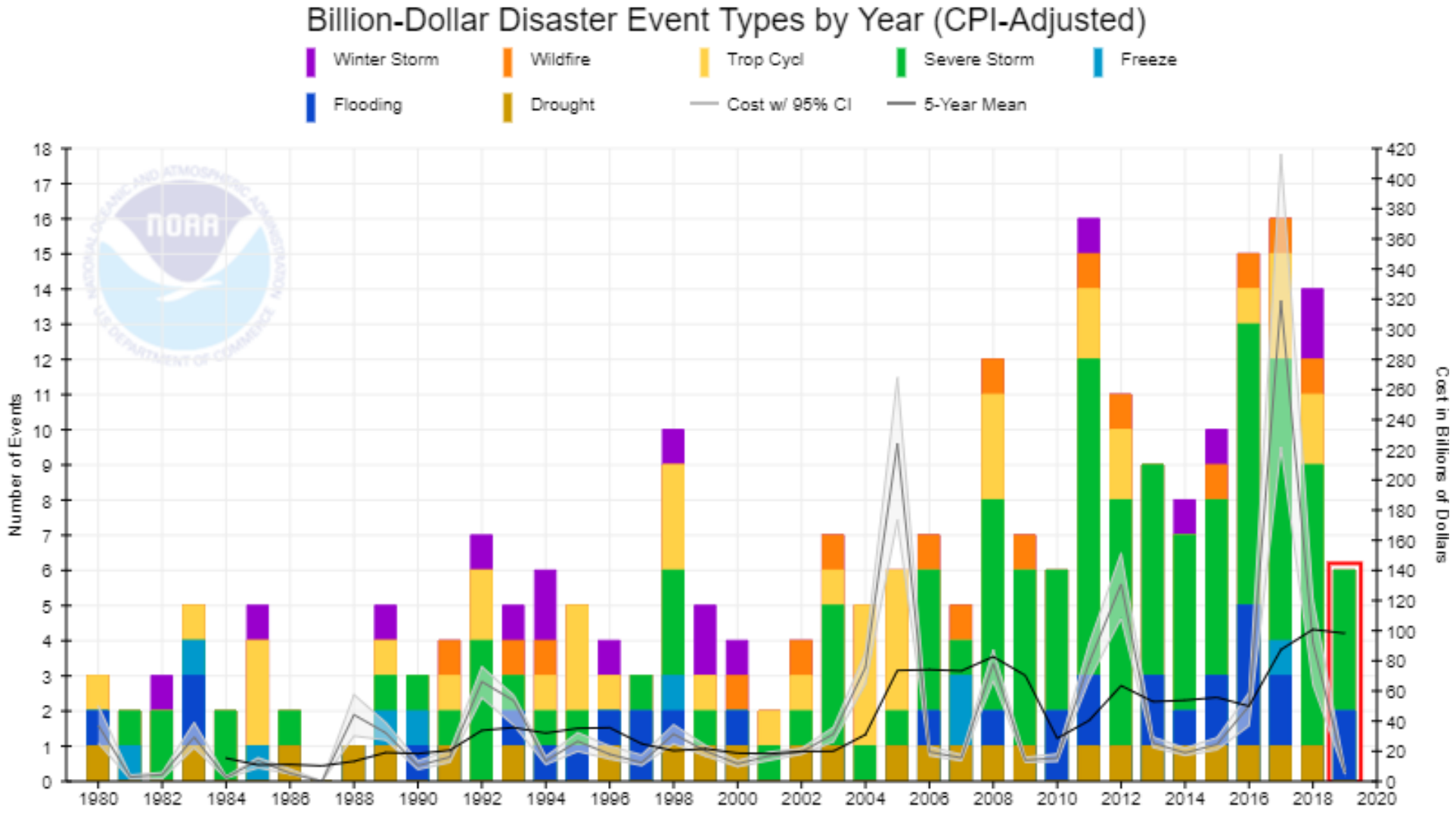
Wildcat Creek Watershed as a Living Laboratory

https://www.kctv5.com/news/at-least-displaced-as-manhattan-kansas-deals-with-flooding/article_206ce498-af9d-11e8-bb8b-bfc0fdd666d9.html

https://www.kansascity.com/latest-news/wi8c8h/picture217769950/alternates/FREE_1140/ManhattanKansasFlooding4_o.jpg

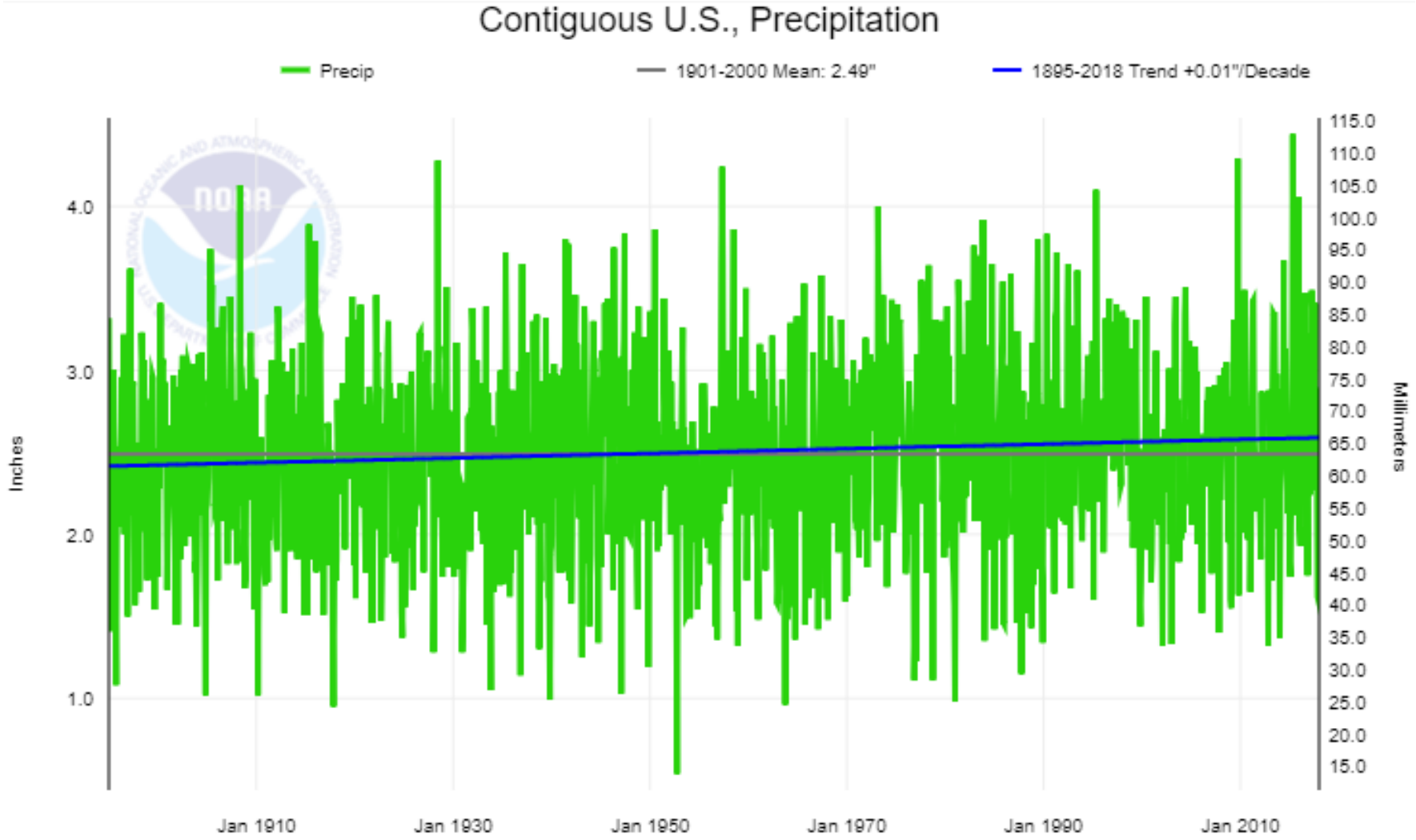
Katherine Nelson
Department of Geography
Kansas State University

Natural Disasters in the U.S.



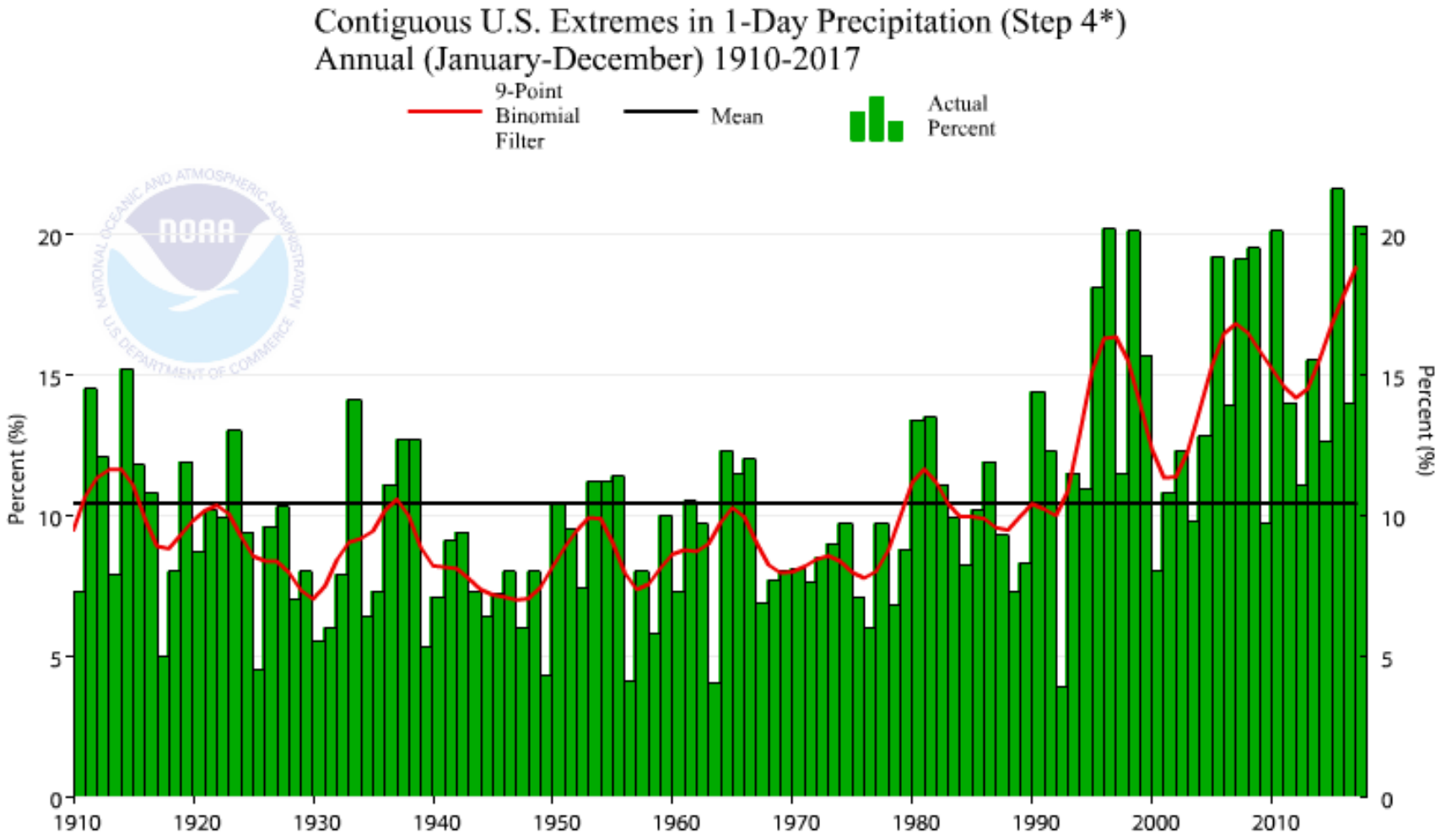
https://www.ncdc.noaa.gov/billions/summary-stats

Average Precipitation Trend



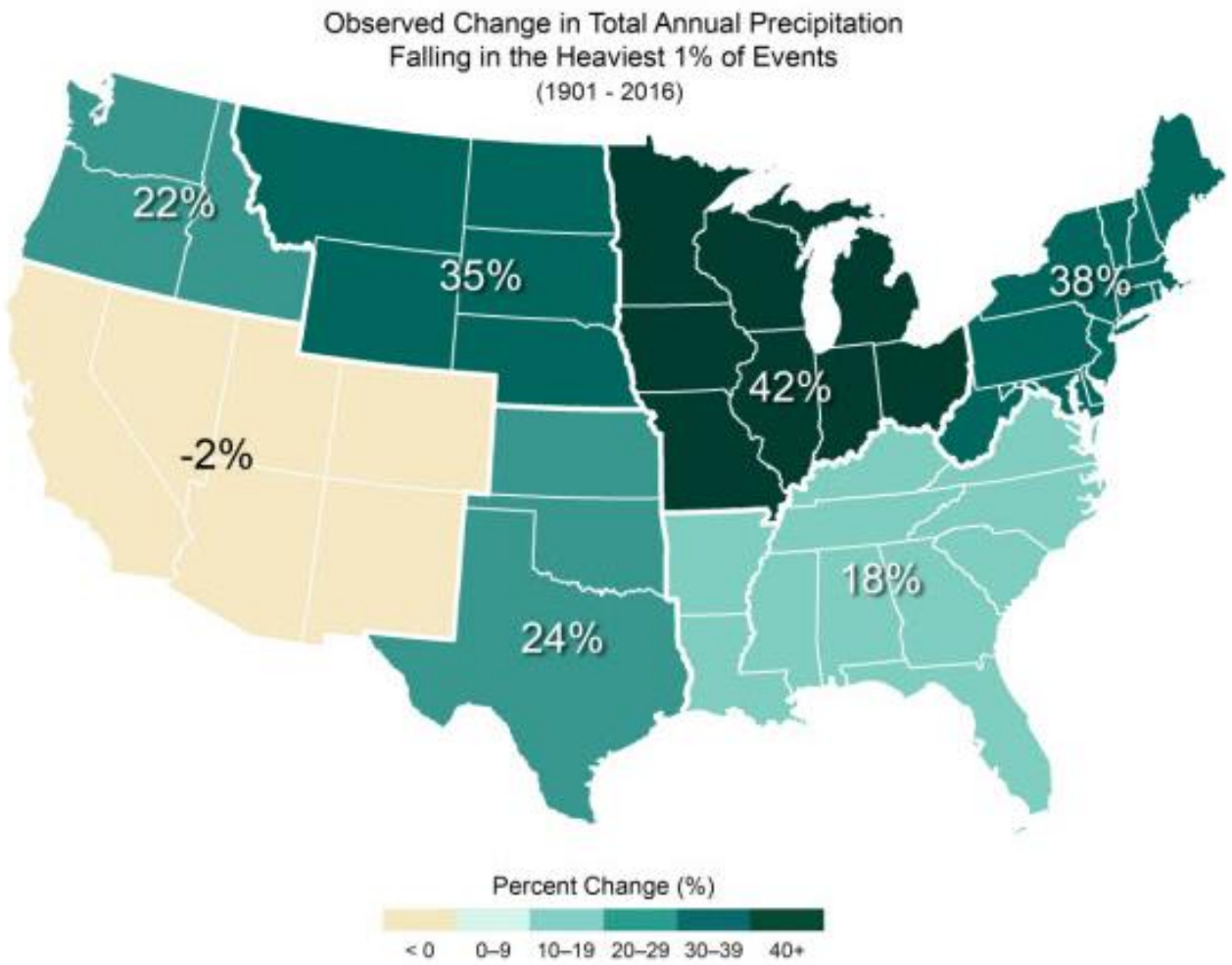
https://www.ncdc.noaa.gov/cag/national/time-series/

Extreme Precipitation Trends



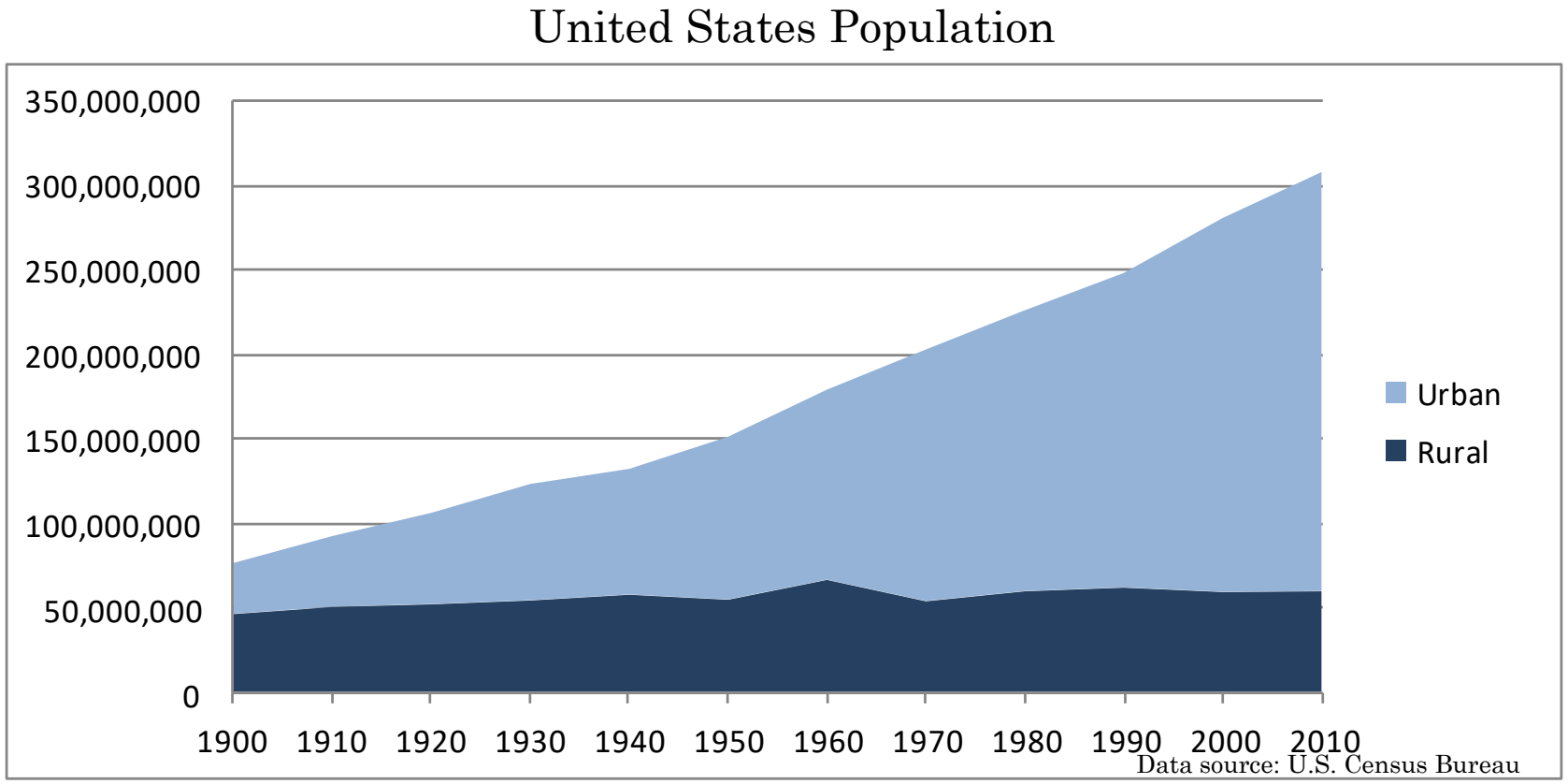
https://www.ncdc.noaa.gov/extremes/cei/

Extreme Precipitation Trends



https://www.climate.gov/news-features/blogs/beyond-data/its-not-heat-its-humidity

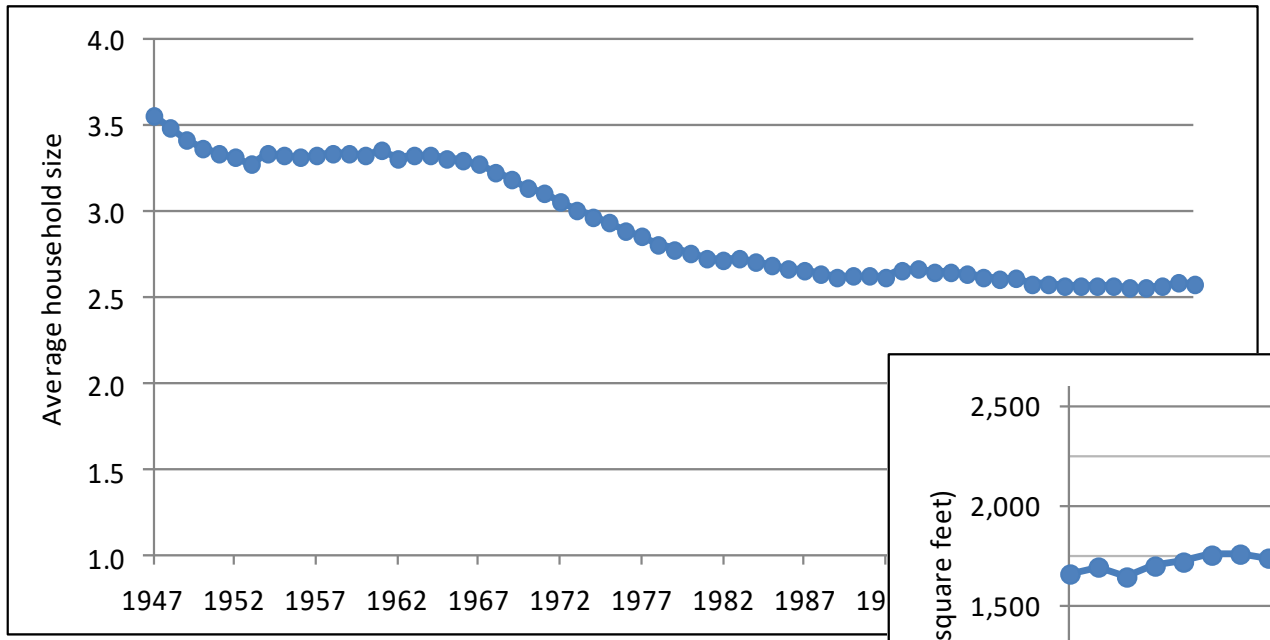
Urbanization



EPA. 2013. Our Built and Natural Environments: A Technical Review of the Interactions Among Land Use, Transportation, and Environmental Quality.

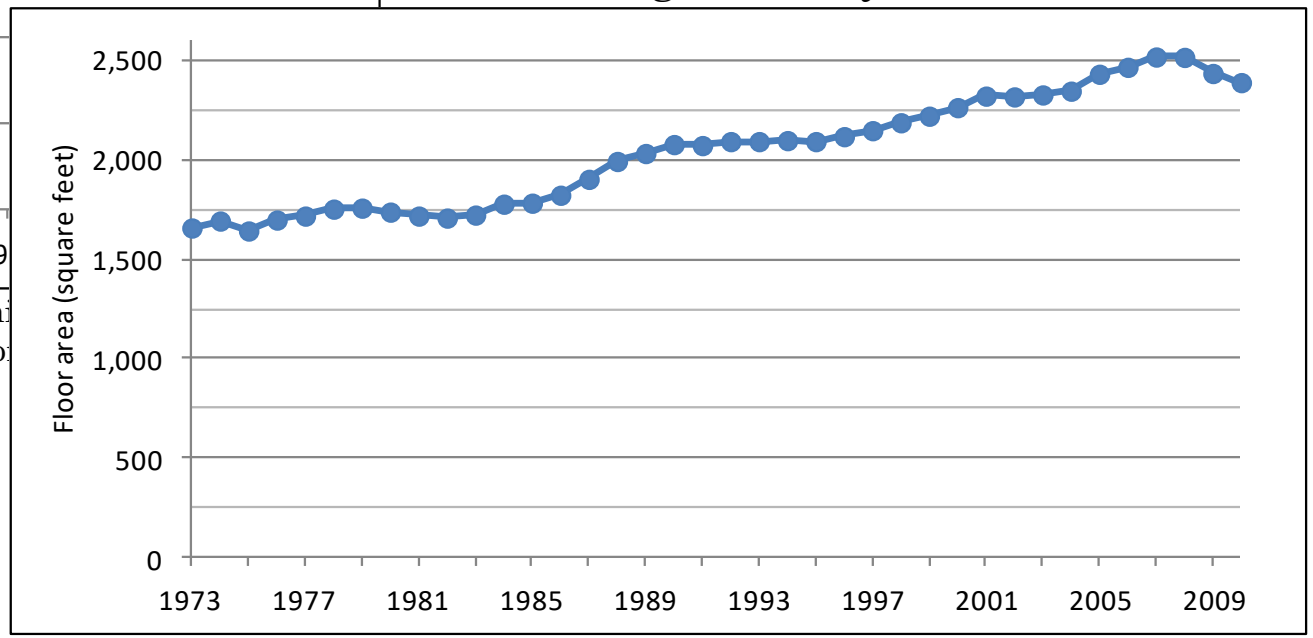
Urbanization

People Per Household



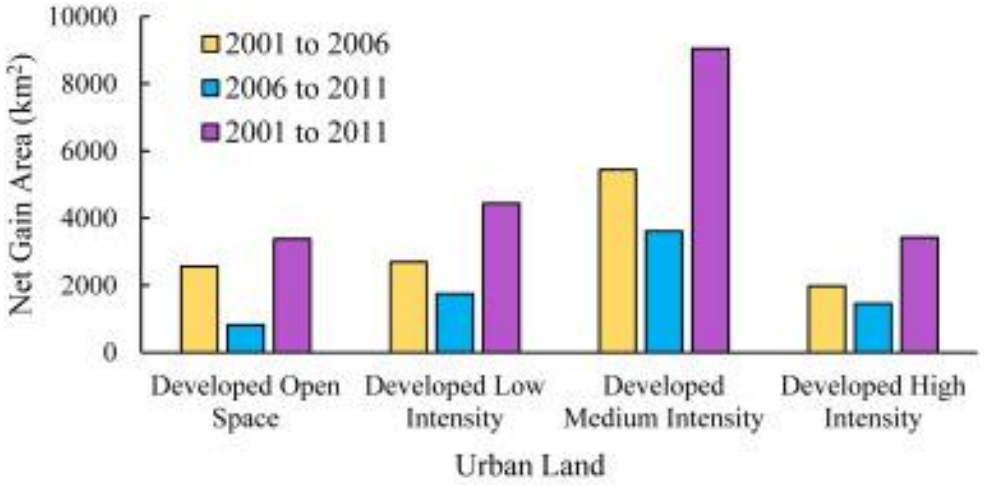
EPA. 2013. Our Built and Natural Environments: A Techni
Interactions Among Land Use, Transportation, and Enviro

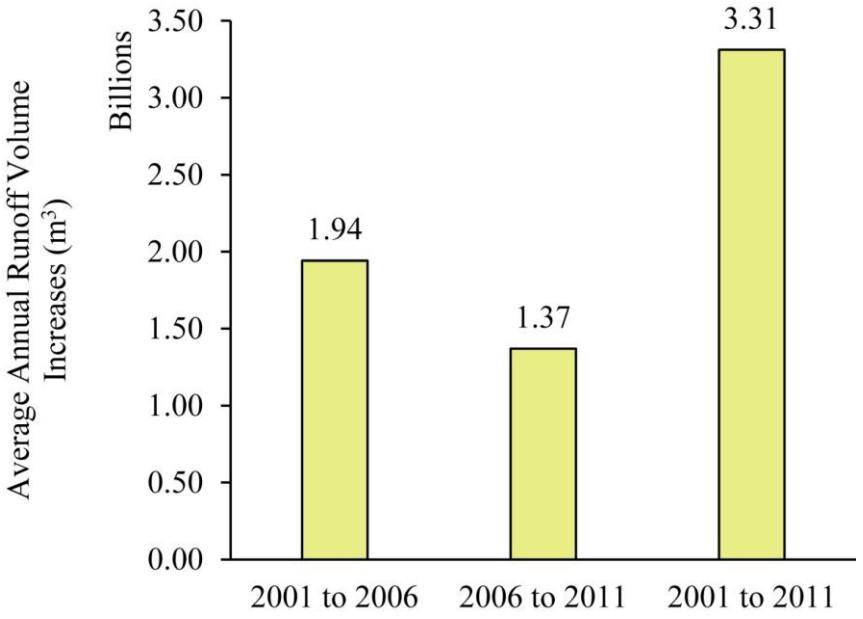
Size of Single Family Homes



EPA. 2013. Our Built and Natural Environments: A Technical Review of the Interactions Among Land Use, Transportation, and Environmental Quality.

Land Cover





Chen et al. 2016. Urbanization impacts on surface runoff of the contiguous United States. Journal of Environmental Management.

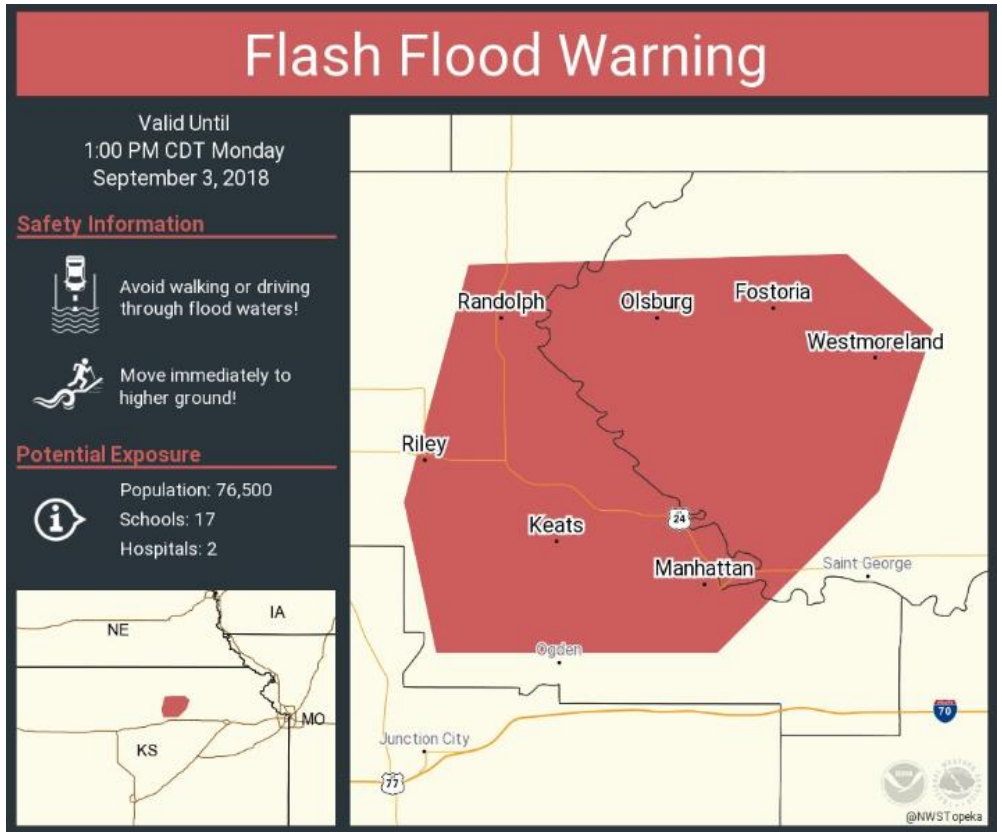
Inland Flooding in Urban Areas

- More frequent extreme precipitation events
- More people and structures in urban areas
- More impervious cover
- More runoff during storm events

→ More frequent flooding

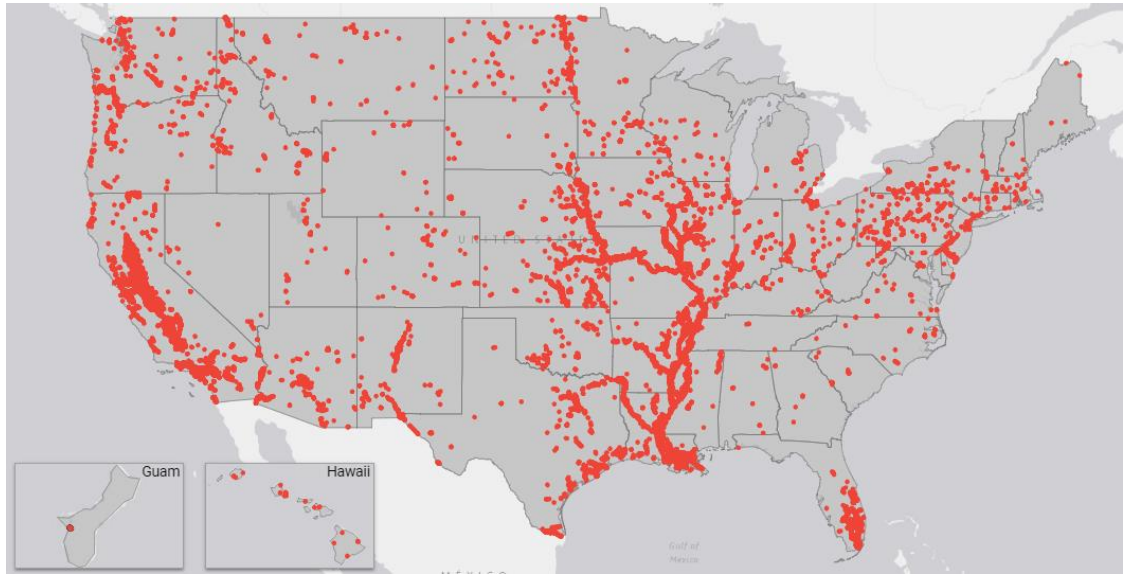
→Worse flooding

→ More impacts

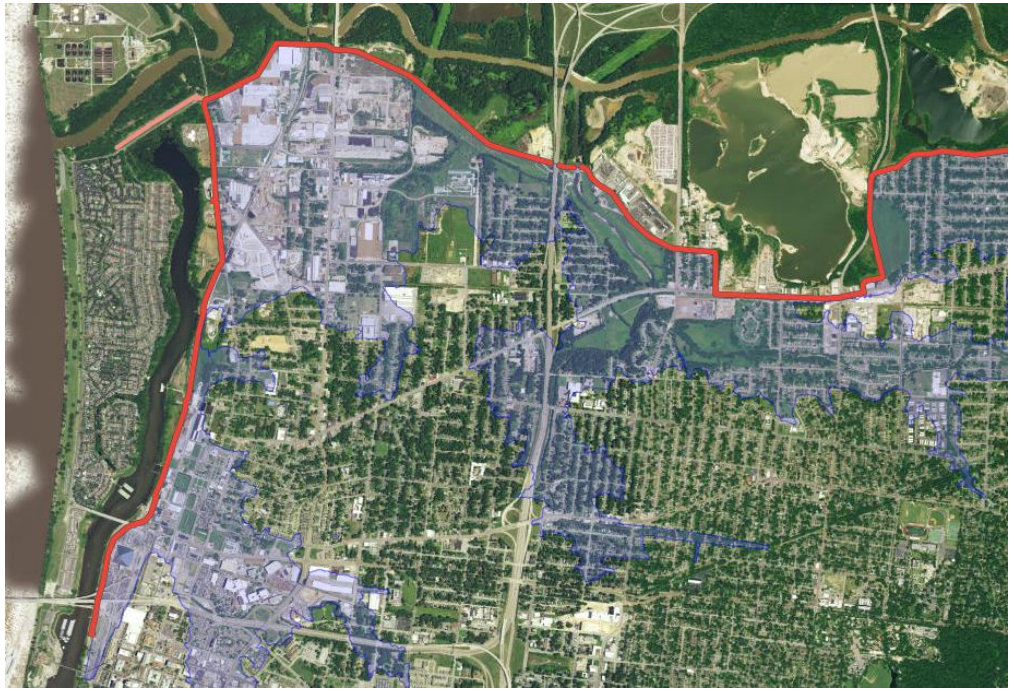


What can we do about this?

- Hard Engineering
  - Dams
  - Levees
- Gray Infrastructure
  - Stormwater management systems
    - Piping, pumping, storage tanks



https://levees.sec.usace.army.mil/#/



https://levees.sec.usace.army.mil/#/levees/system/4005000023/summary

What can we do about this?

- National Flood Insurance Program (NFIP)
  - Run by FEMA
  - Created by Congress in 1968
  - About 5 million active flood insurance policies in 2018
- FEMA - Hazard Mitigation Grant Program
  - More than $4 billion for acquiring and demolishing high flood risk homes
  - Requires matching funds of 25%

https://www.npr.org/2019/03/05/696995788/search-the-thousands-of-disaster-buyouts-fema-didnt-want-you-to-see

What can we do about this?

- Green Infrastructure
  - Green roofs
  - Permeable pavement
  - Bioswales
  - Stock ponds
  - Constructed wetlands
  - Tree planting
  - Rain barrels

http://faculty.capd.ksu.edu/lskab/KSU-LARCP_Rain-Garden-Guidebook-lrs.pdf

Living Laboratories

- Area where experimentation, monitoring, and evaluation of real-world issues are carried out in partnership with community stakeholders.
- Place to do research, pilot new ideas and technologies, train and educate

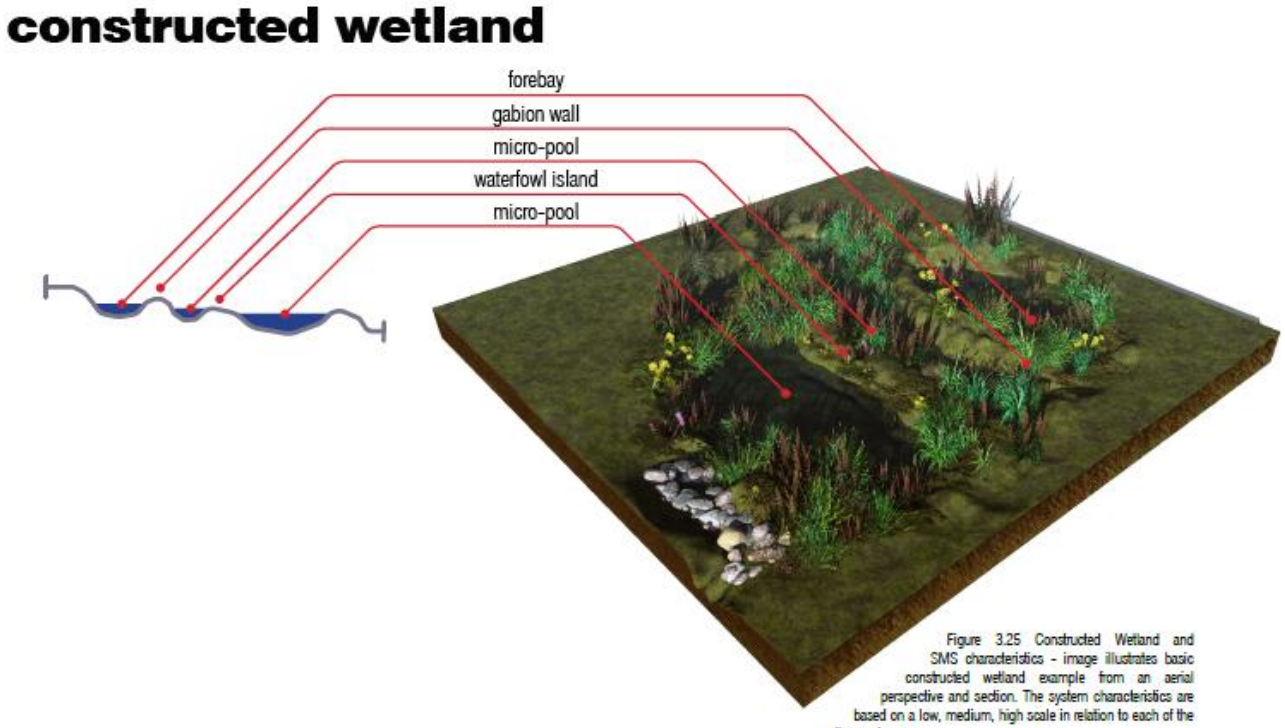


Figure 3.25 Constructed Wetland and SMS characteristics - image illustrates basic constructed wetland example from an aerial perspective and section. The system characteristics are based on a low, medium, high scale in relation to each of the other systems.

Image created by: Buffington, Jared - 2012

JARED BUFFINGTON. (2012). EVALUATING THE AESTHETIC AND AMENITY PERFORMANCE OF VEGETATED STORMWATER MANAGEMENT SYSTEMS

Why Wildcat Creek Watershed?

- Only a few true “urban” or “community” centered living labs
- Most are located in large, highly-developed cities
- Lack of representation in the Great Plains

Silver, J., & Marvin, S. (2016). The urban laboratory and emerging sites of urban experimentation.

Why Wildcat Creek Watershed?

- Engaged community
- Need for stormwater runoff solutions

https://files.kstatecollegian.com/2019/02/September-03-2018-Labor-Day-Flooding-A.S-008.jpg

What could be done?

- Design ways to increase runoff storage and infiltration
  - Construct them
  - Monitor them
  - Modify them
- Support individual actions to reduce runoff
  - Education
  - Resources
  - Monitoring
  - Quantify the benefits

What could be done?

- Teach and train
  - Fieldwork training for KSU students
  - Outreach activities for K-12
  - Service learning for K-Higher Ed
  - Citizen science

https://www.nationalgeographic.org/encyclopedia/citizen-science/

What's next?

Establish a working group of community stakeholders composed of KSU faculty/staff, residents, business owners, teachers, city and county officials, Fort Riley representatives, and community leaders.