Baker and Keystone	Work on getting a groundwater monitoring update to the group.
Outreach Committee, Scott Cowan, Ferris Frost, and Keystone	Put together a list of the issues that have been identified so far and what is known about those issues to help identify where there are gaps.
Keystone	Follow-up with Juniper Katz to get a copy of the final proposal put together by Great Outdoors Colorado, The Nature Conservancy, and Colorado Open Lands.
Keystone	Circulate the internet survey on data holes to the full task force.
Keystone	Check to see if the reports on pollutants that are carried by sediment are posted.
Keystone	Discuss meeting dates with Ross Vincent.
Keystone	Work to have the next Water Quality meeting in Pueblo.

### **Meeting Objectives**

- Hear presentations on identifying the pollutants in stormwater runoff
- Ask questions as necessary to gain knowledge needed to move forward with group discussion about stormwater runoff
- Identify next steps for this issue

### **New or Pressing Issues of Concern**

- The items that are already on the list of pressing issues that this group would like to try to impact are the power plant, the regional sewage treatment facility, and the La Farge gravel pit.
- Some people have heard that the Icon Group has sold the McCulloch Ranch land. The City of Pueblo was approached in the past by the Icon Group, but there hasn't been any formal discussion or dialogue yet.
  - The ranch is 24,000 acres, and the specific concern is around the impact it might have on green space opportunities. It is unclear who this group will have to deal with to discuss land use options for that site.
  - It was noted that not all of the 24,000 acres are in the Fountain Creek watershed.
  - As a next step, Jerry Pacheco agreed to look into who the property owner representative is, make them aware of this Task Force, and invite them to participate on it.
- Banning Lewis Ranch
  - The group suggested having the Banning Lewis Ranch developers come to a meeting and talk about what they are planning to do, because it will have an impact on the

- watershed. There is some time to accomplish this, as it appears that there is nothing going on in the immediate future that will impact the watershed.
- Richard Skorman will work with Keystone to determine the appropriate representative to come speak to the group.
  - Carol Baker will work with Keystone on getting a groundwater monitoring update to the group.
  - The group asked to have a copy of the final proposal put together by Great Outdoors Colorado, The Nature Conservancy, and Colorado Open Lands. Keystone will follow-up with Juniper Katz on this item.

### **Panel Presentations: Identifying Pollutants in Stormwater Runoff**

#### **Graham Thompson, Matrix Design Group**

*Note: We expect this presentation to be posted on the Watershed Study website. Questions should be directed to Graham Thompson at (719) 575-0100.*

- What is sediment?
  - It is made up of particles that are transported by water (e.g., sand, silt, clay, gravel, boulders).
  - It is alternately entrained and deposited.
  - It is linked to erosion.
- Why is sediment a concern?
  - Sediment can impact a variety of things, including water quality, aquatic habitat, and may cause infrastructure disruption.
  - The EPA states: “National water quality inventory reports consistently implicate sediments as a leading cause of water quality impairment.”
  - Sediment in lakes, rivers, streams, estuaries, etc. costs \$16 billion annually nationwide (from: <http://www.epa.gov/warsss>).
  - However, sediment also has benefits and is necessary for agriculture.
- Why is sediment important in:
  - Urban runoff?
    - Pollutants attach to sediments and are transported. Most of the urban water quality best management practices were created because of this issue.
    - Sediment originating from construction activities, road sand, and rubber all have downstream impacts.
  - Channel processes (erosion, sedimentation, degradation)?
    - Sediment impacts many elements of channel processes, including erosion, sedimentation, land loss, infrastructure damage, flood capacity, flood response, and channel form.
- The big picture
  - The Fountain Creek watershed is a dynamic, interrelated system.
  - Even though we talk about the small parts within the watershed, we need to keep in mind what the big picture looks like.
- Where does it come from?
  - The total sediment supply is the sum of upland sources, gully sources, and bed/bank sources of erosion (the last two items can be lumped into channel processes).
  - Upland erosion: Erosion that comes right off of the ground (the surface of the land)

- Gully erosion: Erosion that does not come from the surface of the land or stream channel, but from areas that are gullies.
- Bed/bank erosion: Erosion that comes from the bed or bank of a stream.
- Size matters
  - Wash load is sediment that stays in the water column and doesn't filter out of the water, it takes little energy to move it, and it tends to travel long distances.
  - Suspended load is bed material that is easily kicked up and suspended in the water column.
  - Bed load is made up of bigger items that move with greater energy.
- Both the sources of sediment and how you manage them are different. It is an important distinction to make when discussing sediment management.
- Sediment management
  - Upland
    - National Pollutant Discharge Elimination System (NPDES)
    - Municipal Separate Storm Sewer Systems (MS4)
    - Best management practices (BMPs)
  - Channel process
    - Hydrology
    - Capacity vs. supply
    - Dimension, pattern, profile, particles
    - Stabilization
- Hydrology, particle size, upland source, gully source, channel source, transport capacity, and total load all play into sediment management. The focus today is on the upland sources.
- In a stable watershed, upland sediment is a major portion of the total sediment supply.
- During construction activities, the sediment supply can increase by 10 to 100 times historic levels.
- After urbanization, upland sediment supply can decrease to a fraction of historic levels (i.e., impervious surfaces prevent particles from running off).

### Questions/Answers

- Is the upland sediment supply the most major form of sedimentation in the Fountain Creek watershed? Is that why we're addressing it?
  - Upland sediment supply is typically the most significant source of the total sediment supply. It is unknown what percentage of the total supply is made up by upland supply. There are significant data needs that need to be filled in order to understand what and where the various sediment sources are in Fountain Creek.
  - There is a tremendous amount of analysis in the watershed study, but the one component that is missing is the supply side of the sediment.
- Where does runoff from impervious surfaces (parking lots, rooftops) show up in the total sediment supply equation?
  - In the upland sources. Any sediment not coming out of a channel process is a part of the upland source.
- As you develop upland sediment sources (grassland becomes parking lot, for example), doesn't that have an impact on pollutants as well?
  - Yes, it does.

## **Sediment and Pollutant Data, Pat Edlmann, U.S. Geological Society (USGS)**

*Note: Due to the provisional nature of this presentation, it will not be made available on the website or distributed via email. Keystone has tried to capture the key elements of this technical presentation to the best of our ability. Questions should be directed to USGS: Pat Edlmann, 719-544-7155. Information is also available at: <http://co.water.usgs.gov/>.*

- What is in stormwater runoff in Fountain Creek?
  - Chemical constituents, bacteria, and sediment
- The USGS performed chemical and biological stormwater monitoring in cooperation with Colorado Springs City Engineering in 1992 and from 1998 to the present.
- The USGS performed routine/non-runoff water quality monitoring with Colorado Springs Utilities from the late 1970s to the present.
- Terminology
  - 1 milligram per liter (mg/L or part per million (ppm) equals:
    - 1 inch in 16 miles.
    - 1 cent in \$10,000.
  - 1 microgram per liter (ug/L) or part per billion (ppb) equals:
    - 1 inch in 16,000 miles.
    - 1 cent in \$10 million.
- There were a limited number of storm samples taken at 20 sites in/near Colorado Springs, but there was good distribution. Stormwater quality was not monitored downstream of Security. In 1992, 35 storm samples were collected from storm drains. From 1998 to the present, samples were collected from receiving waters during storm runoff and analyzed for inorganic chemical constituents (there is very limited organic data). Up to 186 properties and constituents have been analyzed, and “contaminants of concern” are generally bound to sediments.
- Nutrients
  - Ammonia and phosphorus are frequently elevated relative to non-runoff periods.
    - Ammonia has not exceeded the acute instream standard.
    - Phosphorus frequently exceeds the recommended non-enforceable EPA guideline of 0.1 mg/L by ten times or more.
- Metals
  - Total levels of arsenic, copper, iron, lead, nickel, manganese, and zinc were elevated relative to non-runoff periods.
  - Total levels of lead and zinc are generally more elevated than other metals.
    - Except for very isolated instances, metal concentrations have not exceeded applicable instream standards.
- Organics (based on available but limited data)
  - Volatile organic content (e.g., benzene, toluene): At least one compound is frequently detected at low levels in samples collected from storm drains. Concentrations are generally below analytical reporting levels. Historic data suggests that volatile organic contents in streams rapidly dissipate.
  - Pesticides are frequently detected at low levels. These include atrazine, diazinon, malathion, prometon, trifluran, and a few others.
  - Polycyclic aromatic hydrocarbons (PAHs) were detected in about 33-66% of the samples. Concentrations are generally below analytical reporting levels.

- PAHs are primarily formed by the incomplete combustion of fuels such as wood (forest fires), coal, diesel, motor fuels, tar, tobacco, etc.
- Bacteria
  - E. coli and fecal coliform bacteria typically exceed recreational standards during storm runoff.
  - Concentrations in storm samples are generally 10 to 100 times greater than during non-runoff samples.
- Aquatic biology (habitat, benthic invertebrates, and fish)
  - Streams have been ‘degraded’ from a biological perspective for several decades.
  - USGS is working to “tease out” the influence of urbanization and storm runoff on ecosystem health and biological integrity.
- Suspended Sediment Concentration
  - Concentrations generally range from 100 to 300 mg/L.
  - In flows greater than 200cfs, much more sediment is entrained and concentrations increase (between 1,000 mg/L to 10,000 mg/L).
  - Average seasonal loads (measured between April and September and does not include bed load):
    - Fountain Creek near Manitou Springs, average seasonal load from 2000 to 2002: 900 tons (total for 1999: 55,000 tons)
    - Monument Creek above Woodmen Road, average seasonal load from 2003 to 2005: 7,000 tons (total for 1999: 141,000 tons)
    - Monument creek at Bijou, average seasonal load from 2003 to 2005: 47,000 tons
    - Fountain Creek at Nevada Street, average seasonal load from 2003 to 2005: 62,000 tons (total for: 700,000 tons)
    - Fountain Creek at Security, average seasonal load from 2003 to 2005: 86,000 tons (total for 1999: 1,000,000 tons)
    - Fountain Creek at Pueblo, average seasonal load from 2004 to 2005: 140,000 tons

#### Questions/Answers

- Do we know enough about the surrounding geology to know where the selenium is coming from?
  - Most of it is dissolved, and decreases slightly during storm runoff. Selenium is more elevated in concentrations as you move further down Fountain Creek. It is coming from the areas where selenium is a part of the geologic formation—Wild Horse Creek is one of the ‘hot spots’ for selenium.
- Are those hot spots contributing more selenium because of erosion?
  - Selenium levels in runoff are more related to urbanization. The selenium quantity over time has not increased. Selenium is a big issue now because the selenium standards have decreased.
- Have you correlated sediment concentrations with slope, channel shape, etc.?.
  - No. Sampling at this time is on a fairly gross scale.
- Regarding sediment as a natural phenomenon, do the numbers you’ve presented represent a problem in Fountain Creek?
  - There is room for improvement, especially in terms of aquatic life use. However, sediment transport is a complex system with many moving pieces, and it is hard to label it as either “good” or “bad.”

- How does sediment impact water temperature? How does urbanization impact this and does it impact wildlife habitat?
  - Water with a high concentration of sediment will generally be warmer. Fountain Creek has possibly increased one to two degrees in temperature, but it is unclear how it has impacted wildlife.

**Barbara Dallemund, El Paso County Stormwater Program and Dennis Maroney, City of Pueblo Stormwater Utility**

*Questions should be directed to Barbara Dallemund at (719) 520-6826 or Dennis Maroney at (719) 553-2283.*

- Human sources of sediment include:
  - Construction
  - Agriculture
  - Landscaping (or lack thereof)
  - Transportation
  - Recreation
  - Mining/smelting
- Some defensive measures
  - Best management practices
    - Construction
    - Post-construction
    - Other
  - Outreach and education
- Fully developing a site can reduce the amount of erosion coming off of that site.
- Agriculture
  - No till practices and contour plowing help
  - Robocow is a Flash animation site that educates the viewer on agricultural practices that can negatively impact a watershed and ways to correct those practices.
- Urban runoff pollutants include:
  - Excess fertilizers, herbicides, and insecticides
  - Oil, grease, and toxic chemicals
  - Sediments from improperly managed lands
  - Bacteria and nutrients from livestock, pet waste, wildlife, and faulty septic systems
  - Solid waste (trash)
  - Atmospheric deposition and hydro modifications
- The NPDES Storm Water Management Program (SWMP) and Stormwater Pollution Prevention Plans (SWPPP) requirements are:
  - Outreach and education
  - Maintaining a stormwater plan during construction
  - Maintaining a stormwater plan for post-construction.
  - Illicit discharge detection and elimination
  - Pollution prevention
- Best management practices currently being implemented in the watershed:
  - Outreach and education
    - Marking catch basins with signs indicating that they drain into a river to prevent dumping. Scout troops are helping to label the catch basins.

- Classroom education: A watershed model provides an opportunity to demonstrate the impacts of land use on precipitation. Teachers are being trained how to use it and how to integrate it into their curriculum.
  - Billboards have been put up to remind people that only rain belongs in the storm drain and that solid waste put down a storm drain will end up in the creek.
  - Pet waste baggies are being provided in parks and open spaces to encourage people to pick up after their pets.
- Construction Tools to Prevent Runoff
  - Ask homeowners to landscape immediately after their home construction is completed to reduce erosion
  - Place anti-erosion mats on unstable slopes and surfaces
  - Use silt fencing to trap sediment before it enters the water system
  - Place filter bags near storm drains where construction is happening, although this method is not as effective as some of the others
  - Create a sediment basin to collect sediment on large construction sites
- Post-Construction (regional facilities): Build multiple use facilities
- Post-Construction (commercial): Incorporate water features as a part of development (ponds, grass filter strips, depressed areas to collect and infiltrate water, etc.)
- Alternatives
  - A no curb parking area bordered by a grass strip that filters, collects, and sends water to a catch-basin.
  - Capture roof runoff in a barrel with a small hole at the bottom to reenter water into the watershed at a slower pace.
  - Detention basin system
  - Ditches
- Treatment trains: Wetlands channel
- Maintenance
  - Best management practices are only as good as they are maintained. Building permits require the developer to assure the municipality that this will happen, but it is difficult to enforce.
  - Some street sweepers are not very effective in terms of picking up the really fine particles that have pollutants attached to them. They have more impact on the aesthetics of a surface than they do on actually reducing sediment volume.

### Questions/Answers

- Does Pueblo's code require developers to ensure that there is no net change in runoff volume as a result of the development?
  - Pueblo requires this for new annexations (runoff is returned to the historic volume of flow).
- Are there overlot grading regulations in place?
  - For any development project that disturbs more than one acre, the developer has to develop a stormwater plan that addresses runoff and erosion during the construction phase.
- Is there a way to know how effective these techniques are? Are there measurable improvements in water quality?

- The Urban Drainage and Flood Control District has done a lot of work to measure the effectiveness of best management practices. Pueblo has just started a program with Colorado State University in Fort Collins to measure the long-term effectiveness of best management practices (no results yet). Volume 3 of the Urban Storm Drainage Criteria Manual includes the range of best management practices and a range of their historic effectiveness.
- In 30 years, when Pueblo is rapidly growing, how do we prevent us from having this same conversation then?
  - We need to try to get ahead of the curve. We have an opportunity to change the regulations to require more water quality-oriented growth and control before more development happens. We can also avoid the past practices that have historically caused problems in Fountain Creek.
- Given what we know about what is in Fountain Creek, and what we know about new development happening in next decade, is there a way to take that information and predict what the water quality implications for Fountain Creek will be?
  - We can look at impervious surface areas relative to runoff, which can be correlated to sediment transport and the like.
  - There is a study being done to estimate what the flow rates in Fountain Creek will be without a detention system. That study suggests that peak flows will go from approximately 22,000 cfs to 36,000 cfs.
- It is important for this group to think about what we can do to accomplish our vision in this arena. How much can we do, given available data and methodologies? How much should we be trying to figure out?
  - There are design models out there to aid in putting together a holistic system for the watershed.
  - We need to think about this topic in terms of the McCulloch and Banning Lewis Ranches.
- For areas being mined that have selenium in the geologic make-up, there are native plants that will uptake selenium and process it. Pueblo is looking into seeding those plants, especially in the Wild Horse Creek area where there is a high volume of selenium.
  - It is worth talking to wildlife experts about this topic because wildlife that feed on those plants could potentially be harmed.
- Do we have a way to enforce regulatory requirements to ensure water quality in new developments?
  - For the Banning Lewis Ranch, Colorado Springs has a dedicated inspector working on the site for this very purpose. In other cases, we've utilized different levels of enforcement, and we are working to increase enforcement overall. We don't have the support of the state in the sense that the state only has one inspector.
  - Community resource monitoring is also an option for this group to explore when it reaches the 'solutions' part of this process.
- The other issue we will have to deal with is that stretches of Fountain Creek are considered impaired by the state, which may result in Total Maximum Daily Loads (TMDL) development. We may eventually have to circle back to the industrial areas and cut back on the amount of discharge they are putting out there.
- There are techniques being developed that result in cost savings to keep enforcement from being the ultimate solution.

## Next Steps

### How to Move this Issue Forward

- There are data gaps and gaps in existing regulations that have been identified in these meetings. It would be great to understand where we don't have enough information to move forward with recommendations.
  - Data needs: It seems like we are doing what we can to address upland sources for new development. For channel stability and other sources of sediment, what do we need? There is a significant data need in sediment size, load, and source as they relate to channel stability. It was noted that there might already be a discussion going on around getting this data, but it is unclear what the timeframe of that study is.
  - This issue is tied to funding. We need to go in front of the Consensus Committee to explain what topics this group can not make recommendations on due to a lack of information about those topics.
- Somehow, we need to match up our data needs with the real world of what is actually feasible for us to do.
  - The group needs a timeline of what is feasible and when.
  - Rich Muzzy may already have this information.
- A potential way to mitigate impacts is reuse, and the group is not sure what Colorado water law says about this topic.
  - More information on this topic would be useful.
  - Who would provide this information? This is actually a water quantity issue, and Carol Baker agreed to help Keystone bring this topic to that working group.
- How sellable/palatable are the issues we are talking about?
  - The full Task Force meeting on April 19 is an opportunity to vet these issues, as well as our overall mission and vision, with the public.
- Regarding the gaps in data, this process will naturally get around to identifying what those needs are. There is a need to get moving on the things we know about and know that we can impact now (i.e., land management practices). Then we should move to identifying the data gaps and the long-term goals.
  - There will always be a need for data, and it will be an ongoing process.
  - It is not clear that we have the data gathering mechanisms already in place.
    - We don't. This issue is part of the internet survey: we identify the data gaps first, and then we figure out what the mechanisms are.
    - Keystone will circulate the internet survey on data gaps to the full task force.
- We talked about sediment in terms of source and concentration, and how to reduce it from a couple of different sources. To maximize our efforts, is there a sediment goal that we want to accomplish?
  - The Consensus Committee has said that the goal is to meet all state standards, but there isn't one for sediment.
  - We need to come up with a goal that can be quantifiably measured, as opposed to the general goal of "less sediment."
  - There is a narrative sediment standard that addresses stream functions.
    - Does it make sense for a small group get together to work on these issues by reviewing the Fountain Creek Vision Task Force vision and Senator Salazar's vision, and then figuring out what to do next?

- The state has leaned towards the “to the extent practicable” standard rather than a numeric standard.
  - Mike Fink and Graham Thompson will work on this issue together.
- We need to always relate back to the vision of this task force. Do we have a process in place that lists the number of issues we have come up with and what we know about those issues so far to help us see the big picture and where there are gaps, so that we can ultimately get a feel for how to craft solutions?
  - The Outreach Committee and Keystone are working on integrating the existing pieces of the vision and the working groups’ efforts. They will get together to flesh it out, and Scott Cowan and Ferris Frost agreed to help as well.
- Regarding a goal for sediment and the concept of historic runoff, is there historic transport data that is available?
  - The USGS has transport data that goes back to the 1970s.
- Some questions we need to answer are: What are the riparian uses we anticipate? Where along Fountain Creek is sediment likely to be a problem or already is one?
  - Is that already characterized in the Corps study?
  - This is an issue for the Land Use/Environment Working Group.

**Next Meeting**

The next Water Quality Working Group meeting will be on Friday, May 11 from 1:00 to 4:00 p.m. at St. Leander Church Hall (1402 E. 7th Ave., in Pueblo).

**Fountain Creek Vision Task Force  
Water Quality  
May 11, 2007  
Final Meeting Summary**

**Attending**

Carol Baker, Stephanie Carter, Scott Cowan, Dennis Darrow, Danny Elsner, Mike Fink, Mark Glidden, Jane Green, Terry Hart, Dan Henrichs, Nancy Keller, Carole Lange, Gene Michael, Rex Miller, Margaret Mora, Jim Munch, Rich Muzzy, Jerry Pacheco, Kirsta Scherff-Norris, Jane Rhodes, Lisa Ross, Juan Trujillo, Ross Vincent, Alan Ward, Pat Wells, Niki Koszalka, and Heather Bergman

**Action Items**

Dan Henrichs	Volunteered to contact Dr. Tim Gates regarding a presentation on salinity for the next meeting
Rich Muzzy and Nancy Keller	Will give a quick presentation on nutrients in Fountain Creek at the next meeting
Pat Wells and Gene Michaels	Will have a one-page summary on the issue of selenium at the next meeting
Carol Baker and Scott Cowan	Will get a selenium fact sheet put together for the outreach committee
Heather Bergman	Will ask Pat Edelmann to attend the next meeting and answer

## **Presentations on Selenium in Fountain Creek**

### **Pat Wells, Colorado Springs Utilities (CSU)**

- ❖ Selenium is a naturally occurring semi-metallic trace element that is most common in cretaceous and tertiary marine sedimentary rocks. It can be highly mobile and is biologically available in arid regions with alkaline soils. Selenium is an essential nutrient for humans and animals. The Food and Drug Administration (FDA) recommends a daily dose of 55 micrograms per day of selenium for adults. Selenium activates antioxidant enzymes, boosts the immune system, and cures dandruff. It is also widely used in electronics, glass, rubber, and pharmaceutical manufacturing.
- ❖ There is a narrow margin between too little and too much selenium. It can be harmful to humans at five to ten times the recommended daily dose. Selenium is more toxic to vertebrates than invertebrates and plants. Selenium is more toxic to fish and wildlife than to humans. Selenium has the ability for bioaccumulation (the accumulation of a substance, such as a toxic chemical, in various tissues of a living organism).
- ❖ Selenium can potentially be very harmful to livestock, birds, and fish. Selenium poisoning can cause reproductive toxicity, alkali disease, and “blind staggers” in livestock. A “blind stagger” includes head pressing, perspiration, blindness, abdominal pain, colic, diarrhea, increased heart and respiration rates, and lethargy. Death can occur quickly.
- ❖ The Colorado Department of Public Health and Environment (CDPHE) has a surface water standard for selenium. The chronic standard is lower than the acute standard. The standard selenium level is 18.4 micrograms per liter (ug/L) acute, aquatic; 4.6 ug/L chronic, aquatic; 50 ug/L water supply.
- ❖ A temporary modification of the Table Value Standard (TVS) of 4.6 micrograms of selenium was made for Monument Creek in July 2003. This temporary modification will expire on December 31, 2007.
- ❖ CSU has made efforts to address selenium with historic sampling and data analysis. The Selenium Source Study (2003), the Plan to Remove Uncertainty (February 2004), and the Monument Creek Selenium Study (June 2005) are studies that have been undertaken by CSU to address selenium.
  - The Selenium Source Study was a limited-scope study to characterize potential sources of selenium in Monument Creek. The study also allowed for investigation of selenium concentrations and sources along tributaries. The focus of the Selenium Source Study was on Templeton Gap Floodway and Douglas Creek. The most striking selenium levels were in the seep water, which was coming out of a shale bedrock formation. That specific sample came back with a selenium content of 360 ug/L. Groundwater flowing through these shale formations appears to pick up selenium in the dissolved phase along its flowpath, resulting in increased loading to surface water where groundwater discharges to the stream,
  - The Plan to Remove Uncertainty further identifies sources and causes of elevated selenium in the watershed. The purpose of this study was to gather

supplemental information to determine an appropriate ambient, site specific standard for Monument Creek.

- At the Las Vegas Waste Water Treatment Facility, the average influent sample was 4.98 ug/L. The average effluent sample was 2.44 ug/L. A 50% removal efficiency was attributed to wastewater treatment processes..
- The Monument Creek Selenium Study found that selenium concentrations tend to be higher in surface water during low flow periods. Groundwater discharge into creeks appears to be a primary contributor to elevated selenium concentrations in Monument Creek... Historically, concentrations of selenium are consistently above the TVS south of the Garden of the Gods.

CSU compiled results from its sampling efforts with data from USGS, CDPHE, and other agencies to calculate the ambient concentration of selenium in Monument Creek using CDPHE's *Guidance on Data Requirements and Data Interpretation Methods Used in Stream Standards and Classification Procedures*, which defines the ambient concentration of metals in a stream to be the 85<sup>th</sup> percentile value of the data. This calculation showed the ambient level of selenium in Monument Creek to be 4.6 ug/L, which equals the TVS. Therefore, CSU recommended that the temporary modification be discontinued and the TVS be reinstated for Monument Creek.

### Questions and Answers

*Is there another source of selenium other than the shale rock?*

Besides Cretaceous shale bedrock, volcanoes have also been shown to be a significant source of selenium to the natural environment.

*Considering the geological features have not changed for thousands of years, is the increase in selenium concentrations due to human activity?*

Direct correlations between irrigation from humans and increased selenium concentrations in surface water have been made for certain locations and conditions. On the Western Slope, for instance, it has been shown that deep percolation of irrigation water into soils and bedrock mobilizes selenium into groundwater, resulting in elevated concentrations of selenium in local aquifers, lakes, and streams.

### **Gene Michaels, Pueblo Wastewater Department**

- ❖ The Pueblo Wastewater Department has surveyed 44 surface water sites and 23 wells in 13 months so that they can have a mass balance model for selenium and do some analysis.
- ❖ The selenium levels for Fountain Creek at Pinon Road are quite high. The levels above Pinon Road are lower. There is an enormous concentration of selenium in Wild Horse Creek and in the Lower Arkansas Basin. The research finds that selenium concentrations are 100 times higher in shale-influenced zones. Selenium concentrations in irrigated alluvial zones are not meaningfully higher than concentrations in non-irrigated alluvium zones. Alluvium is a deposit of sand, mud, etc., formed by flowing water.
- ❖ Wild Horse Creek has a selenium concentration of 22% at mass loading and Fountain Creek has 21% at mass loading. Mass loading is the total amount of "stuff" in the river. The flow of Wild Horse Creek is much more massive compared to Fountain Creek. At

85%, the mass loading numbers for selenium are 580 ug/L at Wild Horse Creek and 19.4 ug/L at Fountain Creek.

- ❖ At ten aquatic biology monitoring sites, the biomass, abundance, diversity, tissue, selenium levels, and habitat are monitored. In terms of biology, macro-invertebrates are dominated by species adapted for fine-substrate plains streams. The fish were typical for plains streams. There was no evidence of unusual fish or abnormalities. The only injuries found were from parasites, which is also typical. The selenium concentration in the tissue of the macro-invertebrate from Wild Horse Creek increased from upstream to downstream.
- ❖ Average selenium concentration in minnows is 21.06 ug/L, sunfish 19.7 ug/L, and suckers 17.5 ug/L. The Environmental Protection Agency (EPA) drafted a standard at 7.91 ug/L. There is no consistent statistical relationship between selenium and fish abundance or diversity. Fish abundance is better explained by habitat (silt) than by selenium

### Questions and Answers

*Regarding the Wild Horse Creek area, could the increased selenium be caused by the increase in septic systems that are leaching selenium back into the Creek?*

There are very few septic systems in that area. The water is yellow from the selenium along that whole area. It is naturally occurring from the shale.

*Was anything found regarding the fish and insects that is inconsistent with what has been found in other areas of high selenium concentration?*

No. The levels are high enough that harmful effects would be found. However, the findings were very minimal.

*What does the high concentration of selenium mean to humans? What does it mean to the people eating the fish with the high concentration of selenium?*

There have not been any specific human problems seen. Humans tend to attenuate selenium quickly. Most multivitamins will contain more selenium than the fish in Wild Horse Creek.

*Is the increase in selenium natural or has there been activity that caused it?*

There was not a big difference in selenium levels found with human interaction.

*What type of wastewater treatment is required for the removal of the selenium?*

Both oxidized and free selenium would need to be removed by reverse osmosis.

*Does the effluent from Pueblo West and Horse Creek increase the amount of selenium present?*

Actually, it dilutes the problem.

*Can selenium cause damage to crops and livestock?*

In terms of crop production, a corn yield can go from 150-200 bushels to 50 bushels. Livestock tend to exhibit sloughed hooves and poor patches of hide. These seem to happen to livestock if there is an under- or over-abundance of selenium.

*Could an ambient standard for selenium be set?*

There is the potential of having an ambient standard for selenium. There would be the need to prove that the selenium was from natural causes. Creating an ambient standard involves a negotiation with the state. The state is looking at ambient numbers. There was a statewide study by Colorado Wastewater Utility Council that showed the lack of impact the high concentration of selenium was having. The study made use of tissue criteria and is going to the EPA.

*How far downstream is selenium an issue?*

Selenium is an issue all the way to Kansas. Kansas is talking about creating a Total Maximum Density Level (TMDL) for selenium right now.

*If an ambient standard is not created for selenium, what will happen with the goal of the Fountain Creek Task Force?*

In terms of the Fountain Creek Task Force, one of the goals is to meet or exceed state water standards. This goal will not be met if selenium levels remain where they are in the watershed. Perhaps the goal will have to be revised.

*Would the selenium levels be lower with out human impact?*

If all human activities went away, we still would not meet the standards.

*Is there any information from other communities regarding selenium?*

Selenium is a big deal on the Western Slope. There is information about their efforts at [seleniumtaskforce.org](http://seleniumtaskforce.org).

*What would be the best way to achieve ambient standard?*

Chasing compliance would not be the best use of resources. The selenium is naturally driven, and we cannot change the shale. The best idea is to have a sound and comprehensive argument to get the ambient standard passed.

### **Working Group Goals**

The group reviewed and revised the goals for water quality that were drafted by the Consensus Committee. The reason for the review and revision of the goals was to determine if they were actually goals or strategies. The updated goals for this group, which will be forwarded to the Consensus Committee for review are:

- ❖ Reduce E. coli to levels are at or below the maximum amount permitted by state water quality standards
- ❖ Reduce stormwater pollution
- ❖ Address and, if possible, decrease selenium
- ❖ Adequately assess water quality in the watershed

### **Next Steps**

At the next meeting, the group will hear presentations on salinity and nutrients in Fountain Creek. The next meeting will be held on Thursday, June 7, from 1 p.m. to 4 p.m. at the Pikes Peak Area Council of Governments office in Colorado Springs.

**Fountain Creek Vision Task Force  
Water Quality Working Group  
June 7, 2007  
Final Meeting Summary**

**Attending**

Scott Cowan, Dennis Darrow, Pat Edelmann, Dan Henrichs, Nancy Keller, Irene Kornelly, Carole Lange, Dennis Maroney, Gene Michael, Rich Muzzy, Pat Nelson, Harold Noonan, Gary Rapp, Lisa Ross, Graham Thompson, Ross Vincent, Alan Ward, Pat Wells, Tim Williams, Niki Koszalka, and Heather Bergman

**Action Items**

Nancy Keller	Contact Gary Banuelos to speak in person or via phone on selenium mitigation. If Gary is unable to come to Colorado, if there is someone locally he could recommend to speak on this topic.
Dan Henrichs	Contact Dr. Gates regarding selenium and salinity
Pat Wells	Locate a speaker regarding water conservation measures at CSU
Colorado Springs Utilities (CSU)	Provide a breakdown of the demand and use of water outside of the home (lawn irrigation)

**Presentations**

**Nutrients in Fountain Creek (Nancy Keller, City of Pueblo)**

- ❖ Non-point sources of nutrients consist of runoff from farms and cities, airborne pollutants carried by storm events, agricultural uses from fertilizer, livestock and runoff from both pasture and rangelands, septic leakage, runoff from failed septic systems, and erosion. Silt carries nitrogen. The control of non-point sources centers on land management practices and regulation of the release of pollutants to the atmosphere.
- ❖ The effects of nutrients on the watershed include degradation in water quality, interference with use of water for fisheries, recreation, agriculture, and drinking. Phosphorous is not toxic to humans and animals, but it can stimulate toxic algae blooms or oxygen depletion. Nitrate is toxic at high levels to humans and animals. The limit for nitrogen in drinking water is 10 mg/l (milligram per liter). Vegetation along the riverbanks and control of urban runoff can help with the level of nutrients in the river. Additionally, agricultural management including matching fertilizer to crop needs, keeping runoff from manure out of the river, and reducing erosion can help with the nutrient levels.
- ❖ The US Environmental Protection Agency (EPA) determined nutrient criteria for Ecoregion IV. The Water Quality Criteria Recommendation was based on geology, land use, ecosystem type, and nutrient conditions. There has been a statistical analysis of the nutrient data in each ecoregion. Percentile values were used to estimate levels that might be expected in water that had not been impacted by man's presence.
- ❖ The Ecoregion IV standard for rivers and streams is 23 micrograms per liter (ug/l) for phosphorus. For nitrogen (nitrate, nitrite, ammonia, and organic nitrogen), the standard is .56 ug/l, and it is 2.40 ug/l for chlorophyll. The Ecoregion IV standard for turbidity is 4.21 Formazine Turbidity Units (FTU).

- ❖ Ammonia is a nutrient and is toxic to aquatic life. Colorado adopted new ammonia standards, and they were based on the EPA Ammonia Criteria and will be effective in October of 2007. Warm water standards are significantly lower. The wastewater facilities in Pueblo will be required to do a \$13 million upgrade to remove ammonia in order to comply with the new standard. Upstream facilities will also have to upgrade if they are not meeting the standards.
- ❖ The 85<sup>th</sup> percentile for nitrate is 4.65 mg/l in Colorado Springs .
- ❖ There were three options given to Colorado due to the wide variability of nutrients found. The state could adopt the EPA's Criteria Recommendations, develop nutrient criteria using the EPA's Technical Guidance Method, or develop a unique system. There has to be some sort of criteria in place. Colorado adopted the Nutrient Criteria Development Plan for Colorado in 2002. Included in these criteria are data collection, data assessment, modeling, and a regulatory process for rivers and lakes. All of these will be looked at during the 2010 Colorado Basic Standards Review, as will water quality standards. The first of these hearings will be in October of 2008.
- ❖ There is no direct-statewide relationship in regards to the totals of nitrogen, phosphorus, turbidity and chlorophyll. If nitrogen is regulated, it does not mean that algae blooms will not happen farther downstream. Colorado has experience with control regulations in several lakes but this is not the case with rivers. It has been difficult to find a good indicator for rivers and streams. The state is not sure what to do with the rivers and streams. It remains to be seen what the nutrient numbers will be and how they will be addressed.

#### **Nutrients in Fountain Creek (Pat Edelmann, U.S. Geological Survey (USGS))**

- ❖ Ammonia concentration on Fountain Creek has decreased in the last 10 years. Currently the levels are a few tenths of a microgram per liter compared to about 9 mg/l a decade ago. Upstream from the Las Vegas Wastewater Treatment Facility, the concentration is under one mg/l. The values have decreased over the last three decades. In the 1980s, the median concentration went from nine to one. This is a drastic reduction in rates of ammonia. However, ammonia is converted to nitrate. There has been an increase in the level of nitrate concentration. Presently the concentration is 2.5 to 3 mg/l.
- ❖ The total phosphorus in the 1980s averaged 5.5 mg/l; today the numbers are .2 to 1.5 mg/l. At Avondale, the phosphorus numbers are .7 mg/l at the 85percentile . The upper basin has even less of a concentration. The upper basin has a concentration of .05 mg/l. Phosphorous is taken up at Pueblo Reservoir.

#### Questions/Answers

*Is the new EPA standard achievable?*

The standard is extremely low and would be very difficult to achieve.

*Are nitrates the primary concern?*

Both phosphorus and nitrates are concerns.

*Will an increase of septic systems create more leaching of some nutrients?*

Yes, it could. If there are many septic systems, there may be increased nutrients.

*Have the nutrient analyses taken into consideration the vegetation changes along Fountain Creek?*

The vegetation is not attributable to the change in nutrient numbers. This would have more to do with increased flow.

*Is oxygen a problem in streams?*

Generally, oxygen is not a problem for streams in the West. In the Midwest, they will have to deal with oxygenation and phosphorus problems.

*Could there be an issue with increased nitrates?*

Ammonia will need to be removed in warm water streams. The by-product of ammonia removal is nitrate. This may turn into an increased rate of nitrate. If there is no requirement to remove the nitrates, they will increase in the watershed. Too much nitrate can lead to issues with drinking water.

*Do both stormwater and return flow create elevated levels in nutrients?*

Yes. Strategies to deal with nutrient levels could have secondary and positive outcomes. If the approach is to use vegetation, it could affect not only nutrient but also selenium levels. Ammonia and phosphorus from urban runoff will attach to solids. Therefore, if there are plans to remove sediment, this will also remove ammonia and phosphorus.

### **Selenium in Fountain Creek (Pat Edelmann, USGS)**

- ❖ Historically, even at low selenium levels there can be deformities in aquatic birds. At very high levels, there can be human health impacts.
- ❖ There are various levels of selenium in the Fountain Creek watershed. There was a significant increase through 2002 and a decrease after 2002. It could be speculated that this decrease was due to the water restrictions in Colorado Springs. The state standard for selenium is 43.6 ug/l. At the Las Vegas Wastewater Treatment Facility, levels start to go down. After the facility, the levels start to increase. The increase happens at about the Pueblo County line. The raised levels at Pueblo are a bit of an anomaly. Regular indications would point to there being a reduction instead of an increase at Pueblo. From the 1990's through the present, there have been higher concentrations below the reservoir. At the 85<sup>th</sup> percentile, the levels at Avondale on the Arkansas River are 12 to 15 ug/l. Wild Horse Creek has concentrations of 500 to 1200 ug/l.
- ❖ Selenium concentrations are reduced when oxygen is decreased. To determine the load of a stream or river, the concentration has to be combined with the flow.
- ❖ There is no significant difference between the Las Vegas Wastewater Treatment Facility and Pinon. There is a 300% difference between Pinon and Pueblo. The change is attributed to groundwater and may not all be a function of agriculture or lawn-irrigation return flows.
- ❖ Flows in the Arkansas River are not considered "steady state," in all state variables are constant in spite of ongoing processes that strive to change them. It is difficult to get good information from the Arkansas because the flow is not typical.
- ❖ Every Fountain Creek tributary is enriched with selenium. The tributaries are bringing in selenium throughout the basin. When you look at the loads, the tributary loading is low. Most of the tributaries are generally not surface water but more groundwater return flows.

## Questions/Answers

*Are agriculture and irrigation exacerbating the problem of selenium in Fountain Creek?*

More irrigation occurred after the building of the Colorado Canal. Before there agriculture, there was very little groundwater. Most of the groundwater came with the building of the Colorado Canal. Farmers are not adding selenium to their crops, but when water is added to an area that historically was never irrigated, selenium can start to leach. When urban areas are built in or around selenium-rich lands that have not been irrigated, the amount of selenium could also increase. If all the human and agricultural influences were removed, the state selenium standards would still not be met.

*Are there any best management practices (BMPs) that address selenium in residential areas in regards to lawn irrigation?*

Yes, but they are limited. Xeriscaping is one way to decrease lawn irrigation. Another option is better planning--for instance, not putting a golf course in selenium-rich areas. If you apply water, you will increase the selenium load so there needs to be water management. Wastewater pipelines remove half of the selenium concentration. Without wastewater treatments, the levels of selenium would be much higher. In California, there has been work with plants that can uptake selenium. When the plants have taken enough selenium, they need to be harvested and removed.

*Where in the sewage treatment process does the selenium come out?*

The selenium comes out in the sludge. It comes out in micronutrients. It is a biological uptake. Most of the selenium ends up in biosolvents that go into a landfill.

*Should northern parts of Pueblo County be developed?*

Because of the concern regarding the selenium impact to the City of Pueblo, development may be an adverse choice at this time.

*Is there a time when the EPA standard is written off as unachievable?*

The chronic standard has not been modified but the acute standard has. EPA put out draft tissue criteria. There are elevated amounts of selenium in sampled fish tissue, but there have not been deformities observed. If it can be proven that the selenium is naturally occurring, there could be an ambient standard given.

*The Army Corps put carbon filters in Fountain Creek by the Army. Do they have an impact on the amount of selenium?*

The filters are there to filter out chemicals at the Pueblo Chemical Depot. They should not be contributing to selenium concentrations. If they are removing carbon, this should also not have an impact on selenium concentrations.

*Could the increased water, in addition to the marine shale, be part of the reason for increased selenium?*

Yes, any water above selenium rich soils will increase selenium levels.

*How many points are being tested on Wild Horse Creek?*

There are tests at the mouth, upstream from Pueblo West, and downstream. There is not enough testing to figure out the source. The upstream points, north of Highway 50 west, have lower selenium levels. It could be septic systems, lawn irrigation, and/or what the groundwater picks up in its return flow path.

*What are options in lowering the concentration of selenium?*

BMPs, land use, and water management can decrease selenium loading. It is not clear if these can reduce the number enough to meet the standard. There is not enough knowledge on selenium geology to counsel developers as to whether or not to develop. Filtering systems also can be a treatment option. Wastewater treatments can help remove selenium.

*Are there any selenium maps?*

Seleniferous soils have been mapped, but the details of the mapping are unknown. USGS has a data set regarding selenium also collecting samples from outcrop areas.

*What happens to the selenium issue if there is an ambient standard?*

If an ambient standard is established, it will no longer be a pressing issue. Recent regulations have made standards more stringent.

*Do we know how to map the flow lines?*

The general lines are known. They run down the valley, but they could intercept and flow into the stream creating a regional drain.

*What are some of the main issues the Task Force needs to deal with regarding selenium?*

One would be to deal with loading and not concentration level when dealing with selenium. Without agriculture or human activity, it is doubtful that the levels would be down to 4.6 ug/l. There are also data concerns surrounding the scale and flow lines that chart the movement of groundwater. Water use and management coupled with land use would also be important issues when looking at selenium.

*How closely tied are the levels of selenium and salinity?*

Selenium, sulfate, and salinity are all coming from the same source area. There are evapoconcentration issues with all three. Many of the same remedies could help with each. Both selenium and salinity levels are rising due to groundwater and leaching occurring from the shale. The levels are not impacted too much by stormwater. Generally, stormwater attaches organics and nutrients to sediment.

*How are selenium and salinity best dealt with in regards to development?*

The levels would be more tied into land use. If there is development around Fountain Creek, north of Pueblo and with poor land use planning, there will be more leaching of selenium and salinity in the watershed.

*Does infiltrating stormwater contribute to selenium levels?*

Infiltrating stormwater will not have big impacts on selenium levels. It would be necessary to develop a clean infiltration bed so that there would not be much impact to the groundwater system.

*If Kansas has issues with the water coming across the state line, could they treat Colorado as a discharge point source? If so, how does this impact land use and loading issues?*

Water attorneys do not feel that Kansas can raise a water quality issue. The regulation is that the standards of Kansas are the EPA levels. Water does have to be of beneficial use. The current issue is now they have a reversed flow gradient.

*Can vegetation be planted to uptake selenium?*

California has areas where vegetation has been planted that will uptake selenium. High selenium plants are often referred to as locoweed.

*Will detention ponds raise selenium levels?*

If you create groundwater recharge, you can expect more issues regarding selenium.

*How will land use planning impact selenium concentrations in the future? Are there things we can do now with land use entering the implementation phase?*

The biggest hurdle in Pueblo is annexation. There are major developments that have yet to get to implementation. Banning Lewis Ranch may have to come back to city council. Banning Lewis Ranch is a 15-year-old annexation with very vague guidelines to follow in terms of land use. It was left vague because it was realized that it would be a long project. The Task Force may not be able to require them to do things but certainly should offer suggestions. In terms of water management, a certain amount of xeriscaping could be suggested.

*Has there been a conclusion that pure shale does not leach selenium?*

No, actually there are studies to the contrary. Ft. Carson feels that the source of their selenium is pure shale.

### **Salinity in Fountain Creek (Pat Edelman, USGS)**

- ❖ Salinity is the total of dissolved solids. If water is filtered and evaporated, the inorganic residue that is left behind consists primarily of calcium, magnesium, sodium, potassium, hydrogen carbonate, aluminum sulfate, chlorine, and fluoride.
- ❖ There is <50mg/l salinity concentration in snowmelt runoff and transmountain diversions. 500 mg/l is the maximum recommended amount of salinity for drinking water. At 700-850 mg/l, the US Department of Agriculture estimates that salinity levels can begin to harm crops. The salinity of oceans is 35,000 mg/l.
- ❖ There have been long-term variations in salinity levels over the last 30 years. Salinity levels at the Las Vegas Wastewater Treatment Facility have been consistent. Since 1975, it has been about 450 mg/l. During the 1970's, at Pueblo, salinity levels were very inconsistent. They varied between 200 to 2,600 mg/l. The average concentration of salinity in Fountain Creek decreased due to the Fountain Creek exchange decree. Higher stream flows can increase loading.

- ❖ Upper Fountain Creek and lower Monument Creek have had an increasing trend in the last four to five years. There is a large increase between Pinon and Pueblo but it is a smaller increase than what is seen for selenium. In Fountain Creek at Avondale, the salinity concentration is 450 to 800mg/l.

Questions/Answers

*What are concentrations of salinity?*

Concentrations are an interaction with geologic material. They are salts left behind from evaporated water, or evapoconcentrations. An example of evapoconcentration is boiling water repeatedly in pot. The residue eventually will result in scaling on the pot. Crops take up water, leave behind salts, and add to the concentrations of salinity.

Next Steps

- ❖ The Task Force would like to have a selenium speaker. Nancy Keller and Heather Bergman will coordinate on getting a speaker.
- ❖ Dan Henrichs will contact Dr. Gates to see if he is available for a presentation about selenium and salinity.
- ❖ It would be helpful to know the demand and use of water outside of the home. Colorado Springs Utilities (CSU) could give a breakdown. Selenium concentrations are decreasing in Monument Creek due to reduced water irrigation for lawn. Pat Wells will help identify a speaker to talk about lawn irrigation in general.
- ❖ There may be lessons to learn from Grand Valley in Grand Junction? It may be a worthwhile discussion for both parties. They know lots of information about agriculture and irrigation but are a bit less knowledgeable about the impacts of urban development.

**Fountain Creek Vision Task Force  
Water Quality Working Group  
July 19, 2007  
Final Meeting Summary**

Attending

Carol Baker, Stephanie Carter, Todd Dahlberg, Dennis Darrow, Danny Elsner, Timothy Gates, Nancy Keller, Carole Lange, Dennis Maroney, Gene Michael, Bruce Miller, Gary Rapp, Lisa Ross, Ann Seymour, Alan Ward, Pat Wells, Niki Koszalka, and Heather Bergman

Action Items

Pat Wells	Prepare a map of saliniferous soils; contact Pat Edelman more additional information if needed; let Heather Bergman know if this is map is not available
Pat Wells	Do a detailed search and review of notes from Western Slope selenium conference
Gary Rapp	Read and summarize any publications from Gary Banuelos
Danny Elsner, Dan Bare, Dennis Maroney, Tim Williams, and	Meet to prepare a preliminary charge to two groups who will outline new drainage criteria

Cynthia Peterson	
Heather Bergman	Talk to Gary Banuelos regarding urban mitigation of selenium; determine if he has any publications available on selenium mitigation; see if he would be willing to present to the group via phone
Heather Bergman	Revise policy review request for proposals and distribute to Consensus Committee

### **Policy Review Options for Consensus Committee**

The group discussed two possible approaches to the policy review endeavor that emerged as the best next step at the last meeting of the Water Quality Working Group. Either scenario would need to focus on the checklist provided in the “Better Site Design” handbook. The two approaches were:

- Issue a request for proposals (RFP) to get a contractor to do the policy review and host meetings with planners and elected officials to share the results and determine how best to proceed.
- Have members of the working group do the policy review and have Heather Bergman and the working group host meetings with planners and elected officials to share the results and determine how best to proceed.

The group agreed that after a few small changes are made to the draft policy review RFP, both of these options should be presented to the Consensus Committee for review and discussion.

### **Selenium Mitigation (Dr. Tim Gates, Colorado State University)**

- ❖ Early work on the selenium research project on the Arkansas River began in 1997, field data collection began in 1998, and the full, ongoing field research program began in 1999. The project includes monitoring and modeling.
- ❖ The research is focused on improving the management of water quality and water quantity in the basin and how to sustain or improve agriculture and the river itself. The research goals are to provide water users and managers with a sound database, realign modeling tools to support water management practices that enhance water quality in the watershed, find ways to reduce concentrations, and conserve water by reducing non-beneficial consumption.
- ❖ There is salt and selenium dissolution in the aquifer. There are substantial return flows of salt and selenium to the river. There are high saline concentrations in the groundwater tables.
- ❖ Research tools include field measurement, field-scale modeling, regional-scale modeling, basin-scale modeling, and pilot studies for implementation.
- ❖ The research centers around La Junta (upstream study region) and Lamar (downstream study region). There is monitoring of the surface and groundwater in both regions.
- ❖ The field measures assess groundwater, surface water, soil salinity and soil moisture, canal seepage losses, and groundwater aquifer properties.
- ❖ The salinity of water gets more concentrated as it moves downstream. Soil salinity is measured by decisiemens per meter (dS/m). Alfalfa will tolerate 2 – 3 dS/m. If the amount of selenium gets higher, the yield of alfalfa will decrease. When the selenium average is above 4 dS/m, there is a loss of crops. The estimated crop yield reduction from 1999-2001 is 14%.

- ❖ There is selenium in the groundwater in the upstream region. The concentration is regional and comes through in “hot spots”. Massive quantities of salt are going back into the river. The estimate for selenium returning to the river is .02/.10/.038 kilogram/day/kilometer (kg/day/km).
- ❖ Some strategies for improvement are increased irrigation efficiency, reduction in recharge, lining of canals to reduce seepage, surface drainage, altered pumping patterns, and a combination of these strategies.

### **Questions/Answers**

*Is it true that people may over-irrigate so that their unused water rights are not taken away?*

This is a negative side effect of our water system in Colorado. It promotes inefficiency. Research is increasingly showing that it is harmful to over-irrigate. There are reduced crop yields due to over-irrigation. There is a movement to adopt more drip and sprinkler irrigation. Water rights are assessed not on how much you divert but are rather based on what you consume. There is a claim of abandonment when people do not divert their share at the head gate because they do not need it.

*Is drip and sprinkler irrigation the most common way to improve ground irrigation?*

Yes. There are also surge techniques, but these are very labor intensive. There will need to be a move toward pressurized systems.

*Are there incentives to farmers to off-set monetary losses and discourage over-use of water?*

There is the Environmental Quality Incentives Program (EQIP) through the government. This program provides significant matching investments to growers. There is hope that the measure will be adopted. It could improve productivity and health of the river.

*Did this research consider tamarisk control?*

Not exactly, the research project started to look at how much water was being used by native vegetation. This research project is interested in studying more on this topic.

*How does selenium affect health?*

It does not affect health very much. It is very rare that livestock will get ill due to selenium.

*If a surface is more permeable, is it better to get the water back into the land instead of pumping it back to the river?*

This would not be a big deal if the water were soaking in without shale underneath. Most of the selenium in the Arkansas is from the upper rivers, including Fountain and Horse Creek. There are concerns about running more water through the ground if there is shale.

*Is it true that if natural percolation is maintained, the chance of putting more selenium in the system is not great?*

Yes, this is true. In an urbanized area, the water quantity going into the river is higher as is the selenium level. This is also true when further urbanization is occurring. It is best to try to avoid the hot spots. There is some geologic data to help locate the hot spots, but not enough.

*Fort Carson just initiated a study regarding selenium and nitrates, including what has been found in the monitoring wells. The study is going to look at pump tests, grades, and geochemistry. Has the research project gone into this area?*

No, it has not. By correspondence from geologic mapping, the selenium is present as are the geologic prerequisites to form selenium.

*Does lawn irrigation relate to selenium?*

In areas where lawns would overlay shale bedrock and so forth, if there is over-irrigation, it will also dissolve the selenium and move it back toward Fountain Creek and the tributaries that feed it.

### **Conservation Measures at Colorado Springs Utilities (CSU) (Ann Seymour, Water Conservation Manager)**

- ❖ CSU worked with conservation early on. In 1940, CSU had initiated supply-side measures include metering, leak detection systems, pressure reduction, and non-potable development. CSU knew it had to strike a balance between developing a new water supply and working to conserve the original water supply.
- ❖ Currently CSU is saving 23-25% of future water through conservation. They are hoping to save another 7-10% in the future.
- ❖ There are several categories for conservation programs including education/outreach and conservation rates, rebates/incentives, regulations, assistance programs, and local partnerships.
- ❖ One tool for water conservation is low-water or xeric landscaping. As part of a public education/outreach effort, the CSU website has a huge database with 400 plants on it, and CSU has a large on-site library including videos, DVDs, and handouts. CSU wants to make it as easy as possible for their customers to get conservation information.
- ❖ Conservation rates are block rates. These are yearly block-rate structures. CSU hoped that people would think more about the amount of irrigation occurring at their homes/businesses if the outdoor irrigation rates were higher.
- ❖ Rebates for conservation include rebates for high-efficiency washing machines, efficiency toilets, and irrigation equipment.
- ❖ Regulations for conservation include the Colorado Springs Landscape Code and Policy Manual. This addresses conservation, aesthetics, environmental quality, land values and investments, human values, nuisance species control, improved design, administration and enforcement, and horticultural sustainability.
- ❖ The assistance program at CSU is the Home Efficiency Assistance Program (HEAP) and is designed to help those with high bills. This includes high bill inspections and the distribution of water-efficient devices.
- ❖ CSU has local partnerships with developers, builders, designers, and members of the green industry who work with water providers to promote conservation. Some of the local partnerships including Peak to Prairie Landscape Symposium, Water Sense, Partnership for Responsible Water Use (PRWU).
- ❖ CSU depends on the community to do its part in conservation in terms of residential water use. The residents have been participating in conservation for a long time. Through the past few years of drought, the customers have responded well and reduced water use. The Smart Water Study surveyed water providers across the west. CSU did not participate in the survey

but applied the same questions/methodology and self-administered the survey. Pre-drought numbers for Colorado Springs are 122 gallons per capita per day and in 2006 (during the drought), Colorado Springs is at 96 gallons per capita per day.

**Questions/Answers**

*Will another xeriscape step be water harvesting?*

That would have to put that to the State to determine what the issues would be with water rights.

*Is there a way to utilize stormwater or rainwater gardens?*

CSU has been educating to slow the water down during infiltration and into the gardens. There is a low impact development (LID) display to show what can be done. CSU is working to retrofit the facility for LID. Mesoscaping is also another suggestion to help with infiltration.

**Next Steps**

- ❖ The Water Quality Working Group will merge with the Water Quantity Working Group.
- ❖ New drainage criteria for new developments and for existing developments would be useful. The Working Group should create two teams to outline new drainage criteria. First, a small team should write a “charge” or a list of key issues to include in the recommendations for new drainage criteria. This small group will meet in the next few weeks to outline the charge to the group; the group will include Danny Elsner, Dan Bare, Dennis Maroney, Tim Williams, and Cynthia Peterson.

**Fountain Creek Vision Task Force  
Stormwater Strategy Task Group  
April 6, 2007  
Final Meeting Summary**

**Action Items**

Rich Muzzy	<ul style="list-style-type: none"> <li>• For next meeting, prepare brief proposal on a policy workshop to review all current policies that affect watershed health</li> <li>• Send information on Community-Based Social Marketing listerv to Heather for distribution</li> </ul>
Richard Skorman and Walter Lawson	Coordinate speaker on trees/plants and urban runoff for next Stormwater Strategy Group Meeting
Dennis Maroney, Barbara Dallemand, and Bill Alspach	Attend Colorado Water Conservation Board (CWCB) meeting on stormwater runoff criteria and report back to the group at next meeting

**Attendance**

Bill Alspach, Carol Baker, Dan Bare, Barbara Dallemand, Danny Elsner, Carole Lange, Walter Lawson, Dennis Maroney, Rich Muzzy, Lisa Ross, Richard Skorman, and Heather Bergman

**Constraints to Addressing Stormwater Runoff**

The group brainstormed the existing and potential constraints to changing the way that stormwater runoff is managed in the watershed. These constraints included:

- Lack of financial and human resources

- Lack of appropriate, accurate, and undisputed data
- Inability to impact all aspects of the problem
- Transient community (it may be hard to educate and influence temporary residents)
- Physical constraints (soils, topography, climate)
- Time
- Lack of enforcement, hard to establish enforcement (how, who?)
- Attitudes (people may not care)
- Code of the West
- Rural/urban divide
- Water rights, tied to peak flows (there is a lot of information and misinformation)
- Getting knowledge to lead to action is hard
- Politics
  - Risk
  - Influence
  - Information
  - Public sentiment
  - Lots of data/lack of data
  - No understanding of issue
  - Need courageous leadership
- No panaceas out there, but many small solutions exist

### **Urban Runoff**

Participants brainstormed strategies for decreasing stormwater runoff in the watershed. These strategies included:

- Decrease future impervious areas/rehabilitate existing impervious areas
  - Porous pavement, clustering, sidewalks, swales, smaller widths, etc
  - Manuals (roadway width, design/drainage standards)
  - Tiered rate re impervious areas
  - Correlate with water quality/habitat
  - Floodplain preservation/restoration don't change streamside overlay
  - Better coordination with planning depts.
  - Parking requirements – require maximum parking area instead of current minimum
  - Prudent line setbacks
  - Thresholds based on drainage
  - Match historic hydrology
  - Policy, permitting, regulations, annex agreements
  - Home Builder Associations (HBAs), green builders
  - Buyer demand
- Impervious surface market
- Education regarding costs/benefits (targeted to HBAs, buyers)
- Stormwater as a resource to be managed, as an amenity
- Streamside overlays
- Treatment of stormwater
  - Infiltration
  - Detention

- Filtration
- Storage
- Reuse/recapture
- Initial abstraction
  - Plant uptake
  - Soil bacterial activity
  - Wetlands
  - Riparian areas
- Link impervious areas with groundwater recharge
- Mapping, categorizing areas of imperviousness
- Credits for good development, recharge
  - Stormwater utility fee credits
  - Basin fee credits
- Decrease urban pollutants
  - Increase knowledge about household pollutants (pesticides, fertilizers, etc.)
  - Regulations/incentives
  - Curb and gutter (remove or sweep more often)
- Community-based social marketing
- Target education to decision makers
- School education will pay off
- Package stormwater runoff with other green issues (transportation, renewables)
- Focus on connected impervious areas
- Tree planting programs and other vegetation projects
  - Free trees
  - What about debris?
  - Large scale tree planting
  - Residential/landscape roles
  - Floodplain
- Enforcement

### **Next Step**

- Could create a list of goals for stormwater regulations—drainage criteria
  - Pay someone to integrate existing lists?
  - Raise issue to Consensus Committee
- Learn more about trees/plants at next meeting
- List of 10 worst urban pollutants
- Several participants will attend the CWCB meeting on permitting criteria for stormwater runoff and report back at the next meeting
- Rich will prepare and share a proposal for a policy workshop to review all policies in the watershed that affect water quality

### **Next Meeting**

- May 11 from 10 a.m. to 12 p.m.
- St. Leander Church Hall (1402 E. 7th Ave., in Pueblo)

**Fountain Creek Vision Task Force  
Stormwater Strategy  
May 11, 2007**

**Final Meeting Summary**

*Location: St. Leander's Church, 1402 E. 7<sup>th</sup> Ave., Pueblo*

**Attending**

Larry Atencio, Carol Baker, Stephanie Carter, Nancy Corlette, Tom Corlette, Dennis Darrow, Danny Elsner, Jane Green, Carole Lange, Alicia Madrid, Dennis Maroney, Margaret Mora, Jim Munch, Rich Muzzy, John Norton, Jane Rhodes, Lisa Ross, Richard Skorman, Juan Trujillo, Ross Vincent, Niki Koszalka, and Heather Bergman

**Action Items**

Rich Muzzy and Dennis Maroney	Responsible for researching the mapping aspect for the next meeting
Jim Munch and Juan Trujillo	Responsible for the new development aspects of the pilot projects for the next meeting
Danny Elsner	Committed to the retrofit aspect of the pilot project for the next meeting; this should connect with the idea of credits for good developments.
Dennis Maroney	Responsible for researching the area of credits for a good development for the next meeting
Lisa Ross and Danny Elsner	Volunteered to research the Best Management Practices (BMPs) for the next meeting
Rich Muzzy	Responsible for the policy review information for the next meeting
Jane Rhodes, Carol Baker and Heather Bergman	Working together regarding a field trip to The Fountain Creek Watershed
Walter Lawson and Richard Skorman	Looking into urban forestry for the next meeting
Margaret Mora	Reviewing the relationship between economic development and land use planning for the next meeting
Ross Vincent	Researching the topic of impervious surface markets for the next meeting

**Meeting Objectives**

- Hear reports on the Colorado Water Conservation Board (CWCB) permitting meeting
- Continue to identify possible strategies to address stormwater runoff

**Reports on CWCB permitting meeting**

- ❖ The training session for the new drainage criteria manual from CWCB is available to communities. The training sessions have great ideas that could be incorporated into existing drainage criteria manuals. It would also be a good beginning tool for communities without existing drainage criteria manuals. The CWCB drainage criteria manual is great as a basic tool but was broad based.

- ❖ Pueblo felt the CWCB manual would be worth considering for adoption. There needs to be an inclusion of a chapter about volume flow not just peak flow. The CWCB indicated there would be future meetings. One of the future meetings would include volume flow.
- ❖ There is another upcoming CWCB meeting on May 30, 2007 at 1:00 PM at the Public Works conference room in Pueblo. The meeting will focus on flood insurance.
- ❖ There is an upcoming CWCB meeting June 13, 2007 in Colorado Springs from 9:00-12:30 PM dealing with levy certification. Federal Emergency Management Agency (FEMA) changed the levy certification regulations last year.
- ❖ There is no drainage criteria manual in the Fountain Creek Watershed. The county uses the drainage criteria manual from Pueblo.
- ❖ There were no specifics about Low Impact Development (LID).

### **Identification of Additional Stormwater Strategies**

- ❖ A policy workshop is proposed. During the workshop, reports and technical information would be looked at to see how current policies from the different cities could be improved upon. It would be important to look at what is being done in other cities and states. A one-day workshop with the planners of the cities and/or counties could make them aware of new information. The information could then be related to the Fountain Creek Watershed. There is no money for the proposed workshop. It would cost an estimated \$33,000 (\$23,000 for the report and \$10,000 for the workshop). A strategy proposed was to do a policy review of all the stormwater policies within the watershed. This idea is not proposing to rewrite existing policy but to use it as a learning tool. The policy review could take about 3-4 months to complete.
- ❖ CWCB is involved in an ongoing study of Monument Creek. When the information is gathered, it will be made public.

### **Review/brainstorm possible strategies**

- ❖ Updating the basin drainage studies could define where the problems and issues are so that they can be fixed. The study would take a year and cost upwards of \$150,000 per basin. It is important to keep the focus on the basin and find the ability to implement the Fountain Creek Watershed inside the basin. Once these are policies, all developers will have to follow.
- ❖ The Environmental Protection Agency (EPA) had a broadcast on social marketing. Any educational pieces taken on by the Fountain Creek Task Force should make this part of their strategy.
- ❖ It should be a strategy to work with water storage and infiltration.
- ❖ Policies continually use the terms historical peaks and volumes. Currently, it is hard to come up with a game plan to achieve historical peaks and volumes. A tool kit could include a how to manual, a Best Management Practice (BMP) manual, and modeling. There is a need for modeling. The issue with modeling is that it is very timely and expensive.

### **New Ideas**

- ❖ The corridor could be a storage facility, infiltration unit, and green way. The corridor could recharge wetlands and be used as infiltration during flood peaks. The Wetlands

Subgroup meets this week and will be discussing these ideas. The Wetlands Subgroup will give a presentation at the June 1, 2007 Land Use/Environment Meeting.

- ❖ There should be development of a map showing the historical sediment and erosion areas. This map would be outside of the FEMA 100 Year Flood Plan. The map could show areas that will have problems in the future based on what occurred in the past. Many of these areas need to be protected.
- ❖ An independent map showing the historical areas where there are sediment and erosion problems should also be created. This map could make people aware of what may happen. This map is different from the one mentioned above.
- ❖ There is a need to analyze the stream in geologic time and from a geologic perspective not only from photos.
- ❖ There should be a significant effort to plant trees (urban forestry). Trees planted or grown in the wrong area can create major problems and dictate where the creek goes. The result of the debris from dying trees can also create major problems. A goal would be to control growth and put the trees in the right areas. The correct placement of trees could be a good strategy to control runoff.
- ❖ The Environmental Protection Agency (EPA) has been advocating the use and introduction of green roofs. A green roof is vegetation on the top of roofs. This concept works well on the coasts but may prove more difficult in an arid climate. There could be the use of the sedum species of plants as well as xeriscaping to make green roofing more appropriate for Colorado. There could also be the use of planters at the base of buildings to catch runoff. All of these ideas have to be within the confinements of the water rights “box”.
- ❖ The breach in the embankment could offer many strategy developments. The information learned from the embankment breach could be used as a mechanism to determine what can be done if all else fails.
- ❖ Utilizing a French drain sends water to the aquifer and provides post construction control.
- ❖ It would be imperative to work with developers in terms of LID. There should be a pilot project, a showpiece for the watershed. The pilot project will show that LID in addition to other ideas can work.
- ❖ Collect rainwater (grey water) to use. This is currently illegal in Colorado.
- ❖ A very low cost solution to cutting down flow and flooding would be conservation. There could be land use requirements and landscape conservation ordinances. In Santa Fe, there is a policy stating for every new building constructed there is an old building that will be retrofitted.
- ❖ A school competition could be held regarding the best ways to manage the watershed.

**Fountain Creek Vision Task Force  
Stormwater Strategy Group  
June 7, 2007  
Final Meeting Summary**

**Attending**

Luke Babbitt, Dan Bare, Dennis Darrow, Danny Elsner, Dan Henrichs, Sarah Keith, Carole Lange, Dennis Maroney, Jim McGannon, Pat McNamara, Rich Muzzy, Lisa Ross, Richard Skorman, Ross Vincent, Tim Williams, Chris Woodka, Niki Koszalka and Heather Bergman

**Action Items**

Rich Muzzy, Heather Bergman, Lisa Ross, and Dennis Maroney	Will work together to determine the details of policy review
Heather Bergman	Will contact Ken Sampley regarding the level of interest Colorado Springs has in implementing a credit system

**Presentations**

**The Role of Trees and Plants in Mitigating Stormwater Runoff (Jim McGannon, City of Colorado Springs)**

- ❖ Trees are the oldest new thing in stormwater treatment. There are great benefits of forest and canopy coverage including energy savings, filtering of pollutants, reduced erosion, and reduced stormwater runoff. Canopy coverage has remained the same since the late 1990s according to mapping of the area. There is less coverage in the eastern part of Colorado Springs. Towards the plains, there is still some canopy coverage.
- ❖ Converting drainpipes to open swales with vegetation can make them quite pretty. For every five percent of tree cover added to a community, stormwater runoff is reduced by approximately two percent. One inch of rain over a 12-hour period with canopy coverage like in Salt Lake City, reduces runoff by about 11.3 mm gallons (17%).
- ❖ A study done in Boulder Colorado showed that trees intercept 6 million cubic feet of stormwater runoff annually (1271 per tree on average). When it is raining, a large tree will take in rainwater through the leaves and trunk, allowing it to infiltrate to the ground around it. Urban forestry and stormwater management greatly affects the natural environment. Studies in the Colorado Front Range have shown that tree cover was estimated to reduce runoff by 52.9 million feet (to the third). This 2003 study was mainly in Denver. With the rainfall interception at .11 per gallon, a small tree can intercept 434 gallons with an estimated annual benefit of \$4.69. Large tree intercepts 1,116 gallons with an estimated annual benefit of \$12.06. City Green Analysis is a software analysis company dealing with mapping urban ecology and measuring the economic benefits.
- ❖ There is a landscape ordinance in Colorado Springs for parking lots. There needs to be natural resources in them. The natural resources can provide shade, reduction in the heat-island impact, and lengthens life of pavement. Natural resources will also reduce run off due to impervious areas.

- ❖ The mountainous areas made up of decomposed granite are highly erosive. The headwaters of Fountain Creek are in the mountains and in the plains. Decomposed granite is what ends up in Fountain Creek. The trees and plant material are catching the snow and high mountain melt. Without the plant matter, there would be much more runoff.
- ❖ The link to the Center for Urban Forest Research, Pacific Southwest Research, U.S. Dept. Ag. Forest Service is <http://www.fs.fed.us/psw/programs/cufr/>.

### **Questions/Answers**

*What is the difference between a well-planted and poorly planted tree?*

If man had planted the tamarisks and they spread for 50 years, it would be a poorly planted tree. Willows planted in hot and dry area are an example of poor planting. Xeroscape is good planting.

*What species of plants work best in a semi arid area?*

Natural Resource Conservation (NRC) does lots of work to determine what should go where. Use the research and resources, there are ways to track what should be planted. Colorado State University has a good source of plant information. They have a website for plant, grass, and tree selection. Army Corps of Engineers (ACE) has done work with riparian area plants.

*Are there trees that need minimal water?*

Trees will need water. In the urban environment, there will always be the need for water and maintenance. The Green Ash tree needs much less water than other types. It is important to study the region and climate to determine what the maintenance needs are for plants and trees.

*Has there been a cost benefit study that compares having plants that reduce runoff and the cost of building a detention facility?*

Yes, the Center for Urban Forestry Research did a study. The closest study was in Boulder and it addressed energy savings and stormwater costs.

*How can the trees be kept out of the channel?*

It is necessary to maintain the waterways to meet our needs. There is a need for labor to maintain drainages. In order to maintain the creek to its existing channel, there needs to be an input of maintenance energy.

*Are there plants that have impacts on pollutants?*

There is no cookbook approach. Some communities have used wetlands to improve water quality. Many plants have nutrient uptakes. Some plants can uptake pollutants and then need to be removed as toxic waste. Soils also have the ability to remove pollutants. Evapotranspiration is the process of transferring moisture from the earth to the atmosphere by evaporation of water and transpiration from plants.

### **Reports from Participants on Strategies**

#### **Mapping (Rich Muzzy and Dennis Maroney)**

- ❖ The FEMA floodplain does not incorporate lateral or vertical migration of the system. Historic and current problems caused by movable boundaries (meander pattern of the

stream) and areas of high erosion are not typically identified on FEMA maps. They are considered problem areas. There needs to be decisions made as to how they are dealt with. People need to be aware of them. There is a historic meander belt area outside of 100-year floodplain. This is an area with historic problems in regards to flooding. It needs to be decided if the areas should be regulated (by the city, county, state or at a federal level) or not.

- ❖ The movement of the Fountain Creek channel can be observed by comparing maps from 1955 to 1999. Fountain Creek has moved greatly from the east to the west. By 1999 the midline of the channel had moved. The midline moves due to growing vegetation, limits in flows, and sediment.
- ❖ There should be a study to find out what the meander has been in the past and what it might be in the future. ACE has done some studies. Arial photos could be used to find out information about the meander. Fountain Creek has massive erosion problems. Some areas are extremely solid where there has been no movement in the floodplain. There needs to be prioritization of certain areas.

### **Questions/Answers**

*Is it possible that the landowners have taken measures to maintain the meander belts?*

There are areas where bank improvements have slowed down erosion. Some landowners have made efforts to stabilize the banks but the channel has taken them out. A combination of sedimentation and vegetation determines where the channel is going.

*Would it be a good idea to let Fountain Creek do its own thing?*

If Fountain Creek were left to itself, there would be issues in the outlying areas. The soil outside of the creek is clay and shale. Fountain Creek deposited the clay and shale from its previous meander belt. Colorado Springs has a streamside ordinance, maybe it would be a good idea for each city to have a streamside regulation.

### **Retrofit Pilot Project (Danny Elsner, Matrix Design and Luke Babbitt, URS)**

- ❖ The effects of increased runoff, peak flows and runoff events are channel degradation, water quality issues, and a decrease in the health of the watershed. The goals of Low Impact Development (LID) are to mimic historic hydrograph conditions, both runoff volume and peak flow. The other goal of LID is to minimize flooding events. The outcomes from the practice of LID are the preservation of natural waterways, minimizing flooding events and environmental stewardship.
- ❖ In order to implement the process, existing infrastructure needs to be identified. Included in the infrastructure are detention ponds, infiltration ponds, inlets, and open space. Any LID that is already in place should be acknowledged. It is necessary to identify what is already addressed and what needs to be addressed. Peak flows, flow volume, and flood control would need to be addressed. There needs to be identification of implementation locations and appropriate LID tools to address the needs.
- ❖ When a LID is being put in, it is very important to monitor and keep any downriver impact to a minimum. There is an option to retrofit an area with LID. Planters could be put at downspouts of buildings so that the water is sent through the planter. Roads can be retrofitted with open curbs and existing landscape infiltration can be utilized.

## **Questions/Answers**

*Can porous pavement be used as an alternative?*

Yes, porous pavement or modular block could be used as an alternative. LID best management practices (BMPs) can be applied in existing infrastructure and drainage.

*How much water can a stormwater planter box hold?*

The intent was to have the water infiltrate. The planter boxes are not meant to hold water. They are only 2 or 3 feet deep with dirt. There is approximately three inches of void space where water can go.

*What would it cost to retrofit a parking lot?*

It would cost about \$5,000-10,000, depending on the size, for the implementation of parking lot ideas.

## **Credits for Good Development (Dennis Maroney)**

- ❖ Peak flow and volume of flow are both necessary to look at. Pueblo only gives credits for detention, which is a start.
- ❖ There are cities in Colorado that have stormwater incentives and credits. Commercial facilities that have detention facilities that are maintained can have a 60% credit in service fees. This can be upwards of \$5,000 per month or 2% of yearly revenue.
- ❖ Pueblo is revising an ordinance. There are points that will be given for quality, infiltration, and detention. With an economic incentive, there should be a noticeable improvement. Having a stormwater utility credit is even more incentive to adopt in into the watershed.
- ❖ Standard design practices are not geared toward things that may be implemented on the watershed. In terms of planning and development, water rights will need to be addressed and historic conditions will need to be met.
- ❖ Maintenance practices are very important. It is necessary to recognize the importance of maintaining and budgeting.

## **Questions/Answers**

*Can credits jump jurisdictional boundaries?*

Yes, they could be implemented in each jurisdiction. Counties that do not have a utility could have adjustments for the impact fees to create a credit. It would be a good idea to have uniformity in the watershed.

*When a stormwater fee is set up, it is based on maintaining or repairing what was there today. If you are granting credits, will that not create a deficit?*

There will be the need to work with a smaller budget. This actually could reduce the cost of infrastructure downstream. The size of the facilities can be reduced. If a facility could be designed, that conveys historic flows and a basin was developed to only match historic flows, you would need pipes to convey the difference in flows. This in turn would make the infrastructure smaller.

## **Best Management Practices (Danny Elsner, Matrix Design)**

- ❖ The main issues for stormwater are peak flows, total volume, and the number of storm events.
- ❖ Development decreases the initial abstraction, decreases infiltration, and decreases the time of concentration. The channel is receiving more water in a quicker timeframe than previously. Less water is needed to create runoff.
- ❖ Infiltration is dependant upon soil type and water rights. The routing of stormwater can vary due to impervious areas and flat slopes. There is both onsite and regional detention facilities. It is not legal to store water unless you have water rights.
- ❖ Currently peak flows and large infrequent storms are dealt with. The frequent and smaller storms are beginning to be dealt with. Currently not addressed is volume and number of storms. There is no requirement to meet historic volume or to meet initial abstractions in terms of number of storm events. A possible solution is infiltration. Storage and reuse are illegal in Colorado, so they are not options. When there is a desire to annex into a city, the developer has to state that it is able to match the historic peaks and balances.
- ❖ The current BMPs that can help with infiltration are grass buffers/swales, modular block porous pavement, sand filters and porous landscapes. Possibilities of BMPs for infiltration are green roofs and rain gardens. In all current ideas involving infiltration, there is maintenance that is involved.
- ❖ To show that historic volumes are being met, some kind of engineering documents would have to be created.

## **Questions/Answers**

*How would the strategies be different for peaks and volumes?*

If you reduce the peaks, this will change the volumes. Slowing down the time of concentration will allow a downstream detention pond to be smaller. All forms of detention have to meet requirements downstream. If the peak flows are delayed, the stream will receive water for longer and more often, which changes the volume as well. If volumes can be matched than historic-peak levels are helped immediately.

*Are slotted and French drains used in Colorado?*

They are not used much in Colorado. Some projects have infiltration galleries.

*Does an increase of volume also increase the amount of sedimentation and erosion?*

It is not the flood flows that cause the most problems with erosion and sedimentation. The smaller, frequent storms have the most effect on channel forming.

*What are the best ways to look at matching the historic numbers?*

The best way would be to look at annual numbers and determine how much rainfall is occurring and try to have that be matched. There is no perfect recipe to match the historic numbers. Development does have an impact on the numbers. Rainfall patterns are always a projection. High intensity, short-lived storms show a quick rise in flow. Engineers will take typical storms and have to make assumptions.

*How do engineers allow for variances in time?*

It is actually uncharted territory. Maintaining the same volume over a period of time is tricky. Currently, engineers try to manage low flow events when historically catastrophic events were dealt with.

### **Best Management Practices (Lisa Ross, City of Colorado Springs)**

- ❖ It is proposed by the city of Colorado Springs to revising its Drainage Criteria Manual Volume 2 (DMC2). This should be completed in 2008. The DMC2 has been in place since 2002. The city of Colorado Springs contacted all review engineers to determine what the issues are and what needs to be done. Urban drainage will fail with out maintenance. Colorado Springs needs to enhance its program for maintenance. By 2008, there will be a drafted program to be approved by the state. The rewriting of the DMC2 is not a complete overhaul but rather just tweaking what is currently available.
- ❖ There are proprietary units used for water quality. There are approximately three or four in Colorado Springs. Some are underground, out of sight and not maintained. The city installed one, the county installed another in a city right of way, one is a retrofit, and private developers install them as well. If credits are tied to maintenance, there is more incentive to maintain properly.
- ❖ Colorado Springs Utilities (CSU) and Urban Drainage are looking for a grant and funding for a study on BMPs for maintenance and lifestyle costs. The grant would also include options to incorporate LID.

### **Questions/Answers**

*Is Colorado Springs interested in implementing a credit system?*

It would be best to refer that question to Ken Sampley. Heather Bergman will contact Ken Sampley.

*What does a credit look like?*

In some cases, they are financial or at times percentages off a bill.

*Has Colorado Springs considered adopting the Volume Three drainage criteria manual?*

No. Colorado Springs does use volume three as base but would not outright adopt it.

### **Impervious Surface Market (Ross Vincent)**

- ❖ The impervious surface market is a program that is supposed to provide an incentive for people to do the right thing by creating tradable credits. However, it also creates an opportunity for people to buy credits for bad behavior. This could be an advantage by supplementing revenue lost from the people doing the right thing.
- ❖ Impervious Surface Markets work better in theory and tend to be an alternative to better programs. There needs to be a mechanism for determining what the objectives are for water quantity. There are a few communities trying this program. However, the research done found almost no discussion of how effective the programs are.
- ❖ The program requires some sort of basin wide oversight mechanism and making sure that it is enforced. The burdens of the enforcement would fall differently to different jurisdictions. If there was a Fountain Creek Watershed Authority, it could help in this area.
- ❖ This is an idea that should be on the table but that needs much further research.

### **Policy Review (Rich Muzzy)**

- ❖ All the questions and presentations given have been technical and policy issues. They are technical and policy issues. In 2002, there was a watershed plan evaluation of current policies with eleven local governments. There could be a policy evaluation workshop and all could be updated.
- ❖ The policy evaluation workshop would address revising existing plan and list some changes that could overall strengthen what is being done for erosion, sedimentation and flooding. The workshop could be one day with the aim to make all entities aware of the information on existing policies. There would need to be a \$33,000 budget.

### **Discussion of Strategies**

- ❖ The common themes of the strategies are the costs/benefits, maintenance, tradeoffs, measurements/verifications, and water rights.
- ❖ In terms of policy review, it should be a goal to get funding. There is no association to water rights because there will not be recommendations of specific policies but rather a listing of possibilities. Policy review influences many of the other strategies mentioned today. The review could take six months.
- ❖ For many years, there have been attempts to procure a grant with out success. The Consensus Committee would need to be approached and the cost could be divided between jurisdictions. Information needs to be given as to how the policy review ideas will physically help “fix” the watershed rather than another study. The only policies to be reviewed will be ones that directly influence the Fountain Creek Watershed.
- ❖ The proposed policy review could be a part of the Fountain Creek plan or it could be completed now and there could be recommendations that are part of the plan.
- ❖ Before the policies are reviewed, the Fountain Creek Vision Task Force needs to determine what things need to be implemented. Before checking the policies, it is imperative that it is known for what content they are being checked. The policy review discussion also needs to include identification of what the Fountain Creek Vision Task Force is trying to accomplish. The current holes in the policy need to be identified and specific recommendations need to be made.
- ❖ Policy review could result in creating a document. Having the creation of a document would move the Fountain Creek Vision Task Force closer to a strategic plan. It is more important to change the implementation of the current document than to change the entire document. It is important to include all local governments so that everyone is heard and included.
- ❖ Rich Muzzy, Heather Bergman, Lisa Ross, and Dennis Maroney will work together to determine the details of policy review. The next step is to brainstorm how to pitch policy review to the Consensus Committee.
- ❖ BMPs should be a priority. These are issues on how to deal with stormwater management and can be tied to policy review. BMPs will be a technical hurdle. They are not well established in stormwater management and will take research and technical evaluation/analysis.
- ❖ It would be helpful to have a small group of participants look at the three major vision documents (Salazar Vision, Petros Plan, and the 2003 ACE Study) and determine

what it takes to merge them. This will help the Fountain Creek Vision Task Force be able to visually describe what the Fountain Creek watershed will look like.