

# **The Performance of Retention Ponds and the Associated Fluvial Geomorphology**

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# The Plan:

## Part I

- Hydrology of Mulberry Place
- Conclusions on Performance
- Comparison to a “Pristine Stream”

## Part II

- Stream cross sections methods
- Qualitative comparison
- Data analysis
- Conclusions



# Retention Study Sites

**Mulberry**

*(Cristina)*

**Ironbound**

*(Greg)*

**Pointe**

*(Brent)*

**Kensington**

*(Lauren)*

**W&M**





# Welcome To Mulberry Place





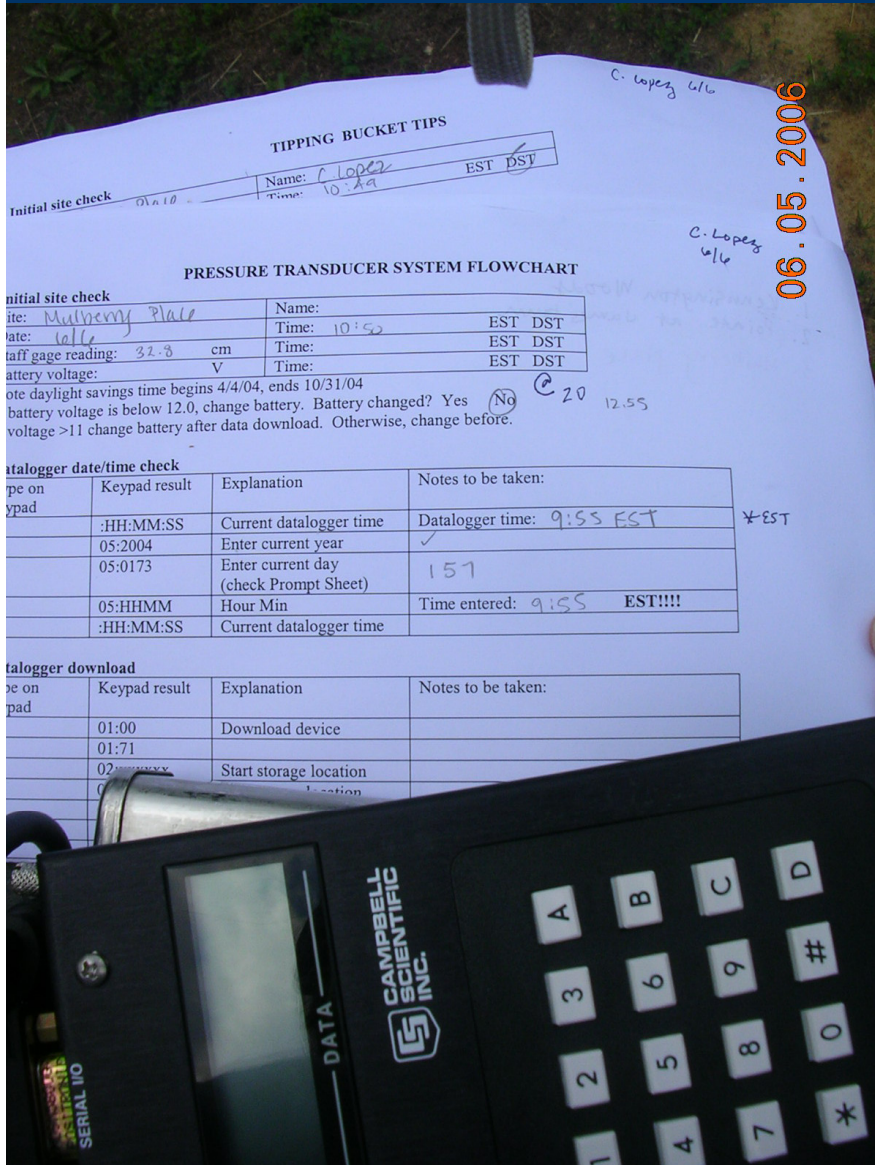
# Performance based on:

-Matching post-development peak flows to pre-development peak flows

-Retention Time

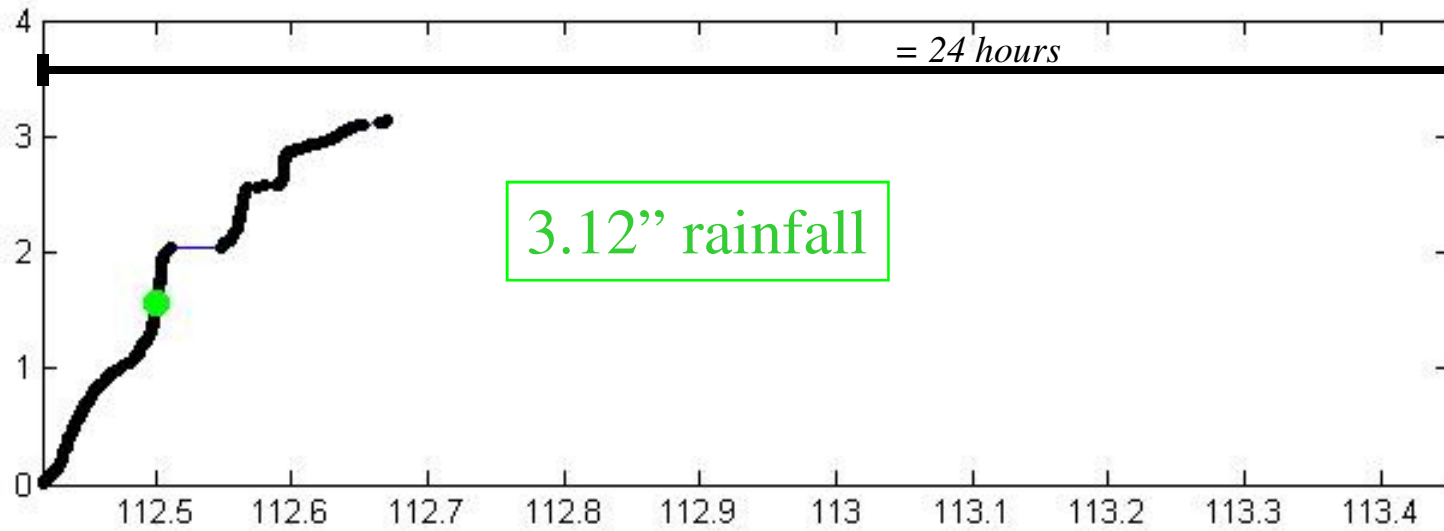
-Runoff coefficient

-Comparison to Pristine

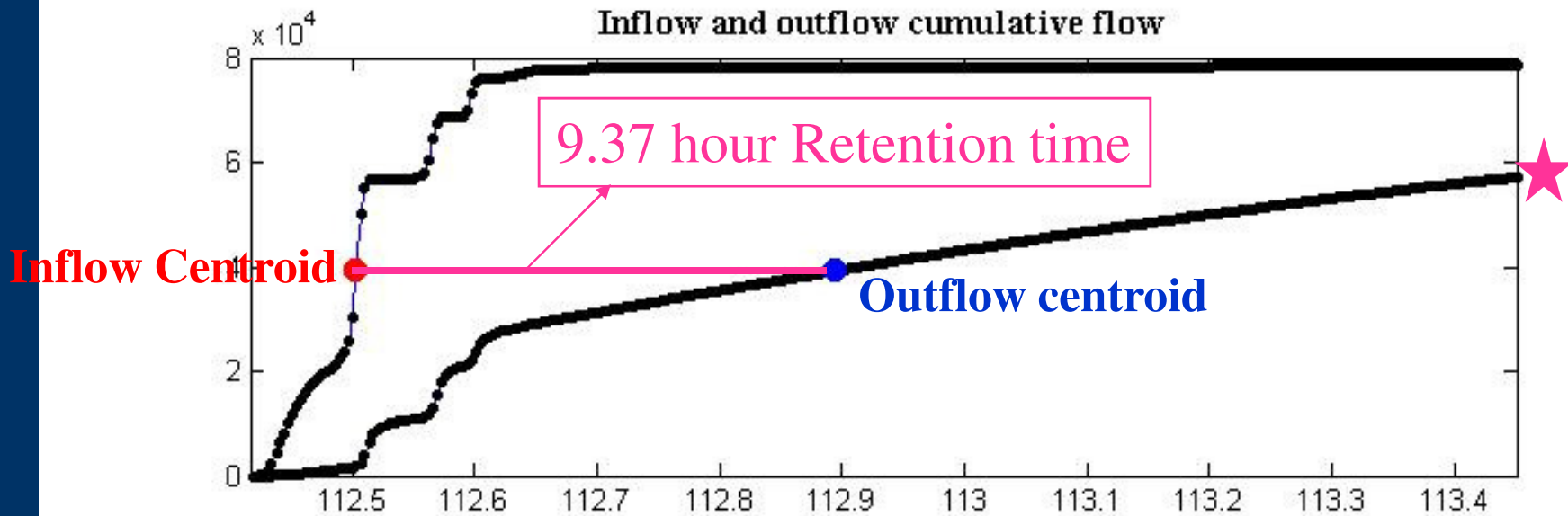




### Cumulative rainfall



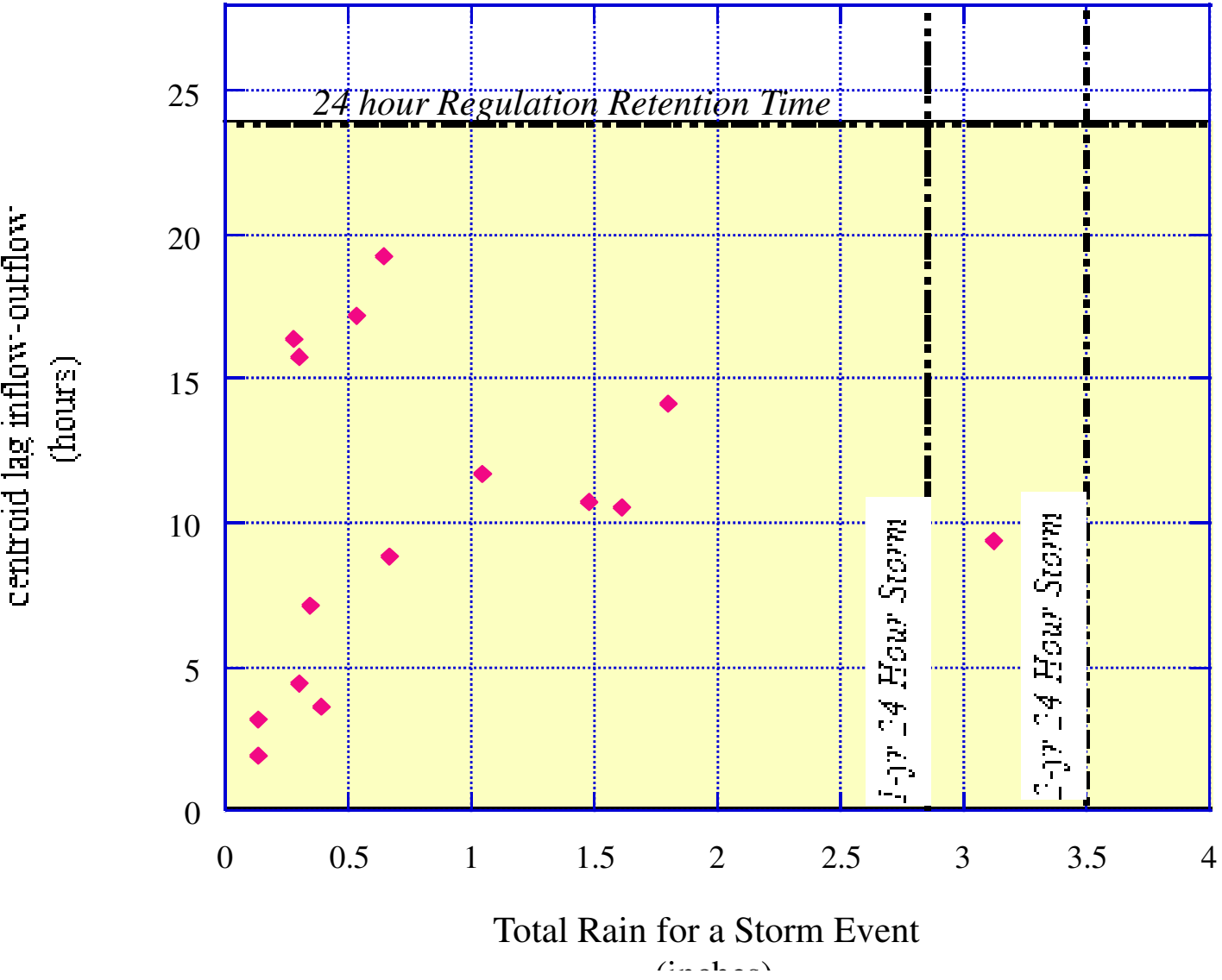
### Inflow and outflow cumulative flow





◆ centroid lag inflow-outflow

### Retention Times for Storm Events 2006, Mulberry Place

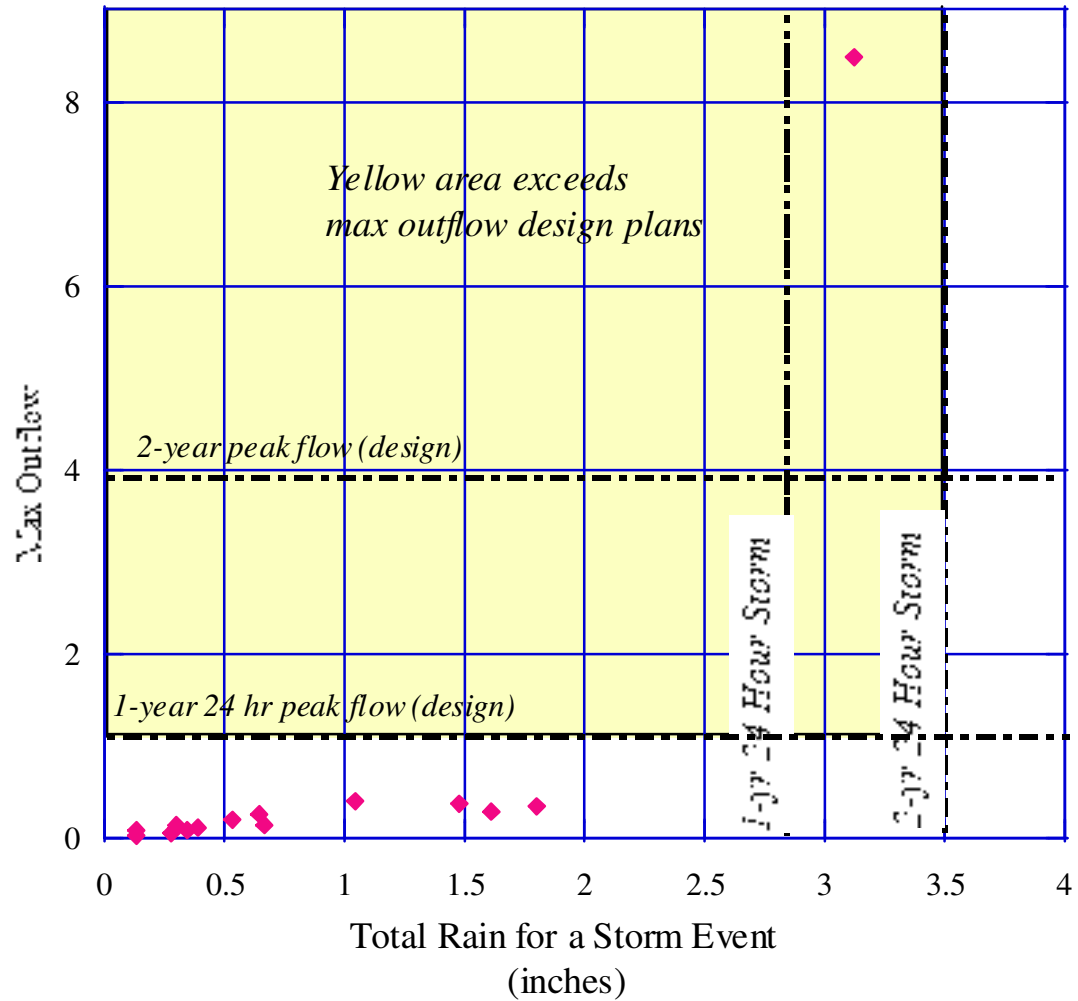




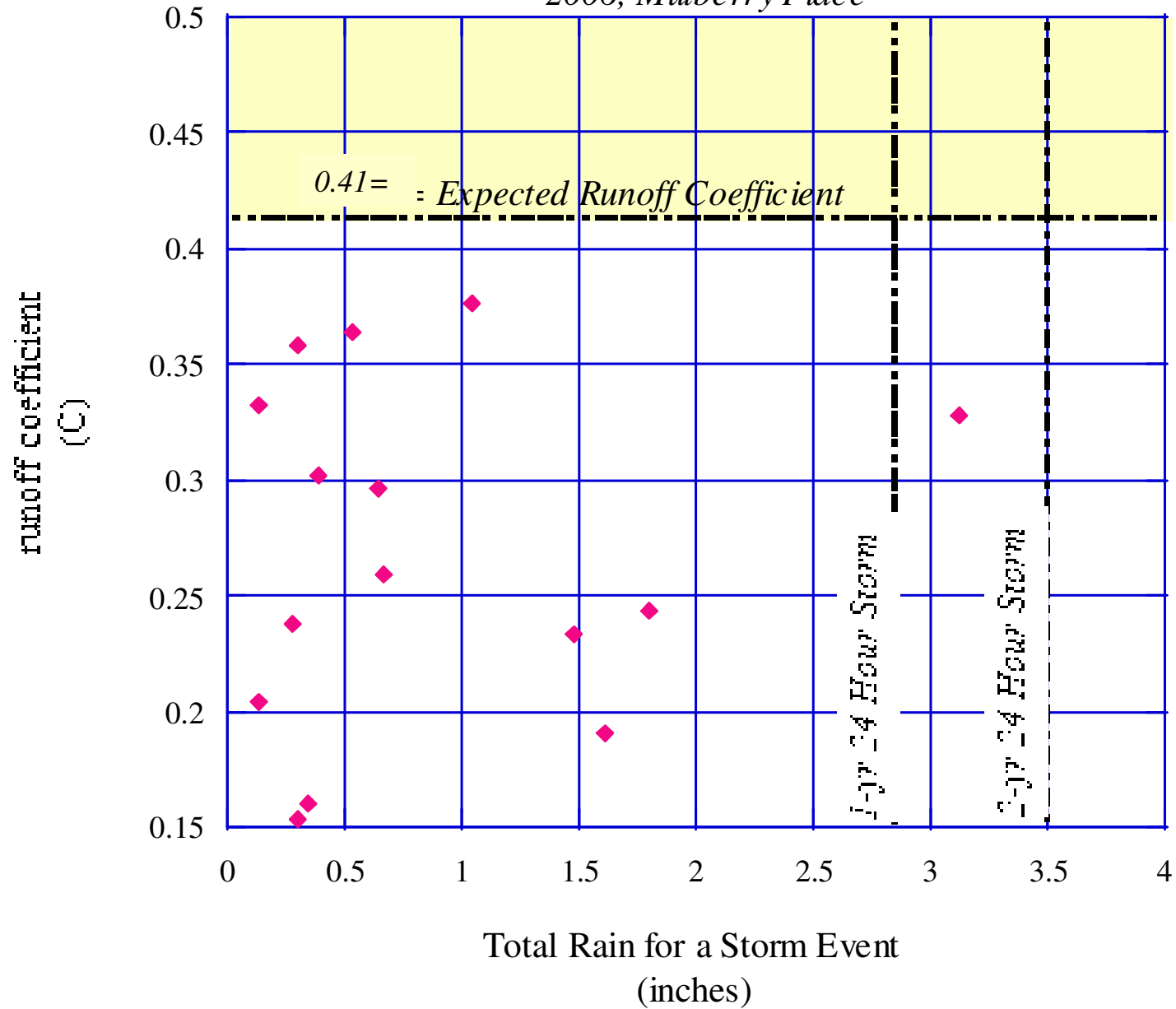


# Peak Outflows

**Peak Outflow**  
2006, Mulberry Place



# Runoff Coefficients for Storm Events 2006, Mulberry Place

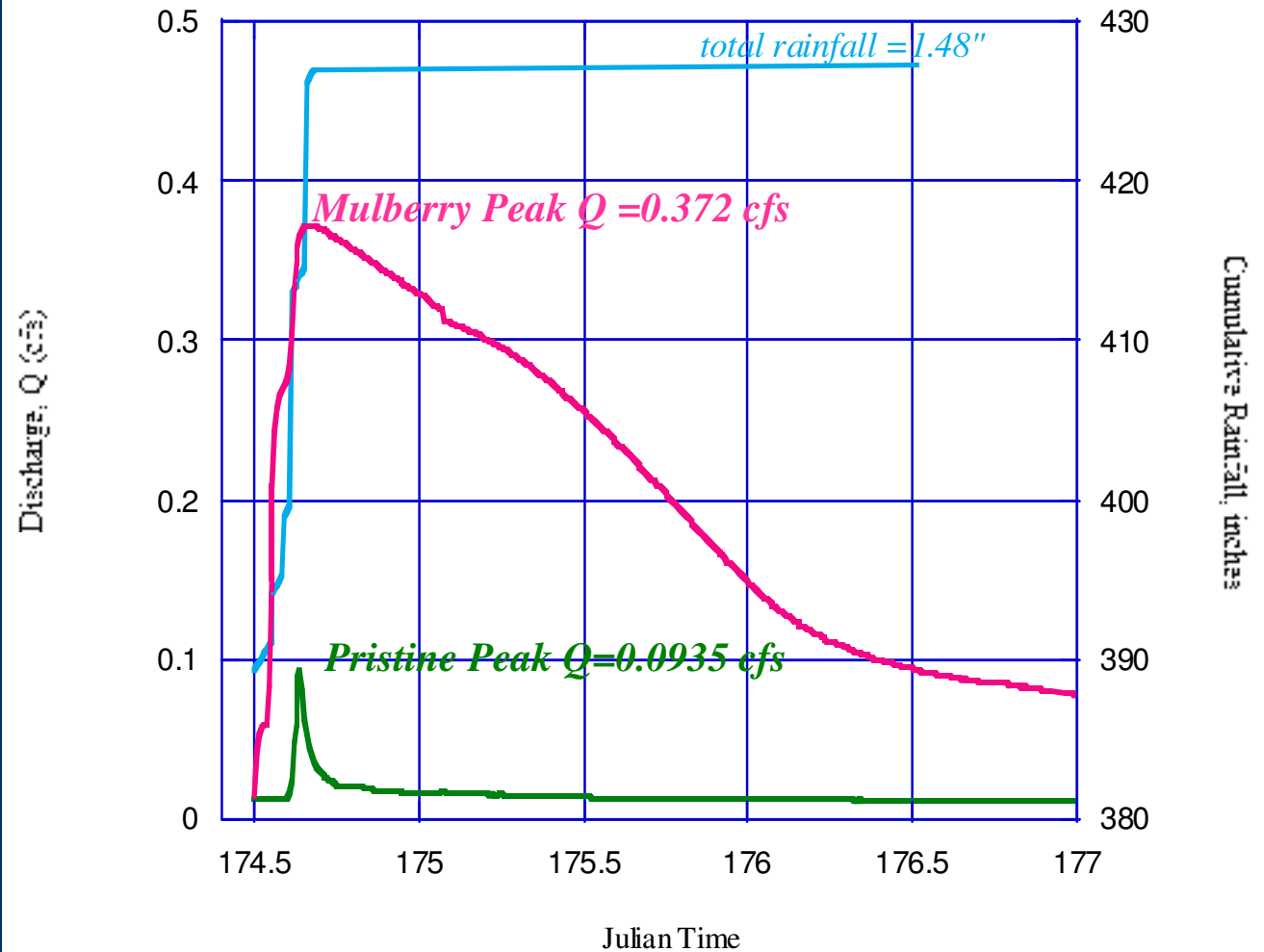




# Comparison to a Pristine Stream



Pristine & Mulberry Discharge



# Conclusions:

## *-Runoff Coefficient:*

All storm events fall below the estimated runoff coefficient

## *-Retention Time:*

No storms held for 24 hours, although most moderate sized up to the 1-yr 24 hours storm are held for around half a day

## *-Peak Outflow:*

Generally is below expected, minus one extreme. Need larger storms.

## *-Return to pristine, pre-developed state:*

Volume of flow and peak flow significantly greater





# The Geomorphic Effects on Streams Associated with Retention Ponds

## *Questions:*

- Do stream cross sections have noticeable changes upstream and downstream from a retention pond?
- How do cross sections associated with retention ponds compare to pristine streams of comparable drainage areas?









# Data Collection

- Leveled cross-sectional transects of the streams
- Vertical summing of the “slices” = area
- Calculation of a suite of measurements





# Ironbound Upstream



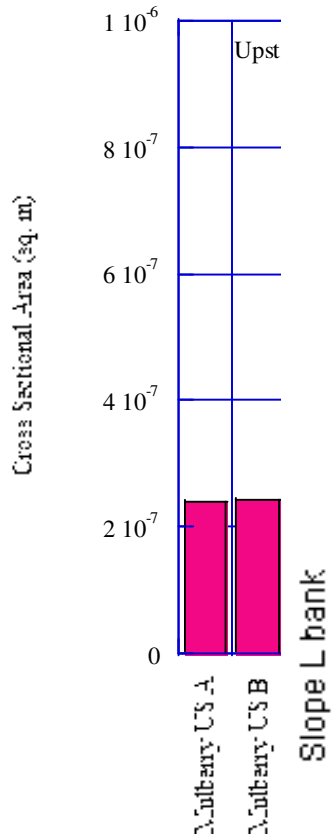
# Ironbound Downstream



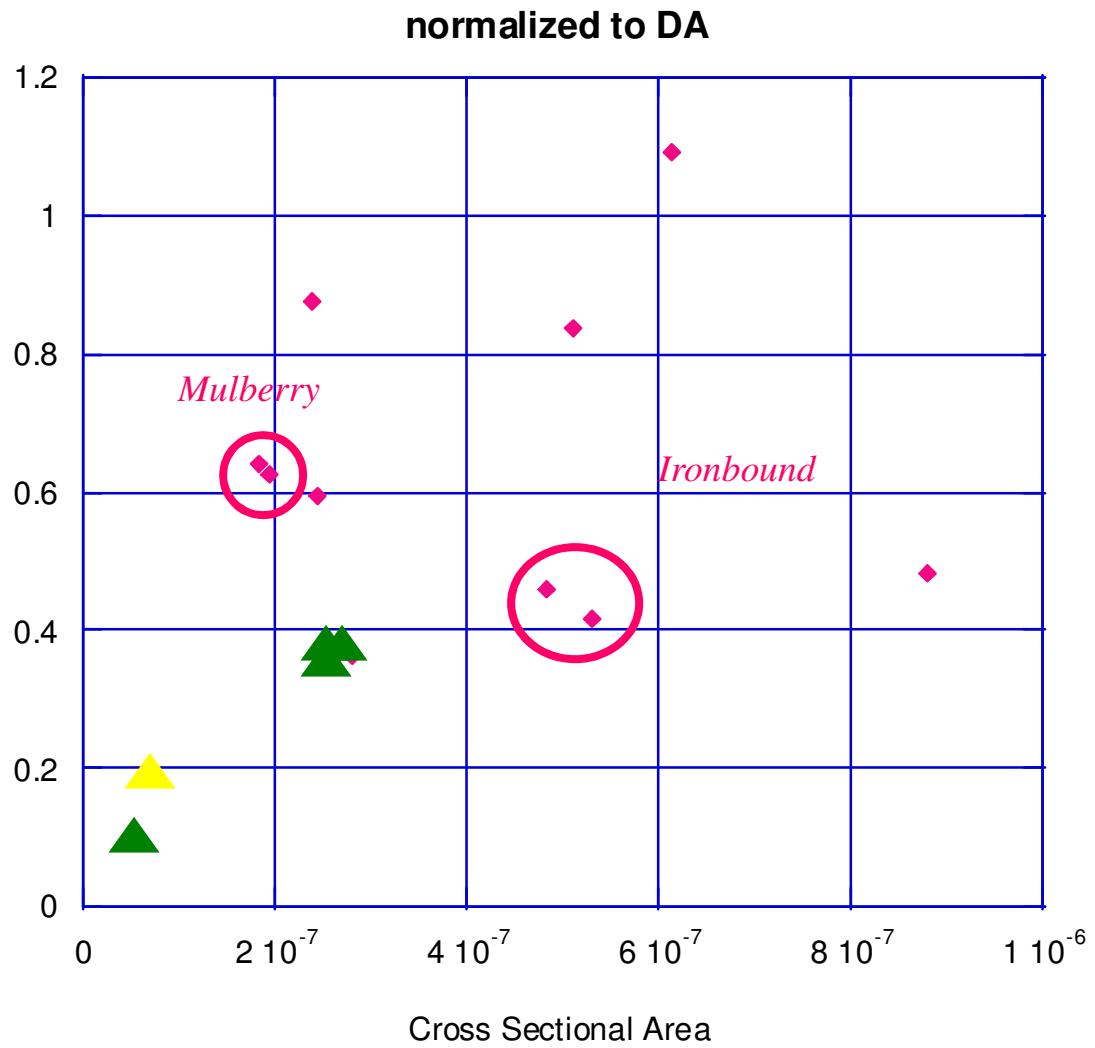


■ Cross Sectional Area

Cross Sectional Area



◆ Slope L bank



# Future Research

- Statistical analysis of my data set
- Collaborate geomorphic research with stream ecology, and water quality research for a macrocosmic look at the effects of Retention Ponds and the health of associated streams
- Look closer at certain downstream characteristics in comparison to upstream:
  - undercutting (take horizontal measurements into account)
  - type of sediment
  - scour vs. depositional areas
  - bank failure





# Conclusions

In all sets of data,  
-slopes of bank  
-area  
-width to depth ratios,  
downstream sections are not as extreme  
as upstream, but still are not comparable  
to pristine conditions.



*Thank You*  
*Greg Hancock (advisor)*  
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*Lauren Hallett*  
*Emily Hathaway*  
*Brent Vickery Aigler*

