FLASH FLOOD POTENTIAL INDEX FOR THE MOUNT HOLLY HYDROLOGIC SERVICE AREA

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- Concept developed by Greg Smith of the CBRFC (2003). Further developed by James Brewster WFO BGM (2009).
- Geographical features play an important role in flash flooding, and GIS is a tool that could display these features.
- GIS development by Joe Ceru WFO CTP.
- The work that Greg started eventually became incorporated into more recent generations of NWS Flash Flood Guidance.

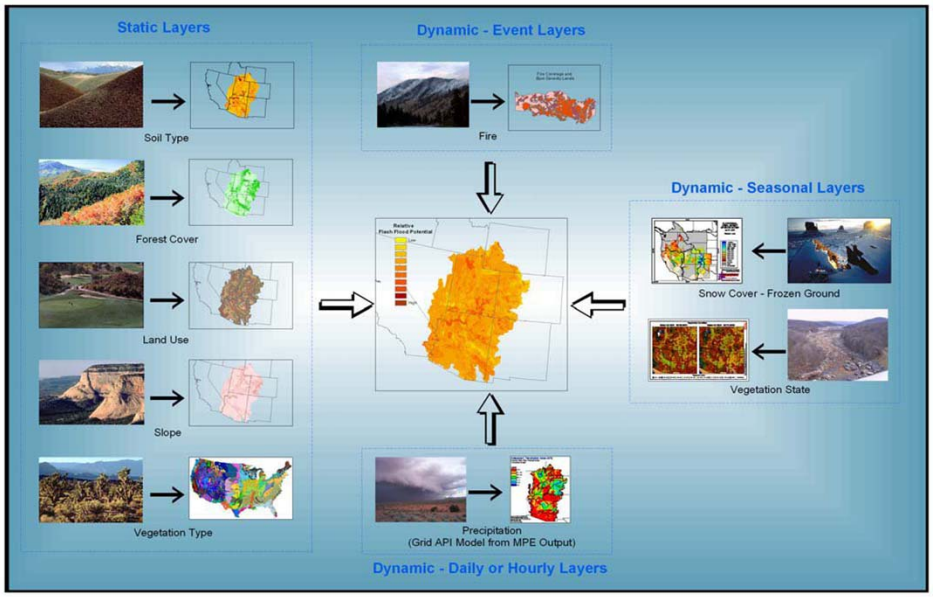
Introduction

Visualization

- Geographic features can be manipulated via GIS.
- Can assess and more importantly visualize the roles of land, vegetation, and urbanization in flash flooding.
- Bottom line – We want to know what locations are most susceptible to flash flooding.

Methodology

- Collect and develop readily available geographic data sets.
- Use GIS technology to resample and reclassify (index) each data set.
  - 10 high threat, 1 low threat
- Mathematically develop a new geographic index grid…the FFPI
- FFPI = (1.5*Slope+LC/LU+Forest+Soil)/N



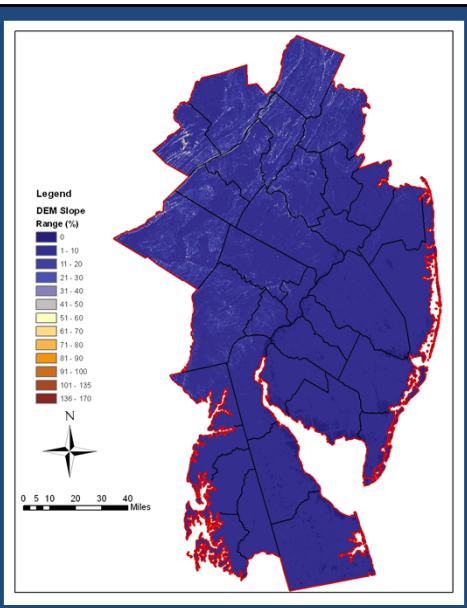
Data Schematic

- The four geographic sets used were…
  - Slope derived from the USGS DEM(%)
    - Digital Elevation Model
  - MLRC Land Use/Land Cover (category)
    - Multi-Resolution Land Characteristics Consortium
  - AVHRR Forest Density (%)
    - Advanced Very-High Resolution Radiometer
  - STATSGO Soil Type Classification (category)
    - State Soil Geographic Database
- Resampled to 30m resolution
- Projected to Albers Equal Area (distortion)
- Reclassified to a standard index (1-10)

Data

Slope

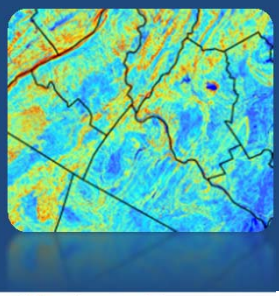
- Derived from the USGS Digital Elevation Model (DEM
- Expressed as a percent.
- 30 meter resolution

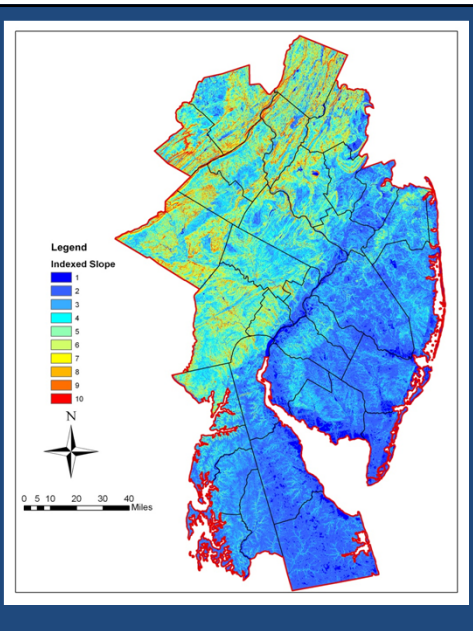


Slope Index

Class	FFPI Index
3%	1
6%	2
9%	3
12%	4
15%	5
18%	6
21%	7
24%	8
27%	9
30% and above	10

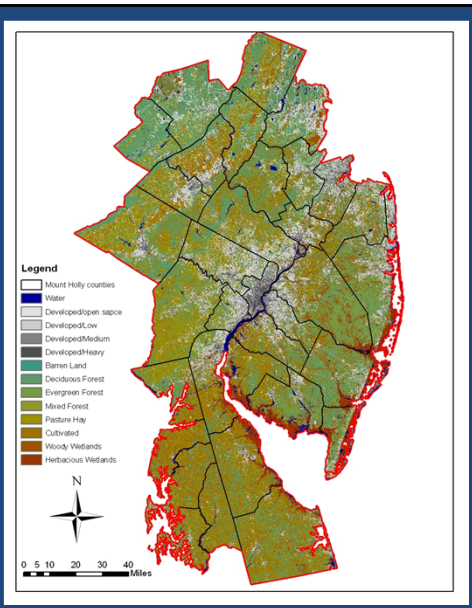
- No slope is given a low potential.
- 30% or higher is given a high potential.





Land Cover / Land Use

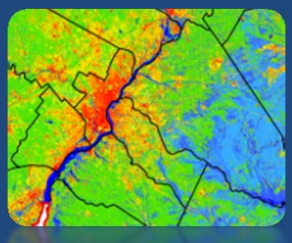
- Grid is a numbered/category classification system
- Gray shades equate to urban class - high potential
- Oranges are wetlands

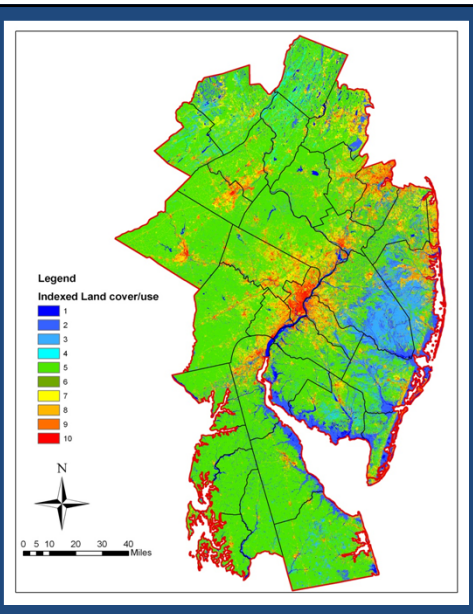


Indexed Land Cover / Land Use

Class	FFPI Index
11 – Water	1
21 – Developed/Open space	7
22 - Developed/Low	8
23 - Developed/Medium	9
24 – Developed/Heavy	10
31 - Barren Land	8
41 - Deciduous Forest	5
42 - Evergreen Forest	3
43 - Mixed Forest	4
52 - Shrub/Scrub	6
71 - Grass	6
81 - Pasture Hay	5
82 - Cultivated	5
90 - Woody Wetlands	2
95 - Herbaceous Wetlands	2

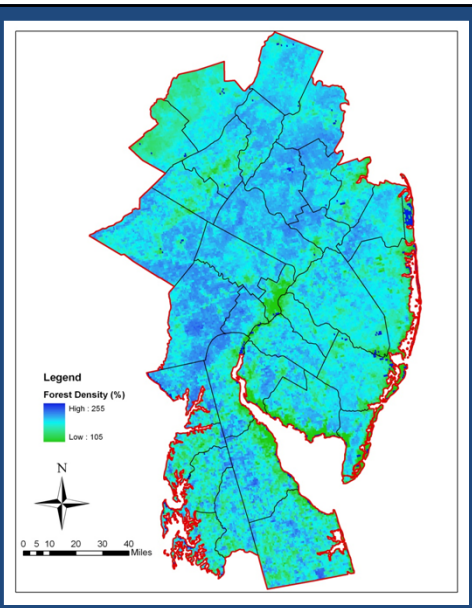
- Indexing ranked low potential (wetlands/water) as 1-2
- Urban areas 8-10





Forest Density

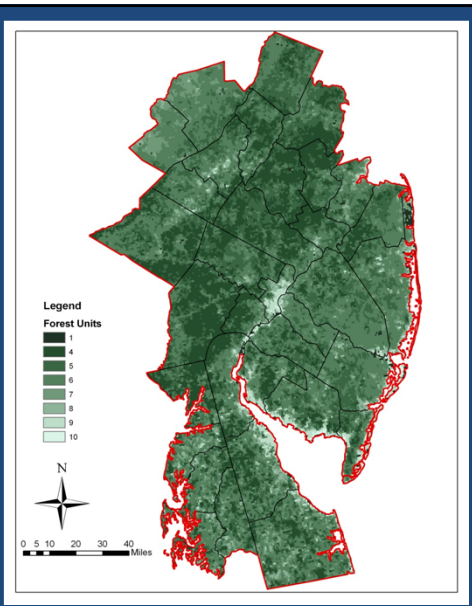
- Expressed as percent cover.
- Most dense west of the I-95 corridor.
- Least dense across the sandy coastal plain and Pocono Plateau.



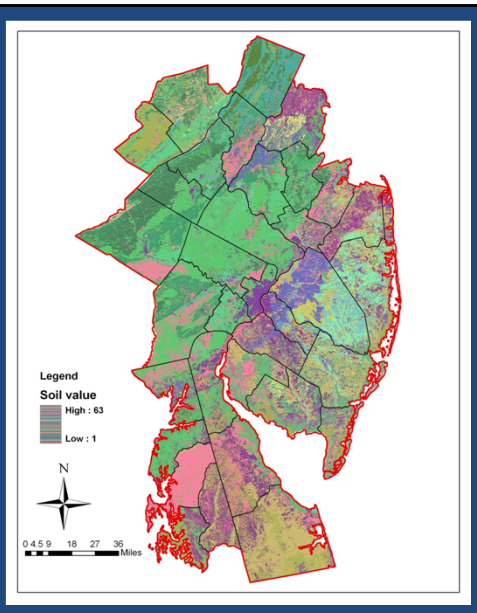
Indexed Forest Density

_Class	FFPI Index
0 – 9%	10
10 – 19%	9
20 - 29%	8
30 – 39%	7
40 – 49%	6
50 – 59%	5
60 – 69%	4
70 – 79%	3
80 – 89%	2
90 – 100%	1

- Index is a reverse of percent cover.
- High density is given low potential.
- Low density is given high potential index.



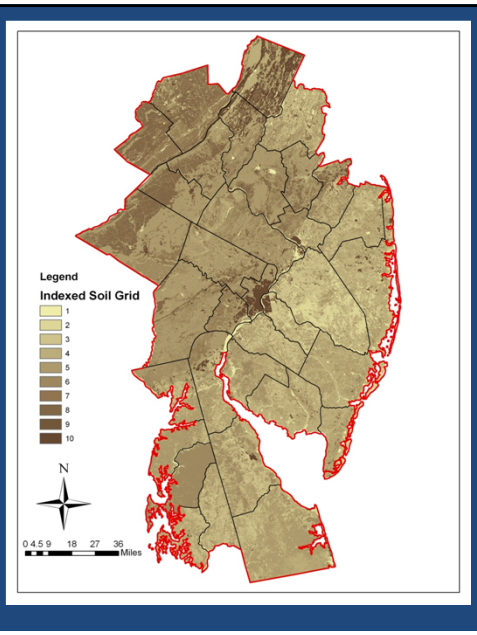
- Grid is a numbered/category classification system.
- 63 different soil types, reclassified into 15 general types.



Soil Class

Class	FFPI Index
1 – Sand	2
2 – Loamy Sand	4
3 – Sandy Loam	3
4 – Silty Loam	4
5 – Silt	5 (4)
6 – Loam	6
7 – Sandy Clay Loam	7
8 – Silty Clay Loam	7
9 – Clay Loam	8
10 – Sandy Clay	8
11 – Silty Clay	8
12 – Clay	9
13 – Organic Matter	5
14 – Water	1
15 – Bedrock/Impervious	10

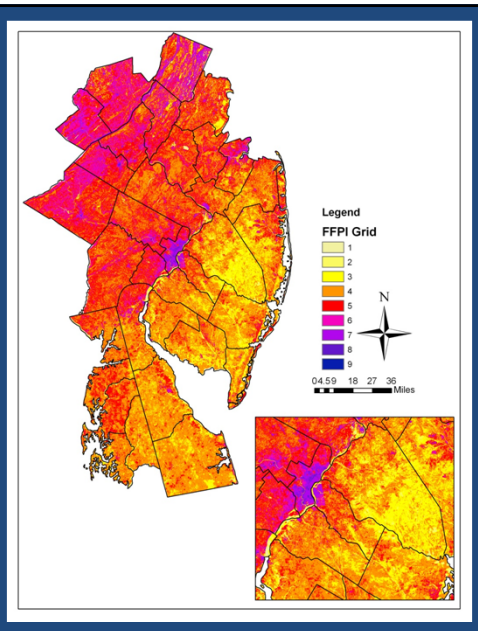
- Lower numbers more sand.
- Higher numbers more clay, bedrock, or impervious.



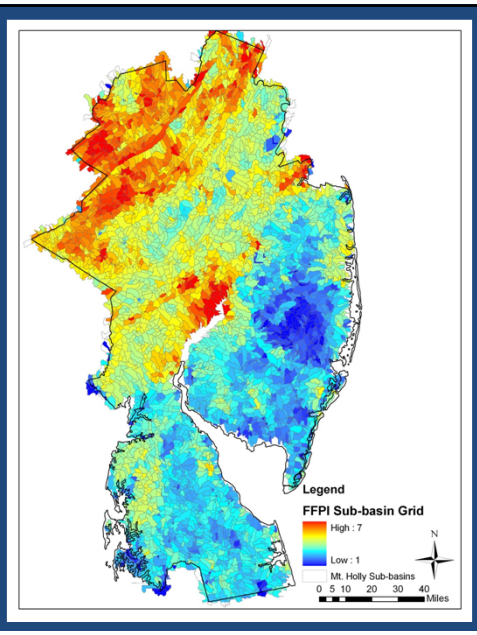
Indexed Soil Class

- Chose not to weight any single value, unlike original project
- Layer data
- FFPI = (Slope + LC/LU + Forest + Soil)/N
  - FFPI = 7 + 4 + 5 + 4 = 20
  - FFPI = 20/4 = 5
- Hydrologic Service Area includes both slope and impervious surface
- One more important than the other?
- Zonally averaged

Methodology Review

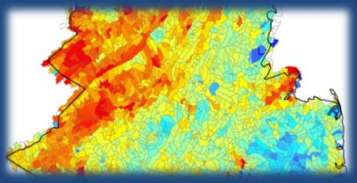


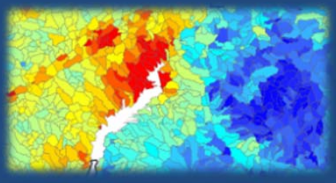
Flash Flood Potential Index Grid



Flash Flood Potential Index (FFPI)

- Results are qualitative
- Simply verifies previous experience
- New areas discovered
- Points to a specific driver





Conclusions

Future Work

- Other field offices
- Susquehanna River Basin Commission
- Temple University's Center for Sustainable Communities – stormwater management
- Verification
- Can it be made into a quantitative product (could flood vs. will flood)?
- Additional layers such as critical facilities