URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

Flood Hazard News

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Open Space Along Drainageways Benefits New Developments

by

David Mallory, P.E., Project Engineer, Floodplain Management Program

Land development projects are responsible for the construction of the majority of major drainageway facilities in the Denver metropolitan area. The District expends considerable effort working with local governments reviewing development proposals for inclusion in the District's maintenance eligibility program. Although the District will accept these facilities for maintenance eligibility, except for closed conduits, we have always encouraged floodplain and open space preservation as our preferred option. Indeed our maintenance eligibility guidelines require only low flow stabilization and maintenance access for preservation projects. The concept of floodplain/floodway preservation provides many floodplain management benefits. Natural drainageways are valuable resources in terms of environmental corridors and wildlife habitat and provide tremendous recreational and educational opportunities.

From the District's viewpoint, the closed conduit is the least desirable approach that provides no floodplain benefit. The engineered channel is more commonly used and can be made eligible for District maintenance assistance. Adding a wetland bottom and enlarged overbank areas is a step in the right direction. However, nothing can improve on nature. Even floodplain fringe encroachment with bottom area preservation offers a significant improvement over the engineered channel as an environmental resource and community amenity.

Most subdivision proposals grudgingly allocate the minimum area to flood flow conveyance and open space needs. However, in the past twenty years, several large-scale developments have done a wonderful job of providing a generous open space set aside along major drainageways.

Mission Viejo (now Shea Homes) began the Highlands Ranch development in the early 1980's. The original planners envisioned a 22,000-acre, 36,000 lot master planned community with 5 million square feet of commercial space. Douglas County's Open Space Conservation Area (OSCA) was created with 8200 acres from the original parcel. Highlands Ranch Metropolitan Districts now manage 1800 acres of parks and open space, 40 miles of trails and two golf courses situated along Dad Clark Gulch, Big Dry Creek, Marcy Gulch and Spring Gulch.

Highlands Ranch Outdoors Community Survey (July 1999) reports that trails were significantly rated most important by residents when compared to other outdoor recreation facilities. Preserving natural areas was identified as the number one management objective. Outdoor recreation opportunities figured prominently in residents' decisions to purchase homes in the Highlands Ranch community.

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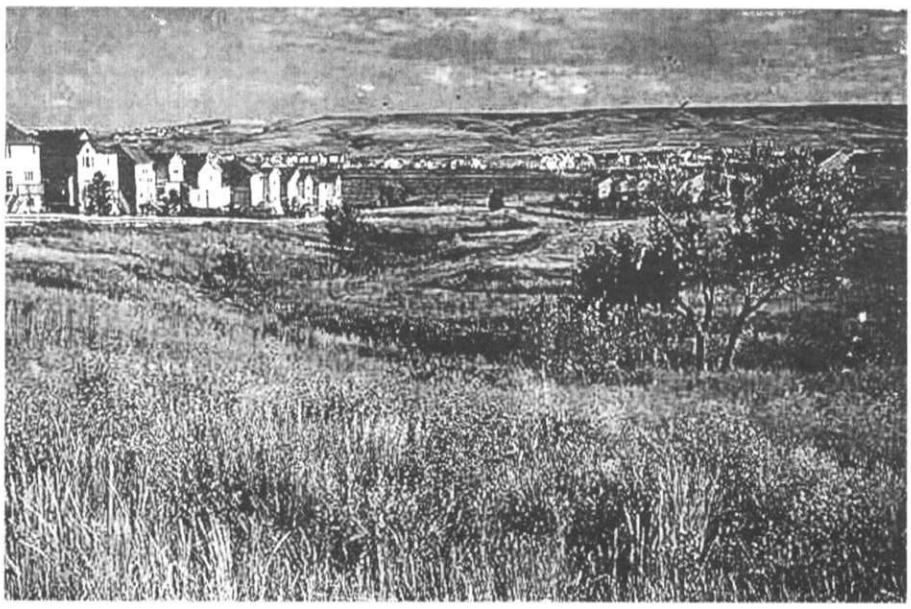


Open space along an unnamed tributary at Rock Creek Ranch in Superior.

Open Space (from page 1)

The continuous open space/drainageway corridors provide an important environmental connection between the OSCA and Chatfield State Park, McClellan Reservoir, and adjacent drainageway corridors. The combination of low flow stabilization, regional detention ponds and base flows created by urbanization has enhanced wetland and riparian zones (see "Added Benefits of Grade Control Structures," *Flood Hazard News,* Dec., 1999). During the last eight years, wetland coverage has increased from 9- to 39-acres without further human intervention. A recent survey by the Audubon Society found a diverse bird population with over 150 species identified.

Homes adjacent to open space areas fetch at least a 10% premium. Imagine the premium revenue from the nearly 3500 homes in this category. Highlands Ranch has recently attracted several major commercial clients, including Lucent Technologies, QWest and Visa. Home sales of course have always been robust, even during the slow growth years in the early 1980's.

Similarly, Richmond Homes' Rock Creek Ranch development, located in Superior, has become a very successful master planned community. The 1,600-acre site includes 3,000 single family lots, 2,000 multifamily units and 2 million square feet dedicated to commercial and residential development. A generous 640-acre open space set aside is situated along Rock Creek and six major tributaries. Improvements include 10 miles of stabilized natural drainageway/open space corridors, fifteen regional flood control/water quality ponds and numerous outdoor recreation facilities. McLaughlin Water Engineers formulated and implemented an innovative comprehensive water management plan. The plan addresses domestic water production, conservation, advanced wastewater treatment, effluent reuse irrigation and water quality treatment of all urban stormwater runoff.

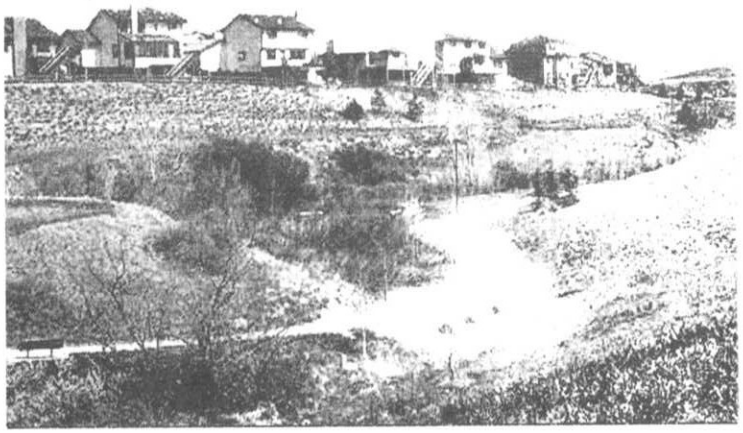
The Colorado Association of Stormwater and Floodplain Managers presented its 1998 Grand Award to Rock Creek Ranch for its floodplain preservation and stormwater management efforts. The result is a wonderful community amenity in terms of natural open space preservation, outdoor recreation and educational value. Drainageway corridors serve as an "outdoor lab" for children at the Superior Elementary School. "Superior's holistic water management approach is especially appropriate for a community in a region where water is a scarce commodity. It is a good example of how environmental sensitivity and economic reality can coexist as mutually compatible goals" (Roger McCoy, Special Districts Manager).

Another development worthy of mention is the next phase of Green Valley Ranch which will be developed by Oakwood Homes. First Creek and Tributary T flow through the 1266-acre site. The open space and adjacent golf course set aside will be 375 acres, or 30% of the total parcel. The project will finish out with 5,000 dwelling units and 140 acres of commercial development. Proposed drainageway improvements are simple. Sellards & Grigg designed low flow stabilization and 260 acre feet of flood storage on the golf course behind the Himalaya Avenue roadway embankment. The golf course will provide a buffer between residential development and natural areas. A significant aspect of this project was the developer's willingness to participate in regional drainageway planning. The result will be a new golf course, significant floodplain preservation and a beautiful new Denver community.

Developers of large master planned communities are willing to take a holistic approach to open space and drainageway planning because they recognize the financial and marketing incentives in addition to environmental and floodplain management benefits for their projects. But how about smaller projects? It turns out that a number of smaller projects have also created floodplain preservation based amenities. The process is similar. Complete a master land use, open space and floodplain management plan. Include recreation and stormwater management aspects. Emphasize continuity and look for regional environmental and recreational connection opportunities. Recognize financial and marketing incentives. A golf course is not essential but certainly a bonus. Examples of successful moderate scale projects include Hidden River along Tallman Gulch in Parker, the Sanctuary in Jefferson County and Rock Creek through the Flatirons Mall development in Broomfield.

In generously setting aside and preserving natural resources, land development projects preserve landforms, environmental assets, mitigate flood risk and enhance community value. It's a time proven development approach that succeeds in both strong and weak economic cycles. The reason of course is because people respond very positively to these amenities.

The following individuals provided information and/or photographs for this article: Mike Galuzzi, McLaughlin Water Engineers; Steve Dougherty, ERO Resources Corp.; Steve Ormiston, Shea Homes; Dick Leopoldus, Oakwood Homes and Chris Seeley, Highlands Ranch Metro Districts.



Highlands Ranch open space in Douglas County.

Tucker-Talk

by L. Scott Tucker

Timely Comment from the District's Executive Director

The Urban Drainage and Flood Control District had another successful year in 2000. New planning projects were initiated and others completed, many developer projects were reviewed and approved, undeveloped floodplains were purchased, drainageways and floodplains were maintained, assistance to local governments in meeting their NPDES permit requirements continues to be provided, basic research in best management practices to improve stormwater quality is continuing, many capital projects were initiated and completed, a major undertaking to completely revise the *Urban Storm Drainage Criteria Manual* was initiated, South Platte River activities expand each year, and the flood warning program continued to grow and flourish. All programmatic areas were extremely busy and productive, the accounting and finance people are keeping track of an ever increasing number of activities, and the secretarial support staff are running hard to keep up with their critical work.

But, success is also measured over a period of time and not just a year at a time, and the District's long term success and success in 2000 is attributable to the people that get the job done. I would like to focus this article on recognizing the hard work of an experienced, committed and dedicated staff. By reading the articles in this issue of Flood Hazard News you can see what I mean and one has to wonder how so few people get so much done.

Ben Urbonas is Chief of Planning and the South Platte River Programs and has been with the District for 24 years. His staff includes Project Engineer Bryan Kohlenberg, Project Hydrologist John Doerfer, and Engineering Inspector Ken MacKenzie. Bryan has been with the District seven years, John ten years and Ken four. In addition Ben has two student interns, Tracy Thurau and Dave Kurtz, helping with research and data collection efforts. Ben and his staff coordinate and manage all of the drainage and flood control master planning projects which totalled over $800,000 in 2000, maintain facilities along 40 miles of the South Platte River, implement cooperative projects on the South Platte in cooperation with public and private property owners, develop basic data related to the right-of-way and geomorphology of the South Platte, implement a major effort to revise the *Criteria Manual*, and continue to provide assistance to some 37 local governments working to meet their stormwater NPDES permits.

Bill DeGroot is Chief of the Floodplain Management Program and has been with the District for 27 years. His staff is comprised of Project Engineers Kevin Stewart and Dave Mallory. Kevin and Dave have been with the District seventeen years and three years respectively. They review all proposed drainage plans prepared by developers that are submitted by local governments for our review. Approval of developer constructed facilities makes them eligible for the District to maintain them. They also delineate flood hazard areas, assist local governments in administering floodplain regulations, coordinate FEMA efforts, collect flood damage data and document flood flows after flooding events, operate and maintain the District's flash flood warning program, distribute notices to floodplain occupants, continue developing a District GIS capability, and are continuing development of the Cooperating Technical Community (CTC) program with the Federal Emergency Management Agency.

Dave Lloyd is Chief of the Design and Construction Program. Dave's staff consists of a Project Engineer, Paul Hindman, and a portion of the time of a student intern, Chris Rozelle, shared with Bill DeGroot. Dave has been with the District 19 years and Paul 16. Dave and Paul manage over 80 design and construction activities that are in various stages of negotiation, right-of-way acquisition, design or construction. Another Project Engineer position is being added to the Construction Program in 2001 to help Dave and Paul keep all their projects going. All projects are in partnership with local governments and typically Dave and Paul manage the design process and the local government partner provides construction administration. However, the District is also the construction contract administrator on projects where the local government does not have the capabilities to manage a complex construction project. In 2000 over $12,000,000 of design and construction work took place and about $20,000,000 is scheduled in 2001. Dave and Paul would probably agree that constructing a project is in many cases easier than getting all the funding is place, reaching agreement on what to do, and obtaining all the environmental permits that are required. All design and construction work is performed by private contractors.

The Chief of the Maintenance Program is Mark Hunter who has been with the District twenty years. Mark's staff includes two Project Engineers, Dave Bennetts and Cindy Thrush, and two Engineering Inspectors, Mike Sarmento and Jeff Fisher. Dave has been with the District eighteen years, Cindy two years, Mike thirteen years, and Jeff two years. In addition there are four student interns working in the Maintenance Program that primarily help with inspection of routine maintenance work. The main thrust of Mark's group is managing the maintenance service contracts which includes routine, restoration, and rehabilitation projects that are identified in a Maintenance Work Program. In 2000 there were about 340 individual

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Floodplain Management Program Notes

By
Bill DeGroot, P.E., Chief, Floodplain Management Program

Planning for the future

One of the first and best policy decisions of the District was to delineate and regulate 100-year floodplains based on projected future development of the watershed. I was reminded of this fact again recently when the 2000 census numbers were released and we found that Colorado had added a million people over the last ten years, with most of them landing in the District's area.

Even though this makes all the sense in the world we still have lots of developers and their engineers insisting that they should only have to address the historic discharges. We constantly have to educate these folks that urbanization dramatically changes the watershed hydrologic regime, and those changes have to be accounted for in order to provide for the health, safety and welfare of our citizens and their customers. The surest way of doing that is to use future conditions hydrology.

Our preferred approach continues to be to stay out of the floodplain, thereby preserving its natural and beneficial values while minimizing the risk to new development. David Mallory's cover story details examples of several successful developments where the developer has set aside open space along major drainageways, to the benefit of all concerned.

Another approach, which we have been putting into many of our recent master plans for developing areas, is regional detention. The advantages of regional detention are that you can own it, maintain it, and know that it will be there when needed. The major disadvantage is getting the funding to get it built by the time it is needed. More on this topic below.

The year in review

We continue to be just about maxed out on development referrals, and it is a constant struggle to assure that new development doesn't increase the flood hazard potential within the District.

Our maintenance eligibility program continues to expand under David Mallory's direction. He currently has over 200 separate projects somewhere in the process between design review and final acceptance of construction. Unfortunately, most projects, no matter how simple, require two, three or even four submittals.

Kevin Stewart continues to assure that we have the best possible flood detection system, and he continues to be in demand as an expert in this field (see his list of professional activities on page 20 and his column in this issue). If you check out our web site at www.udfcd.org you will also see Kevin's handiwork.

Implementation efforts

One real challenge has been to implement portions of our master plans, particularly regional detention facilities, as development occurs. We have had some successes over the last couple of years that I would like to highlight.

The E-470 Public Highway Authority has helped build the first phase of detention ponds where their highway construction crossed East Toll Gate Creek and Tributary T to First Creek. They also constructed their crossing of Second Creek such that it is compatible with the plans for future implementation of a detention pond at that location. Finally, their plans for their final construction phase include borrow areas on Third Creek and Buffalo Run Tributary which will be converted to detention ponds. We've had some battles along the way but we do appreciate and acknowledge the Authority's efforts.

We have negotiated an intergovernmental agreement (IGA) with Aurora, Denver, Gateway Regional Metro District and Town Center Metro District (Oakwood Homes) for implementation of the regional detention facilities called for in the upper First Creek master plan, including cost sharing for two of the facilities, Green Valley Ranch Golf Course Pond and Blue Grama Pond. The IGA calls for Town Center to construct the Green Valley Ranch pond in conjunction with golf course construction and to be reimbursed by the other parties. Even though the IGA is still in the signing process, Town Center went ahead and built the Green Valley Ranch pond. I appreciate their willingness to do that.

Perhaps the most gratifying project, however, was the construction of what we call Parkfield II Pond by American Realty Trust (ART) on the Rocky Mountain Arsenal (RMA). We have been trying for six years to negotiate intergovernmental agreements between Denver, the RMA, Commerce City, Adams County and the District for the implementation of the Irondale Gulch master plan.

Finally, everything came together in 2000 for this one facility. The US Fish and Wildlife Service (USFWS), ART and Denver signed the agreement and construction began. The key elements of the agreement are that the USFWS, acting on behalf of the RMA, allowed the facility to be built on the RMA; the project creates 6.9 acres of new wetlands, ART funded the project and built it; and Denver agreed to accept maintenance responsibility for the facility. Our involvement was to approve the facility for District maintenance eligibility. We expect Denver to request our maintenance assistance out of the Denver allocation of District maintenance funds.

With that success under our belts, we have begun preparation of an environmental assessment (EA) of the remaining master planned facilities proposed on the RMA. Our hope is to have an EA approved later this year, which will then allow us to implement these facilities over time as needed. ERO Resources/Sellards and Grigg is the consultant.

Finally, we completed an interim

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Flood Warning Program Activities

by
Kevin G. Stewart, P.E., Project Engineer, Floodplain Management Program

HMS Closes Business after 11 Years
Since 1990, the private meteorological firm of Henz Meteorological Services (HMS) has been responsible for the early flood predictions and notifications provided to local governments by the District's Flash Flood Prediction Program (F2P2). This program provides forecast services from mid-April through mid-September and has been in operation for the past 22 years. John Henz, President of HMS, decided to close business operations after accepting a staff position with HDR Engineering in Denver. HMS Meteorologist Bryan Rappolt also accepted a position with HDR. John and his business associates have been providing the F2P2 meteorological services since its inception in 1979.

Flood Warning Research Underway
The District and the Boulder/Boulder County Office of Emergency Management have signed an agreement to study the effectiveness of the local flood warning program for the City of Boulder and Boulder County. This program was created in 1979 based on behavioral science research and recommendations by the University of Colorado following the 1976 Big Thompson Canyon flash flood disaster. The study approach will be to make use of the latest available findings and research from more recent Colorado and U.S. flood disasters, like the 1997 Spring Creek flash flood in Fort Collins, to estimate the effectiveness of the existing program and recommend ways to improve it. Dr. Eve Gruntfest with the University of Colorado at Colorado Springs will be the lead researcher. Eve was involved with the original research conducted by CU in 1977.

ALERT System News
Like the rest of the world, the District's ALERT system survived significant system changes driven by Y2K. Modern computer equipment and new software replaced the aging/obsolete 486 base stations and other antiquated components, which had performed well for many years. This upgrade included a new operating system (OS), initiating another learning-curve process. While not totally bug-free, the new systems performed well during the 2000 flood season. The software supplier (HydroLynx Systems of Rancho Cordova, CA) and a local engineering consultant (Bruce Rindahl with Brown and Caldwell, formerly with HDR Engineering) provided valuable technical support. The new OS also provided the gateway to popular Internet TCP/IP communications making the dedicated web server (http://alert.udfcd.org) the easiest way to obtain rainfall measurements, stream/reservoir water levels and weather data from the District ALERT system. Prior to this, the primary means of acquiring ALERT data was by direct modem connections (authorized users only) or by requesting hard copy products from the District. While dial-up access is still reliably used, the Internet solution has clearly become the method of choice for most users, as expected. The District currently supports 7 ALERT base stations. The "ALERT Web Server" resides at the District office with the primary 2-node LAN base and STORM Watch™ platforms. The LAN base is designed for automatic emergency failover operations should either PC malfunction.

A mouse (*Zapus hudsonius preblei, a.k.a. Preble's Meadow Jumping Mouse*) has delayed completion of the Douglas County ALERT expansion project that was started in 1997. With five gaging stations fully operational, the proposed sixth station (East Plum Creek) has become the most costly. Installation is pending resolution of this issue and the proposed site (approximately 5 miles south of Castle Rock) is currently under review by the U.S. Fish and Wildlife Service.

ALERT system expansion anticipated for 2001 includes southwest Denver, eastern Aurora and Third Creek downstream of DIA. Preliminary investigations have been completed for these projects and funding arrangements are progressing. ALERT mesonet (weather stations) growth and utility is continuing with additional stations expected for 2001. The newest weather station in this 15-station network was installed in June at the State Patrol's radio tower facility on Squaw Mountain south of Idaho Springs. This platform hosts a sonic wind sensor, a tipping bucket rain gauge and measures temperature and relative humidity every 15 minutes. This high elevation site (11,400') has already proven itself a valuable storm-forecasting tool for meteorologists by providing the means to continuously monitor a 6,500-foot vertical profile of wind, temperature and moisture. The weather station for the Urban Farm at Stapleton will be the next to come on-line sometime this winter. Weather stations are also anticipated for sites near Aurora Reservoir, Marston Lake in SW Denver and DIAD Incorporated in Longmont. DIAD provided maintenance services for the District and Boulder County ALERT systems during 2000 and authored the STORM Watch™ software package mentioned previously.

Flood Season 2000 in Review
The 2000 flood season --- a year characterized by record high temperatures, destructive forest fires and one flood-related death --- may be the most uneventful overall since the F2P2 began operating in 1979. In spite of extended periods of dryness and heat, District flooding made headline news for a few events this past year, with August 17 being the most tragic. On this day, a 37-year-old Denver fire fighter and father of three, Robert Crump, lost his life after rescuing a woman from swirling waters in northeast Denver.

Messages were issued to local governments on 23 of the 24 days listed in the following table, setting a record low for the 22-year period of F2P2 operations. Sunday, August 13 was the "miss" when unexpected storms

(Continued on page 18)

Maintenance Program Activities

by

Mark R. Hunter, P.E., Chief, Maintenance Program

Routine Maintenance

Through the routine maintenance program $687,700 was spent in 2000 for mowing and debris pickups. This work was done on approximately 220 different sections of drainageways within the District boundaries. This equates to a total of over 100 miles of drainageways in the Denver area on which we performed scheduled mowing and debris pickup maintenance.

In the year 2000, some local governments continued calling for an increased level of mowing and debris pickups on many urban drainageways. Many of the more urban drainageways now receive four or five mowings and seven or eight debris pickups per year. In the early 1980s the sole purpose of the routine program was to pick up large debris that could otherwise contribute to blockages and flooding problems. At that same time the corridors surrounding the urban drainageways were not appreciated for the resource that they are today.

These days urban drainageway corridors are prized as neighborhood amenities. Along with that outlook comes the community desire for a level of drainageway maintenance that goes beyond our original flood control debris pickups. Three or four debris pickups per year is now inadequate on the more urban drainageways.

We understand that on some urban drainageways our routine maintenance crews are the only service the drainageway will receive. Also, it is not practical to split duties on a given reach with a second agency. With this in mind we are capable of increasing the frequency of debris pickups and mowings on non-irrigated drainageways where the local government sets that as a priority. For certain drainageways, the local government may believe it is worthwhile to increase the routine services in exchange for less funding being available for restoration or rehabilitation work.

All of our routine work is done on structured schedules by private contractors. We are not set up to carry out landscape maintenance, on-call work, or emergency services. In the past we have participated with other agencies by splitting maintenance duties along drainageways through improved parks. We have seldom been pleased with our performance in these areas. Recognizing this, we will resume our initial policy of not providing mowing and debris pickup on irrigated drainageway corridors.

For the year 2000 we awarded eight separate contracts for routine work. Three of those contracts were awarded through an internal review of proposals submitted by potential contractors. The remaining five were awarded through a direct competitive bid process. Over the last three years we have been transitioning away from awarding routine contracts based on an internal review of contractor proposals toward awarding them based on the competitive bid process. For the year 2001 all the routine contracts will be awarded through competitive bids.

Restoration Maintenance

In 2000 the restoration program completed $1,149,000 of work. Restoration projects typically address isolated drainage problems where the solution involves small-scale construction. Seventy-five individual activities were completed during the year. A major advantage of the restoration program is the ability to use it to react quickly to local drainage needs.

Nature dictates that as long as sediment is being carried by a stream some of that sediment will drop out when the stream expands into a quiescent pool. One of the on-going obligations created when detention ponds are built is to keep those ponds relatively free of accumulated sediment. We have removed sediment from two dozen detention ponds over the last two years. It takes a continual effort to keep these flood protection facilities functioning as intended. We envision that it will be more difficult to carry out this type of regular maintenance in the future as the Clean Water Act regulations become more restrictive.

An example of regular detention pond maintenance is Fairfax detention pond which is situated on **Fairfax Tributary** in Commerce City. The sediment is removed from this pond once or twice a year. It is in a popular well-maintained park so maintenance access must be coordinated with other park uses. We are always impressed with how much sediment accumulates in this pond even though the whole tributary basin is developed. Perhaps dirt and debris washed off the streets are the main contributors.

East and West Toll Gate Creeks join together west of Chambers Road in Aurora. The site is surrounded by open space characterized by the meandering streams with steep cut-banks. The project called for confining the lateral erosion of the creeks without impacting the natural high-plains character of the area. Bio-engineering techniques were used exclusively to stabilize the toes of the steep banks. Limited regrading was done at the toes of the eroding slopes to allow erosion prevention measures to be installed. The upper part of each eroding bank was left intact to preserve the quality of the open space.

In last year's *Flood Hazard News* we reported on the re-naturalization of a portion of **Boulder Creek** near Highway 287 in eastern Boulder County. The main feature of the work was to return sinuosity to the creek alignment and to install "bendway" weirs to keep the low channel banks in place. A bendway weir redirects the flow by letting the main current of the stream go the direction it intrinsically wants to go as it flows over the weir. Other weirs, such as jetties and groins, forcibly divert the flow by creating an obstruction. The re-contoured stream

appears to be thriving with the help of attentive revegetation efforts.

For its last three miles, before it discharges into the South Platte River, **Cherry Creek** flows in a vertical concrete-walled channel through central Denver. Approximately 70% of the edge of the low flow channel through this reach is lined with boulders. At the gaps in the protection the creek can still threaten the concrete walls or the nearby trail. When we repair this type of erosion near the trail we also install a two-foot wide recovery zone at the edge of the trail. This will help warn persons that they are in danger of going off the edge of the trail. It also gives them additional width in which to regain the main trail surface.

Little Dry Creek crosses under the Highline Canal south of Orchard Road in Arapahoe County. Downstream from the irrigation canal crossing steep-banked erosion on the creek is threatening private property. The owner of the canal and the private property owner are both willing to participate with us in funding the project to accelerate the erosion control work. This is a good example of cooperation among multiple parties to address a common problem. We enjoy doing this kind of project because the result is very often a multi-purpose improvement with many pleased parties.

STATUS OF MAINTENANCE REHABILITATION PROJECTS

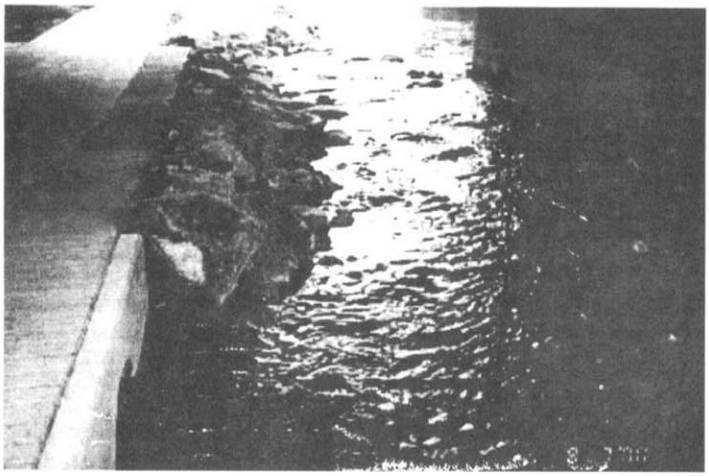
Project	Jurisdiction		Cost	Status
ADAMS COUNTY				
Little Dry Ck., Shaw Heights. - South of 80th. Repair bank erosion, partic.	Westminster	Design	$65,000	100%
		Const.	600,000	90%
Sand Creek -confluence w/ S. Platte R. Repair bank erosion, participation	Commerce City	Design	14,600	25%
		Const.	canceled	canceled
ARAPAHOE COUNTY				
Big Dry Creek – east of University Blvd Repair to channel and trails	Arapahoe County	Design	$41,050	60%
		Const.	next year	0%
Cherry Creek – west of Colorado Blvd. Repairs to outlet of tributary.	Glendale	Design	10,000	100%
		Const.	25,000	100%
East Toll Gate Trb. - Along Uravan Av Drops and channel repair	Aurora	Design	70,950	90%
		Const.	next year	0%
Little Dry Ck. – east of Holly at Arap. Sediment trap and park repairs, partic.	Arapahoe County	Design	41,800	70%
		Const.	canceled	canceled
Little Dry Ck – Quincy to Belleview Av Grade control at sewer crossings partic.	Cherry Hills Village	Design	by others	100%
		Const	100,000	0%
S.J.C.D. North – East of Sheridan Bvd. Repair low flow channel and drops.	Arapahoe County	Design	34,387	100%
		Const.	350,631	10%
Willow Creek, Jamison Trib. – Dry Ck Road. Repair drop structures, partic.	Arapahoe County	Design	by others	100%
		Const	329,888	100%
BOULDER COUNTY				
Coal Creek – west of Erie at r.r. tracks Rebuild obliterated channel	Erie	Design	by others	75%
		Const.	canceled	canceled
Elmer's Twomile Ck. – s. of Iris Ave. Rebuild detention pond and channel	Boulder	Design	by others	85%
		Const.	next year	0%
DENVER COUNTY				
Cherry Creek – W. of Colorado Blvd. Repair drop structure	Denver	Design	$66,697	100%
		Const	220,424	100%
Cherry Creek – Highline canal crossing. Repair drop structure, participation	Denver	Design	19,985	70%
		Const	next year	0%
Cherry Ck, Babi Yar T.-Yale &Havana Drops, bank repair	Denver	Design	45,320	100%
		Const.	328,967	100%
Harvard Gulch – Through DeBoer Park Rebuild trickle channel	Denver	Design	39,845	80%
		Const	next year	0%
Lakewood Gulch – In Martinez Park Trail repairs, participation	Denver	Design	by others	100%
		Const	6,000	100%
Lakewood Gulch – Federal to Knox Channel erosion repair	Denver	Design	83,432	100%
		Const.	394,647	95%
South Platte River, Westside Trib. - N.E. of 6th and I-25. Install pipe.	Denver	Design	82,868	100%
		Const.	334,278	100%
DOUGLAS COUNTY				
Sulphur Gulch – W. of Hwy #83. Rebuild drop structure	Parker	Design	$77,940	100%
		Const.	281,000	20%
Tallman Gulch – In Rowley Downs Trail construction, participation	Parker	Design	by others	100%
		Const	75,000	100%
JEFFERSON COUNTY				
Dutch Ck – NE. of Pierce & Coal Mine Repair eroding channel	Jefferson County	Design	$76,558	100%
		Const.	458,010	100%
McIntyre Gulch – Union at Alameda Pk Repair erosion and drops, participation	Lakewood	Design	63,910	100%
		Const.	300,000	10%

Rehabilitation Maintenance
Twenty-two projects were at various stages of design or construction during 2000. Those projects are listed in the accompanying table titled "STATUS OF MAINTENANCE REHABILITATION PROJECTS". Rehabilitation projects usually take the form of consultant-designed repairs that are intended to address severe problems that have occurred on a previously improved urban drainageway. By the end of 2000 the District will have spent about $3,077,100 on rehabilitative design and construction for the year. A few of the unique projects are discussed below.

Shaw Heights Tributary joins Little Dry Creek at Sheridan Boulevard and 76th Avenue in Westminster. Upstream from that point Shaw Heights Tributary passes through a small park. Above that it is compressed into a narrow corridor between a railroad track and residential backyards. Construction of drop structures and a geocellular confinement system to provide bank stabilization is nearing completion.

In the previous two issues of *Flood Hazard News* we have reported on the sediment trap that was constructed on **Willow Creek** at Dry Creek Road in Arapahoe County. It has been in operation since early summer of 1999. In early fall of 1999 we removed nearly 1000 cubic yards of accumulated sediment from the facility. We have

Channel erosion on Sulphur Gulch below the drop structure.



An example of a recovery zone on Cherry Creek.

done two sediment removals so far this year with each being about 800 cubic yards. It is a small sediment trap with a holding volume of about 0.6 acre-feet serving a drainage basin of over eight square miles. It is not capable of capturing the fine sediments but, it has served well in catching the sandy and granular material.

We have learned that there are drawbacks to designing multiple phases of a lengthy project and then building those phases over several years as funds become available. As the plans sit on the shelf new design concepts are developed, neighborhood concerns change, and political directions are amended. This frequently results in a construction plan that is obsolete before it is built. The goal of the channel reconstruction on **Dutch Creek** east of Pierce Street was to correct bank erosion near a pedestrian bridge and to stop a headcut from eroding through a wetland. The original design had been done seven or eight years ago. Much of that design had to be redone this year as a result of the factors mentioned above plus the topographic changes that had occurred in the project area.

Southwest of Federal Boulevard and Colfax Avenue **Lakewood Gulch** flows through the rolling landscape of Sanchez Park. The original design for this work was begun 10 years ago. This design also had to be revised, more than once, for the same reasons mentioned in the paragraph above. The work, which is currently under construction, will install drop structures and boulder edging in select locations on the low flow channel to arrest the erosion and protect the corridor's Cottonwood trees.

Construction is now being completed on the **West Side Tributary** to the South Platte River northeast of 6th Avenue and I-25. This project sat on the shelf for five years waiting for funding and because of a conflicting sewer line construction project that needed to be completed before this project could begin. While waiting for its turn this project was also redesigned to updated standards. But, that was not the last change as construction of this project revealed another dilemma. The channel drained an industrial area from early Denver. The water was contaminated with residual petroleum products which in turn had contaminated the soil throughout the length of the project. Dealing with the tainted soil in the proper manner caused a 56% cost overrun over the original bid.

Flowing from east to west through the center of downtown Parker is sandy-bottomed **Sulphur Gulch**. In 1994 a grouted sloping boulder drop structure was built on Sulphur Gulch about two thousand feet upstream from its confluence with Cherry Creek. There are no grade control structures on the gulch downstream of the drop structure. The consequence has been rapid and destructive erosion of the channel bed below the drop resulting in the collapse of the lower edge of the structure. A construction contract to repair the structure is now underway.

In the early and mid-1980s the Maintenance Program rehabilitated six drop structures on **Cherry Creek** between University Boulevard and Holly Street in Denver. We rebuilt all six of them as sloping riprap drop structures making use of the existing sheet pile as the cutoff wall for our new drops. Each of the rebuilt drops starting failing almost immediately. Areas of the riprap appeared to be undersized and, in general, riprap is only as strong as its weakest area. With the completion of the reconstruction of the structure west of Colorado Boulevard in May, 2000 we have now re-rebuilt five of them as grouted sloping boulder drop structures.

Cleaning out the Willow Creek sediment trap.

Re-Greening the Platte

by
Ken A. MacKenzie and Ben R. Urbonas
South Platte River Program

Over the last two years the South Platte River Program of the District has directed much energy towards work intended to return the vegetation along portions of the South Platte River to a more native condition.

Working with South Suburban Park and Recreation District, Colorado Water Conservation Board and the City of Littleton, we removed 365 Russian olive trees growing along the banks of the river south of Denver. This work was a continuation of an effort we began in 1997, which, to date, has removed over 1,000 Russian olives from the riverbanks. In areas where these exotic species were removed, there are now growths of native volunteer saplings, including Boxelders, Plains cottonwoods and Peach-Leaf willows. We have installed sleeves of wire fence material around many of these prized natives to help protect them from beaver damage.

In addition, working with Denver's new South Platte River Park District, we have removed almost 300 dead or diseased Siberian elms along the river in the past two years. When removing trees, we leave behind some large sections of the cut tree trunk on the banks, lodged behind the stumps and trees left standing. Leaving these logs parallel to the river helps prevent soil erosion, creates habitat for wildlife, and provides a decaying biomass as habitat and as a nutrient source for new plant growth. Much of the remaining tree material was chipped and spread over the upper riverbanks as mulch. To replace the non-native Siberian elms, we have planted over 450 native Plains cottonwood and Peach-Leaf willow poles, about 8,000 sandbar willows, and over 3 million shrub seeds.

The District also continues to work with other groups to further the goals to revegetate the river. One of these was *Fresh Start*, a non-profit organization that provides Denver youth with a supervised opportunity to make court-ordered restitution for graffiti offenses. We dug holes and donated beaver protection materials for a tree planting effort by these youth. In addition, to give newly planted trees and shrubs a better survival opportunity, we donated a 195-gallon water tank and watering accessories to *Fresh Start*. They have used this truck-mounted system to deliver many thousands of gallons of water to new trees and shrubs in Denver. We also donated native shrubs and volunteered our personal time to assist with the planting efforts during Denver's annual *Trails Day* volunteer event on the South Platte.

Returning native grasses, shrubs and trees to restored riverbanks and to areas overgrown with weeds and invasive trees and shrubs is a priority of the South Platte River Program. We pursue this goal with a four-pronged approach: (1) introduction of a mixture of native grass species appropriate for specific site conditions, (2) inclusion of native shrub seed into the grass mix whenever appropriate, (3) planting of native trees whenever site conditions permit and (4) use of rigorous weed control measures. In the past two years we have reseeded over 20 acres of restored riverbank and provided weed control mowing at least three times during the growing season at each of 27 project sites. This equates to 276 acres of weed-control mowing. We look forward to working with our partner communities, organizations and volunteer groups to return native plant species to the river banks.

Willow Creek Project Wins National Award

Last year we reported that the District and project sponsors Arapahoe County and South Suburban Parks and Recreation District won the 1999 Colorado Association of Stormwater & Floodplain Managers (CASFM) Grand Award for Engineering Excellence. CASFM then submitted this project to the Association of State Floodplain Managers (ASFPM) for national award consideration. The Willow Creek Project won the National award which was presented at the annual ASFPM conference in Austin, TX in June. This was an important year to win this prestigious award as this year it was decided to name this award after FEMA Director James Lee Witt in recognition of his landmark efforts to support, enhance and encourage local floodplain management capabilities. Mr. Witt presented the award at the conference to Cindy Thrush.

Following is a brief description of the project. This is a multi-faceted project that addresses both the flood control and water quality aspects of stormwater management. It was a joint project between the District's Capital and Maintenance Programs.

The project is located in Arapahoe County in a natural open space park area. The drainage area tributary to the project site is 8.10 square miles (5184 acres), the 2 year discharge is 1650 cfs and the 100 year discharge is 6100 cfs. The Willow Creek watershed is fully urbanized in the lower half of the basin where the project is located, and is actively being developed in the upper half of the basin.

The primary purpose of the project was to stabilize the Willow Creek channel and to repair a vertical channel bank approximately 30 feet in height. Through the creativity and willingness of all project sponsors, several bioengineering techniques were used instead of traditional stabilization techniques. During the design phase, an opportunity arose to address water quality concerns, specifically sediment from the upstream watershed. A sedimentation pond was constructed to remove sediment before it reaches the Englewood Dam flood pool area. The pond enhances the water quality of the stormwater before it reaches the open space area, as well as mitigating excessive sediment buildup that repeatedly closed the recreation trail downstream of the project area.

Design and Construction Program Notes

By
David W. Lloyd, P.E., Chief, Design and Construction Program

The year 2000 was another busy year for the District's Design and Construction Program and saw us committing over $6 million to design and construction projects by year-end. Most of this funding has gone toward the construction of several new projects as well as the continuation of projects started in past years. Design and Construction currently has in excess of 90 active projects in varying stages from design through construction. Because of this continuing increase in active projects, the Design and Construction Program hopes to have a new project engineer on board in early 2001 to assist Paul and me with this workload.

A number of projects were constructed this past year in the City of Aurora which had been many years in the planning and design process. Modifications to the Exposition Park detention pond were near complete by the end of 2000. This state jurisdictional dam was retrofitted with a new spillway and outlet works, eliminating the old outlet system which discharged into the Denver High Line Canal, costing the City of Aurora several thousand dollars in fees each year. Aurora Parks will complete the project in 2001 with the revegetation of the newly graded park.

Meadowood Channel improvements were also near complete by year-end. This 6,000-foot reach of channel between Quincy and Hampden was reconstructed with a number of drop structures and a maintenance access path. A developer originally constructed the channel several years ago with grouted riprap drop structures, which had been slowly deteriorating over the years.

The Jewell Wetlands detention pond was constructed in 2000 along Upper Westerly Creek in Aurora. This added detention will supplement existing detention downstream at Utah Park. The 700 foot long embankment, along

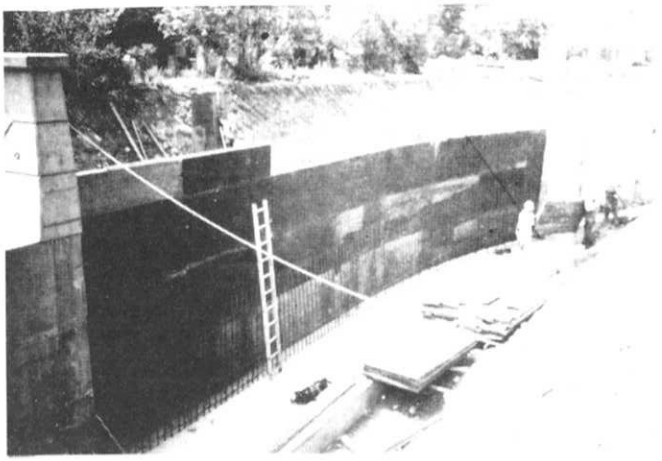
STATUS OF DISTRICT DESIGN PROJECTS

Project	Participating Jurisdiction(s)	Status
Shaw Heights Tributary	Westminster	Complete
Niver Creek Tributary L	Thornton	Complete
Lena Trib. H	Jefferson County	Complete
Cherry Creek Drop Structures	Glendale	Complete
Clear Creek @ Kipling	Wheat Ridge	Complete
Lakewood Gulch @ Perry	Denver	Complete
Leyden Reservoir	Arvada, Westminster	Complete
South Trib. to Slaughterhouse Gulch	Littleton	Complete
Valley Club Outfall	Arapahoe County	Complete
North Tributary of Massey Draw	Jefferson County	95% Complete
Lakewood Gulch @ Welchester Park	Jefferson County	95% Complete
Drainageway G	Jefferson County	90% Complete
Piney Creek	Arapahoe County	75% Complete
Cottonwood Creek	Arapahoe County	75% Complete
McKay Outfall	Adams County	70% Complete
Pinehurst & Academy Park Tribs	Denver	70% Complete
Happy Canyon Creek	Douglas County	50% Complete
Kalcevic Reservoir	Adams County	25% Complete
Lena Gulch @ Mountain Side	Jefferson County	25% Complete

STATUS OF DISTRICT CONSTRUCTION PROJECTS

Project	Jurisdiction(s)	Cost	Status
Niver Creek Trib. M	Federal Heights	$200,000	Complete
Cherry Street Bridge	Glendale	1,500,000	Complete
Clear Creek @ Ford Street	Golden	1,500,000	Complete
Drainageway E	Columbine Valley	1,088,000	Complete
Granby/Sable Outfall	Aurora	160,000	Complete
Greenwood Gulch @ Monaco Way	Arapahoe County	450,000	Complete
Irondale Gulch 80th Ave. Outfall	Adams County	800,000	Complete
Littles Creek Phase II	Littleton	950,000	Complete
Massey Draw @ Carr Street	Jefferson County	775,000	Complete
West Dad Clark Gulch	Douglas County	450,000	Complete
Bayaud/Hooker Outfall	Denver	774,000	Complete
Jewell Wetland Detention	Aurora	907,000	Complete
Lakewood Gulch Quail to Oak	Lakewood	650,000	Complete
Shaw Heights Trib. Phase I & III	Westminster	1,135,000	Complete
Little Dry Creek @ Sheridan	Westminster	1,295,000	Complete
Monaco Park Outfall	Commerce City	113,000	Complete
Piney Creek Greenfield Trib.	Arapahoe County	178,400	Complete
Ralston Creek @ 56th Ave.	Arvada	1,718,000	Complete
20th & Meade Outfall	Denver	694,100	Complete
Dad Clark Gulch	Douglas County	520,000	Complete
Westerly Creek @ Expo Park	Aurora	3,400,000	95% Complete
Meadowood Creek	Aurora	3,204,000	95% Complete
Cherry Creek Drops	Glendale	700,000	95% Complete
Grange Hall Creek Phase 2	Northglenn	932,000	95% Complete
Weaver Creek @ Simms	Jefferson County	840,000	95% Complete
South Trib. Slaughterhouse Gulch	Littleton	837,000	95% Complete
Twenty Mile Detention	Parker	795,000	80% Complete
Lakewood Gulch @ Perry	Denver	1,136,900	95% Complete
Goose Creek	Boulder	3,803,000	70% Complete
Big Dry Creek Trail	Littleton, Englewood	715,000	40% Complete
Virginia Village Outfall	Denver	1,230,000	25% Complete
Valley Club Outfall	Arapahoe County	1,400,000	20% Complete
Grange Hall Creek Phase 3	Northglenn	563,000	15% Complete
Pleasantview Tributary	Jefferson County	256,000	10% Complete
Wonderland Creek	Boulder	575,000	5% Complete

Grade control structures were built to resemble natural rock outcroppings at Grange Hall Creek in Northglenn.



Tight quarters require massive structural elements along Goose Creek in Boulder.

A grouted sloping boulder drop structure on Cherry Creek upstream from Cherry Street in Glendale.

A bike path crossing structure under Sheridan Blvd. in Westminster provides additional flood carrying capacity for Little Dry Creek.

with grade control structures in the reach of channel upstream of the embankment, will help maintain ground water levels necessary to support the existing wetlands in this area.

The District partnered with Highlands Ranch Metropolitan Districts this year in the construction of a number of grade control structures along Dad Clark Gulch and Marcy Gulch in Highlands Ranch. One project of note, which is currently under construction, involves the use of soil cement in a number of drop structures along Marcy Gulch. We hope to continue the construction of these soil cement drops in 2001.

Improvements along Ralston Creek near its confluence with Clear Creek were completed this year in conjunction with a new bridge structure at 56th Avenue. The City of Arvada hopes to construct park improvements along this stretch of Ralston Creek, which is historically known as the site where gold was first discovered in Colorado. For several years this site was the home of a mobile home park consisting of about 90 units which had experienced frequent flooding. The District had previously cooperated with the City of Arvada in the purchase of this property and the relocation of the mobile homes.

Another project outside the norm of typical channel improvements was the Lakewood Gulch project between Quail and Oak Streets in cooperation with the drop structures containing architectural features consistent with the industrial theme of the surrounding area were constructed, along with a number of sculptures with the same theme.

The Shaw Heights Tributary project in Westminster was completed in late 2000. This project involved construction of a new crossing at 80th downstream of 80th. This project will eliminate the frequent flooding that has occurred over the years to several businesses along 80th Avenue.

The year 2001 looks to be very busy with funding identified in the 5-Year Capital Improvement Program for 50 new or existing projects.

Viele Lake Channel 25 Years Later

By
Kenneth R. Wright
Jonathan E. Jones
Wright Water Engineers, Inc.

In 1968, with the Urban Drainage and Flood Control District's new *Urban Storm Drainage Criteria Manual* undergoing review and comment by dozens of drainage engineers and many agencies, the District, City of Boulder (City), and the Colorado Department of Highways (CDOH) decided to try out the "new approach" to drainage. The site selected for a new major drainage system was the South Boulder Road interchange at US 36. Fortunately, the engineers for the three agencies agreed to go with "the new environmental approach to drainage."

When Ken Wright of Wright Water Engineers (WWE) was given the assignment by the CDOH in 1968, he perused the draft chapters on major drainage and detention storage and went to work with the new 100-year storm runoff criterion. The result of WWE's design was a series of inflow and outflow culverts for the cloverleaf-enclosed area so that, during a 100-year storm runoff, the outlet conduit would create a backwater, causing water to temporarily pond within the cloverleaf. Wright gave the CDOH the option of either a wet or dry pond, and they selected the dry pond to create an open expanse of grass with a narrow wetland channel along the south side.

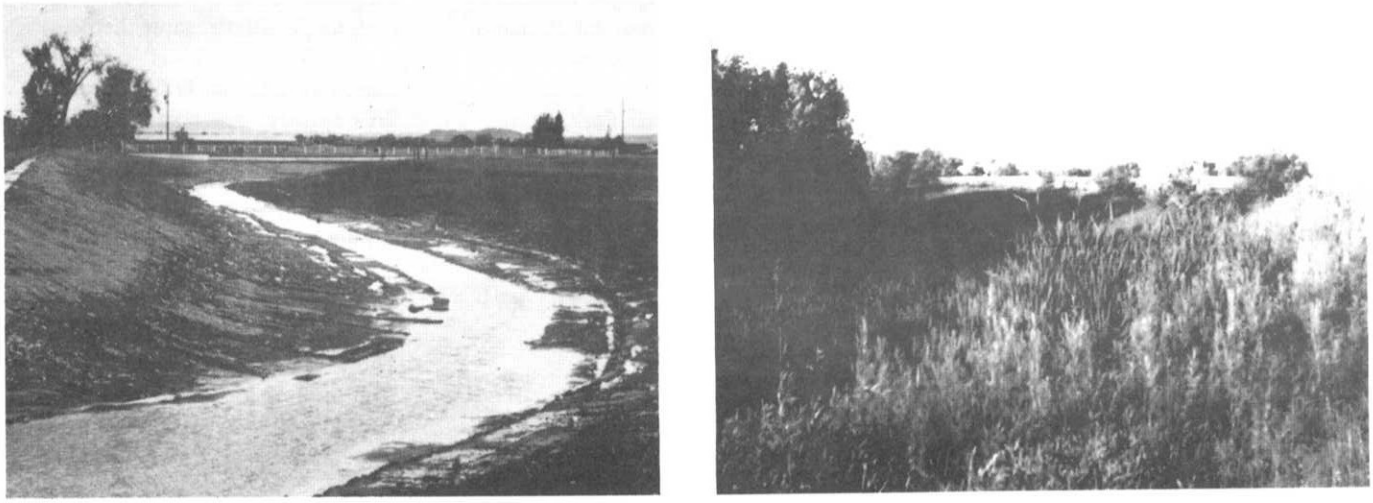
The north cloverleaf loop was handled in somewhat the same way, with a narrow earthen channel filled with wetland vegetation where maintenance would be easy and low-cost. The biggest decision for the District and the City was the downstream Viele Lake flood control channel. Here, WWE specified a wide, flat bottom with 4:1 side slopes and a rather flat grade so that wetland vegetation could keep its feet wet. A high roughness factor was selected to account for future vegetation. The major drainage system at the interchange was completed in 1969. The downstream channel was constructed in 1974, with Bill DeGroot serving on his first construction assignment with the District. Ted Dieffenderfer, long time engineer for the City, was also on the project to help insure that the channel would serve its intended function.

As time passed, the downstream flood control channel was all but forgotten as cattails and bulrushes flourished and Great Plains cottonwoods took hold on the 4:1 side slopes of the channel. At the same time, willows decided that they liked the environment. All this happed without much notice because the new flood control channel needed no maintenance; it was left to do its own thing. Neither WWE nor the agencies realized that the Thorne Ecological Institute moved into a new office right next to the channel. Over a period of a couple decades, Dr. Oakleigh Thorne, founder and president of the institute, watched the channel mature and operate. Thorne contacted WWE last July about the channel and reported:

"We observe [the channel] daily outside our office window. . . about 50 yards away. This channel is. . . a popular nesting area for red-winged blackbirds, who are present in high concentrations during the nesting season. The channel appears to be a highly valuable wetland area. . . Song sparrows and common snipe also nest here.

"Several years ago, when we had heavy rains on the Bear Creek watershed, this channel filled up completely with floodwater (up to the top of the rock gabion corner where the channel does a right-angle turn by our office). This was early in the spring, in late April, I believe, and the new year's growth of cattails had not yet shown. The water flowed over and completely covered the old tan cattails. Where we usually had a cattail swamp, we suddenly had a full-fledged river! It carried the heavy load of water extremely well.

"During the flood period, I observed that the male red-winged blackbirds, which had been holding territories in the cattails, became very agitated and chased all other "intruder" birds from their territories. On one occasion, I saw a male try to chase a "foreigner" female (of the same species) from his territory. The two "tangled" in midair "face to



Viele Lake Channel downstream from US 36 in 1975 and 2000.

face" flapping wildly. The fighting two descended down into the water, whereupon the male held the head of the female under the water until she eventually drowned. Her head bobbed up a few times, but all in vain. . . the male kept pushing her head under the water. When he finally flew up from the water, the female never again reappeared above the surface. I have never observed anything like this in all my six decades of bird watching."

Viele Lake channel downstream from the Boulder Turnpike, designed and constructed in accordance with the new criteria manual, has already observed its 25th birthday, and it was a happy birthday for the song sparrows, common snipes, and red-winged blackbirds. It was also a happy birthday for the maintenance people simply because they didn't have anything to do there.

Denver area Block Clearance for Preble's Meadow Jumping Mouse

By Mark R. Hunter
Chief, Maintenance Program
mhunter@udfcd.org

The Preble's meadow jumping mouse (*Zapus hudsonius preblei*) (PMJM) is a subspecies of meadow mice found only in riparian pockets along the Front Range of the Rocky Mountains between southern Wyoming and Colorado Springs, Colorado. The 2 ½-ounce rodent is three inches long with a six-inch tail and long hind feet adapted for jumping.

On May 12, 1998 the U.S. Fish and Wildlife Service (USFWS) published a final regulation to list the PMJM as a "threatened" species under the federal Endangered Species Act (ESA). The "threatened" designation provides more flexibility then the "endangered" listing in meeting the goals and requirements of the ESA. Under this designation state and local governments and landowners can play a larger part in establishing rules for its recovery.

Even before the "threatened" listing the USFWS had established interim guidelines for trapping surveys to determine the presence or absence of the PMJM and to gain more information about the subspecies. With the decision to list the PMJM as "threatened" the trapping surveys and habitat assessments became mandatory for many construction projects below 7400 feet elevation that impact wetlands and/or streambanks. The link between these construction projects and the ESA is that such projects fall under the jurisdiction of Section 404 of the federal Clean Water Act. The Section 404 regulations require that all ESA precautions must be observed when applying for a 404 permit for a construction project.

Many PMJM surveys and habitat assessments have been done over the last several years. Since 1997 over 300 trapping surveys within the Denver area have failed to locate PMJM. Based on this information discussions were held with the USFWS regarding the possibility of a block clearance for the PMJM. A block clearance is a zone in which the USFWS has determined that the species in question in no longer likely to exist.

The USFWS encouraged UDFCD and its consultant, ERO Resources of Denver, Colorado, to compile all the trapping surveys and outline the area that showed consistent negative findings. The result was a map that included most of metropolitan Denver, but excluded the likely PMJM areas in Douglas, Jefferson, and Boulder counties. In addition to the USFWS, the proposed clearance map was reviewed by biologists from the Colorado Division of Wildlife, members of the Preble's Meadow Jumping Mouse Technical Working Group, the Colorado Preble's Meadow Jumping Mouse Science Advisory Team, and the Preble's Meadow Jumping Mouse Recovery Team.

The USFWS has formally accepted the PMJM block clearance map submitted by UDFCD. The map, prepared by ERO Resources, describes that portion of metro Denver where ESA precautions for the PMJM are no longer necessary. The USFWS approval letter recognizing the map is dated July 17, 2000 and is valid for three years. The Tri-Lakes Corps of Engineers office in Littleton, Colorado will accept Section 404 permit submittals that appropriately use the block clearance map as a reference. Of course, if evidence of a PMJM is found in the future inside the clearance zone the map will be subject to modification.

The USFWS has a website for the PMJM. The address is "www.r6.fws.gov/preble" They have posted a copy of the approval letter and a copy of the block clearance map on the website. Click on the map and it will be displayed using Acrobat Reader.

Feel free to refer to the clearance map when submitting for an Individual 404 permit or when verifying nationwide 404 coverage. If your project is within the clearance area you should indicate so in the 404 submittal letter to the Corps of Engineers and include a reduced copy of the map with an "X" marking the project location. For the submittal letter it is suggested you state something like the following:

"This project site is within the boundaries of the block clearance and is indicated with an X on the accompanying clearance area map. Based on the designation of the block clearance zone as recognized by the USFWS in their letter dated July 17, 2000 it is not necessary to conduct Preble's meadow jumping mouse habitat assessments or trapping surveys for projects within the block clearance boundaries."

If the proposed project is not within the clearance zone the map is of no benefit for Section 404 permit submittals and the normal procedures of PMJM habitat assessments and trapping surveys are still in effect. Contact the Corps of Engineers (303-979-4120) or the United States Fish and Wildlife Service (303-275-2370) for more information on the Preble's meadow jumping mouse.

South Platte River Program Notes

by

Ben Urbonas, P.E., Chief, South Platte River Program

Maintenance Activities

Routine Maintenance

In 2000 the South Platte River routine maintenance included an equivalent of

- 9.1 miles of tree trimming and pruning along the river trail,
- 3.6 acres of string trimming at access ramps and rest areas,
- 78 miles of trail edge mowing, and
- 192 miles of trash and debris pickup and removal along the river.

A total of 160 truckloads of trash and debris were removed from the river and taken to landfills. We continue to study statistical data pertaining to trash and debris accumulation patterns gathered over the past five years, and in 2001 we will further tailor our removal program to maximize results.

For the fourth consecutive year we participated in the Greenway Foundation's annual NIMBY Fest volunteer trash pickup, during which an additional twelve truckloads of trash were removed. In addition, government personnel and volunteer groups picked up and removed trash from the river corridor throughout the year. Unfortunately, we do not have an estimate of the volume removed by them. Trash is also regularly removed from trash receptacles maintained by park personnel along all recreational trails.

Routine maintenance continues to be the most cost effective program in terms of environmental enhancement and public service. Without it, the trash along and in the river would accumulate. Since it was begun under the South Platte River Program we now have twice the number of yearly trash pickups, mowing of trail edges and invasive weed control than we did 14 years ago. At this level of activity we find the river corridor needs are addressed quite well.

Removal of Undesirable Tree Species.

In 2000 the routine maintenance program continued to work with local government agencies to control infestations of non-native and undesirable tree species along the river. In the City of Brighton's Morgan Smith nature area we removed 133 tamarisk plants and planted 36 cottonwood trees. Working with the South Suburban Park and Recreation District and the City of Littleton, we removed 217 Russian olives from the riverbanks in South Platte Park. In addition, we removed 77 dead and diseased Siberian elms in Denver and another 300 in Adams County. The removal of invasive non-native trees provides the opportunity for native cottonwoods, box elders, willows, and others to become established. These natives in turn provide better habitat for wildlife native to this region.

Restoration Maintenance

In 2000, the restoration maintenance program continued to stabilize, rehabilitate, and revegetate eroded riverbanks, protect exposed utility crossings, and rehabilitate existing structures. The District also assisted local governments with maintaining the recreation trails along the river which are used for maintenance access. In addition, the program restored a vacant lot adjacent to the river.

Over 2000 feet of badly eroded, degraded and trashed out riverbanks were cleaned up, regraded to a gentler slope, protected with buried rock riprap, and revegetated with native grasses, shrubs and Cottonwood trees. These types of bank restoration projects normally comprise the bulk of the restorative maintenance work performed by the South Platte River Maintenance Program.

This year, however, the largest restorative maintenance project buttressed an exposed utility crossing near the plant owned by the Metro Wastewater Reclamation District at 64th Avenue and York Street. The structure was a major barrier to fish migration and a hazard to anyone boating the river. The drop is now a sloping grouted boulder drop structure approximately 80 feet long. (See before

Before and after views of the utility crossing protection project.

and after photos). It was jointly funded by the District and Metro and not only made the utility crossing more structurally sound, but also provided for safer boater passage and fish migration.

At 58th and York Street in Adams County, a unique opportunity presented itself. A vacant lot adjacent to the river was continually being used and abused by the public. The District was constantly removing trash and debris that had been dumped on this site. Therefore, with the help of Adams County Parks we cleaned up, regraded, and revegetated the lot; and installed bollards along the roadway to limit access and hopefully limit trash dumping. Metro Wastewater Reclamation District pitched in to help restore this site by donating Metro-Gro compost for use as a topsoil amendment.

This year the old wooden pedestrian bridge near Huron Street in Denver was removed and replaced with a 10-foot wide, self-weathering steel bridge with concrete deck. Denver and the District jointly funded this replacement. Icon Engineering and SDG, Inc. were the consultants and Tierdael Construction was the general contractor. The new, wider bridge and improved trail approaches allow for better recreation/maintenance access that now meets ADA requirements. A lane of traffic for one block along northbound Platte River Drive was eliminated as part of this project, providing for a wider riparian area so important to the movement of wildlife.

The project to replace a wooden pedestrian bridge near First Avenue (extended) was delayed again, this time due to the discovery of elevated contaminant levels in the area; a heritage of past industrial practices on adjacent properties. It is now necessary to investigate options for environmental cleanup and different construction alternatives. To summarize, this project has to consider that this bridge replacement project: (1) is within a major river floodway, (2) involves limited channel/trail right-of-way (adjacent to Interstate 25 and a chemical plant), (3) may disturb contaminated soils, (4) must conform to ADA requirements, (5) will require major trail detour during construction, and (6) ask, what's next? We hope to overcome these issues and look forward to this bridge replacement becoming a reality by 2002.

Cooperative Projects with Private Property Owners

Cooperative projects are constructed on flowage and maintenance access easements dedicated to the District by private property owners adjacent to the river in exchange for river restoration work. To date almost 500 acres of these easements have been dedicated, resulting in over 20 bank stabilization and riparian revegetation projects on these properties since 1988. Often, the local park departments use these easements for the construction of recreation trails.

One cooperative project was completed this year and two were designed for construction in 2001. The completed project involved the extension of a series of bendway weirs adjacent to the Ready Mixed Company's gravel pit in Brighton. Seven new weirs were built downstream of five weirs originally constructed in 1997. So far, we are experiencing success with the weir concept at this site and hope to report on its successful operation in the future.

A bendway weir is a low-level, upstream angled rock sill, keyed in to the outer bank of a waterway bend. The weirs help reduce flow velocity and concentration of current along the outer bank of the bend, thus encouraging an eroded bank to "heal" itself. With the weirs in place, the risk of bank failure is significantly reduced. For more information on bendway weirs, the reader is encouraged to visit several articles on the internet by searching on "bendway weirs" or visiting the 1997 issue of *Flood Hazard News*.

Two additional cooperative projects are planned for 2001. Aggregate Industries, Inc. and Asphalt Specialties, Inc. have both expressed an interest in working with the District in order to fulfill their bank stabilization requirements for mining within 100-year floodplains in Adams County. We hope to complete bank stabilizations along these future sand and gravel pits by the fall of 2001.

Capital Improvement Projects

Upper Central Platte Valley Project

Since last year the pace for this project picked up considerably through the involvement by the City and County of Denver of the U.S. Army Corps of Engineers. The Corps has agreed to do a river restoration project of the Colfax Reach (I-25 to 12th Avenue) of this project; and has completed the reconnaissance and feasibility studies, and the final design for this reach in record time. The project was bid and is now under construction. It is expected that the work will be completed by Spring of 2002.

Because of certain legal restrictions, Denver and the District could not sign the project cooperation agreement with the Corps. The Greenway Foundation has agreed to do so on behalf of Denver for this project. For subsequent projects Denver will be the signatory for Corps projects within its corporate boundaries. This is because the Corps' rules that prevented this from happening for the Colfax Reach project have been changed. Much credit for this change goes to the Corps. They took the initiative to find ways that now treat local sponsors in more of a partnership role than before, a trend which we hope will continue.

The Cops has received an authorization to do reconnaissance and feasibility studies for the Zuni and Sun Valley Reaches starting late in 2000. The river restoration work for these two reaches has been estimated to cost $15,000,000 and Corps help to have this plan implemented is much needed. The Corps plans to follow the basic concepts developed for Denver and the District by McLaughlin Water Engineers.

Globeville Area Project

As reported last year, Phases 1 and 2 of this project have been completed, but before the benefits of this work can be fully realized, Phase 3 will have to be built. The design for Phase 3 was completed, but the Farmers Reservoir and Irrigation Company (FRICO) refused to accept the new diversion concept. As a result, we went back to

the drawing board and asked Love & Associates to develop an entirely different concept. One was developed that appears to be much more acceptable to FRICO, but the costs have now risen from $7.1M to around $13M and we still need to work out many issues and details before the new concept can be finalized and implemented. One of these is to find the additional moneys to build it. Only 1/3 of the added costs can be attributed to the change in concept. The rest are the result of escalating construction costs in our region during the related delays. Nevertheless, we now need to find another $6M to finalize the Globeville project, not an easy task. Regardless, Denver and the District will continue to pursue implementation in order to provide flood relief for this North Denver neighborhood.

Adams County Master Plan Update
We continue to work with CDM (since 1998) and with Adams County, the cities of Brighton, Thornton, Commerce City, South Adams County Water and Sanitation District and the Denver Water Department to update the South Platte River Major Drainageway Plan through Adams County. Many local, state and federal agencies, as well as many individuals and local organizations, have contributed their ideas toward its development. The Phase A report was completed in 2000 and we expect the Phase B, namely the final master plan, to be completed by spring of 2001. Once completed, this plan will provide the communities of Adams County with a long-term roadmap of how the South Platte River corridor will be preserved and develop.

Stormwater Permit Activities

by

John T. Doerfer, Project Hydrologist, Master Planning Program

The past year has been an active time for municipalities in the District with regard to stormwater permitting activities. Denver, Aurora, and Lakewood were required to prepare permit renewal applications for a second 5-year term. The smaller municipalities participated in the state of Colorado's rulemaking that define the implementation programs required after their initial general permit application in March 2003. The District assisted its member governments in these activities, and continues a stormwater-quality monitoring program initiated in 1997.

Phase I Municipalities. The cities of Denver, Aurora, and Lakewood are classified as "Phase I" point sources of pollutant discharges as defined in the Clean Water Act Amendments of 1987. The three cities have been under a discharge permit since May 1996, which is expires in 2001 and must be renewed. The District has been assisting the three cities to develop their renewal applications. At this time, the cities have proposed to emphasize in the next permit term on their industrial compliance program greater emphasis on education, especially the use of BMPs. The Colorado WQCD regulates industrial permits directly and much of the current activities appear to be redundant. The cities have also proposed to reduce somewhat their dry-weather sampling program. The experience so far has shown that little additional information is being produced from their current activities and the resources needed for this activity could be directed more effectively someplace else.

Phase II Municipalities. During the past year, the WQCD proposed rules that would apply to "Phase II" sources, defined as municipalities with less than 100,000 population that are located in an "urbanized area" as defined by the Census Bureau (areas with more than 50,000 and a population density greater than 1000/square mile). This includes virtually all municipalities in the District. It is likely that Arapahoe County, although it submitted a Phase I application in July 1997, will be permitted under Phase II. Whereas Phase I defined all construction sites greater than 5 acres as industrial sources requiring stormwater discharge permits, Phase II will include those between 1 and 5 acres in size as well.

The state rulemaking was required to adopt the federal regulations for Phase II published December 8, 1999. The WQCD formed a Task Force in February 2000 to develop its rules. The District took the lead by becoming a "Party" in the rulemaking hearings, and was active in the Municipal workgroup leading up to the rulemaking. Many of Colorado's municipalities participated in this process. The Water Quality Control Commission completed the Phase II rulemaking with adoption of state regulations on December 11, 2000. The District will continue to assist local governments prepare for their permits during the next two years.

Stormwater Monitoring Program. The District has coordinated a water-quality monitoring program on behalf of Denver, Aurora, Lakewood, and Arapahoe County to assist with their municipal stormwater permit requirements. Under a cooperative agreement with the U.S. Geological Survey, a total of five sites on the South Platte River, Sand Creek, and Toll Gate Creek have been sampled for 3 years during storm runoff and snowmelt events. Samples are analyzed at the Metro Wastewater Reclamation District. The program is intended to assess long-term trends, and will also provide data for watershed planning and regulatory issues. The program has been proposed for continuation in the next cycle of the Phase I permits.

Remember that color versions of all of the photographs in this issue can be seen on our web site at:

www.udfcd.org

Floodplain (from page 4)

implementation plan for Third Creek. We know that implementation of the master plan will be a long time coming. In the meantime development of the upper watershed is underway, and the lower Third Creek facilities are very limited in their capacity. This plan will help us buy some time before the full master plan facilities will be required. HDR Engineering prepared the plan.

FEMA news

I continued to represent the National Association of Flood and Stormwater Management Agencies (NAFSMA) as an advisor to FEMA's Technical Mapping Advisory Council. The council's authorization expired in November. Its final report is being printed, and, along with FEMA's proposed map modernization plan, offers great hope for future maps. However, until FEMA receives some significant funding source ($750 million over seven years), most of these recommendations will languish.

Our Cooperating Technical Communities (CTC) activities were fairly limited this year. In March we felt we had reached an agreement with FEMA to assume the review of requests for Letters of Map Change (LOMCs). In fact we even selected a consultant to assist us with that effort. However, at the last moment FEMA's lawyers found something they didn't like, and we have been unable to finish the deal.

We received a small grant from FEMA from funds allocated to CTCs. We used the funds to combine AutoCAD files from our Willow Creek Flood Hazard Area Delineation (FHAD) study and Douglas County GIS roadmap files using FEMA's Digital Flood Insurance Rate Map (DFIRM) specifications. We used that experience to develop guidelines for our consultants to use on future FHADs to assure maximum compatibility with future DFIRMs. Our consultant was Merrick and Co.

A pet peeve

One of my pet peeves is developer engineers who look at a FIRM and if no floodplain is shown, declare their project to be free of flood hazards. Never mind the size of the channel on their site or the size of the tributary watershed. Never mind the fact that the Flood Insurance Study that created the FIRM is 20 years old and that the drainageway wasn't studied then because it was way out in the boonies. And never mind that the District delineated the flood plain several years before. If it's not on the FIRM, there is no hazard.

Lakewood City Engineer Jay Hutchinson has asked FEMA to put the following note on Lakewood's FIRM and they have agreed to do so: "Local community floodplain management requirements may apply in areas other than specific zones shown on this Flood Insurance Rate Map. Contact the local community for specific requirements." Maybe it will help.

Master planning efforts

Somehow I ended up managing two difficult master planning projects, even though the District has a separate Master Planning Program. I'm certainly going to be more careful in the future so that that doesn't happen again.

We have completed the Phase A portion of the master plan revision process for the lower portion of the First Creek watershed. We expect Commerce City and Adams County to select an alternative for preliminary design by the end of February, and the new master plan to be done by the fall. We have also been re-delineating the First Creek floodplain and delineating some tributary floodplains for the first time. Our consultant is Turner, Collie & Braden.

We have also completed the Phase A for the South Boulder Creek master planning effort. This is the District's third attempt to prepare a plan that has a chance to be implemented. We should know by April if we have been able to devise an alternative acceptable to Boulder, Boulder County and the University of Colorado. Our consultant is Taggart Engineering Associates.

Two District projects win CASFM awards

Two projects sponsored in part by the District won awards at the annual conference of the Colorado Association of Stormwater and Floodplain Managers (CASFM) held in Steamboat Springs in September. Brief descriptions of the projects are given below.

The winner of the Grand Award was the Marston Lake North Tributary Outfall. Local sponsors were Denver Wastewater Management Division and Denver Parks and Recreation Department. The lead consultant was ICON Engineering, Inc.

The project is tributary to Bear Creek in Bear Creek Park, and is located north (downstream) of Fort Logan National Cemetery. The project reach drops 40 feet in 500 feet. The solution was to carry flood discharges in a 72" diameter RCP through the project site. Low flows are kept on the surface, flowing through four small ponds. The outlet for the RCP is concealed in the lowest of the four ponds. The project solved a difficult drainage problem while creating an aesthetically pleasing addition to the park.

The Lower Boulder Creek Stream Rehabilitation Project received an Honor Award at the same conference. Local sponsor was the Boulder County Parks and Open Space Department. The lead consultant was Love & Associates, Inc.

In the mid-70's the Corps of Engineers channelized a reach of Boulder Creek, straightening the channel and removing two meander bends. This caused channel and bank instability. This project reconstructed the historic meanders for low flows. Wetlands were created in the abandoned portions of the Corps' channel and trees were planted to provide shade for the channel.

Warning (continued from page 5)

developed over central Jefferson County near Morrison and just south of the District in Douglas County causing brief heavy rainfall near Castle Pines. Both events lasted only 20 to 30 minutes, dropped just over an inch of rain, and covered areas of less than two square miles. No flooding was reported from either event. On August 13 and four other days (July 16&17 and August 17&29), the ALERT system triggered rainfall rate alarms due to 1" amounts falling in less than one hour. On two other days (August 18&28), street-flooding rainfall rates of 0.5" in 10 minutes were measured by ALERT gages. Two NWS flash flood warnings were issued in the District for July 16 and August 17, and a flash flood watch has issued for July 17. The following briefly describes some of the more notable events.

Days having flood potential

Apr	None	0
May	17,25	2
Jun	27	1
Jul	10,12,14,16-17,20	6
Aug	13,15-18,21,24-31	14
Sep	1	1

Wednesday, May 17

Snowplows were needed along C-470 near Highlands Ranch for this first flash flood threat day of the 2000 flood season. The media reported grape-sized hail up to 6" deep and rainfall totals of 1.7" in Brighton, Aurora and Parker. The ALERT gage at the Highlands Ranch Water Treatment Plant measured 1.93" after the hail had melted. The maximum precipitation amount in the network (2.13") was recorded near Smoky Hill and Gun Club Roads in SE Aurora. No significant stream flooding was reported. Storms plagued much of NE Colorado on this day with 23 tornadoes being reported, but no serious injuries. Messages calling for street/nuisance flooding potential were in effect between 10:30 a.m. and 3:00 p.m.

Sunday, July 16

After nearly two months with only five days of limited flood potential, the widespread rains of July 16 attempted to recover the region's moisture deficit. It was during this extended dry period that two major Colorado wildfires caused record damage in Jefferson and Larimer Counties ("Hi Meadow" and "Bobcat" Fires). The July 16 storms produced rainfall rate alarms at 16 gaging stations in the ALERT network. Rainfall amounts exceeded 0.5" throughout much of the system while peak totals approached 3" at a number of locations. The higher measured amounts occurred in the Lena Gulch and Ralston Creek drainage basins in Arvada, Lakewood, Wheat Ridge and unincorporated Jefferson County. The Ralston Reservoir gage recorded the highest rainfall total (3.70"). The day's rain resulted in at least 8 annual peak stream gage measurements (see table). The Havana Park detention basin gage, located in Aurora's Westerly Creek basin near 11th and Havana, broke its 13-year high water record at 12 minutes past midnight. The NWS issued a flash flood watch effective for the Front Range foothills from noon until midnight. With rain accumulations approaching critical thresholds at some locations, a flash flood warning was issued for the District foothills. No major flood problems were reported.

Monday, July 17

The District escaped the flood threat on this day but areas in extreme northwest Elbert County were less fortunate. Flooding in the upper Box Elder Creek basin washed out County Road 13 near Elizabeth and caused other problems in town. By the time the floodwaters reached the District/Arapahoe County border, the peak had attenuated and no problems were reported. A flash flood watch had been in effect for the entire District from noon to 10 p.m.

Thursday, August 17

This day will be remembered for the sad loss of Denver fire fighter, Bob Crump, who died in the line of duty after rescuing a woman from floodwaters in the vicinity of E. 49th Ave. and Colorado Blvd. The ALERT gage in Commerce City measured 2.64" for a 5-hour period ending at 8 p.m. This is closest to the location where Bob Crump lost his life after being pulled into a submerged open 36" storm sewer. The storm at this location was estimated to be a 75-year event.

The flooding realized this day was somewhat unexpected. Morning analysis indicated minimum flood potential, but weather conditions changed substantially by mid-afternoon. At 3:32 p.m., HMS issued a message for Arapahoe County calling for strong thunderstorms capable of producing 0.5" to 1.5" in 15-30 minutes with hail as large as 0.5" possible. The message was valid from 3:45 to 8:00 p.m. and the

2000 Peak Flows. Some of the more notable peaks measured by the ALERT system in 2000.

Date/ Time	Location	Peak in cfs
May 17 17:25	Harvard Gulch Park at Logan Street	350
June 20 12:59	Boulder Creek near Orodell	** 610
July 16 22:02	Westerly Creek at Montview Blvd.	460
July 16 23:04	Goldsmith Gulch at Eastman Avenue	370
July 17 00:12	Havana Park Detention	* 540 (Depth 8.1')
July 17 00:44	Ralston Creek at Carr Street	2,300
July 17 00:50	Harvard Gulch at Jackson Street	270
July 17 01:36	Cherry Creek at Steele Street	1,230
July 17 02:00	Maple Grove Resv on Lena Gulch	24 (Elev. 5526.9)
July 17 04:44	South Platte River at Henderson	9,260
Aug 17 16:52	Slaughterhouse Gulch Detention	* 140 (Depth 8.4')
Aug 17 17:05	Goldsmith Gulch at DTC/Temple Pond	340 (Depth 4.3')
Aug 17 17:14	South Platte River at Union Avenue	1,700
Aug 17 17:38	South Platte River at Dartmouth Avenue	2,300
Aug 17 18:32	Holly Dam	112 (Depth 14.1')
Aug 17 19:27	South Platte River at 19th Street	5,690
Aug 18 00:04	Englewood Dam	* 161 (Depth 19.3')
Aug 29 21:49	Niver Creek Detention	64 (Depth 14.9')

*** New record**

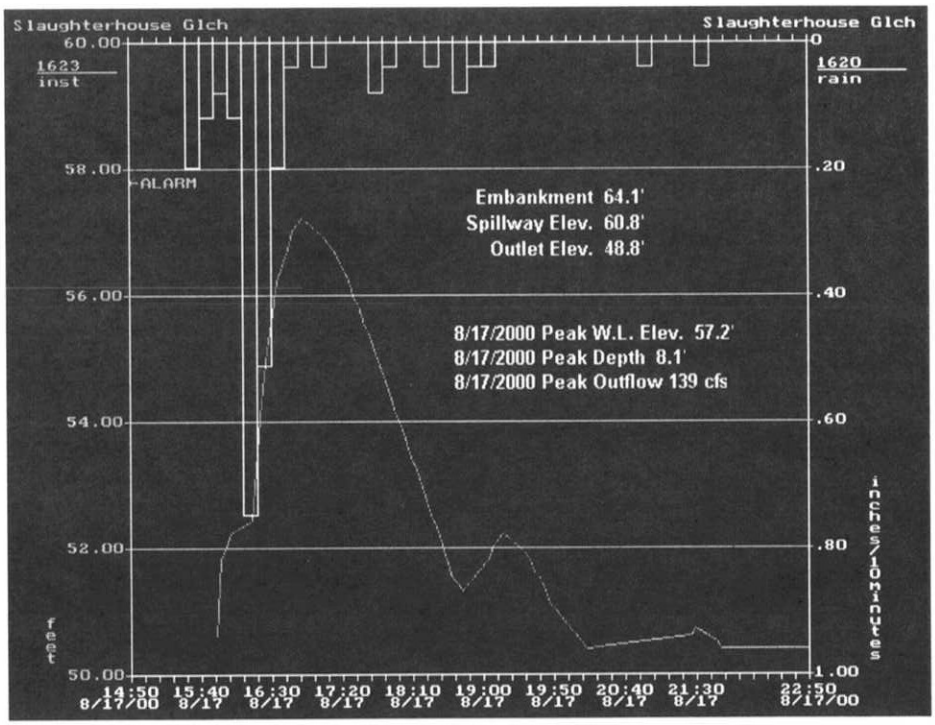
**** Peak due to snowmelt**

Note: A complete listing of record high water measurements for ALERT stream gages can be found at http://www.udfcd.org/FWP/alert.htm

risk to life and property was considered low. Subsequent messages followed, but this was the first notice of any potential flood threat. Within the next 10 to 15 minutes, heavy rainfall was occurring over northern Douglas County and the Littleton area. By 4 p.m., the NWS had issued an urban and small stream flood advisory for this storm and at 4:37 p.m. the advisory was upgraded to a flash flood warning for a large portion of the Denver metropolitan area.

Slaughterhouse Gulch through the City of Littleton was one area hit hard by this storm. In 1998, the District's Construction Program completed storm drainage improvements to the upper basin, thus allowing new detention facilities to begin providing some relief to properties downstream. This multi-phase project was initiated in 1985 with the City of Littleton and Arapahoe County. The Grant Street detention basin near Orchard and Broadway performed well during this event, filling to a record depth of 8.1 feet (see figure). Damages were certainly prevented at this location. Another detention basin further downstream at Powers Park overflowed, resulting in some significant property damage to a duplex in the floodplain along West Berry Drive. The Powers Park facility was designed to handle up to a 10-year storm, which was exceeded on August 17. The peak flow table shows six other ALERT stream gages, in addition to the Slaughterhouse gage, that measured annual peaks from this storm.

Looking upstream at the Powers Park pond spillway overflow on August 17. Photo by Bob Deeds, City of Littleton.



Grant Street pond hydrograph and hyetograph from August 17, 2000.

Monday, August 29

Between 7:30 and 9:00 p.m., a large thunderstorm produced heavy rainfall over Commerce City, Thornton and western Adams County causing some localized flooding. The storm dumped up to 2" of rain in 20 to 40 minutes and was accompanied by frequent cloud-to-ground lightning. The Niver Creek detention basin at 88th and I-25 measured its annual peak on this day. This was the last significant rain event of the 2000 flood season.

Summary

The 2000 flood season marks the year with the fewest days with messages issued (23, average is 35, record high 51 in 1996), the fewest number of verified message days (20), and the lowest number of message days for June and July (1 and 6 respectively). ALERT data is currently available from 144 gaging stations (126 rain gages, 64 water level sensors and 15 weather stations).

2000 Professional Activities of District Staff

Scott Tucker, Executive Director

*Presenter at National League of Cities workshops on Phase II Stormwater Regulatory Program in Washington, DC, in March.
*Presenter at Conference on Southwest River Management and Restoration in Phoenix in April.
*Participant in the Society of American Military Engineers (SAME) meeting to discuss current and future District programs with SAME members in June.
*Invited participant in meeting with FEMA Director James Lee Witt to discuss FEMA programs, at the ASFPM annual conference in Austin in June.
*Authored an article titled "Municipalities Face Specter of New TMDL Rules" for *Water World*, July/August, 2000.
*Participant in Aspen's Public Forum on Drainage Issues in August.
*Chaired Stormwater Management session at National Association of Flood and Stormwater Management Agencies (NAFSMA) annual conference in San Diego in October.
*Member of Board of Directors and Co-Chairman of the Stormwater Management Committee of NAFSMA.
*Member of Board of Directors and Vice Chairman of Future Programs Committee of the Metro Wastewater Reclamation District.

Bill DeGroot, Chief, Floodplain Management Program

*Chair of the Floodplain Management Committee of the National Association of Flood and Stormwater Management Agencies (NAFSMA), and chaired a session on Floodplain Management Issues at NAFSMA's annual meeting in San Diego in Oct.
*NAFSMA's technical advisor to the Technical Mapping Advisory Council.
*Member of ASCE's Technical Mapping Advisory Task Committee.
*Co-authored, with Ben Urbonas, "Added Benefits of Grade Control Structures," which was published in the *Journal of Floodplain Management* in July.
*Presented an update on FEMA's Cooperating Technical Communities Initiative at the Colorado Association of Stormwater and Floodplain Managers annual conference in Steamboat Springs in August.

Kevin Stewart, Project Engineer, Floodplain Management Program

*National Hydrologic Warning Council (NHWC) Representative for Southwestern Association of ALERT Systems.
*NHWC Representative to Interstate Council on Water Policy as member of Advisory Committee on Water Information ("ACWI"), Streamgaging Task Force, Washington DC.
*Alternate member of ACWI Hydrology Subcommittee, Washington DC.
*Guest Instructor at Cooperative Program for Operational Meteorology ("COMET") Symposium on Heavy Precipitation and Flash Floods, University Corporation for Atmospheric Research ("UCAR") in Boulder in September.
*Presenter and session moderator at 17th Annual Conference of the ALERT Users Group in Monterey, CA in May.
*Coordinator for the 12th Conference and Exposition of SAAS in Lakewood in October.

Ben Urbonas, Chief, Master Planning & South Platte River Programs

*Continuing as a Principal co-investigator (Eric Strecker & Jonathan Jones principal co-investigators) for an EPA funded ASCE effort to develop Nationwide BMP Evaluation Data Management software and to accumulate and evaluate BMP data for performance and its relationships to design parameters.
*Co-authored papers with Jonathan Jones, Eric Strecker, Jane Clary and Marcus Quigley on the EPA-sponsored ASCE-BMP database project.
*Co-authored, with Bill DeGroot, "Added Benefits of Grade Control Structures," which was published in the *Journal of Floodplain Management* in July.
*Spoke at the APWA National Congress in Louisville, KY at a special session on the Environmental Friendliness of BMPs.
*Participated in a training session on stormwater management and BMPs sponsored by the Water Environment Federation at WEFTEC 2000 in Anaheim, CA in October.
*Participated in a national broadcast as a part of the Technology Transfer Program of the Center for Transportation and the Environment at North Carolina State University.
* Participated in a training session on stormwater BMPs, *Urban Storm Drainage Criteria Manual Volume 3 – Best Management Practices*, at the Colorado Association of Stormwater and Floodplain Managers annual conference in Steamboat Springs in August.
* Serving as the general chairman to organize a United Engineering Foundation conference on the topic of "Stormwater BMP use and receiving water impacts.". This conference is being sponsored by U.S. EPA and the ASCE Urban Water Resources Research Council and will take place in Snowmass, Colorado, August 19-24, 2001.

Cindy Thrush, Project Engineer, Maintenance Program

*Secretary of the Board of Directors for the Colorado Association of Stormwater and Floodplain Managers (CASFM).
* Presented a paper titled "Retrofitting Drainage Facilities for Water Quality" at the 31st annual conference of the International Erosion Control Association in Palm Springs in February.
*Accepted the James Lee Witt award for Local Excellence for the Willow Creek Project, on behalf of the District, at the annual conference of the Association of State Floodplain Managers in Austin in June.

(Continued on page 21)

Professional Activities (Continued from page 20)

Paul Hindman, Project Engineer, Design and Construction Program
*President of the Colorado Chapter of APWA.

John Doerfer, Project Hydrologist, Master Planning Program
*Chairman of the Stormwater Quality Committee, Colorado Association of Stormwater and Floodplain Managers (CASFM).
*Chairman of Awards Committee, 2000 CASFM Annual Conference.
*Chairman of Municipal Workgroup, Colorado Stormwater Task Force.
*Speaker on stormwater monitoring program at Southwestern Association of ALERT Systems Conference in Lakewood in October.
*Panelist on stormwater regulations at American Public Works Association – Colorado Section Conference in Lakewood in February.
* Speaker on construction-site sediment control measures at International Erosion Control Association workshop in Ft. Collins in June, and at Kaufman & Broad of Colorado, Inc. in Aurora in October.

Mark Hunter, Chief, Maintenance Program
*Member of International Erosion Control Association (IECA) standards committee on riprap and standards committee on articulating blocks.
*Secretary of the Board of Directors for the IECA-Mountain States Chapter.
*Member of IECA Conference Planning Committee, Technical Review Committee and Awards Committee.

David Bennetts, Project Engineer, Maintenance Program
*Presented the Lower Boulder Creek Stream Rehabilitation Project for Award at the 11th Annual CASFM Conference in Steamboat Springs in September.
*Presented a Paper on Bio-engineering at the High Altitude Revegetation Conference in Ft. Collins in March.
*Speaker on Soft Approaches to Drainage and Flood Control Facilities at the 11th Annual Conference of the Colorado Association of Stormwater and Floodplain Managers (CASFM) in Steamboat Springs in September.
*Presented a Paper on Emerging Technologies in Bio-engineering at the 22nd Annual Conference of the National Association of Abandoned Mine Land Programs in Steamboat Springs in September.

Tucker (continued from page 3)

maintenance projects ranging in size from $100 for a small trash and debris pick up to over $400,000 for a large rehabilitation project. These consisted of about 250 routine maintenance commitments, over 70 restoration projects, and about 20 rehabilitation projects. All work is performed by private contractors which in 2000 included seven routine contractors selected annually and five restoration contractors also selected annually. Rehab projects are larger projects that require design plans and specifications and each project is bid separately through a formal competitive bid process.

All this work could not get done without a crackerjack support staff. Frank Dobbins, Chief of Finance and Accounting, keeps financial track of all the projects with the help of Darla Schultz, an independent accounting contractor. Frank has been with the District for fifteen years. They provide monthly reports that monitor all revenues and expenditures for the hundreds of projects going on at any one time plus all other District activities. Good financial control is an absolute necessity to good management. In addition they administer the personnel and benefit programs of the District such as health insurance and keeping track of vacation time and all the other things that need to be done to keep people happy.

The glue that keeps us all going is the secretarial and front office support staff. This operation is managed by Sandy Gonzalez, Administrative Secretary, who is assisted by Secretaries Galene Bushor and Margaret Corkery. Sandy has been with the District for four years, Galene twenty years, and Margaret just joined the District in November. They answer the phones, type the letters, get the mail out, help the public, keep track of all our plans and reports, manage the filing system, order and keep track of supplies, and do all the things that make the rest of us look good but take for granted. In addition Sandy is the "go to" person for all the office related projects that continuously need doing such as remodeling the office, negotiating office equipment contracts, researching new purchases, setting up Board meetings and working with Board members, designing and implementing a new secretarial computer system, and developing a new data management system for the myriad of names, addresses, companies, vendors, etc we need to keep track of, to name just a few.

If I didn't miss anybody that totals up to nineteen full time people including myself and six student interns. It is a small staff that gets a lot of work done. We like what we do and are proud of what we do. This is confirmed by the fact that the average years of service with the District for present employees is over thirteen years. I would like to acknowledge and thank them all for a job very well done.

Master Planning Program Notes

by

Ben Urbonas, P.E., Chief, Master Planning Program

Planning Projects

The projects ongoing in 2000 and to begin in 2001 are listed in the "Status of Planning Projects" table. The master planning workload continues to grow and shows no sign of letting up. In 2000 we added 6 new projects and completed only 4. In 2001 we will begin 6 new planning projects and hope to complete 6.

Technology Transfer & Education

Software

We have been converting and upgrading the *CUHP* and *UDSWM* software. The latest versions of each may be downloaded free of charge from our web page (www.udfcd.org). Both now run totally under the Windows system and both have improved data input user interfaces (i.e., fewer errors). We will continue work on both to enhance output management, including links to spreadsheet graphics features. User manuals will also be added to the downloads.

Under an ongoing agreement, *Computer Software Library, Inc.* (P.O. Box 27517, Denver, CO, 80227, Tel. 303-947-3413, FAX 303-985-8882) can provide fee-based support to users needing assistance. In addition, the District entered into a non-exclusive agreement with *XP Software* to have the CUHP software integrated into their software system (*see related article*). If you have any suggestions regarding the posted software, please e-mail us your suggestions.

Urban Storm Drainage Criteria Manual

In 2000 we started to update Volumes 1 and 2 of our *Manual*. Wright Water Engineers, Inc. is the consultant helping us to update and modernize these two volumes. We hope to have the first full draft of the manual available in March of 2001 and have the document ready for distribution by mid-2001. Many of you have contributed your time, details and case studies for which we are very grateful. A complete report on the updating process and acknowledgement of everyone's contributions will be in the next issue of this newsletter.

STATUS OF PLANNING PROJECTS

Project	Sponsor(s)	Consultant	Status
Big Dry Cr. Tribs (ARAPCO)	Arapahoe Co.	WRC	Complete in 2000
Englewood City-Wide	Englewood	TCB	Complete in 2000
Globeville-Utah Junction	Denver & Adams Co.	Kiowa	Complete in 2000
Niver Creek Extension in Federal Heights	Federal Heights, Thornton, & Adams Co.	Kiowa	Complete in 2000
Basin 4100, DFA 0054 & 0056 Update	Thornton & Adams Co.	Kiowa	50% Complete
Broomfield & Vicinity MP Update	Broomfield & Westminster	Kiowa	85% Complete
Cottonwood Area Catchment OSP	Parker & Douglas Co.	Farnsworth & Polk	85% Complete
Four Mile Canyon Cr.	Boulder & Boulder Co.	Love & Assoc.	50% Complete
Holly Hills Trib. To Harvard Gulch	Arapahoe Co. & Denver	SEC	50% Complete
Lower Box Elder OSP	Adams Co. & Denver	Wright Water	80% Complete
Lower First Cr. OSP Update	Adams County & Commerce City	Turner Collie & Braden	50% Complete
Plum Creek OSP - FHAD	Douglas Co.	WRC	50% Complete
Sulphur & Tallman Gulches Outfall Plan	Douglas Co. & Parker	Kiowa	90% Complete
Town of Erie OSP	Town of Erie	Love & Assoc.	75% Complete
Applewood OSP	Jefferson Co., Golden	Kiowa	15% Complete
Upper Piney Cr. & Tribs	Aurora	Kiowa	20% Complete
Unnamed Tributary to W. Toll Gate Creek	Arapahoe Co., ECCV & Aurora	Kiowa	25% Complete
Todd Creek	Thornton & Adams Co.	Kiowa	10% Complete
Fairmount Area OSP	Jefferson Co., Golden, Arvada	n/a	Select Consultant
RMA 815 & Adj. Areas	Commerce City, Adams Co.	n/a	Select Consultant
Oak Gulch & Stroh Ranch	Parker & Douglas Co.	n/a	Select Consultant
NE Sheridan OSP	City of Sheridan	n/a	Select Consultant
Cherry Creek MDP u/s of Cherry Cr. Reservoir	Parker, Douglas Co., Arapahoe Co. & CCBWQA	n/a	Start in 2001
Horse Creek OSP	Adams County & Aurora	n/a	Start in 2001
Skunk Creek	Boulder & Boulder Co.	n/a	Start in 2001
Second Creek (Lower) MP Update	Adams Co., Brighton & Commerce City	n/a	Start in 2001
Rocky Mtn Ditch	Denver & Lakewood	n/a	Start in 2001
High Line Canal - Marcy G. to Mississippi Ave.	Denver WD & WWMD, Greenwood Village, Littleton, Cherry Hills Village, Arapahoe Co. & S. Suburban Park & Rec, Dist.	n/a	Start in 2001

Stormwater NPDES Activities

A major new workload is related to the support of the municipalities within the District as they continue to or begin to deal with EPA's and Colorado's stormwater regulations. John Doerfer has been helping with this effort and has been doing a great job (*See a related article by John Doerfer*). We will continue to work with the cities and counties. Anyone needing assistance or staff training can contact John or me. We will try to help you in any way we can.

March 8, 2001 Seminar On Updated
Urban Storm Drainage Criteria Manual – Volumes 1 and 2
Holiday Inn, 120th Avenue and I-25 in Northglenn.

In 2000 the District has been working with Wright Water Engineers, Inc. to update Volumes 1 and 2 of the *Urban Storm Drainage Criteria Manual*. The District is sponsoring a one-day seminar for cities, counties, towns, special districts, state and federal agencies, consultants and other interested organizations and individuals. Its goal is to inform everyone about proposed changes to the manual and seek public input. The tentative agenda is below.

You and your staff are invited to attend. Please register by filling out the form below and mail it with the requested payment to Sandy Gonzalez. Include a check, money order or purchase order (governments only). Please return your registration forms no later than February 16, 2001. Space is limited. If you have any questions, call Sandy at 303-455-6277.

Tentative Agenda

7:45 a.m.	Registration
8:15 a.m.	Welcome and Introduction
8:30 a.m.	Status of Update – Review Needs
8:40 a.m.	Policy – What Changed/Remained the Same?
9:20 a.m.	Legal Issues Related to Drainage
9:45 a.m.	Planning Chapter
10:00 a.m.	Break
10:20 a.m.	Rainfall, Runoff and Storage Chapters
11:00 a.m.	Major Drainage and Hydraulic Structures Chapters
12:00 p.m.	Lunch
1:15 p.m.	Culverts Chapter
1:45 p.m.	Streets, Inlets and Sewers Chapter
2:10 p.m.	Flood Proofing Chapter
2:35 p.m.	Revegetation Chapter
2:45 p.m.	Case Studies I (Stapleton Redevelopment) and Spreadsheets
3:15 p.m.	Break (Seventh Inning Stretch)
3:25 p.m.	Case Studies II (Willow Creek, Rock Creek, Goldsmith Gulch, others)
4:00 p.m.	Open Discussion
4:30 p.m.	Closure

Mail this form with a $35.00 per person registration fee to:

Urban Drainage and Flood Control District
2480 West 26th Avenue, Suite 156-B
Denver, CO 80211

Please type or print clearly

Organization _____

List all attendees - attach a separate sheet if necessary

Name(s) _____

_____

Street Address _____

City, State, Zip _____

Organization Phone _____ Fax _____

Total number registered _____ x $35.00 = Amount enclosed $_____

District Wins Accounting Award

For the twelfth year in a row the District has received a "Certificate of Achievement for Excellence in Financial Reporting" from the Government Finance Officers Association of the United States and Canada. The certificate is presented to government units whose comprehensive annual financial reports achieve the highest standards in government accounting and financial reporting. Congratulations to Frank Dobbins, Chief of Finance and Accounting, for continuing this string of awards.

District Licenses CUHPF to XP Software

The District has entered into an agreement with XP Software, the developers of XP-SWMM™. This agreement grants XP Software a nonexclusive right to incorporate the CUHPF software into the software package that they market. We are doing this is in response to requests from several consultants and municipalities asking if that could be done. In agreeing to this, the District does not support or endorse any commercial product. We are pleased, however, that this arrangement will permit the municipalities and consultants using this package to now use the CUHPF option for generating stormwater runoff estimates.

URBAN DRAINAGE AND FLOOD CONTROL DISTRICT
2480 West 26th Ave. #156-B
Denver CO 80211

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