Low Impact Development
LID and Flood Control

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I Live in a Watershed........
Overview

- Flood Control District
- Hydrologic Cycle
- The cause of flooding
- LID and the hydrological cycle
- LID in flooding context
- Basin Flooding vs. Stream Stability

San Ramon Creek @ Brookdale Avenue
January 2006
Who is the Flood Control District?

- Special District of the State
- Formed in 1951
- Governed by County Board of Supervisors
- Staffed by County Public Works
- 32 Employees
- Countywide, including cities

Alhambra Creek Flooding
Martinez 1950
What Does the Flood Control District Do?

- Watershed Planning
- Adequate drainage for new development
- Maintain regional flood protection system
- Hydrology resource for the county

Walnut Creek Flooding
Walnut Creek 1958
The Hydrologic Cycle
Local Hydrologic Cycle

Before Construction:
- Evapotranspiration
- Surface Runoff
- Interflow
- Baseflow

After Construction:
- Evapotranspiration
- Surface Runoff
- Interflow
- Baseflow

Canopy Interception
The Impact of Impervious Surfaces
What Causes Flooding

- Rainfall vs Runoff
- Storm intensity (100 year storm)
- Antecedent Conditions

1997  Downtown Martinez New Years Flood
Infiltration Rates (from Luna Leopold)

![Graph showing infiltration rates over time with different plot densities.]

- 4 plots, average density 37%
- 11 plots, average density 18%
- 3 bare plots
The Flood Hydrograph

Effects of Urbanization

- Original peak lag time
- Peak lag time after urbanization
- Stream response after urbanization: Water reaches stream faster, with higher peak discharge
- Original stream response

Discharge vs Rainfall

Period of rainfall vs Time
Flood Forecasting

Contra Costa County Forecasting Model: 7-5-3-2 Flood

Downtown Walnut Creek - 1958
Antecedent Conditions

Conditions preceding a storm. Characterizes watershed wetness before a storm.

• Flooding is more likely to happen when the soil is already wet.
Sponge Model

The wetter the sponge, the more water runs off
Antecedent Conditions Leading up to the December 31, 2005 Storm

Graph showing cumulative rainfall and creek flows from November 15, 2005 to December 31, 2005. The graph includes:
- ORF Cumulative Rainfall
- RIC Cumulative Rainfall
- Wildcat Creek Flows @ Vale Rd.

Key dates and events:
- Dec. 2, 2005
- Dec. 18, 2005
- 23rd
- 26th
- 28th
- Dec. 31, 2005

Cumulative Rainfall from 11/15/05
- Time
- Creek Flows (cfs)
Historical Antecedent Conditions that have preceded flooding in Contra Costa County

- 7" of rain for the season starting on July 1.
- 5" of rain in the last 30 days.
- 3" of rain in the last 7 days.

Alhambra and Masonic Street, Martinez
- 7" of rain for the season starting on July 1.
- 5" of rain in the last 30 days.
- 3" of rain in the last 7 days.
- National Weather Service forecast of two (2) inches of rainfall in the next 24 hours
Tools to Use

Flood Control District Rain Gauge web page.

http://www.co.contra-cost.ca.us/depart/pw/content/Hydrology.html

Google

“Contra Costa Rain”
or
“Contra Costa Rain Gauge”
LID and the Hydrologic Cycle

- Soil Infiltration
  - Porosity
  - Permeability
  - Soil Structure
  - Vegetation

- Watershed Recovery Time

- Time of Concentration

San Ramon Creek @ Livorna Rd, Alamo
January 2006
Regional Drainage vs Local Drainage

- Local Design: 10 year
- Regional Design: 100 yr
- Pipe Sizing and LID
- LID Offsets
  - Global Warming
  - Flashy Storms
  - Length of Hydrological Data

Grayson Creek Channel - 1957
System Function and LID

- Floodplain Development
- Basin Storage
- Stream Stability

Murderers Creek, El Rancho Drive, Pleasant Hill, 1952
Sustainable Watershed

Creek Stability/Function
(Geomorphology)

Community

Water Quality/Quantity
(Hydrology)

Habitat
(Ecology)
The Future

- Watershed Based Approach
- Stream Goals
- Second Generation Conversion
- 50 Year Plan
Remember you live in a Watershed too........