



# Stormwater and Landscaping on Grinnell College Campus

Samantha Snodgrass  
2016

---

# What Happens to Rain?

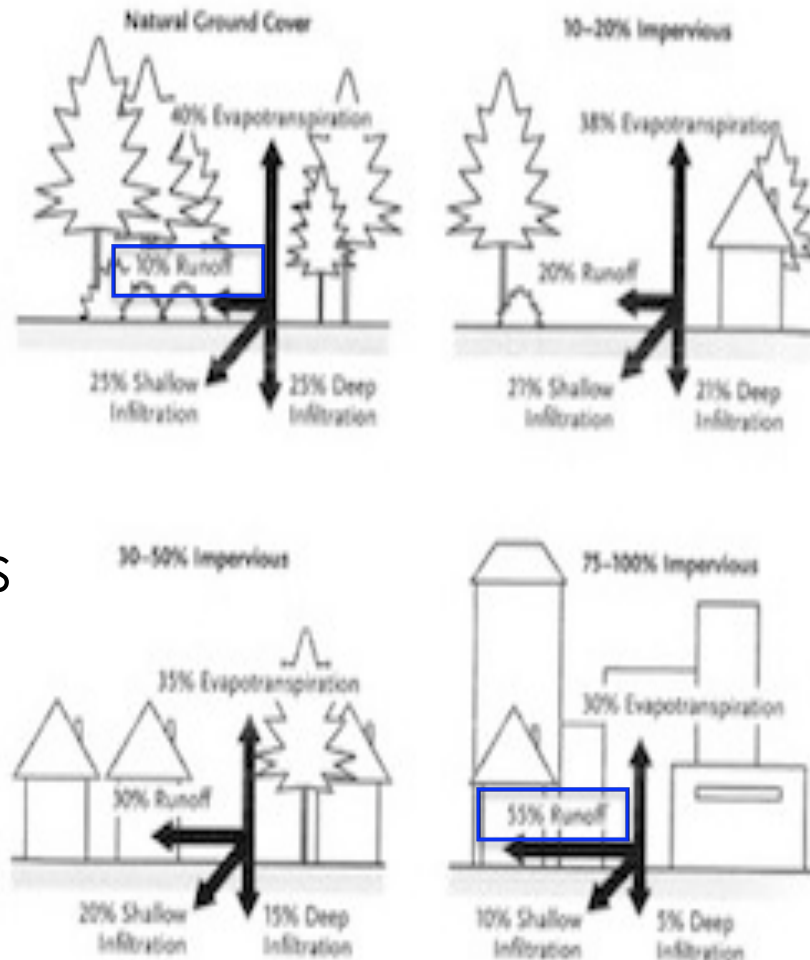
With increased urbanization:

QUALITY<sup>1,2,3</sup>

Runoff

polluted by:

- Sediment
- Nutrients
- Chemicals
- Heat



QUANTITY<sup>4</sup>

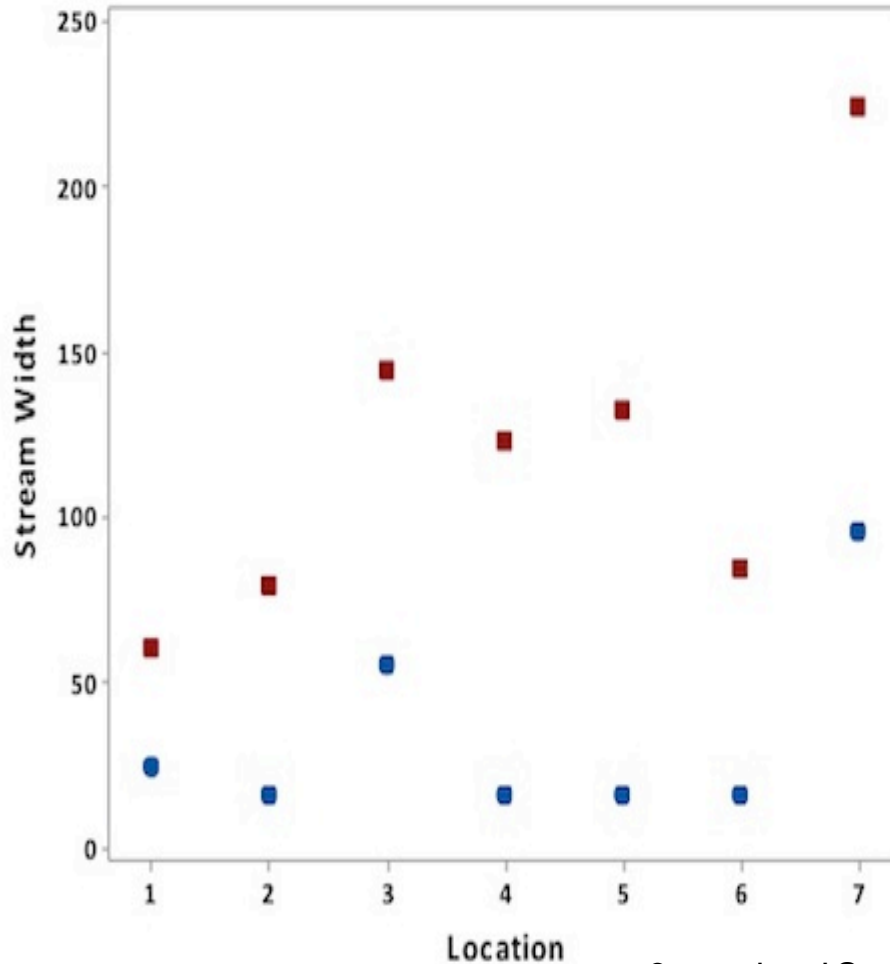
More runoff  
=larger volumes  
=greater flooding damage

Is this happening in Grinnell?

1842 Land survey measured all stream surface widths and mapped their locations.

We found 7 sites where streams measured by the Public Land Survey exist today in Grant Township (Grinnell)





Variable  
 ■ 1840s Width (inches)  
 ■ 2015 width (inches)

1842  
 mean=33.9"

2015  
 mean=120.9"

Average  
 difference=  
 86.9" (~7.2  
 ft..)

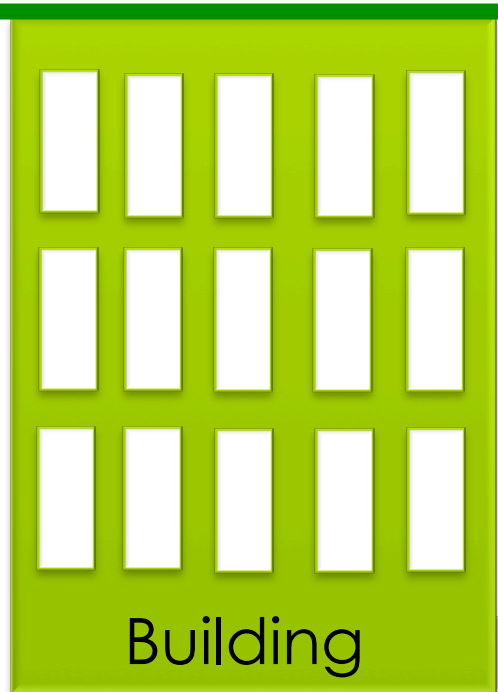
Paired t-test  
 T=6.98

P=0.000

So what?  
 Evidence that either erosion or human  
 interference has widened these streams.

# Infiltrate More Rainwater

Green roof



Building

- 50%-75% rainwater stays on roof<sup>6</sup>
- 42-45,000 sq. ft. in size
- Infiltration into ground
- Less salt in the winter<sup>7</sup>

Pavers

Underground gravel system

- More infiltration to groundwater<sup>8</sup>
- Slower rate of runoff<sup>5</sup>
- Native plants
- 54 gardens capture 1.6 million gals water<sup>9</sup>

Rain garden





Images of three infiltration technologies:

**Left:** Stuttgart Germany green roof on skyscraper/office building

**Center:** Grinnell, Iowa permeable pavers outside the Drake library

**Right:** Council Bluffs, Iowa test rain garden established by Master Gardeners

# Case Studies

## Monona, Iowa<sup>7</sup>:

- Permeable pavement parking lot
- Less salt and black ice in the winter

## Upper Iowa University, Fayette, IA<sup>10</sup>:

- Bioswale, retention pond
- 100% of a 25 year flood
- Annual maintenance = 40 hrs/yr

## Charles City, Iowa<sup>11</sup>:

- 17 blocks
- Permeable paving, bioretention, infiltration
- 100% retention of 2 year storm, 90% retention of 10 year storm
- Avoided sewer renovation





# How to implement in Grinnell?

If these technologies are great, why haven't they been established on Grinnell College's campus?

---



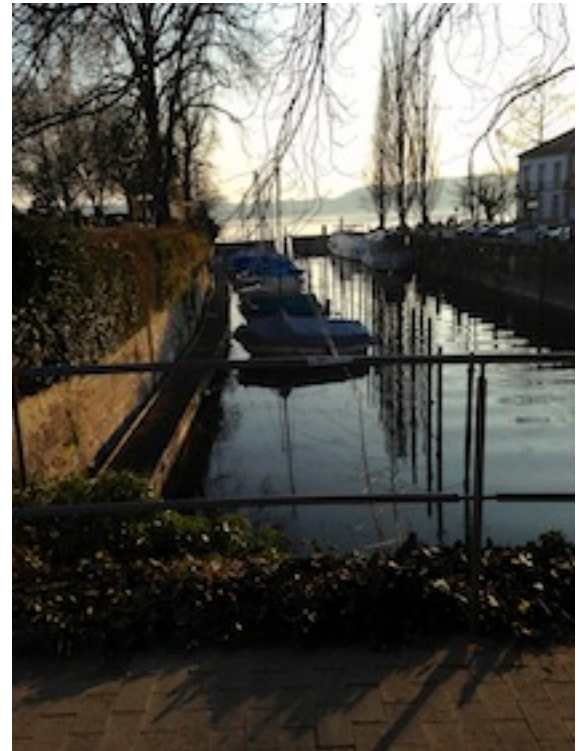
# Challenges

- Costs
  - More expensive
  - Fewer contractors; though this is changing
- Aesthetics
  - Weedy, Unkempt
  - Does not match beauty ideals held by community members
- High water table
  - Specific to Grinnell, not enough space between water table and surface to implement practices
  - More limiting for rain gardens

# Landscape Architects, Atelier Dreiseitl

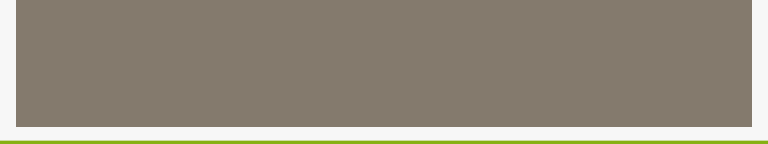
Architectural firm that specializes in landscape and waterway restoration

- Restore historic local environments
- Facilitate connections between people and the environment
- Serve multiple functions, including waterway health



# Next steps

- What are Grinnell values and beliefs?
- **<http://goo.gl/forms/49u5aNCzAM>**
  - Survey questionnaire
  - Students, staff, faculty and residents of Grinnell can participate
  - 10 minutes to complete
  - \$20 Amazon gift card raffles
  - Closes April 15<sup>th</sup>
  - [snodgras1@grinnell.edu](mailto:snodgras1@grinnell.edu)



Questions?

# References

1. Kolpin, D., and Hornbuckle, K. (2010). What's in Your Floodwaters? In A Watershed Year: Anatomy of the Iowa Floods of 2008, C.F. Mutel, ed. (University of Iowa Press), pp. 155–162.
2. Indiana Wildlife Federation Landscaping the Sustainable Campus: A guide for adopting a sustainable approach to landscape management on Indiana's universities and colleges.
3. American Rivers Natural Flood Protection Bradley, Jr., 2010
4. (2014). Flash flooding easing around Eastern Iowa, but worries remain. The Gazette.
5. Notes from 3/16/15 with Yurick in Stuttgart, Germany
6. Brewitt, P. Concrete Progress: The Parking Lot That Doubles as a Sponge. Orion Mag.
7. Dietz, M.E., and Clausen, J.C. (2005). A field evaluation of rain garden flow and pollutant treatment. *Water, Air, Soil Pollut.* 167, 123–138.
8. Iowa State University, University Extension (2010). Master Gardener Demonstrations and Webinar Show How to Landscape for Rain.
9. American Society of Landscape Architects Green Infrastructure & Stormwater Management Case Study: Upper Iowa University.
10. American Society of Landscape Architects Green Infrastructure & Stormwater Management Case Study: Charles City Downtown Permeable Streetscape.
11. Johnston, D.M. (2010). Watershed-Based Flood Management. In A Watershed Year: Anatomy of the Iowa Floods of 2008, C.F. Mutel, ed. (University of Iowa Press), pp. 193–198.