

## 6. Summary and Evaluation of Policy and Technical Management Strategies

This section summarizes policy and technical management strategies relevant to the Fountain Creek Watershed.

- Section 6.1 outlines federal and state regulatory programs that affect activities within the watershed.
- Section 6.2 contains a comprehensive summary of local (county and municipal) regulatory programs. A matrix summarizing local regulatory programs is included as Appendix F.
- Section 6.3 identifies a broad range of potential management practices that protect and restore watershed health.
- Section 6.4 contains general channel stabilization methods for problems in the Fountain Creek Watershed.

### 6.1 Summary of Current Federal and State Regulatory Programs

Federal and state regulatory programs affecting activities within the watershed are divided into seven specific categories:

- Floodplain;
- Riparian and Wetland Habitat;
- Stormwater and Urban Runoff;
- Construction Discharge Permits;
- Water Quality;
- Water Resource Development; and
- Wastewater Treatment Plant and Industrial Discharge Permits.

Information regarding guidance documents for some of the categories is also discussed.

#### 6.1.1 Floodplain

The Federal Emergency Management Agency (FEMA), pursuant to Title 44 CFR Parts 65, 70, and 72 (February 6, 1997), addresses issues including:

- Identification and Mapping of Special Flood Hazard Areas;
- Procedures for Map Correction;

- Procedures and Fees for Processing Map Changes;
- Final Rule and Fee Schedule for Processing Requests for Map Changes; and
- Flood Insurance Study Backup Data.

The Colorado Water Conservation Board (CWCB) administers Colorado's Flood Protection Program. The Flood Protection Program is directed in Section 37-60-106(1) C.R.S. (1990) to prevent flood damages; review and approve floodplain designations prior to adoption by local government entities; and provide local jurisdictions with technical assistance and floodplain information. In addition, an August 1, 1977 Executive Order requires the CWCB and Land Use Commission, which has since been dissolved<sup>1</sup>, to assist entities in meeting the requirements of the National Flood Insurance Program. Additional information can be obtained from the CWCB Flood Protection Program website at:

[http://cwcb.state.co.us/Flood\\_Program.htm](http://cwcb.state.co.us/Flood_Program.htm).

#### **6.1.1.1 FEMA National Flood Insurance Program (NFIP)**

The National Flood Insurance Program (NFIP) is a federally established insurance program available to communities that participate voluntarily and agree to develop and enforce floodplain management ordinances in accordance with NFIP requirements. The NFIP was established by the National Flood Insurance Act of 1968 and was updated and modified in 1973 and 1994. Floodplain management ordinances are administered in El Paso County and its municipalities by the floodplain administrator under the Pikes Peak Regional Building Department; in Pueblo County by the Director of the Department of Planning and Development; in Teller County by the County Planning Director; and in the City of Pueblo by the Stormwater Coordinator.

### **6.1.2 Riparian and Wetland Habitat**

#### **6.1.2.1 Clean Water Act, Section 404 Regulations**

Section 404 of the Clean Water Act regulates the discharge or placement of dredged or fill material into waters and wetlands of the United States. Activities that may be regulated

---

<sup>1</sup> The Colorado Land Use Commission has been dissolved, but as there is no official record of it being dissolved in the CRS, the duties and requirements of the Commission are still contained in the CRS. There is also no record of any changes to the CRS that would supersede the formation of the Commission or its requirements.

under Section 404 include infrastructure development, draining or filling of wetlands, channel and waterway modification, maintenance and repairs, and construction of dams or levees for water resource development. The program is administered by the U.S. Army Corps of Engineers (ACOE) with review by other federal agencies.

Pursuant to Section 404(e) of the Clean Water Act, the ACOE has the authority to issue general permits on a nationwide basis for any category of activity involving discharges of dredged or fill material if the activities in that category are similar in nature and have minimal adverse environmental effects, individually or cumulatively. Nationwide permits (NWP) are a type of general permit issued by the ACOE and are designed to authorize, with little or no delay or paperwork, certain activities having minimal individual or cumulative adverse effects on the environment (see 33 CFR 330.1 for policies concerning NWP).

#### **6.1.2.2 Colorado Natural Heritage Program**

The Colorado Natural Heritage Program (CNHP) provides services that include online access to data, mapped locations of imperiled species and areas of statewide significance, conservation plans, species and site inventories, expert scientific consultation services, and species habitat and ecological modeling.

#### **6.1.2.3 Colorado Division of Wildlife (State Guidance and Enforcement)**

The Colorado Division of Wildlife (CDOW) provides access to and information regarding the Natural Diversity Information Source (NDIS). The mission of the NDIS is to provide data and analysis needed to enhance decisions on land use affecting Colorado's animals, plants and natural communities. This mission is accomplished by bringing together information from a variety of sources, including the CDOW, the CNHP, Colorado State University, local governments and other conservation partners.

#### **6.1.2.4 U.S. Fish and Wildlife Service**

Some of the permits commonly requested from the U. S. Fish and Wildlife Service (USFWS) that apply to activities occurring in the Fountain Creek Watershed include:

- Habitat Conservation Plans and Incidental Take Permitting Process;

- Special Use Permits for Authorization for Research and Study of Cultural Resources; and
- Land Use Permits

The USFWS and the National Marine Fisheries Service have adopted a policy to address the conservation needs of species that are listed or are proposed to be listed under the Endangered Species Act (ESA) of 1973 as amended, while providing for the continuation and enhancement of recreational fisheries. This policy identifies measures to ensure consistency in the administration of the ESA between and within the two agencies; promote collaboration with other federal, state and tribal fisheries managers; and improve and increase efforts to inform nonfederal entities of the requirements of the ESA while enhancing recreational fisheries. This policy meets the requirements set forth in Section 4 of Executive Order 12962, Recreational Fisheries.

#### **6.1.2.5 Endangered Species Act (61 FR 27978, June 3, 1996)**

The fundamental purpose of the Endangered Species Act (ESA) is to conserve and recover species in danger of extinction, and to conserve the habitats and ecosystems these species depend upon. The ESA does this by listing a species as either endangered or threatened. “Endangered” means the species is presently in danger of becoming extinct without conservation and recovery effort, and “threatened” means the species is at risk of entering endangered status. In Colorado there are 14 fish, 1 amphibian, 9 bird, 8 mammal and 13 species of plants listed as threatened or endangered. In the Fountain Creek Watershed, listed species include the Preble's Meadow Jumping Mouse, the Greenback Cutthroat Trout, the Piping Plover, the Ute Ladies' Tresses Orchid, the Arkansas Darter, the Mexican Spotted Owl and the Least Term Burrowing Owl.

### **6.1.3 Stormwater and Urban Runoff**

#### **6.1.3.1 National Pollutant Discharge Elimination System Phase I and II**

The Clean Water Act as amended provides for the National Pollutant Discharge Elimination System (NPDES) to regulate the discharge of pollutants to waters of the United States. This permit program was established (and in some states is administered by) the U.S. Environmental Protection Agency (EPA). In other states including

Colorado, authority is granted for permits to be administered by an appropriate state agency. Colorado's Department of Public Health and Environment (CDPHE) administers the state's NPDES permitting program, while the EPA administers the NPDES program for federal facilities within Colorado such as Fort Carson and the U.S. Air Force Academy.

The NPDES program initially focused on point source dischargers and all were required to have a permit. Amendments to the Clean Water Act in 1987 initiated the process of controlling stormwater pollution and required the EPA to develop a phased strategy for implementing the NPDES Stormwater Program. The goal of the stormwater permits program is to reduce the amount of pollutants entering streams, lakes and rivers as a result of runoff from residential, commercial and industrial areas

The Phase I regulations were implemented in 1993 and requires cities with a population greater than 100,000 to obtain a permit. The City of Colorado Springs was the first city in the Fountain Creek Watershed to be affected by the NPDES Phase I regulations. Information regarding the City of Colorado Springs Phase I permit can be found at [www.springsgov.com/Page.asp?NavID=139](http://www.springsgov.com/Page.asp?NavID=139).

In December 1999, the EPA promulgated the final Phase II NPDES stormwater regulation affecting cities/counties with a population between 10,000 and 100,000. Initially, Phase II will impact El Paso County, the City of Fountain, the City of Manitou Springs, the Town of Monument and the City and County of Pueblo; Teller County may be affected in the future. These communities are required to develop and implement six stormwater management programs or minimum measures:

1. Public Education/Outreach
2. Public involvement
3. Illicit Discharge Detection and Elimination
4. Construction Site Runoff Control
5. Post-Construction Management
6. Pollution Prevention/Good Housekeeping for Municipal Operations

A permit application outlining programs that fulfill the permitting requirements was

submitted for each of these communities in March 2003. The programs established by the permits must be implemented by March 9, 2008.

#### **6.1.4. Construction Discharge Permits**

A construction discharge general permit is required under NPDES Phase II for stormwater discharges from construction activities that result in a total land disturbance of equal to or greater than one acre where those discharges enter surface waters of the United States or a municipal storm sewer system leading to surface waters of the United States. The permit also authorizes stormwater discharges from any other construction activity designated by EPA as having the potential to contribute to a water quality standard or for significant contribution of pollutants to surface water.

The EPA is developing Effluent Limitation Guidelines and New Source Performance Standards for the Construction & Development Point Source Category. When finalized, this regulation will establish technology-based standards for wastewater discharges to navigable waters from construction sites regulated by the NPDES permitting program and also standards for post-construction best management practices (BMPs).

#### **6.1.5 Water Resource Development**

The use of water in Colorado is governed by the office of the State Engineer, Division of Water Resources, and also by state law. The Colorado Constitution states that the right to appropriate the unappropriated water of the state “shall never be denied.” Water rights in Colorado are governed by the doctrine of prior appropriation. In essence, this means that while no person can literally own the water in a stream, all people, municipalities and corporations have the right to use the water for beneficial purposes.

Water is then allocated by what has come to be known as the “first in time, first in right” maxim. The first person to appropriate water (to take water physically from a stream or underground aquifer) and apply it to beneficial use is known as a “senior appropriator.” A senior appropriator has the right to have his or her water needs met before a junior appropriator. “Beneficial use” is recognized by the Colorado Constitution as a preference of water uses in this order: domestic, agricultural and industrial.

Water rights are granted by a special Water Court, and Colorado recognizes both

“absolute” and “conditional” water rights. An absolute water right is defined as an appropriation that has been completed by the diversion and beneficial use of the water by the appropriator. However, most projects take a number of years to plan, construct and complete; therefore, the appropriator can obtain a conditional water right from the Water Court to protect his or her priority before completing the actual appropriation of the water to assure that water that was available at the beginning of the project will still be available when it is completed. The project must proceed with “reasonable diligence” and demonstrate such diligence every 6 years.

There are two general types of water rights in Colorado: direct flow and storage. A direct flow right is usually measured in terms of a rate of flow rather than a total volume of water. The appropriator may take water at the approved rate as long as the water is physically available in priority and it is applied to a beneficial use. Direct flow rights also operate with a “duty” (amount of water necessary for the stated use) that functions as a limit on the amount of water that can be diverted under a priority and is designed to prevent waste. For example, an appropriator with a direct flow right of 10 cubic feet per second (cfs) to irrigate a 100-acre field cannot divert more water than is needed to irrigate that 100-acre field at the rate of 10 cfs.

The second type of water right is a storage water right, which is measured in terms of volume. The appropriator might have the right to store a prescribed amount of water in a vessel such as a reservoir each year for beneficial use at a later time. Storage rates are usually permitted for one filling of a vessel per year.

## **6.1.6 Water Quality**

### **6.1.6.1 Clean Water Act, Section 303(d) Regulations**

The CWA section 303(d) requires states to identify waters that are not expected to meet the national goal of being "fishable and swimmable" and to develop Total Maximum Daily Loads (TMDLs) for these waters with oversight from the EPA. A TMDL is a calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards.

Section 303(d) of the Clean Water Act requires states to prepare and submit biennially a list of waters to the EPA that do not or may not meet water quality standards. This is used to set pollution abatement program priorities in areawide management programs and must be done for stream segments where technology based controls for both point and non-point sources are not able to meet the standards.

The 303(d) list identifies priority waters requiring a TMDL process, which allocates pollutant loads or potential pollutant loads among all identified sources in a manner such that the combined discharges do not cause the water quality standards for a given water body to be exceeded under existing and future conditions. To control the pollutant levels, NPDES permits are issued and administered by the CDPHE through its Water Quality Control Division (WQCD). TMDLs are pollutant-based for individual creek sections. In the 2002 303(d) Monitoring and Evaluation (M&E) List, sections Segments 1 and 3 of Fountain Creek were listed for sediment.

#### **6.1.7 Wastewater Treatment Plant and Industrial Discharge Permits**

The goal of the NPDES program for wastewater dischargers is to ensure that every publicly owned treatment works facility treats their wastewater in a manner that protects public health and aquatic life. The permitting program establishes pollution limits and specifies monitoring and reporting requirements to meet this goal. The EPA has also developed a NPDES watershed strategy that is consistent with its larger watershed approach to address the following six focus areas:

- Statewide coordination;
- Streamlining of the permitting process within a watershed;
- Monitoring and assessment;
- Programmatic measures and environmental indicators;
- Public participation; and
- Enforcement.

As a component of the influent wastewater stream, industrial wastes that may contain toxic pollutants represent a significant risk to the effective operation of wastewater treatment operations and to the goal of achieving fishable and swimmable water quality in receiving waters. Therefore, operators of publicly owned treatment works must establish a pretreatment program to prevent the release of potentially toxic pollutants to the influent wastewater stream to their treatment plants.

Under NPDES, the CDPHE established 6 general permit categories that cover over 27,000 permittees to date:

- Light industry;
- Construction;
- Auto recycling;
- Heavy industry;
- Sand and gravel mining; and
- Metal mining.

## **6.2 Summary of Current Local Regulatory Programs**

This section reviews local regulatory programs and ordinances and discusses local strategies. A summary of local regulatory is included in the Policy Matrix (Appendix F). Zoning ordinances, regulations and drainage criteria were reviewed from the eleven local governments within the Fountain Creek Watershed: El Paso County, Pueblo County, Teller County, the City of Colorado Springs, the City of Fountain, the City of Manitou Springs, the City of Pueblo, the City of Woodland Park, the Town of Green Mountain Falls, the Town of Monument and the Town of Palmer Lake.

Documents from each local government were evaluated to provide a common, consistent baseline for decision making. In order to protect and restore the Fountain Creek Watershed, regulations and policies must address the non-point source origins of problems in the watershed and recognize specific issues related to watershed health, particularly erosion, sedimentation and

flooding. It is important to determine how progress can be achieved to ensure that each of the eleven local governments implement regulations that consider the regional and cumulative effects of their programs and activities within the Fountain Creek Watershed.

This is particularly important because municipal and county zoning regulations are designed to provide a systematic process for the development and use of lands within their own jurisdictions. By regulating the location and height of structures, the amount and location of parks and open space, the development and structure of subdivisions (including lot sizes and spacing) and allowable activities, zoning regulations have the potential to dramatically influence the state of the land surface, the effect on precipitation and run-off, and ultimately the state of the watershed.

### **6.2.1 Regulatory Program Review and Summary**

Local regulations and ordinances that affect stormwater management, erosion control, and floodplain restrictions in the counties and municipalities within the Fountain Creek Watershed are shown in the Policy Matrix (Appendix F). The Policy Matrix allows for regulatory categories that are common in each jurisdiction in the watershed to be compared. The matrix also identifies categories where documents or policies do not exist or are not comprehensive. A more detailed discussion in the following sections indicates both the common points and differences in policies and ordinances throughout the watershed.

The Policy Matrix is divided into regulatory categories that include:

- Drainage Planning Policies
- Stormwater Utility
- Stormwater Design Criteria
- Financial Responsibility
- Development Near Channels, Irrigation Ditches, and Drainageways
- Stormwater Runoff Detention
- Stormwater Runoff

- Quality of Stormwater Runoff
- Channelization
- Erosion and Sediment Control
- Erosion, Sediment Control and Stormwater Quality (combined)
- Floodplain Standards
- Streamside Approach/Prudent Line
- Drainage Basin Fees
- Grading
- Easements
- Required Improvements
- Street Design
- Construction
- Miscellaneous

## **6.2.2 Review and Comparison of Policies and Ordinances**

Policies and ordinances of local governments within the Fountain Creek Watershed were reviewed, compared and identified as being either common to all communities or unique to a particular community.

### **6.2.2.1 Policies and Regulations Common to All Communities in the Watershed**

There are several ordinances and policies with similar objectives that are shared among individual communities, including:

- **Floodplain Restrictions.** All land use control documents require residential development to be located at a minimum elevation equal to or above the base

(100-year) flood elevation. Other development inside the floodplain must be floodproof and waterproof below the base flood elevation. Proper anchoring and hydrostatic resistance must also be in place. Floodplain development standards are required by the Federal National Flood Insurance Act in order for counties to qualify for federal flood insurance. Municipalities must have the legal authority to implement land use and control measures that comply with federal requirements in order to qualify for federal flood insurance.

The Colorado Land Use Act allows local governments to identify, designate and regulate development within flood hazard areas through a permitting process. Colorado Revised Statutes (CRS) allow local units of government to develop planning and zoning regulations addressing, in part, development within the 100-year floodplain. Please see the Floodplain category in the Policy Matrix (Appendix F).

- **Development Planning.** All local governments within the watershed require a complete drainage plan for new developments. The requirements of each drainage plan differ, and although there are no state requirements (CRS do authorize municipalities and counties to consider such requirements), most drainage plans consider on and off-site drainage improvements, assume full development of any proposed development upstream, and place all costs of improvements upon the developer.

In some municipalities and counties the costs are offset for the developer only if regional facilities are constructed as part of the development. Jurisdictional drainage planning for new development is authorized under CRS, pertaining to county and municipal planning and zoning. NPDES Phase I and Phase II Stormwater regulations (refer to Section 6.1.3) require local governments of a certain population to address stormwater runoff from new developments through an NPDES permit from the State. Please see the Drainage Planning Policies category in the Policy Matrix (Appendix F).

- **Erosion Control Plan.** All governments require an erosion control plan that outlines methods for reducing soil erosion during construction and grading of land. All governments have some policy addressing erosion control, but the

level of requirements varies across the watershed. General requirements include an erosion control plan to be approved prior to the commencement of construction. More specific policies address requirements for temporary and permanent sediment control facilities, protection of land cover for long construction periods, and security required until construction is completed and inspected.

Erosion control plans are required components of Stormwater Management Plans for construction activities, which are required under NPDES Phase II for stormwater discharges from construction activities resulting in a total land disturbance of equal to or greater than one acre where those discharges enter surface waters of the United States or a municipal storm sewer system leading to surface waters of the United States. A regulation that has been proposed by the EPA (Effluent Limitation Guidelines and New Source Performance Standards for the Construction and Development Category; FR Vol. 67, No. 200, June 2002) would establish performance standards and/or effluent limitation guidelines for construction sites on a nationwide basis. A decision regarding this has not been rendered. Please see the Erosion and Sediment Control category in the Policy Matrix (Appendix F).

Industrial facilities including most manufacturers, mining, transportation facilities, power plants, landfills, wastewater treatment plants and recyclers that discharge water must be covered by a state stormwater discharge permit.

- **Detention.** Local governments within the watershed recognize the importance of detention when increasing the impervious area within the basin. While not all communities have specific criteria regarding detention, its importance is mentioned in their planning policies. There are no specific federal or state laws or regulations mandating stormwater detention. However, state statutes require counties to adopt subdivision regulations requiring developers to submit maps and plans (where applicable) for facilities to control stormwater in excess of historic runoff levels. Counties are also required by state statute to include provisions governing standards and technical procedures applicable to storm drainage systems and detention facilities in their subdivision regulations.

Similar requirements do not extend to municipalities. Please see the Stormwater Runoff Detention category in the Policy Matrix (Appendix F).

- **Design Requirements.** Detailed design criteria for structures such as roads, culverts, channel linings, detention, storm sewer systems and others are provided across the watershed. Municipalities without specific criteria adopt county guidance. While detailed design criteria are not contained in federal or state laws and regulations, state statutes require that standards and technical procedures for stormwater drainage and sanitary sewer service be established in subdivision regulations for unincorporated county areas. Some stormwater drainage design requirements for county road systems (and municipal streets to a lesser extent) are contained in the state statutes, the detailed requirements of which are the responsibility of counties and municipalities to determine.

Under the Colorado Land Use Act (CRS 24-65-105), the Colorado Land Use Commission<sup>2</sup> is required to develop model resolutions to serve as guidelines for county planning commissions in developing subdivision regulations. These resolutions shall include provisions for criteria, standards, technical processes, and operational procedures. These resolutions must also address development of land use and construction controls within designated floodways. Beyond this, however, there are no model ordinances or standards promulgated within the state statutes addressing any structures or land use features. Please see the various categories in the Policy Matrix (Appendix F).

#### 6.2.2.2 Communities With Ordinances or Policies Unique to the Watershed

Some communities within the Fountain Creek Watershed have unique policies or ordinances related to stormwater issues within the basin, including:

- **Stormwater Utilities.** One ordinance that is unique to the Cities of Manitou Springs and Pueblo is the creation of stormwater utilities that generate revenue for building and maintaining drainage facilities. Currently, Manitou Springs generates revenue by charging each water customer three dollars per month on

---

<sup>2</sup> The Colorado Land Use Commission has been dissolved, but as there is no official record of it being dissolved in the CRS, the duties and requirements of the Commission are still contained in the CRS. There is also no record of any changes to the CRS that would supersede the formation of the Commission or its requirements.

their utility bill. The City of Pueblo adopted a stormwater utility ordinance that became effective on June 1, 2003, which was created to meet the need of improving the quality of streams and creeks and prevent flooding. All properties within the City of Pueblo pay a stormwater service charge based on impervious area of individual ownerships. While no state or federal laws or regulations mandate the establishment of stormwater utilities, several state statutes do grant the authority to establish local improvement districts, and give direction to local governments seeking to create stormwater utilities. Please see the Stormwater Utility category in the Matrix (Appendix F).

- **Drainage Basin Fees.** Some jurisdictions in the watershed impose drainage basin fees for new developments or substantial improvements, including the City of Colorado Springs, Town of Monument, Town of Palmer Lake, City of Woodland Park and El Paso County. Fees are based on a developed acreage algorithm. El Paso County adopted detailed regulations outlining specific measures with respect to drainage basin fees, which address various scenarios, such as drainage facility construction cost and lot size that might allow for fee reduction or reimbursement of fees. Under the City of Colorado Springs drainage basin fee system, public drainage facility costs in excess of the drainage basin fees are reimbursed to the developer as other drainage basin fees become available in the respective basin. While drainage basin fees are not mandated by either state or federal laws or regulations, procedures are contained in the state statutes that require counties to establish subdivision regulations and related development standards, and criteria for establishing payment of drainage fees. Please see the Drainage Basin Fees category in the Policy Matrix (Appendix F).
- **Channel Stabilization.** In Colorado Springs and El Paso County, channels must be adequately stabilized to prevent erosion in excess of historic flows. The City of Woodland Park has a similar ordinance indicating that stream and watercourse banks and channels downstream from any land disturbing activity shall be protected from increased degradation by accelerated erosion resulting from high velocity runoff. While there are no state or federal laws or regulations mandating the stabilization of natural channels for erosion control, state statutes give local governments the authority to remove obstructions to flood channels

(which may include eroded materials). Authorities granted by the state to local governments concerning new subdivisions allow counties and municipalities to require developers to submit maps and plans (where applicable) for facilities to control stormwater in excess of historic runoff from areas undergoing development. Please see the Channelization category in the Policy Matrix (Appendix F).

- **Erosion Control Buffer Zone.** The City of Pueblo requires an erosion buffer zone to be delineated near highly erodible channels to allow for future natural widening of the channel and to provide for protection of the stream corridor. Submittal must show this zone on the plat. El Paso County incorporates a similar policy in their Prudent Line Setback. While no state or federal mandates for erosion buffer zones exist, state statutes do allow local governments to identify highly erodible areas through their master planning process and adopt measures to guide development within these areas. Please see the Streamside Approach/Prudent Line category in the Policy Matrix (Appendix F).
- **NPDES Stormwater Requirements.** The City of Colorado Springs recently adopted an additional drainage criteria manual that specifically addresses its NPDES Phase I requirements including BMPs and stormwater quality. It is expected that El Paso County will adopt similar measures for compliance under NPDES Phase II requirements. The other communities in the watershed designated to comply with NPDES Phase II requirements are the City and County of Pueblo, the City of Fountain, the City of Manitou Springs and the Town of Monument.
- **Streamside Ordinance.** The City of Colorado Springs recently adopted a new Streamside Ordinance with the purpose of guiding the development and maintenance of property adjacent to stream corridors. Development is to be compatible with the environmental conditions, constraints and characteristics of these areas. The ordinance is specific in requiring design review, development standards, allowable impervious area, streamside buffers, and land uses within the streamside zone. This policy is unique in that it has the most detailed coverage regarding development near streams.

While no federal or state laws or regulations mandate this type of ordinance, floodplain development standards are required by the Federal National Flood Insurance Act in order for counties to be eligible for federal flood insurance. The Colorado Land Use Act allows counties to designate flood hazard zones as areas of state interest where regulations may be implemented. CRS allow local governments to develop planning and zoning regulations addressing, in part, development within the 100-year floodplain. For areas outside of the 100-year floodplain, state statutes allow local governments to identify appropriate land uses and development densities within areas of special jurisdictional interest, including stream corridors; however, specific criteria are not mandated. Please see the Streamside Approach/Prudent Line category in the Policy Matrix (Appendix F).

- **Downstream Impacts.** The City of Pueblo has the most provisions requiring that new development does not increase the water management problems of downstream entities. Several ordinances require analysis showing that downstream impacts to property are negligible due to the development. Other than the National Environmental Policy Act (applicable to actions taken or funded by federal agencies), no other federal or state laws or regulations directly require the assessment of downstream impacts generated by upstream development. However, counties are required by state statutes to specify design and drainage standards for development under subdivision regulations. These standards must address the impact of the new development on existing flood control and storm drainage facilities in the area. The assessment of downstream impacts may be required by jurisdictions under this statutory provision. Please see various categories in the Policy Matrix (Appendix F).

## 6.2.3 Policy Strategies

### 6.2.3.1 Watershed Concerns Not Addressed in Existing Documents

- **Volume Increase.** Most jurisdictions in the watershed require detention in order for peak flows to be attenuated, and although this controls flooding during storm events, the total volume of flow is not reduced. Increased impervious areas throughout the watershed cause increased runoff volume that results in

prolonged shear stress to channels during flood events and more baseflow during other periods. Irrigation return flows also contribute to increased volume. Further, transbasin water imported for water supply results in higher sanitary and storm sewer flows, ultimately discharging and adding non-historical flow into Fountain Creek.

The EPA's stormwater permit program under the Clean Water Act, implemented at the state level through NPDES permits, recommends that permittees select BMPs designed to maintain pre-development runoff conditions at sites where new or re-development is planned. The state, in its guidance to Phase II stormwater permittees, does require permittees to develop design criteria and standards for BMPs and identifies stormwater quantity detention and infiltration practices as among those to be included. These requirements only address the issue of stormwater volume increase within the areas of permit coverage.

Outside of permitted areas, no other federal or state laws or regulations directly address this issue. If stormwater volume increases and/or transbasin diversions contribute to stream channel erosion and sedimentation and causes water quality impairments to a stream, the Clean Water Act may require the state to develop a TMDL for sediment, which would lead to enforceable requirements aimed at the sediment sources.

- **Clear Water Scour and Sediment Transport.** Currently there is not an ordinance among the watershed jurisdictions related specifically to clear water scour and sediment transport. A common problem across the watershed is the settlement of sediment in detention facilities, which can result in increased clearwater scour downstream. While no state or federal laws or regulations address this issue directly, the Federal Clean Water Act and the state laws that implement it indirectly address sources of sediment to state waters where those sources result in the stream being listed as water quality-impaired due to sediment.
- **Flow Bulking.** There are no current ordinances specifically related to flow bulking, which refers to the quantity and size of sediment and may affect the

hydrologic analysis of the drainage basin. Bulking transported by storm runoff may significantly increase the volume of flow, affect flow characteristics and can be a major characteristic in the hydraulic design of drainage structures. Bulking factors are typically used in determining design for facilities located within mountainous regions that are subject to fire and subsequent soil erosion.

- **Channel Improvement Impacts.** Existing design criteria do not sufficiently address system impacts that can occur from the construction of channel improvements. A more holistic design approach should be considered to address both upstream and downstream changes that may result from in-channel projects, particularly in the mainstem of Fountain Creek where meander migration is most pronounced. While no state or federal laws or regulations address this issue directly, the Federal Clean Water Act and the state laws that implement it indirectly address sources of sediment to state waters where those sources result in the stream being listed as water quality-impaired due to sediment.
  
- **Enforcement and Maintenance.** Maintenance of stormwater facilities and enforcement of ordinances are also an issue in the watershed, especially in new facilities that were not properly installed, do not functioning properly, or have failed entirely. The City of Woodland Park has the only ordinance requiring financial accountability for facilities that are not properly installed. Enforcement will become even more important as the NPDES Phase II stormwater rules go into effect for the larger jurisdictions in the watershed. The federal NPDES Phase I and Phase II stormwater regulations mandate ordinance enforcement and BMP maintenance requirements. Local jurisdictions required to obtain a NPDES Phase II permit must:
  - Adopt minimum control measures designed to reduce the introduction of pollutants to their municipal separate storm sewer system (MS4) to the maximum extent practicable;
  
  - Demonstrate long-term operation and maintenance of appropriate BMPs; and
  
  - Adopt and enforce stormwater ordinances.

No federal or state requirements exist that specifically address these issues outside of areas covered by these permits. A proposed EPA regulation (Effluent Limitation Guidelines and New Source Performance Standards for the Construction and Development Category; FR Vol. 67, No. 200, June 2002) would establish performance standards and/or effluent limitation guidelines for construction sites on a nationwide basis, but would not address post-construction stormwater management.

#### **6.2.3.2 Implementation of New Policies**

Effective maintenance and enforcement practices for stormwater and erosion control should be implemented across the watershed. New policies and regulatory controls should be adopted and developed to provide a basis for conducting inspections, issuing violation notices, imposing fines, and issuing stop work orders for violations during construction. An effective program would ensure that compliance and inspection is consistent throughout the watershed. This could be accomplished by clearly identifying tiers of violations and associated metrics in order for property owners and contractors to understand the implications of their actions. The most important aspect of the success of this type of program is regular construction inspections and strict compliance with regulations, which would mandate a larger labor force (Burrell, 2002).

### **6.3 Other Watershed Policies**

There are several national organizations that provide helpful links and information pertinent to the future development in the watershed including ordinances and policies in place in other communities. This includes several watershed organizations located within Colorado and associated with the Colorado Watershed Assembly, such as the North Fork River Improvement Association, which recently won an award for building a watershed partnership on the North Fork of the Gunnison River that resulted in significant restoration and improved aquatic riparian habitat.

Table 6-1 provides a summary of useful watershed organizations relevant to the Fountain Creek Watershed.

**Table 6-1. Relevant Watershed Organizations**

Watershed/ Organization Name	Mission Statement and/or Relevance to Fountain Creek Watershed	Location	Contact Information
Watershed Management Council	A non-profit educational organization dedicated to the advancement of the art and science of watershed management.	National, based in California	www.watershed.org
The Stormwater Manager’s Resource Center	Links to ordinances of several communities by specific topic.	National Organization	www.stormwatercenter.net
Colorado Watershed Assembly	Mission is to support collaborative efforts to protect and improve the conservation of land and natural resources of Colorado watersheds.	Colorado	www.coloradowater.org
Colorado Water Protection Project	Mission is to implement a comprehensive public relations campaign and support activities to increase public awareness in Colorado about the causes of and solutions to urban polluted runoff resulting from household activities including non-point source pollution.	Colorado	www.ourwater.org
Urban Drainage and Flood Control District	Ordinances and policies, flooding, erosion and sediment control, Phase II NPDES regulations.	Denver, Colorado	www.udfcd.org
Clean Water Action Plan- Watershed Success Stories	Summaries of successful watershed projects, some including erosion and sediment, best management practices	Various watersheds across the U.S.	www.cleanwater.gov/success/index.html
North Fork River Improvement Association	Mission is to meet current and future demands for traditional uses of the river while improving stream stability, riparian habitat, and ecosystem function along the North Fork of the Gunnison River.	Hotchkiss, Colorado	www.nfria.paonia.com/index.htm
Roaring Fork Conservancy	Community outreach	Basalt, Colorado	www.roaringfork.org
Big Thompson Watershed Forum	Voluntary watershed protection program with stakeholders, with strong public and financial support. Mission is to facilitate cooperative water quality assessment, reduce or eliminate existing and potential water quality problems and educational programs.	Loveland, Colorado	www.btwatershed.org
Calleguas Creek	Non-point source pollution, flood protection and sedimentation control, and public outreach and education	Ventura County, California	www.calleguas.com/cbrochure/introld.html
Los Angeles County Watershed Management	Erosion control, stormwater quality, and best management practices, stormwater and runoff ordinances.	Los Angeles, California	ladpw.org/wmd/

#### 6.4 Technical Strategies

This section identifies a broad range of potential watershed management practices designed to mitigate past and future effects based upon previously accepted and identified best management practices (BMPs). When properly installed and maintained, BMPs play an important role in controlling non-point source pollution, thereby protecting water quality and riparian habitats, mitigating floods and maintaining stream stability. Several BMP manuals have been developed at national, regional and local levels.

On the national level, the Urban Water Resources Research Council (UWRRC) of the American Society of Civil Engineers developed a National Stormwater BMP Database. This database has undergone intensive review by many experts and encompasses a broad range of parameters including test site location, watershed characteristics, climatic data, BMP design and layout, monitoring instrumentation, and monitoring data for precipitation, flow and water quality. This database is part of a larger project with the ultimate purpose of identifying factors that affect BMP performance, developing measures for assessing BMP performance and using the findings to implement design improvements.

The National Stormwater BMP Database Search Engine is available online at <http://www.bmpdatabase.org/background.html>, as well on CD. It enables users to access BMP data stored in the master stormwater database. The current database contains 98 BMPs at 84 test sites (UWRRC, 2001).

The Colorado Department of Transportation (CDOT) has developed an Erosion Control and Stormwater Quality Guide. The guide is intended to aid designers, field and maintenance personnel, consultants and contractors in designing and implementing measures to protect water quality. Guidelines are given for the application, use limitations, design, construction and maintenance of BMPs for erosion and sediment control and stormwater quality management (CDOT, 1995).

The City of Colorado Springs adopted the *Drainage Criteria Manual, Volume 2, Stormwater Quality Policies, Procedures, and Best Management Practices (BMPs)* for compliance with NPDES Phase I regulations. El Paso County will adopt similar measures to ensure compliance with the NPDES Phase II requirements.

### **6.4.1 Channel Stabilization Methods**

Each channel stability problem is unique, and as such, the methods required to address each problem must be tailored to fit site-specific conditions. Multiple methods exist to address the problems described in Section 4, Characterization of Watershed Problems and Issues. A list of methods and a brief discussion of solutions that may be appropriate for current and potential future problems found in the Fountain Creek Watershed is provided below. Some case examples are explained along with recommended stabilization methods to mitigate the problem. Other structural, nonstructural, industrial and commercial BMPs that are used in Colorado for stormwater and non-point source runoff management can be found in the City of Colorado Springs *Drainage Criteria Manual, Volume 2, Stormwater Quality Policies, Procedures, and BMPs* (2002) and the *Urban Drainage and Flood Control District Drainage Criteria Manual Volume 3* (1999).

#### **6.4.1.1. Grade Control**

Grade control measures provide stabilization for the channel bed, which are particularly important to locations such as Cottonwood Creek and Monument Creek where degradation is an ongoing problem. Two such examples explained below are Newbury Riffles and boulder drop structures (riffle drop).

##### **6.4.1.1.1 Newbury Riffle**

Newbury Riffles provide a simple way to control grade with a natural looking structure that checks the channel grade, adjusts with the river grade and does not require concrete.

##### **6.4.1.1.2. Boulder Drop Structure (Riffle Drop)**

Boulder drop structures (riffle drops) provide channel grade control for stream channels and are normally constructed in upstream/downstream pairs. The upstream drop structure provides a drop in water surface elevation of approximately 18 inches and the downstream structure provides a drop of approximately 6 inches. The spacing between the drop structures is typically 0.3 to 0.6 times the channel width.

Boulder drop structures are typically angled in an upstream “V” pattern to direct the river energy into the channel center and away from the banks, thus reducing bank erosion potential. The upstream drop structure should be made with a dip in the center of 4 to 18 inches. A firm foundation is required to prevent piping, sliding and undermining. The foundation is constructed of 36-inch or larger boulders imbedded in the channel with additional 36-inch diameter boulders added on top to increase drop height.

The benefits of boulder drop structures include:

- Constructed with natural materials
- Provides pool/riffle sequence
- Provides pool scour and grade control
- Enhances fish habitat and allows fish passage
- Reduces bank erosion upstream and downstream of structure
- Less expensive than concrete structures

The drawbacks of boulder drop structures include:

- Results in a hard point within the river and can eliminate natural meandering
- Requires periodic maintenance if rocks are displaced
- May require additional protection of footing

#### **6.4.1.2 Bank Stabilization**

Engineered bank stabilization measures are available in a wide variety of materials and approaches. Methods discussed below include J-Hook weirs, Bendway weirs, bioengineering and pole planting of cottonwood and willow.

##### **6.4.1.2.1 J-Hook Weirs**

**Purpose** - Provide stability for the river channel, reduce potential for bank erosion, and enhance stream habitat. May also be used to redirect flow.

**Description** - The structures normally are constructed in a series. These structures are designed to reduce erosion along the outside of meander bends. They will also establish a pilot channel by focusing flow within the channel to a central point. In so doing, a scour hole is created which can provide fish habitat. The structure must be adequately keyed into the streambank.

Lateral channel stability is achieved by the development of a pool-riffle or pool-run regime. The distance between structures should be dictated by the average spacing between pools in a channel with similar characteristics as well as local channel hydraulics. Spacing between structures may be much decreased along the outside of tight meander bends if adequate bank protection is to be attained. Large boulders (e.g., 2 feet to 3 feet in diameter) are required for construction in order to minimize the potential for displacement during high flows. Graded riprap may also be utilized. The structure should be tapered from the streambank to the outermost edge with the structure height at the streambank approximately twice the height of the outer edge.

#### **Benefits**

- Constructed with natural materials
- Provides fish habitat
- Reduces bank erosion
- Inexpensive

#### **Drawbacks**

- Requires careful design and installation to ensure proper function

#### **6.4.1.2.2 Bendway Weirs, Rock Barbs**

**Purpose** - To reduce erosion along the outside bank of a channel bend.

**Description** - The structures are constructed in series along the outside of a bend. The structures are spaced approximately 75 to 100 feet apart with the first one being installed at the bend entrance and the final at the bend exit (see detail). Each structure is approximately 0.25 to 0.5 times the base flow channel width in length and is tapered into the flowline. The structure is generally built of well-graded stone and is tapered with the instream end being approximately 2 feet in height and bank end approximately 4 feet

in height. The weirs are typically angled 10 to 25 degrees upstream. The structure must be adequately keyed into the streambank.

**Benefits**

- Structure is made of natural materials
- Provides sediment storage and local scour
- Provides fish habitat and allows fish passage
- Reduces bank erosion upstream and downstream of structure
- Less expensive than traditional streambank armoring

**Drawbacks**

- Potentially changes the course of a river if designed incorrectly
- Requires periodic maintenance if rocks are displaced
- Opposite bank erosion, if hydraulics are not correctly understood
- Root failure possible, if inadequately protected
- Potential for failure due to erosion or high flows is fairly high

**6.4.1.2.3 Bioengineering**

**Purpose** - Increase bank slope stability using native materials.

**Description** - The toe of the bank slope is armored with riprap, gabions, or other hard material below the channel bottom to an elevation equal to or greater than low flow stage. The channel bank above this point is graded to a 3:1 slope or less and reinforced using vegetative material, such as willow post plantings, wattles (bundles of stems), etc. This technique should be utilized on a portion of the streambank where channel hydraulics and tractive forces are not excessive.

Geotextile matting may be used to assist in stabilizing the bank. The material can be a permanent matting or one that will degrade through time. Installation of the matting (e.g., staking) should occur per manufacturer's recommendations. Matting greatly reduces the potential for surface erosion during high flow events. Planting species, such as willows, through the matting will increase flow resistance and act to reinforce the bank. Willow posts must be planted when dormant. Post should be greater than 1 inch

in diameter and be placed on a 3-foot by 3-foot grid pattern. The posts should be at least 3 feet long with about 2 feet below ground.

**Benefits**

- Structure is made of natural materials and visually appealing
- Improves stability
- Relatively low cost
- Less expensive than using hard materials

**Drawbacks**

- Should not be used where a beaver problem exists
- May fail if tractive forces above the flow stage are too great
- If plantings do not “take”, banks are left largely unprotected

**6.4.1.2.4. Pole Planting Of Cottonwood And Willow**

**Purpose** - Additional planting of cottonwood and willow is intended to establish (or reestablish) native vegetation in riparian areas and provide bank stabilization. Pole planting techniques are especially useful on woody species such as willow and cottonwood.

**Description** - Cuttings should be gathered from trees in the surrounding area by cutting branches at a 45 – degree angle while the trees are dormant. If not planting the same day, cuttings may be stored in water for a few days. Poles should be planted cut-end down at a depth sufficient to reach the water table. The terminal end of the pole may be pruned (paint to prevent water loss) to prevent flowering and to promote growth at the rooting end. Before any project involving stream channels, the appropriate state (Water Resources, Division of Wildlife) and federal agencies (U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service) must be notified, as permits may be required. Protection from beaver may be necessary and can be achieved through installation of wire mesh guards around cuttings.

**Benefits**

- Stabilizes banks
- Creates wildlife habitat

- Poles can be planted deep enough to reach low water tables
- Resistant to high velocity flows once established

**Drawbacks**

- Management (grazing, beaver, etc.) is necessary to ensure successful establishment
- Some replanting may be necessary due to mortality