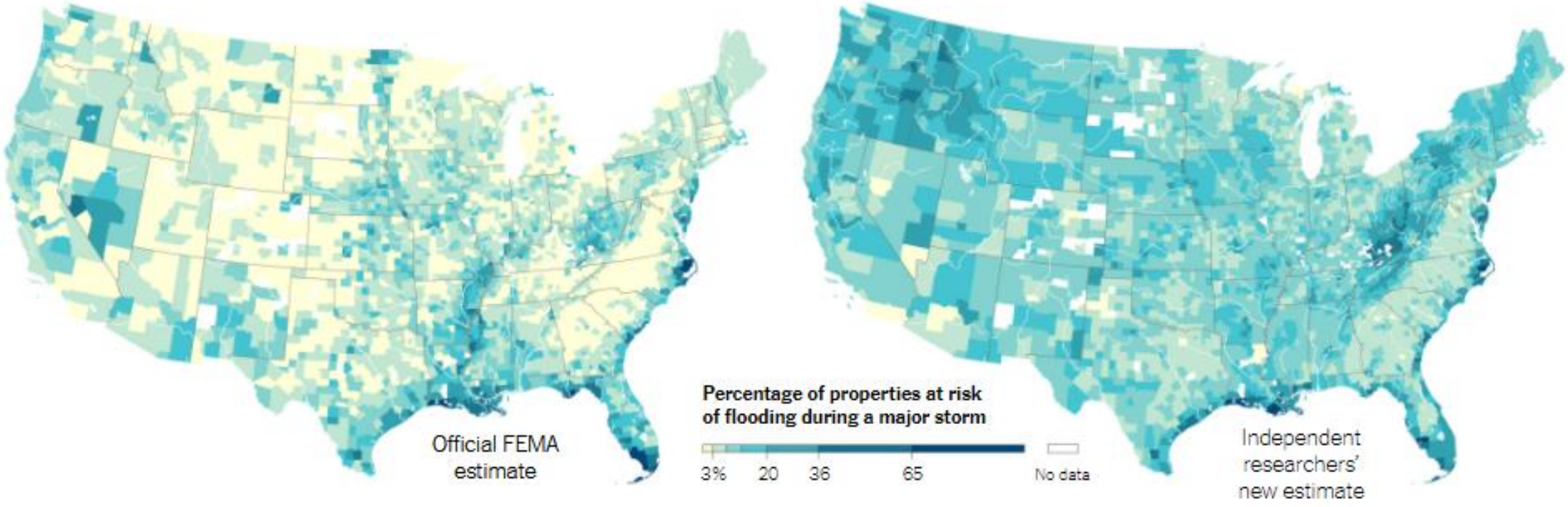
Floodplain Management

- FEMA Flood Insurance Program
  - Flood Insurance Rate Maps (FIRM)
  - Minimum floodplain management requirements for insurance purposes
- State Regulations
- Local Ordinances
  - Floodplain Management
  - Zoning/ Land Use/ Land Management



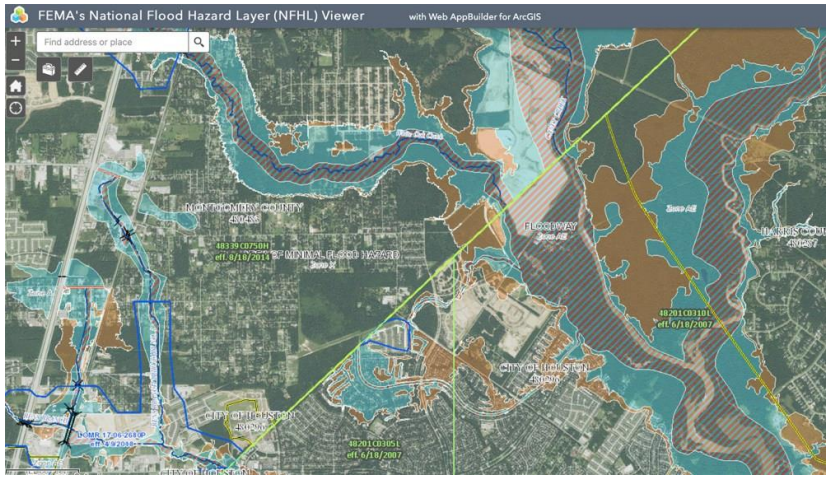
Source: First Street Foundation

FEMA Flood Maps

- Risk often underestimated
- Costly to keep up to date
- Not always best science but rather affordable science
- Don't account for flooding from intense rainfall
- Don't cover smaller watersheds
- Used for flood insurance and can't map future conditions
- Average map age is ~18 years old

Flood Mapping Process

- Hydrologic Study
  - Regression equations based on stream gage data (statistical)
  - Computer model to convert rainfall to runoff (deterministic)
    - Primarily based on rainfall, soils, and land use
- Hydraulic Study
  - Computer model to determine flood elevations
    - Uses topographic data, hydraulic structure data, land use, and flow data
- Mapping
  - Uses flood and ground surface elevation data to delineate floodplain limits



Community Floodplain Management Responsibilities

National Flood Insurance Program (FEMA)

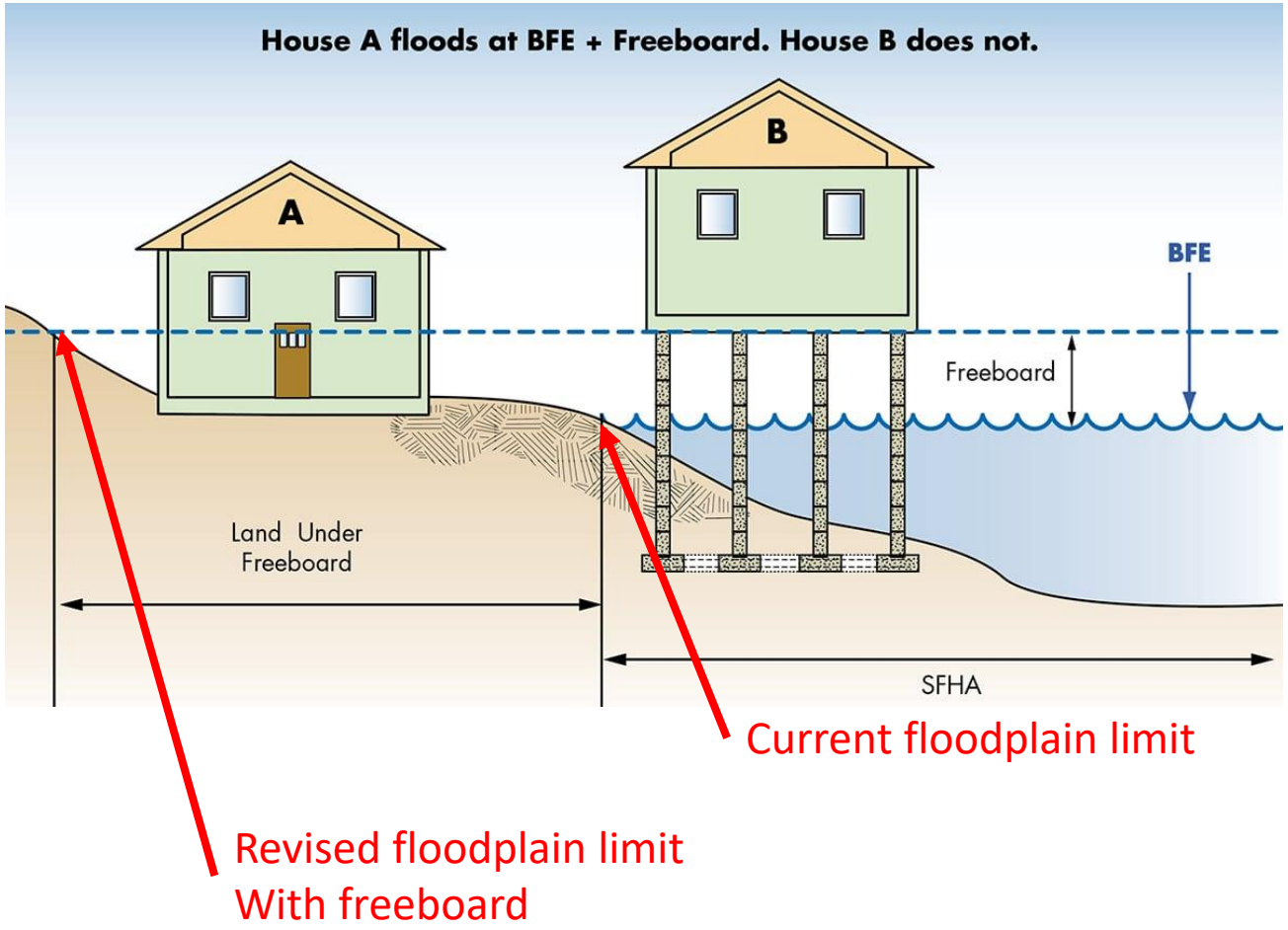
- Regulate development in FEMA mapped flood hazard areas
- Adhere to FEMA's minimum standards
- Review development proposals to ensure compliance with FEMA

Local Development

- Review development proposals to ensure compliance with local ordinances
- Issue/ deny permits for floodplain development
- Can enforce stricter requirements than FEMA
- Responsible development and flood resiliency is obligation of the community – not FEMA

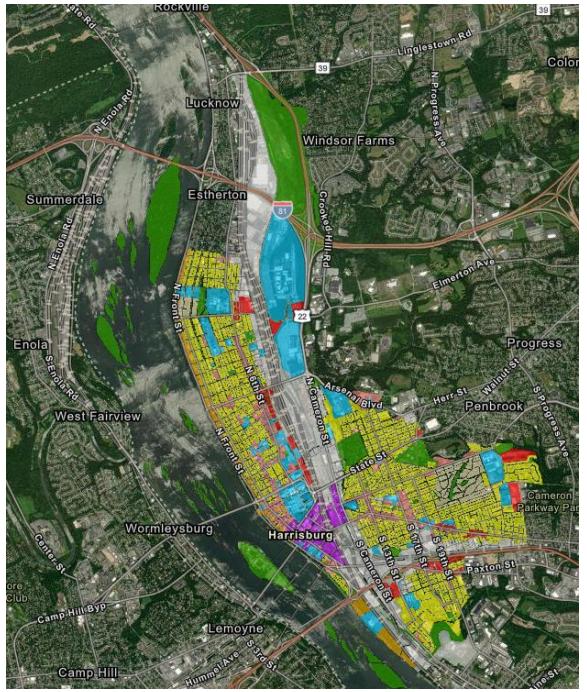
Opportunities for Communities to Increase Flood Resiliency

- Freeboard (vertical only)
  - Require new development to build a specified height above the flood elevation
- Mapping freeboard (vertical and horizontal)
  - Require new development to build outside of “future” floodplain



More Opportunities for Communities to Increase Flood Resiliency

- Runoff Predictions from Future Land Use
  - Use Zoning Maps to assume full build-out conditions
  - Prepare H/H models to develop flow rates and flood delineations
  - Many recent FEMA models include this data, although current day land use is used for flood insurance maps
- Future Rainfall Predictions
  - Current Rainfall plus 10% (Virginia Beach)
  - Projected Future Rainfall Statistics (Chesapeake Bay Program)
  - Both require updated Hydrologic/ Hydraulic models and mapping to identify risk
- Combination of both?
  - How conservative should we be?



Another Opportunity for Communities to Increase Flood Resiliency

- "Design" Storm
  - Storm Duration not often talked about
  - Hurricane (~24-48 hrs) vs thunderstorm (~1-6 hrs)

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.344** (0.312-0.378)	**0.411** (0.373-0.453)	**0.490** (0.443-0.540)	**0.547** (0.494-0.602)	**0.618** (0.554-0.681)	**0.670** (0.599-0.740)	**0.7**22 (0.643-0.800)	**0.772** (0.683-0.858)	**0.833** (0.729-0.932)	**0.881** (0.765-0.992)
10-min	**0.549** (0.499-0.604)	**0.658** (0.596-0.724)	**0.784** (0.710-0.864)	**0.874** (0.790-0.963)	**0.985** (0.884-1.09)	**1.07** (0.955-1.18)	**1.**5 (1.02-1.27)	**1.22** (1.08-1.36)	**1.32** (1.15-1.48)	**1.39** (1.21-1.56)
15-min	**0.686** (0.624-0.755)	**0.827** (0.750-0.911)	**0.992** (0.898-1.09)	**1.11** (1.00-1.22)	**1.25** (1.12-1.38)	**1.35** (1.21-1.49)	**1.**5 (1.29-1.61)	**1.54** (1.37-1.72)	**1.66** (1.45-1.86)	**1.74** (1.51-1.96)
30-min	**0.941** (0.855-1.03)	**1.14** (1.03-1.26)	**1.41** (1.28-1.55)	**1.60** (1.45-1.77)	**1.85** (1.66-2.04)	**2.04** (1.82-2.25)	**2.**2 (1.98-2.46)	**2.40** (2.13-2.67)	**2.64** (2.31-2.95)	**2.82** (2.45-3.18)
60-min	**1.17** (1.07-1.29)	**1.43** (1.30-1.58)	**1.81** (1.64-1.99)	**2.09** (1.89-2.30)	**2.46** (2.21-2.71)	**2.76** (2.47-3.05)	**3.**6 (2.72-3.39)	**3.37** (2.98-3.75)	**3.79** (3.31-4.24)	**4.12** (3.58-4.64)
2-hr	**1.40** (1.27-1.55)	**1.70** (1.55-1.88)	**2.16** (1.95-2.38)	**2.51** (2.26-2.76)	**3.00** (2.69-3.30)	**3.40** (3.03-3.75)	**3.**2 (3.38-4.22)	**4.25** (3.74-4.72)	**4.87** (4.23-5.45)	**5.37** (4.62-6.04)
3-hr	**1.51** (1.37-1.67)	**1.84** (1.66-2.03)	**2.33** (2.11-2.57)	**2.72** (2.45-3.00)	**3.27** (2.93-3.61)	**3.73** (3.32-4.12)	**4.**1 (3.72-4.66)	**4.72** (4.13-5.25)	**5.45** (4.70-6.10)	**6.05** (5.15-6.81)
6-hr	**1.86** (1.70-2.05)	**2.25** (2.05-2.48)	**2.84** (2.58-3.13)	**3.33** (3.01-3.67)	**4.05** (3.63-4.46)	**4.66** (4.14-5.14)	**5.**3 (4.69-5.89)	**6.05** (5.25-6.71)	**7.10** (6.07-7.95)	**8.00** (6.73-9.01)
12-hr	**2.25** (2.04-2.52)	**2.72** (2.46-3.04)	**3.46** (3.12-3.87)	**4.10** (3.67-4.57)	**5.07** (4.49-5.64)	**5.92** (5.19-6.59)	**6.**7 (5.94-7.67)	**7.92** (6.76-8.88)	**9.54** (7.94-10.8)	**10.9** (8.93-12.4)
24-hr	**2.62** (2.40-2.89)	**3.17** (2.90-3.50)	**4.08** (3.73-4.50)	**4.88** (4.44-5.36)	**6.10** (5.51-6.67)	**7.19** (6.44-7.83)	**8.41** (7.47-9.14)	**9.80** (8.60-10.6)	**11.9** (10.3-12.9)	**13.8** (11.8-14.9)

Anne Arundel County, MD
07/04/2019 Storm:

2" rainfall in 3 hours produced similar discharge to 100-year, 24-hour "design" storm

FEMA Community Rating System Incentives

- Voluntary incentive program that rewards community floodplain management practices that exceed FEMA's minimum requirements
- Flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community's efforts
- Three goals:
  1. Reduce and avoid flood damage to insurable property
  2. Strengthen and support the insurance aspects of the National Flood Insurance Program
  3. Foster comprehensive floodplain management

More proactive flood risk reduction efforts

=

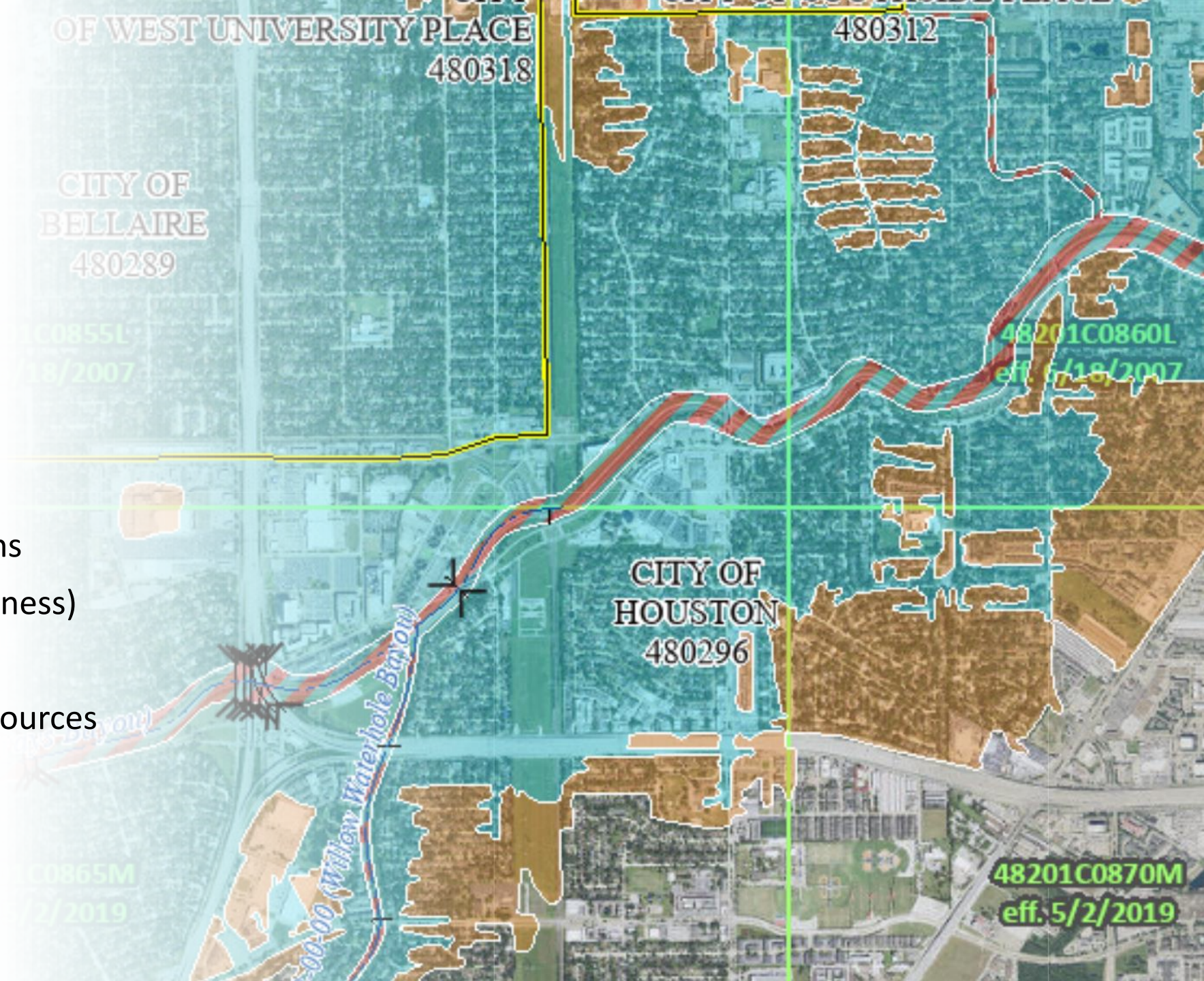
Lower flood insurance premiums

Table 110-1. CRS classes, credit points, and premium discounts.

CRS Class	Credit Points (cT)	Premium Reduction	
		In SFHA	Outside SFHA
1	4,500+	45%	10%
2	4,000–4,499	40%	10%
3	3,500–3,999	35%	10%
4	3,000–3,499	30%	10%
5	2,500–2,999	25%	10%
6	2,000–2,499	20%	10%
7	1,500–1,999	15%	5%
8	1,000–1,499	10%	5%
9	500–999	5%	5%
10	0–499	0	0

Floodplain Management Challenges

- Existing Development
- Existing Infrastructure
- Unidentified Hazards
- Loss of Natural Floodplains
- Urbanization (Imperviousness)
- Inadequate SWM
- Lack of local technical resources



Good Floodplain Management Resource

- Association of State Floodplain Managers
  - Training, Conferences, Research, Education, Outreach, Policy, Advocacy, etc.
  - Certified Floodplain Manager (CFM) certification program
  - www.floods.org
  - State Chapters organize conferences, webinars, and other activities

ASSOCIATION OF STATE FLOODPLAIN MANAGERS

VFMA

PAFPM

MARYLAND ASSOCIATION OF FLOODPLAIN & STORMWATER MANAGERS
MAFSM