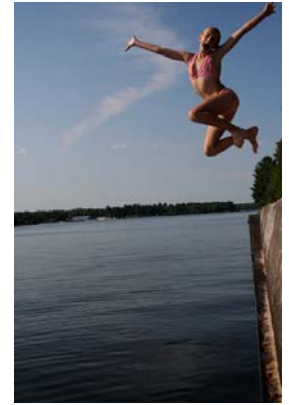


# Evolution of Storm Water Management in Developing Areas

Ronald Cavallaro, PE



Up to 1980



# Provide for conveyance

Convey flow downstream as fast as possible

- Channelization

- Concrete channels

- Flood control dikes

- Drain land in agricultural areas

- Lack of storm water storage requirements



Up to 1980

# 70s Development and Drainage “Improvements”





# Results

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Flooding

Water quality degradation

Loss of habitat

Impacts on aquatic species

Stream bank erosion





Up to 1980

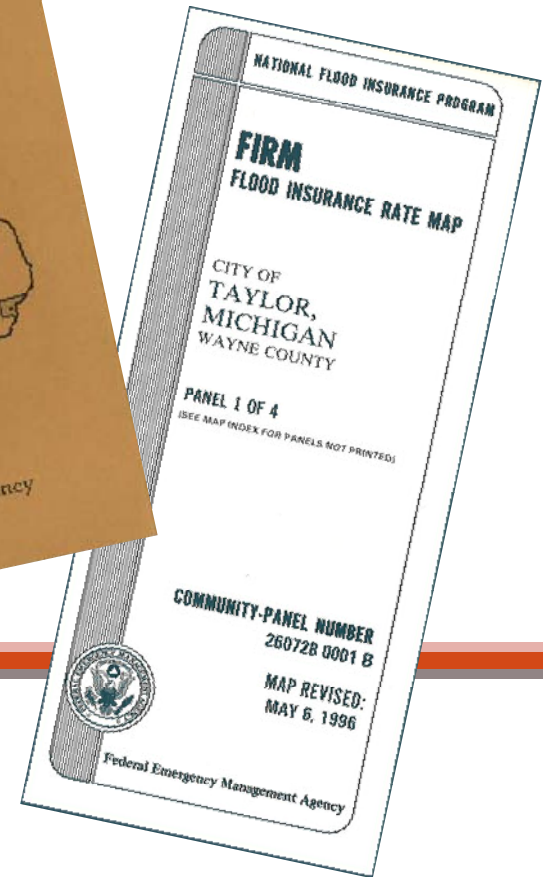
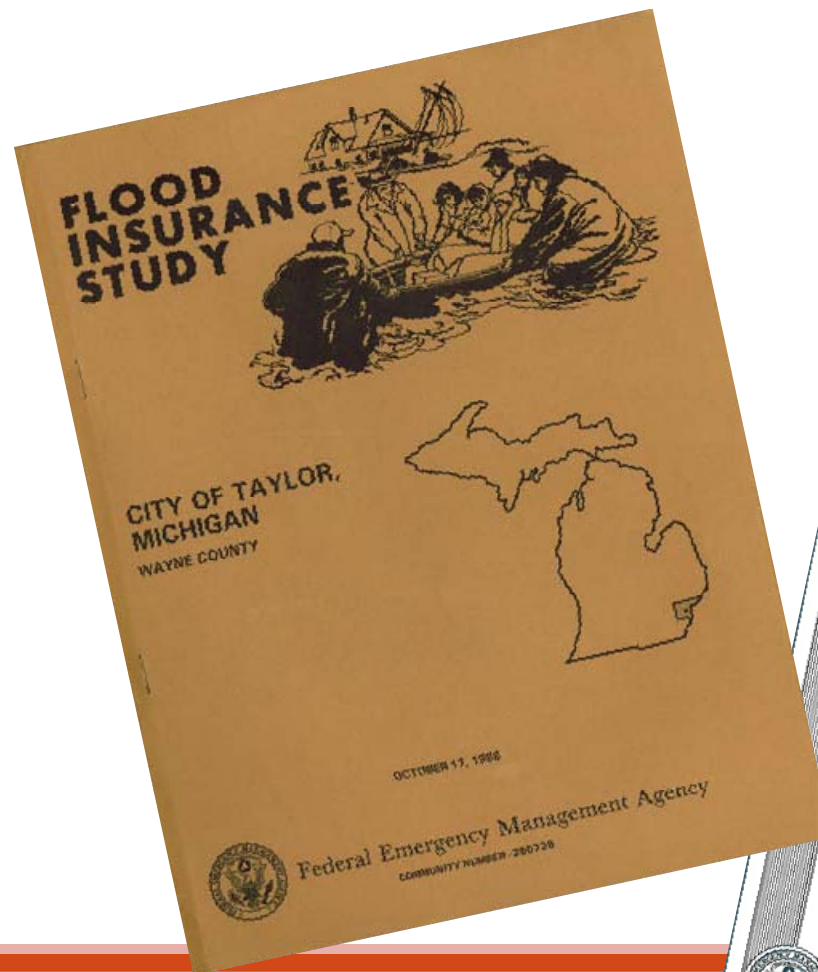






CWA

Up to 1980



## Public Awareness

Passage of Clean Water Act

Creation of FEMA (Encroachment)

Started to realize value of wetlands, floodplains, and native ecosystems

1980 – early 1990s



## Recognized need for storm water storage

On-site detention for flood control

Regional systems

Flood control projects



1980 – early 1990s



## Results

Improvement in flooding conditions

Other impacts still occurred



Early 1990s – 2000



## Small Storm Event Storage Regulations

Recognized need for additional storage requirements

Additional floodplain regulations (floodplain protection)

Watershed planning

Early 1990s – 2000



## Results

Reduced flooding

Water quality and habitat improvement

Improvement in stream degradation

Retrofit projects to solve past mistakes



Early 1990s – 2000



## Entrance to Reader Center

... before and after construction of stepped-pools

Early 1990s – 2000



## Entrance to Reader Center

... 1 month after construction



2000 – Current



Elements of Watershed Management Plan

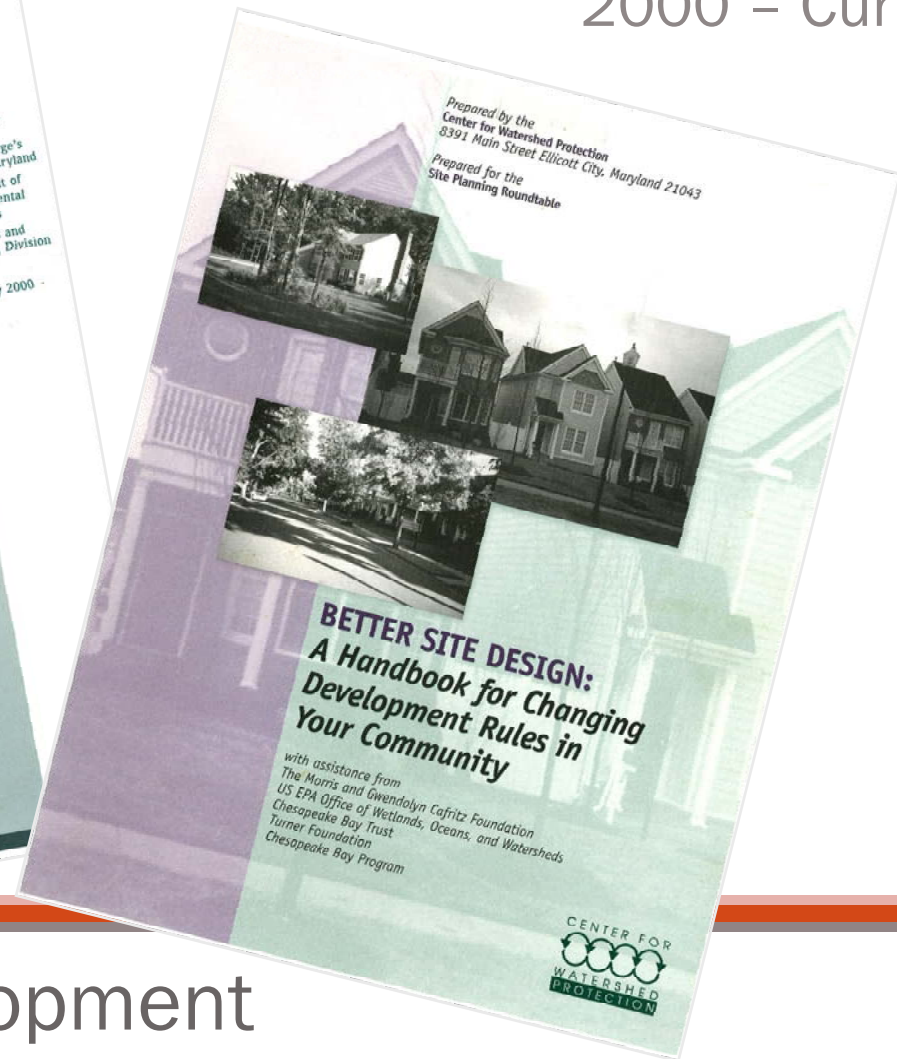
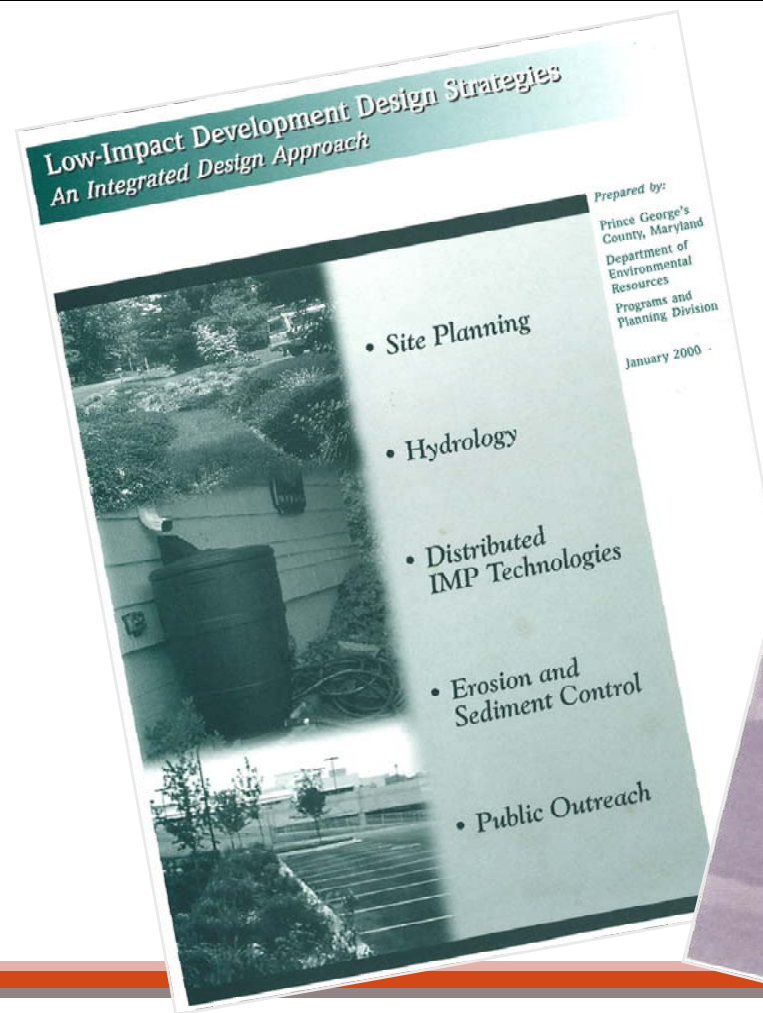
## Storm Water Runoff Volume

Still problems with increasing runoff volume

Determined the need to control runoff volume “LID”

Watershed planning

2000 – Current



## Low Impact Development

Combines hydrologically functional site design with pollution prevention measures to compensate for land developments' impacts on hydrology and water quality.



2000 – Current



## Wayne City Hall

CMI Grant Funded  
Bioretention Systems  
Rain Gardens

Reduction in Pavement  
Treatment Structures

2000 – Current



## WCDC / Scio Township Hall

Shared Parking

Bioretention

Solar Energy

Multi-stage detention

Native Landscaping



Questions?



## Evolution of Storm Water Management in Developing Areas

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