Reducing the Storm Water Footprint of GVSU through BMP’s

Association of State Floodplain Managers

Grand Rapids, MI
June 22, 2016

Dr. Peter J. Wampler
Talk Road Map

• Brief Geomorphic History of the Grand River and Grand River Ravines
• Historic storm water and Land Use practices at GVSU
• Storm water runoff monitoring and research
• Best Management Practices at GVSU
• The future of BMP’s and storm water at GVSU
The Grand River and Grand River Valley

Churches and Wampler (2013)
The Grand River Ravines are unique.

Churches and Wampler (2013)
~ 15,000 years ago

~ 14,000 years ago

Womble and Wampler (2006)
~ 13,000 years ago
Runoff direction toward ravines

- Drainage divide bisects campus.
- Historically water was directed east into the ravines from parking lots and buildings.
Talk Road Map

- Brief Geomorphic History of the Grand River and Grand River Ravines
- **Historic storm water and Land Use practices at GVSU**
  - Storm water runoff monitoring and research
  - Best Management Practices at GVSU
  - The future of BMP’s and storm water at GVSU
1958 Aerial Photo of the GVSU Site
2004 Aerial Photo of the GVSU site
Changes in Impermeable Surface Area

Womble and Wampler (2006)
Storm water directed to ravines

Original library under construction
Drainage pipe into ravine behind Padnos
Erosion below one of the drainage pipes
Runoff and Erosion Control

Video courtesy of Steve Snell, facilities planning
2012 flooding in the ravines after a ~ 1 inch rain in 30 min
Runoff Impacts

- Erosion and sediment transport
- Slope destabilization
- Biological impacts
- Thermal impacts
- Water quality degradation
Talk Road Map

• Brief Geomorphic History of the Grand River and Grand River Ravines
• Historic storm water and Land Use practices at GVSU

• Storm water runoff monitoring and research
• Best Management Practices at GVSU
• The future of BMP’s and storm water at GVSU
Storm water monitoring 2006-2014

- 2006 – Runoff modeling and first discharge monitoring (Womble and Wampler 2006)
- 2009 – Baseline biologic and hydrologic data collection (Snyder et al, 2009; Wampler, 2009)
- 2011 – Water quality analysis of ravine runoff (TSS, turbidity, conductivity, pH) and GIS-based watershed analysis to evaluate hydrologic impact of diversion of parking lots to newly constructed ponds. (Simonson et al., 2011)
- 2012 – Evaluation of water quality (nitrate; phosphate, turbidity, TSS) in the storm water pond system and the ravines. (Wampler and Kneeshaw, 2012)
- 2013 – Continued monitoring of water quality in Pond#1 of the pond system and Little Mac Ravine
- 2014 – Water Quality Study in Little Mac and Adjacent Ravines and geomorphic mapping near Little Mac Ravine

Research and Monitoring data can be found at www.gvsu.edu/stormwater
ISCO Sampler used for ravine Monitoring and sampling
Sediment samples from 5/23/11
Summer 2011 Hydrograph

Hydrograph - May 27th, 2011 to August 15th, 2011

A: Diversion of area A
17.72 acres - 6/13/2011

B: Diversion of area B
9.92 acres - 6/16/2011

C: Diversion of area C
1.31 acres - 6/27/2011

D: Diversion of area D
4.62 acres - 7/8/2011

1.7 meters
TSS Concentration in Little Mac Ravine

TSS Concentration per Event

A: Diversion of area A
17.72 acres - 6/13/2011
B: Diversion of area B
9.92 acres - 6/16/2011
C: Diversion of area C
1.31 acres - 6/27/2011
D: Diversion of area D
4.62 acres - 7/8/2011

Date

TSS Concentration (mg/l)

Stage (m)

Hydrograph - May 27th, 2011 to August 15th, 2011

A: Diversion of area A
17.72 acres - 6/13/2011
B: Diverson of area B
9.92 acres - 6/16/2011
C: Diversion of area C
1.31 acres - 6/27/2011
D: Diversion of area D
4.62 acres - 7/8/2011

0.53
0.31
0.19
0.09
1.7 meters
~ 33.6 acres of parking lots redirected
GVSU Storm Water Management Complex
GVSU Storm Water Management Complex

Pond#1
Pond#2
Pond#3
Pond#4
Talk Road Map

• Brief Geomorphic History of the Grand River and Grand River Ravines
• Historic storm water and Land Use practices at GVSU
• Storm water runoff monitoring and research
• **Best Management Practices at GVSU**
• The future of BMP’s and storm water at GVSU
Storm Water BMPS at GVSU

- Bio swales
- Permeable Concrete and Asphalt
- Rain Gardens (Large and Small)
- Detention Ponds
- Green roofs
- Vegetated buffers (no mow zones)
BMP examples

Permeable Concrete
Green Roof on Mackinac Hall

Bio swale with art
BMP examples

Permeable Asphalt

Turf Building Rain Garden
BMP Benefits

Introductory geology students at storm water ponds

Bald Eagle at the Pierce Storm Water Management Complex 2011
Talk Road Map

• Brief Geomorphic History of the Grand River and Grand River Ravines
• Historic storm water and Land Use practices at GVSU
• Storm water runoff monitoring and research
• Best Management Practices at GVSU

• The future of BMP’s and storm water at GVSU
Field Tour of GVSU BMP’s – The Good, the Bad, and the Ugly

- Thursday June 23 1:30 to 5:30.
- Discuss what has worked and what has not worked for GVSU storm water management.
- See me if you have questions about the tour.
Questions?

http://www.gvsu.edu/stormwater
http://faculty.gvsu.edu/wamplerp/
wamplerp@gvsu.edu