

# USDCM Volumes 1 and 2 Revisions – What's New

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# The Team



**28** Public Agency  
Contributors

**108** Individuals

# URBAN STORM DRAINAGE

VOLUME

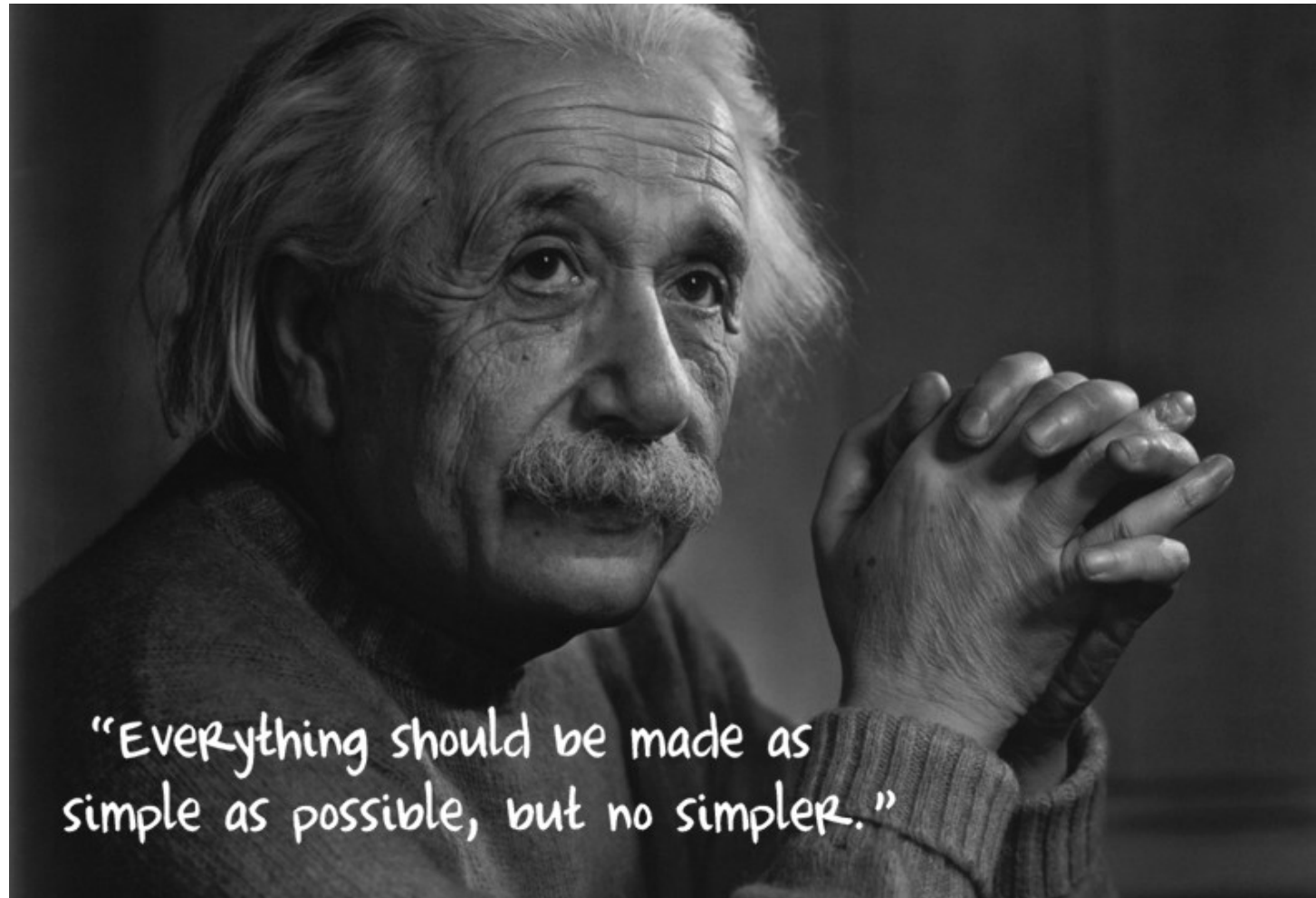
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CRITERIA  
MANUAL



MANAGEMENT, HYDROLOGY, AND HYDRAULICS

# Chapter 1, Policy



"Everything should be made as simple as possible, but no simpler."



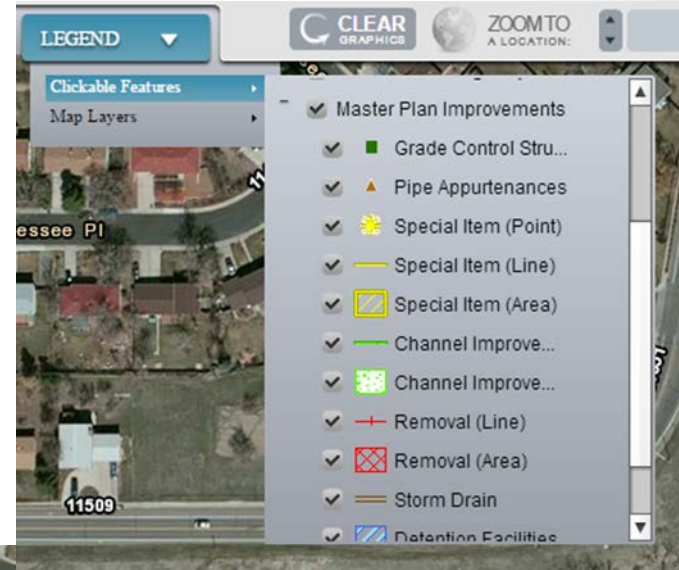
# Also in Policy...

## Master Plan Floodplain Easements



# Also in Policy...

Publically Accessible UDFCD Library





# Chapter 2, Law

- Reviewed and Updated case law.
- Added CRS 37-92-602 (8).



# Chapter 2, Law

- Added CRS 37-92-602 (8).

## Stormwater Detention and Infiltration Design Data Sheet

Workbook Protected

Worksheet Protected

Stormwater Facility Name:

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Facility Location & Jurisdiction:

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### User Input: Watershed Characteristics

Watershed Slope =  ft/ft

Watershed Length =  ft

Watershed Area =  acres

Watershed Imperviousness =  percent

Percentage Hydrologic Soil Group A =  percent

Percentage Hydrologic Soil Group B =  percent

Percentage Hydrologic Soil Groups C/D =  percent

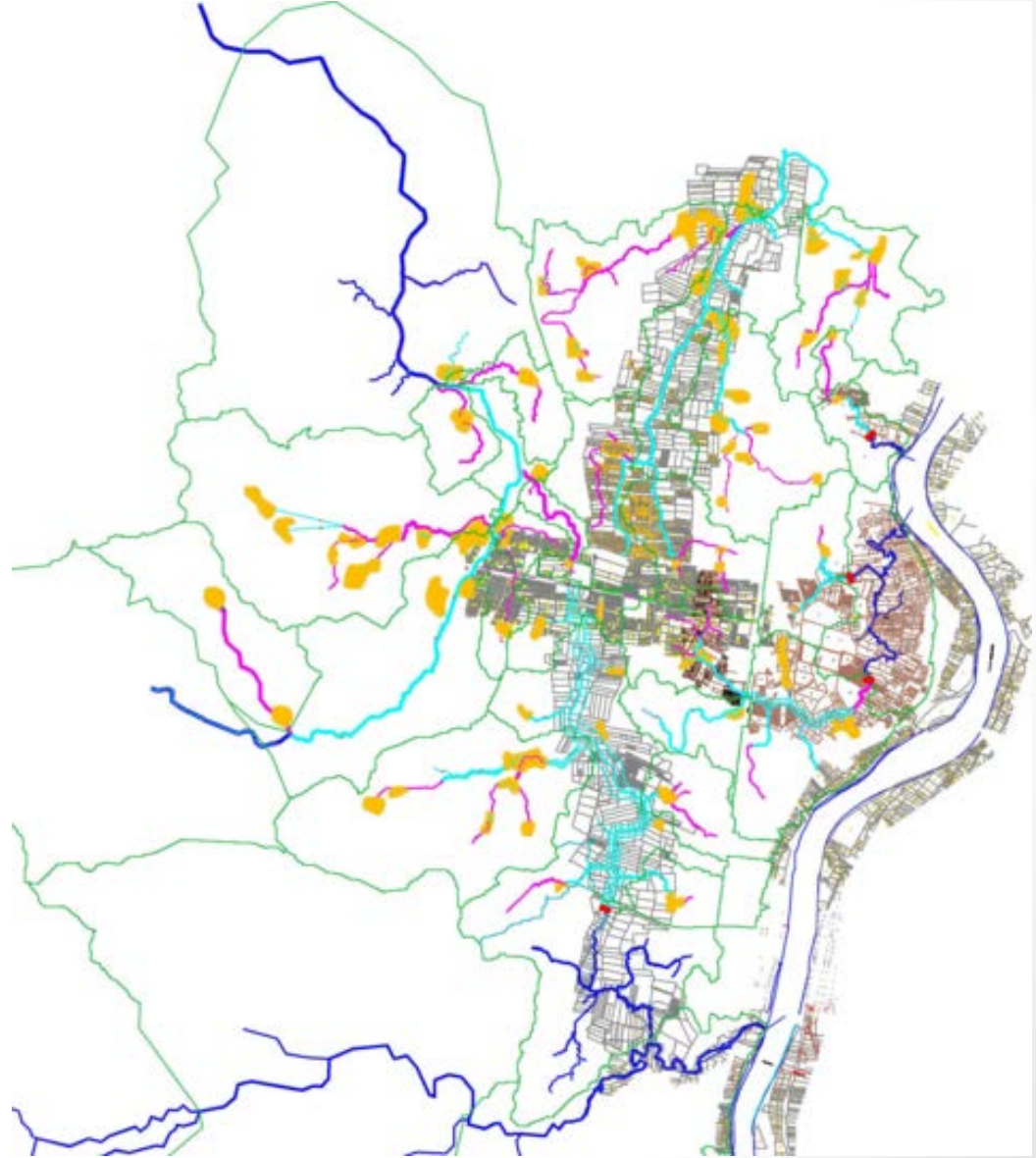
Location for 1-hr Rainfall Depths (use dropdown):  
 ▼

User Defined	User Defined	User Defined	User Defined
Stage [ft]	Area [ft^2]	Stage [ft]	Discharge [cfs]
0.00		0.00	



# Chapter 3, Planning

- Master planning process



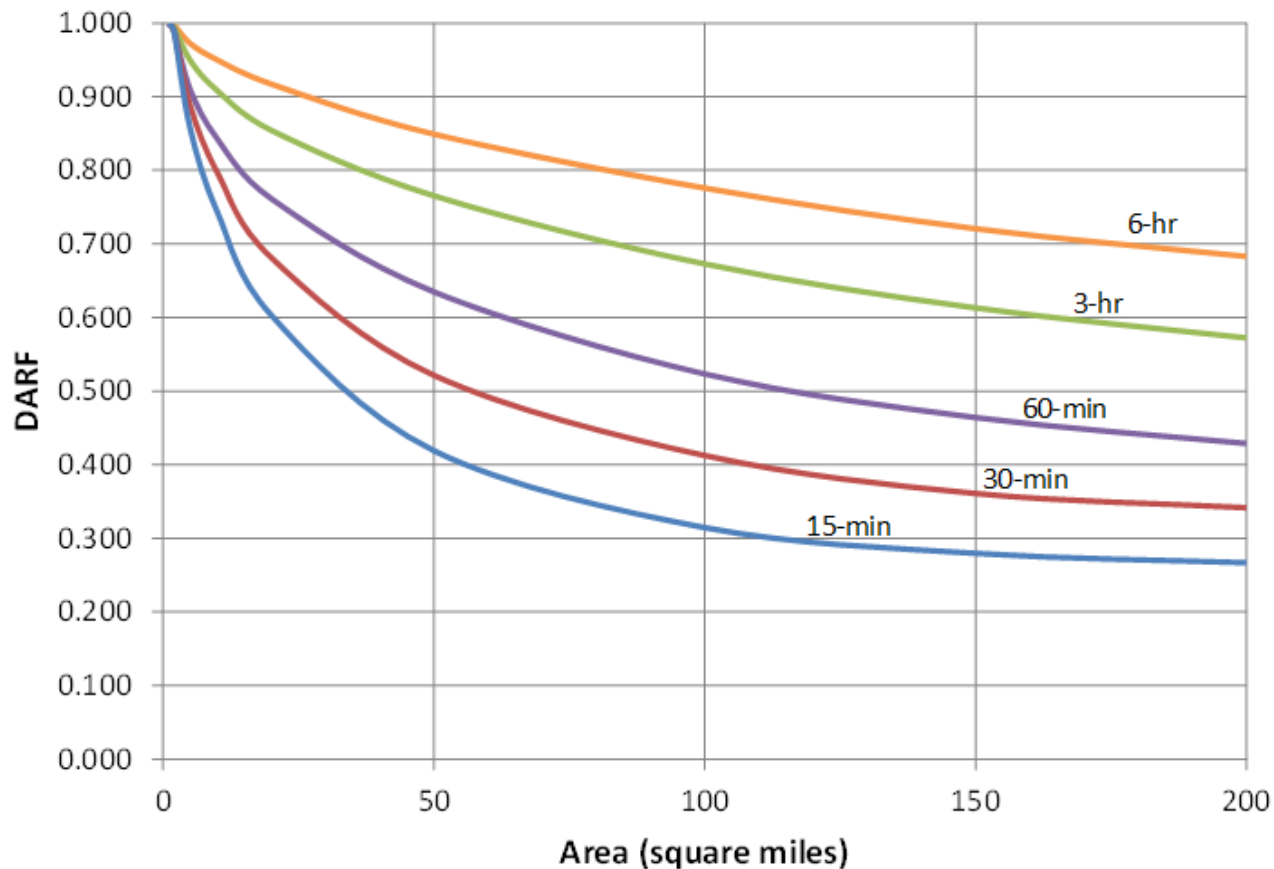
# Chapter 4, Flood Risk Management

- Fundamentals of floodplain management
- Floodplain mapping changes and admin.
- Flood insurance
- UDFCD, Local, and State programs
- Floodproofing
- Assistance for property owners



# Chapter 5, Rainfall

New depth reduction factors (DRFs) for frequent events

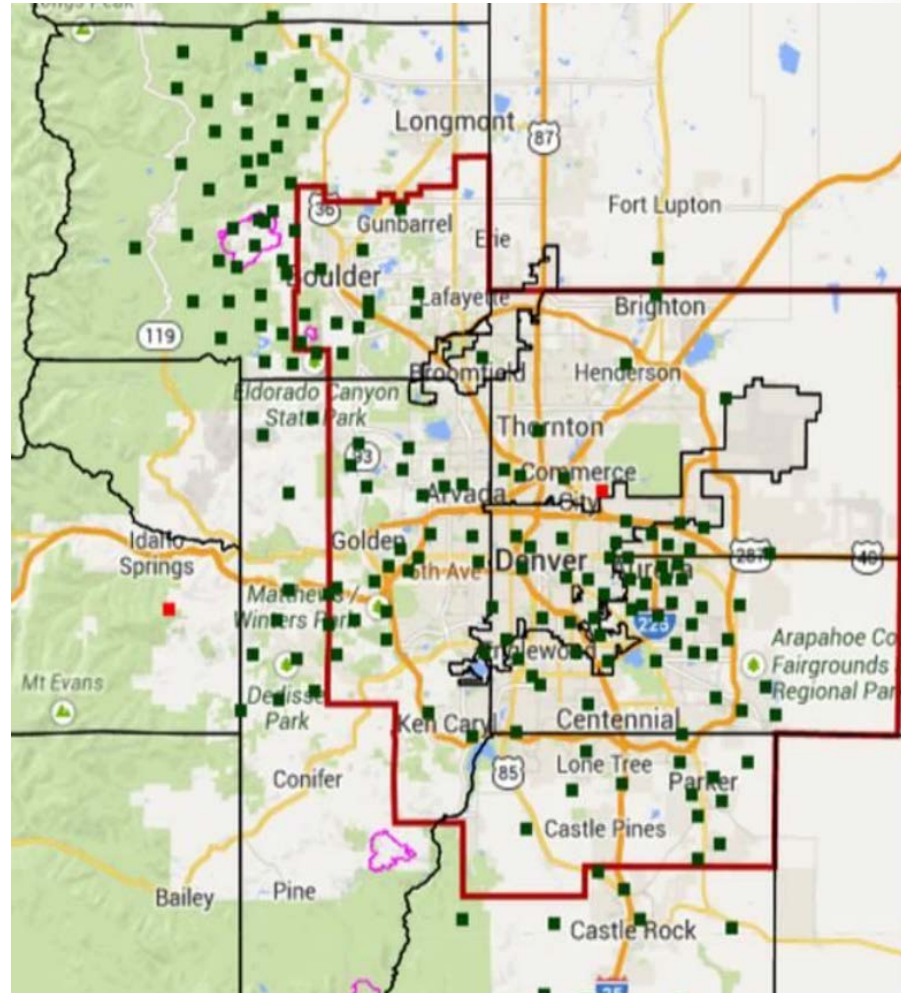


Carlton 2010



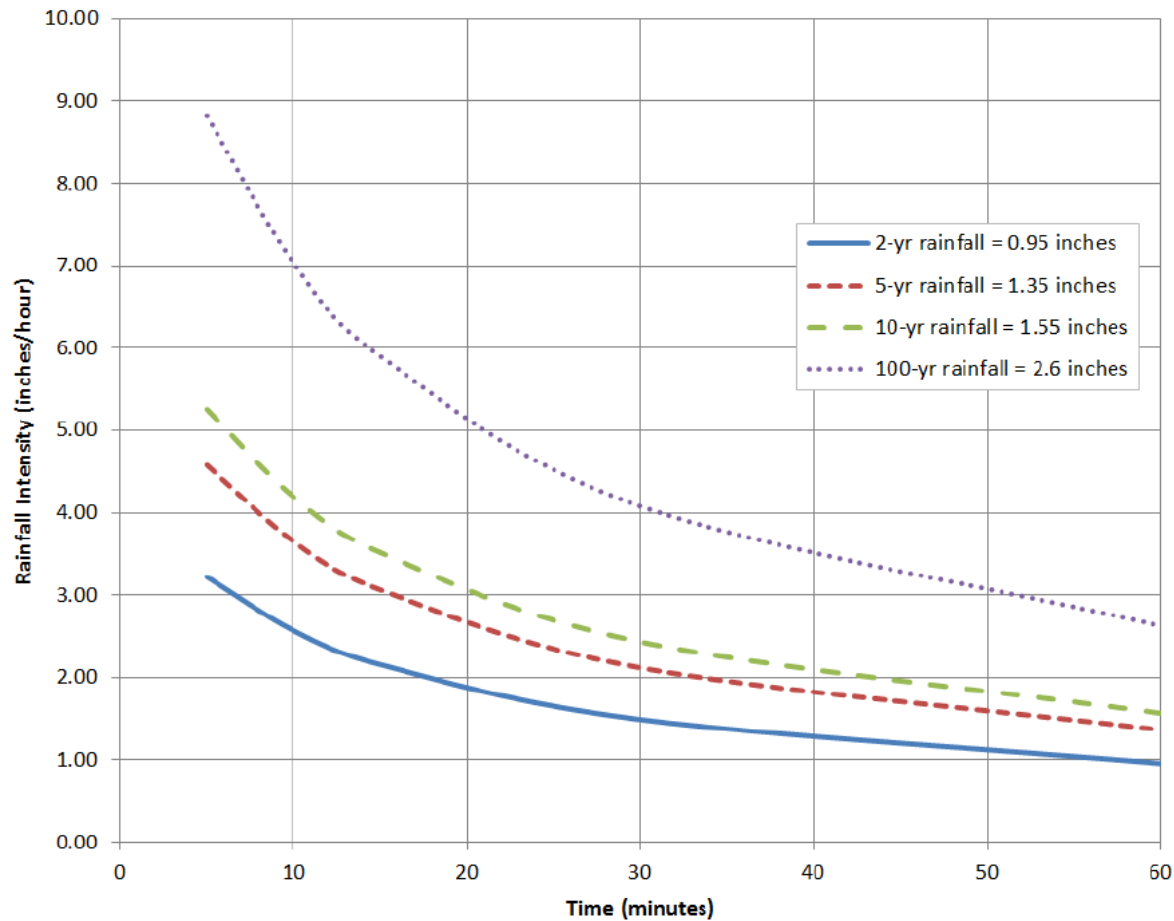
# Chapter 5, Rainfall

Continued use of NOAA Atlas 2 rainfall.



# Chapter 5, Rainfall

## New UD-Rain workbook



# Chapter 6, Runoff

- New runoff coefficients
- New time of concentration equation
- (peak flow and volume comparisons between Rational/FAA and CUHP)





# Chapter 6, Runoff

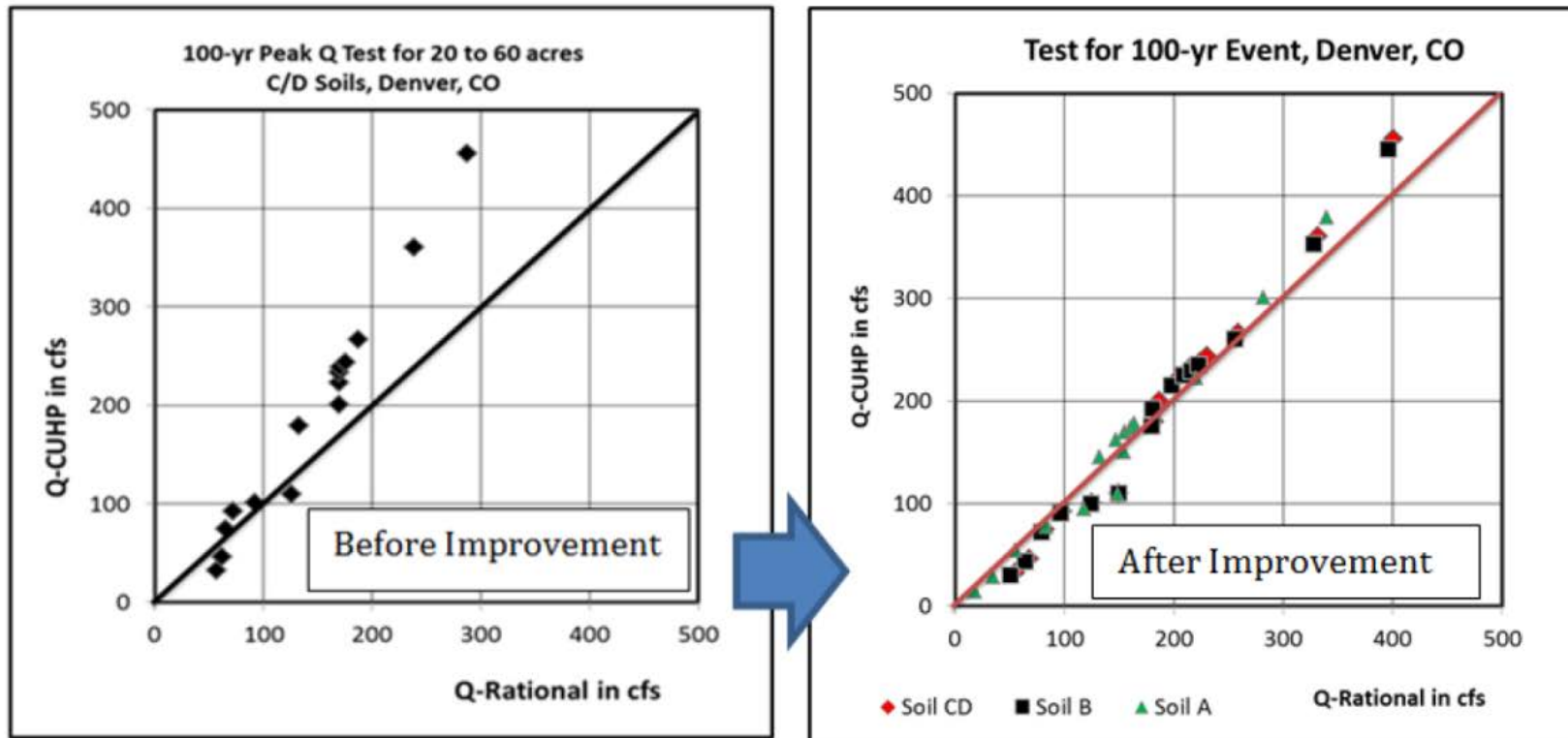


Figure 7.3 Improvements on Modeling Consistency for 100-yr Peak Flows

# Chapter 6, Runoff

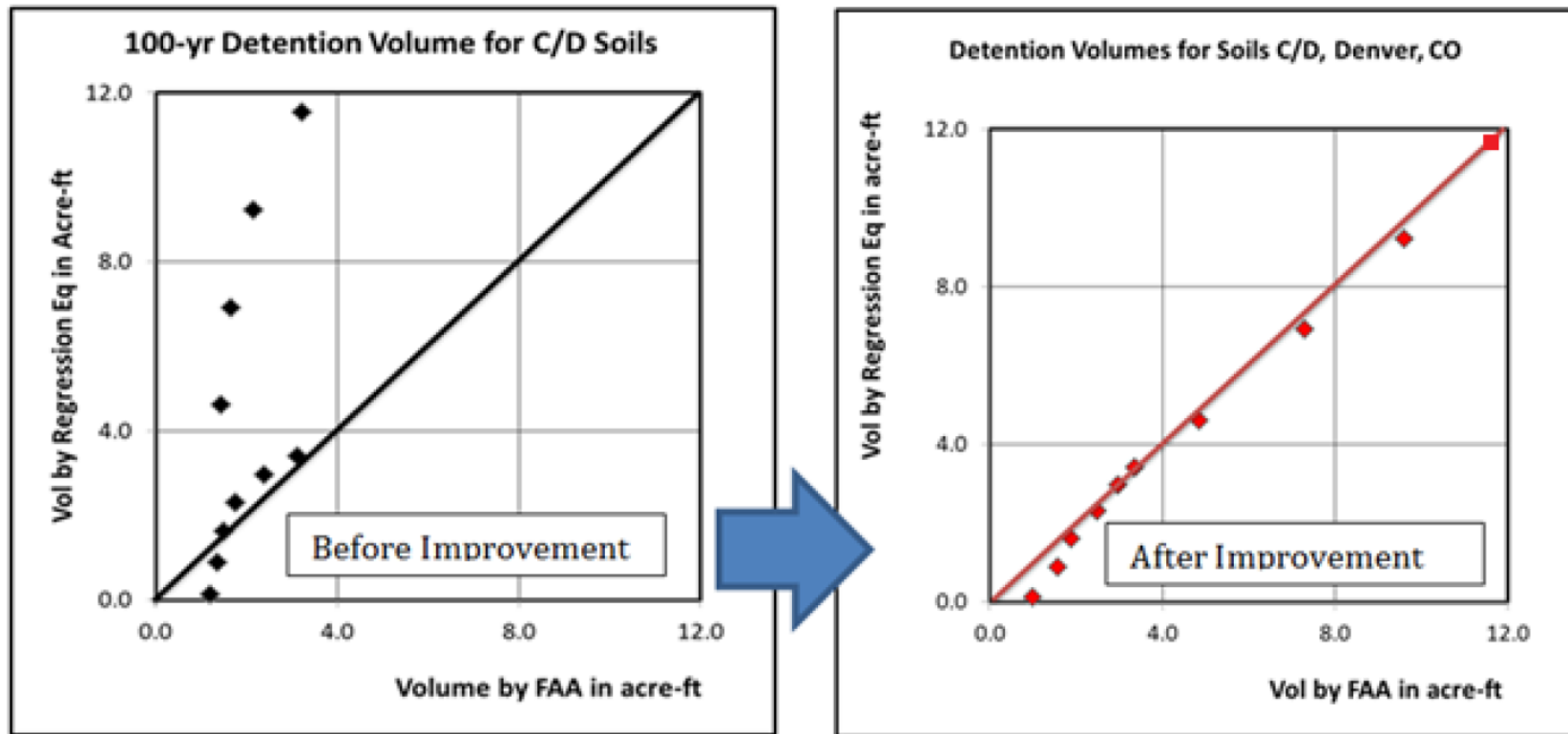
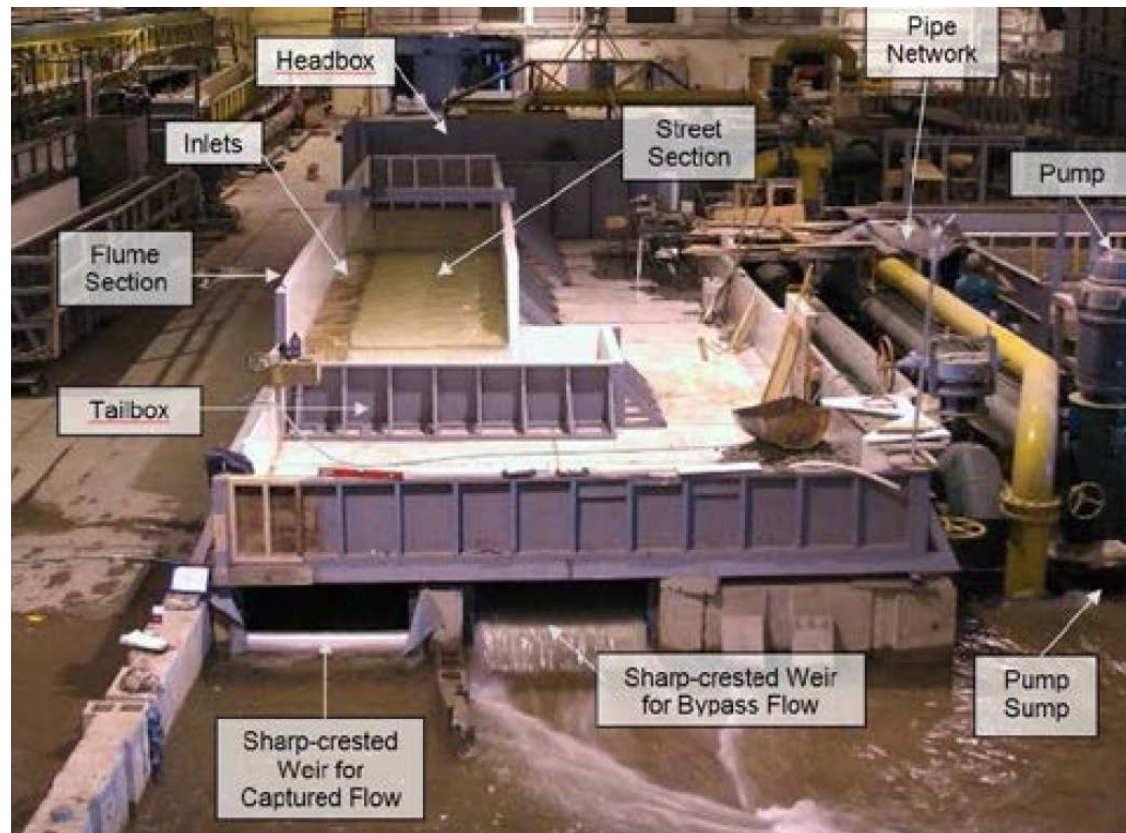


Figure 8.1 Improvements to Modified FAA Method

# Chapter 7, Streets, Inlets, and Storm Drains

Integration of physical model results





# Chapter 7, Streets, Inlets, and Storm Drains

## Improvements to UD-Inlet

### Inlet Management

Worksheet Protected

	Delete	Delete	Delete
<b>INLET NAME</b>	<a href="#">Inlet 1</a>	<a href="#">Inlet 2</a>	<a href="#">Inlet 3</a>
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	On Grade	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

#### USER-DEFINED INPUT

Show Input Details

Receive Bypass Flow from:		Inlet 1	Inlet 2
Minor $Q_{KDOWN}$ (cfs)			
Major $Q_{KDOWN}$ (cfs)			
Minor Bypass Flow, $Q_b$ (cfs)	0.0	0.3	0.5
Major Bypass Flow, $Q_b$ (cfs)	0.0	2.0	4.2

#### Watershed Characteristics

Subcatchment Area (acres)	0.7	0.85	0.85
Percent Impervious	75	75	75
NRCS Soil Type	C	C	C

#### Watershed Profile

Overland Slope (ft/ft)	0.03	0.03	0.03
Overland Length (ft)	136	136	136
Channel Slope (ft/ft)	0.02	0.02	0.02
Channel Length (ft)	157	240	240

#### Minor Storm Rainfall Input

Design Storm Return Period, $T_r$ (years)	5	5	5
One-Hour Precipitation, $P_1$ (inches)	1.35	1.35	1.35

#### Major Storm Rainfall Input

Design Storm Return Period, $T_r$ (years)	100	100	100
One-Hour Precipitation, $P_1$ (inches)	2.61	2.61	2.61

#### CALCULATED OUTPUT

Show Output Details

Minor Total Design Peak Flow, Q	2.1	2.8	2.9
Major Total Design Peak Flow, Q	4.8	7.7	9.9

# Chapter 8, Open Channels



(Natural)

# BFFs!



# “Helpful Mindsets”



# Chapter 8, Open Channels

## Swales (not “major” drainage)

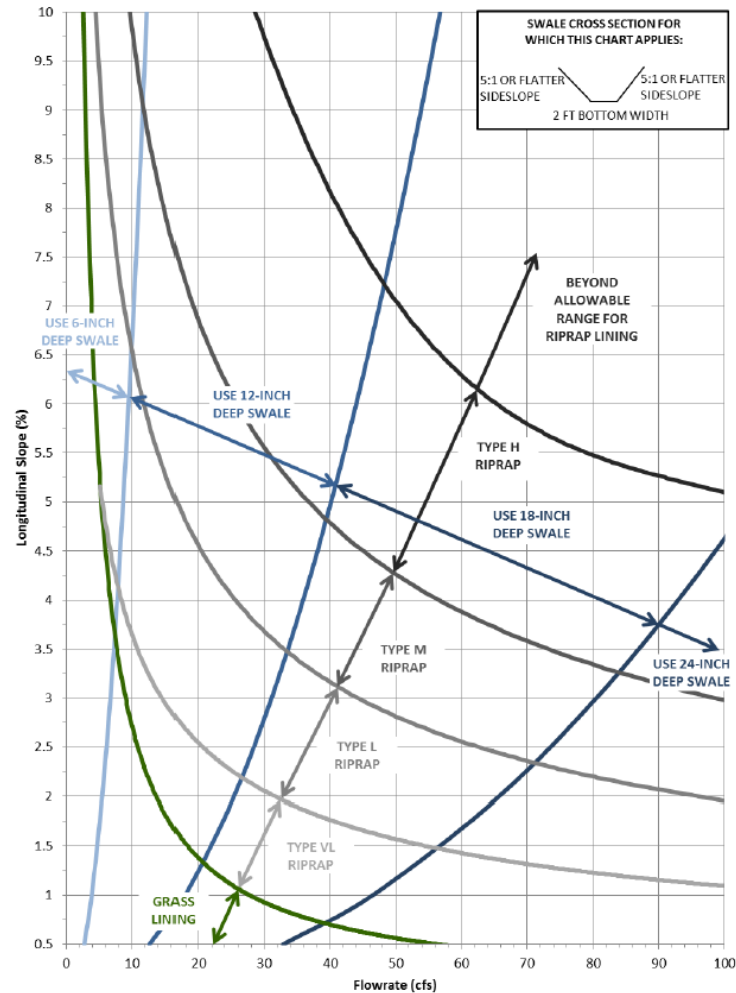
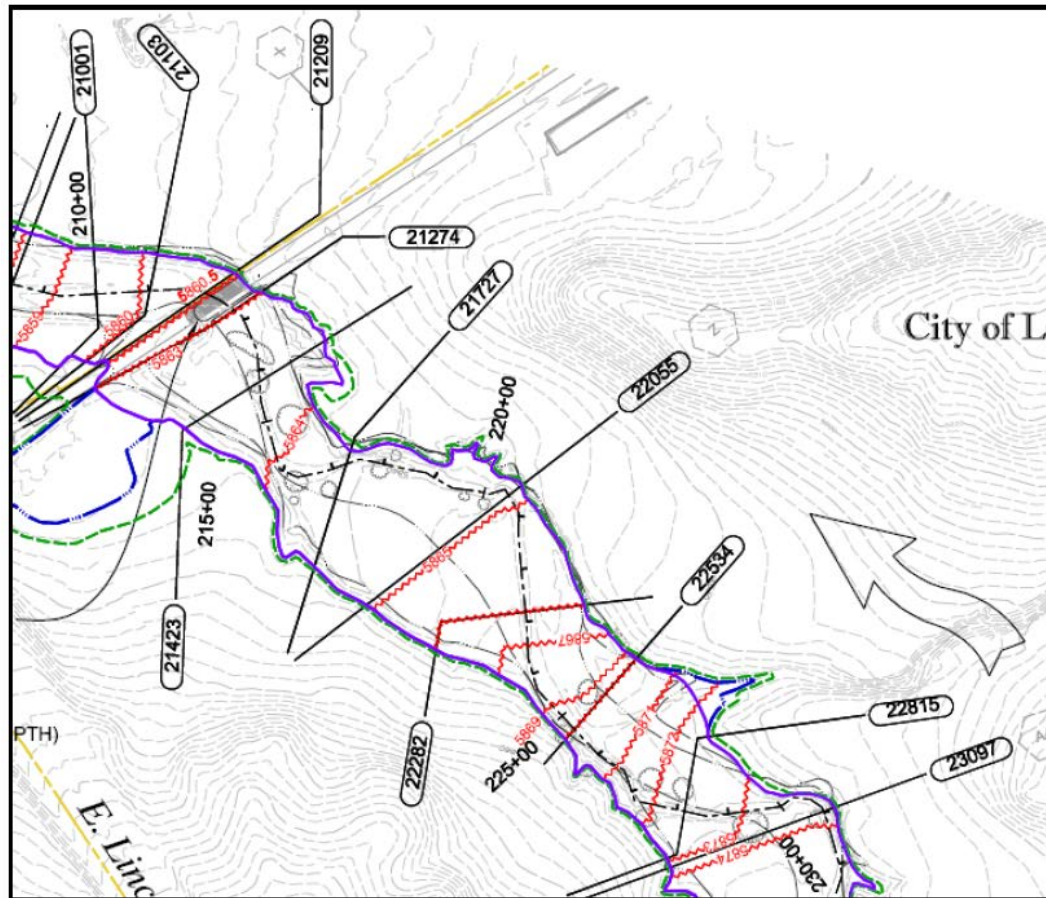


Figure 8-22. Swale stability chart; 2- to 4-foot bottom width and side slopes between 5:1 and 10:1 (Note: Riprap classifications refer to gradation for riprap used in soil riprap or void-filled riprap. See Figure 8-34 for gradations.) (Source: Muller Engineering Company)



# Chapter 8, Open Channels

- Guidance for HEC RAS users
- Detail on evaluating roughness coefficients



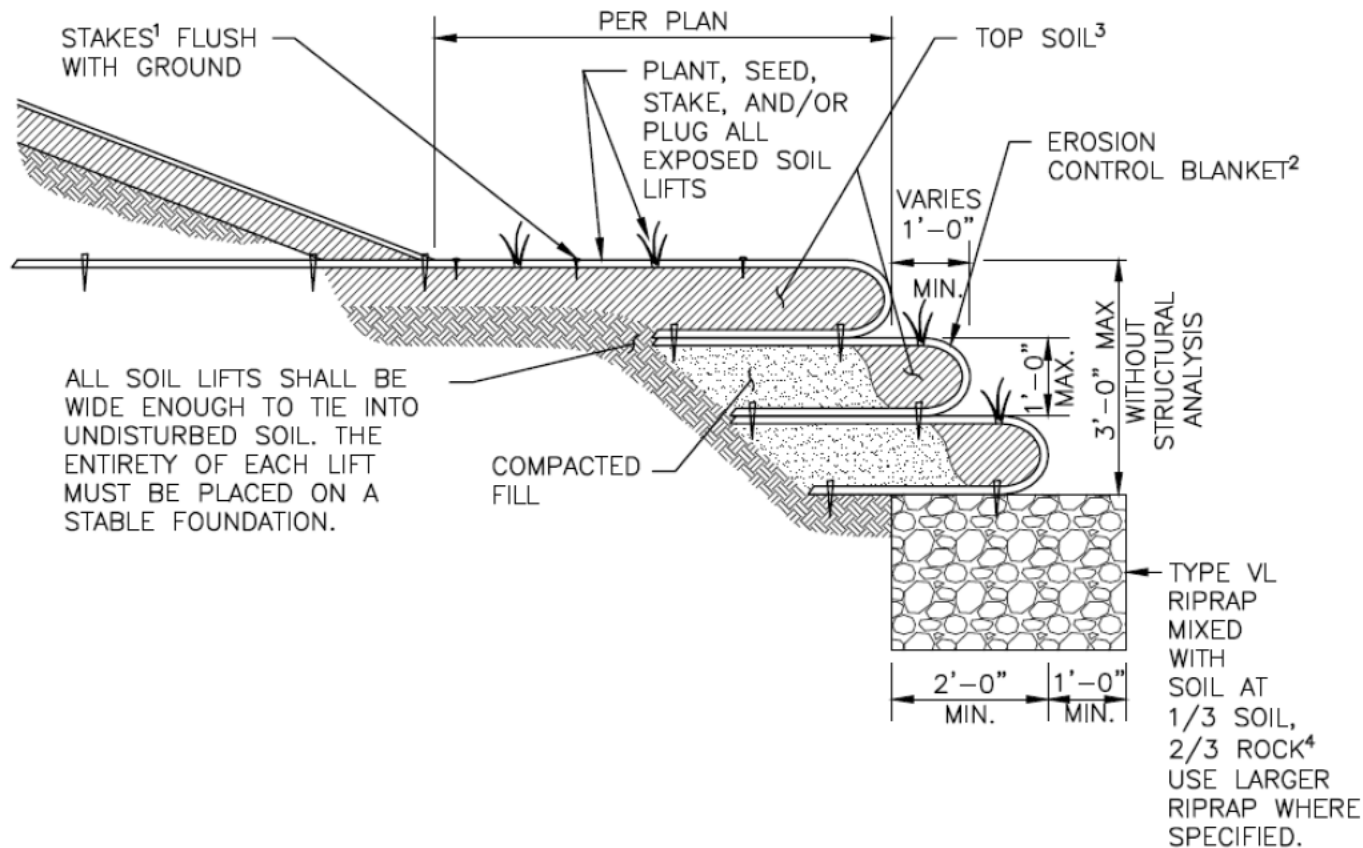
# Chapter 8, Open Channels

- Void-filled riprap
- Mild and steep slope riprap sizing



# Chapter 8, Open Channels

## Expanded guidance on bank protection





# URBAN STORM DRAINAGE

VOLUME

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2

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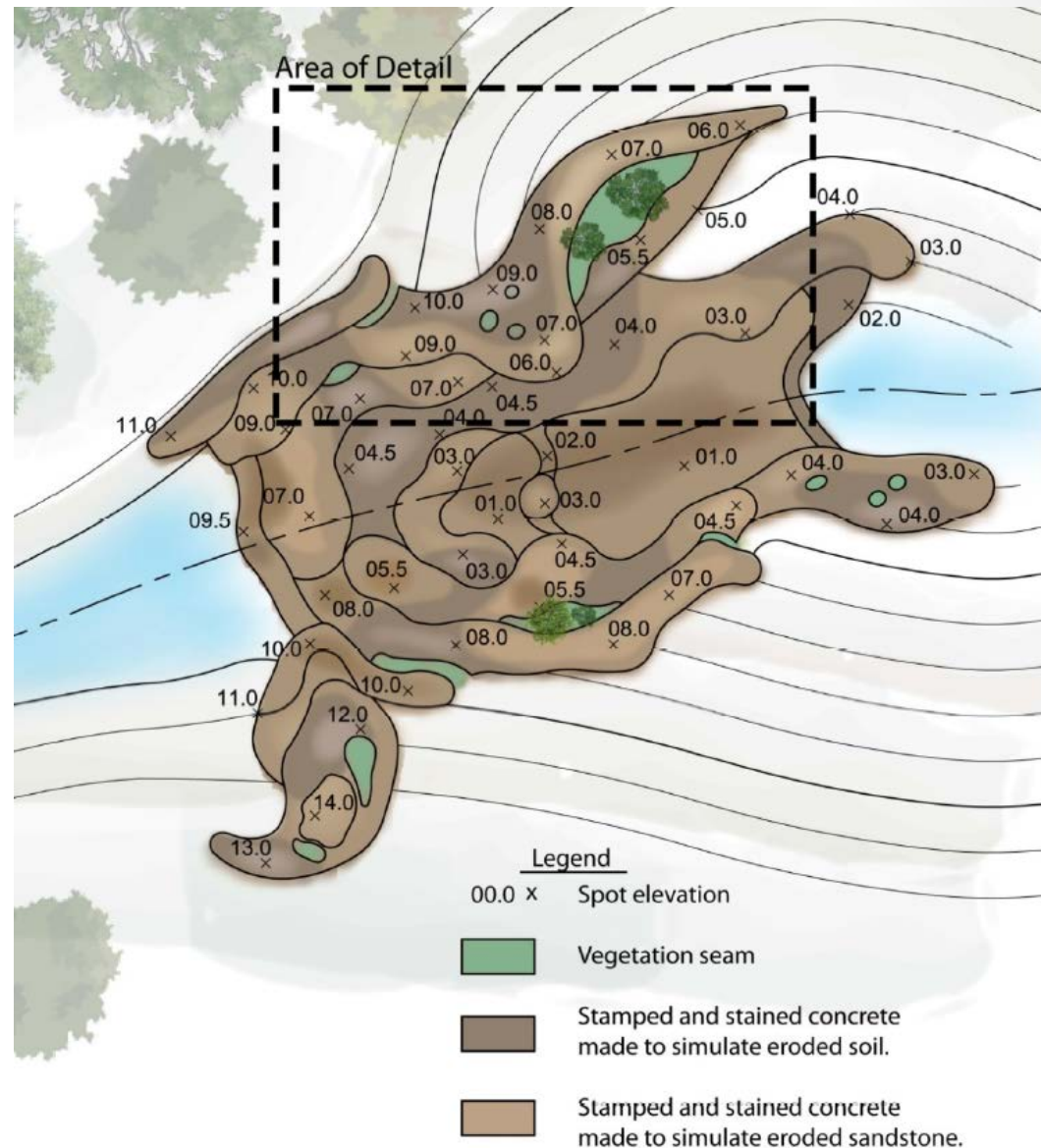


STRUCTURES, STORAGE, AND RECREATION



# Chapter 9, Hydraulic Structures

Added Sculpted  
Concrete Drop  
structures





# Chapter 9, Hydraulic Structures

Better defined when the simplified method for design is appropriate.





# Chapter 10, Stream Access and Recreational Channels

- Design of paths adjacent to streams
- Other safety related criteria





# Chapter 10, Stream Access and Recreational Channels

## Boatable channels



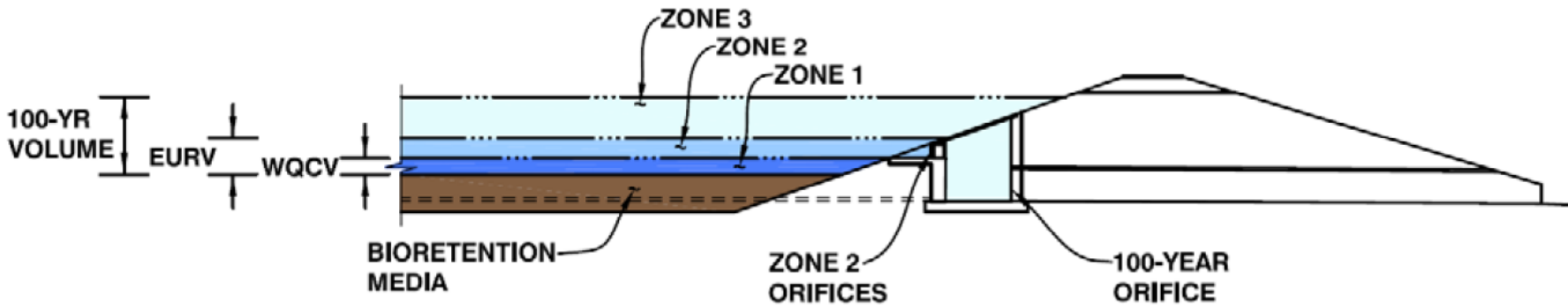
# Chapter 11, Culverts and Bridges

Clarified safety grate recommendations

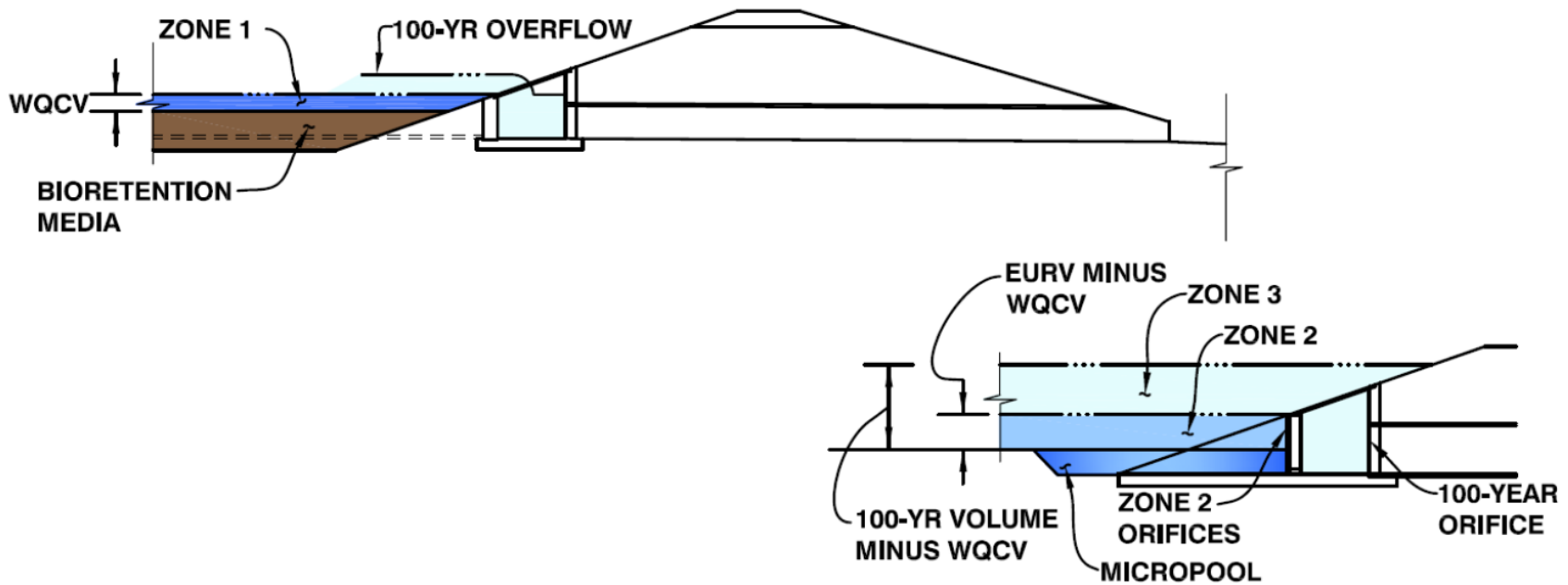


# Chapter 12, Storage

Added guidance for incorporating FSD within different WQ BMPs.



# Chapter 12, Storage





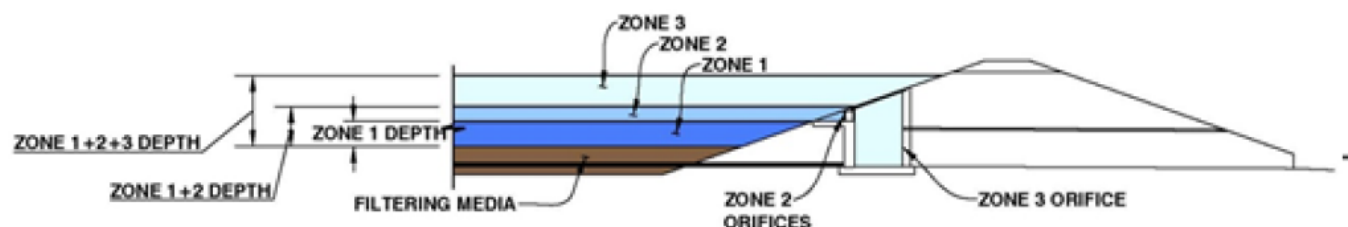
# Chapter 12, Storage

**Table 12-4. Sand filter or bioretention facility combined with full spectrum detention**

<b>Zone</b>	<b>Volume</b>	<b>Drain Time of Zone, hrs</b>	<b>Maximum Release Rate</b>
1	12-hr WQCV	12	Based on drain time
2	EURV minus 12-hr WQCV	12 to 32 <sup>1</sup>	Based on drain time
3	100-yr minus EURV	Based on release rate	0.9(predevelopment Q <sub>100</sub> )

<sup>1</sup>Colorado law requires 97% of the 5-year event to drain within 72 hours.

# New Tools for *Storage*



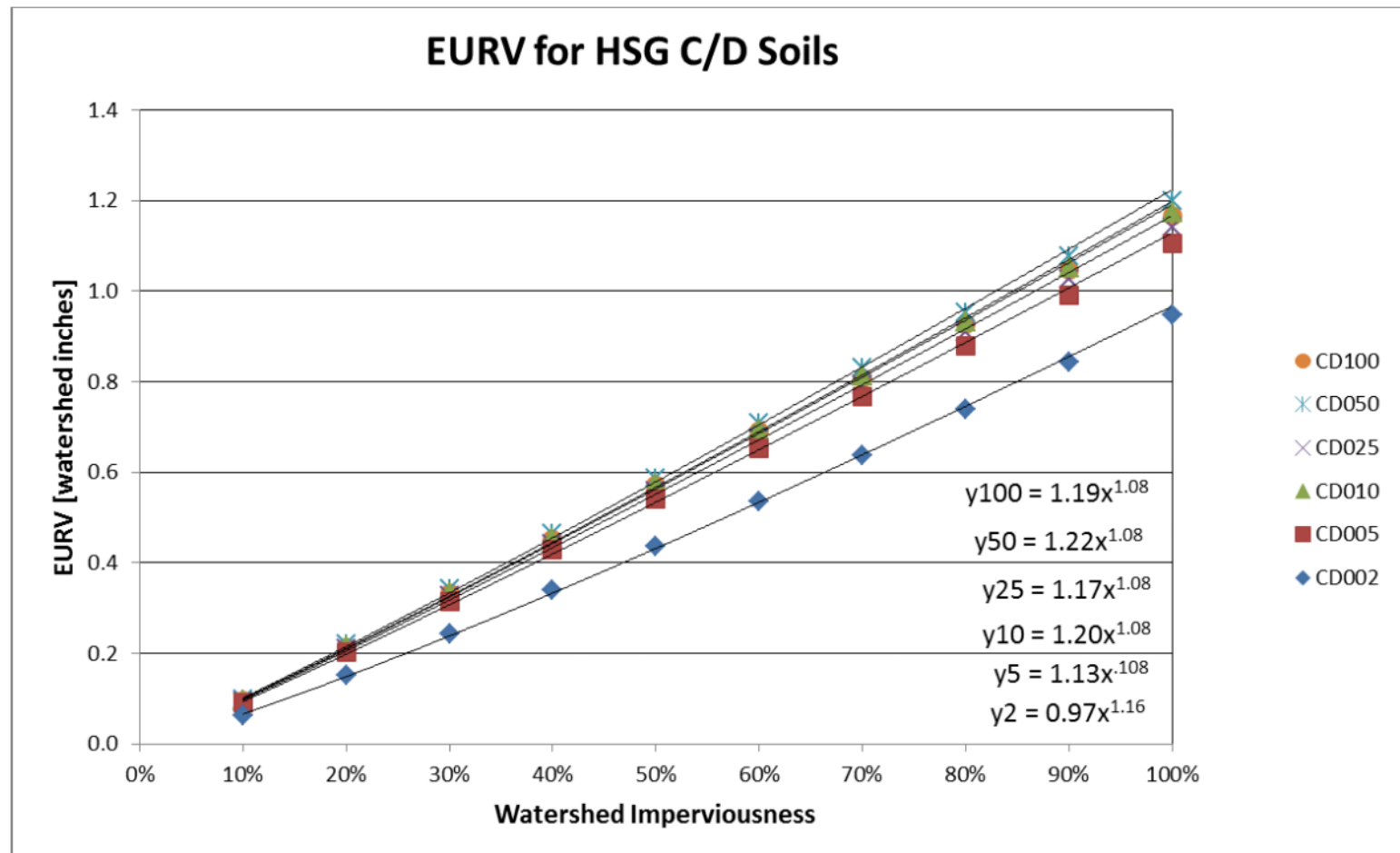
## FILTERING BMP WITH 3 ZONES

### Required Volume Calculation

Sand Filter (SF) <input type="button" value="v"/>	=	<b>SF</b>	
Watershed Area	=	20.00	acres
Watershed Length	=	1,300	ft
Watershed Slope	=	0.005	ft/ft
Watershed Imperviousness	=	75.00%	percent
Percentage Hydrologic Soil Group A	=	0.0%	percent
Percentage Hydrologic Soil Group B	=	0.0%	percent
Percentage Hydrologic Soil Groups C/D	=	100.0%	percent
Desired WQCV Drain Time	=	12.0	hours
Location for 1-hr Rainfall Depths	=	Denver - Capitol Hill	<input type="button" value="v"/>

# Other changes in *Storage*

- New predevelopment runoff equations
- New EURV equations



# Chapter 13, Revegetation

## Upland/Riparian/Wetland

- Site Prep
- Plant Material and Installation
- Mulching
- Maintenance
- Post-Construction Monitoring

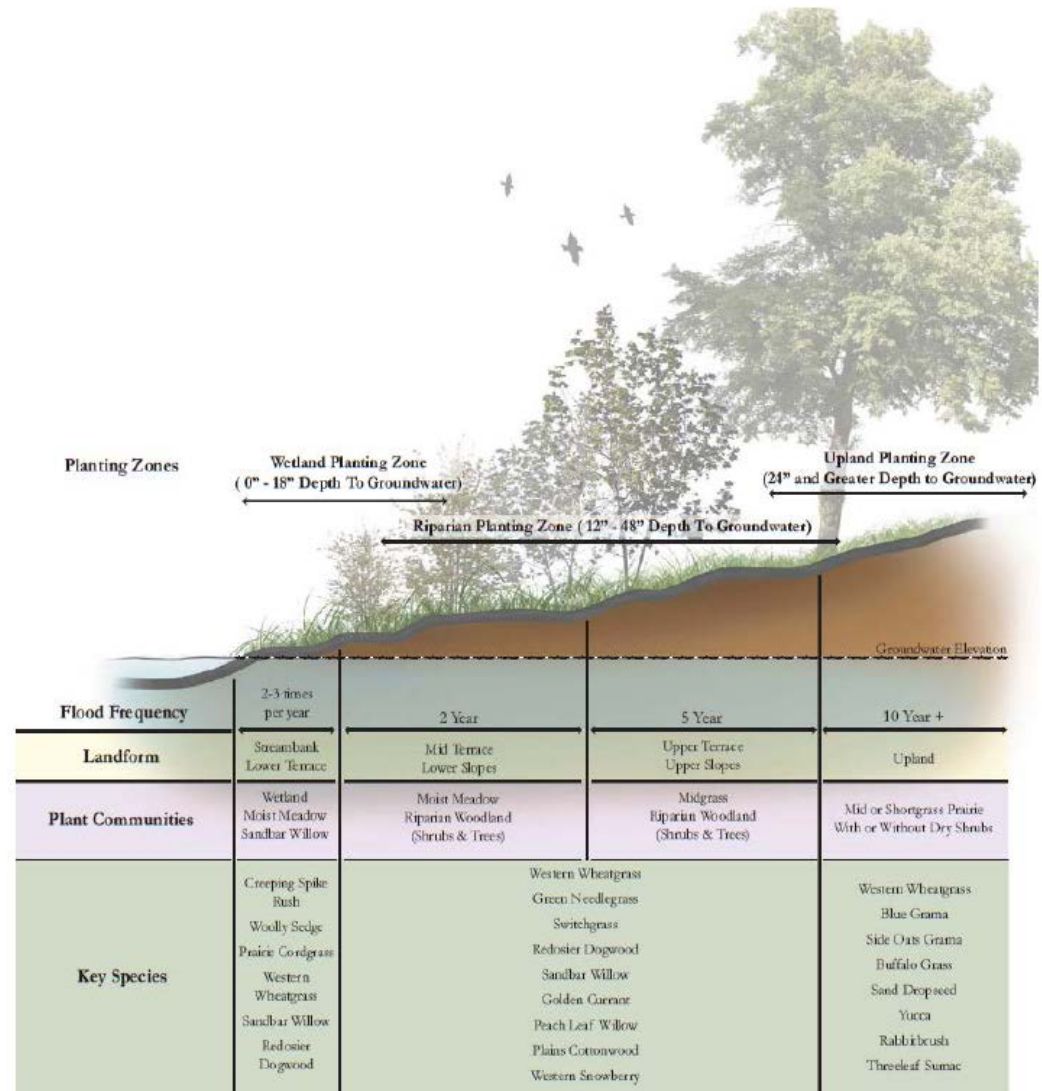


Figure 13-1. Wetland, riparian and upland habitats and planting zones



# Next steps:



- Education and outreach
- Three-minute workbook videos
- UD-Rational

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# Thank You!