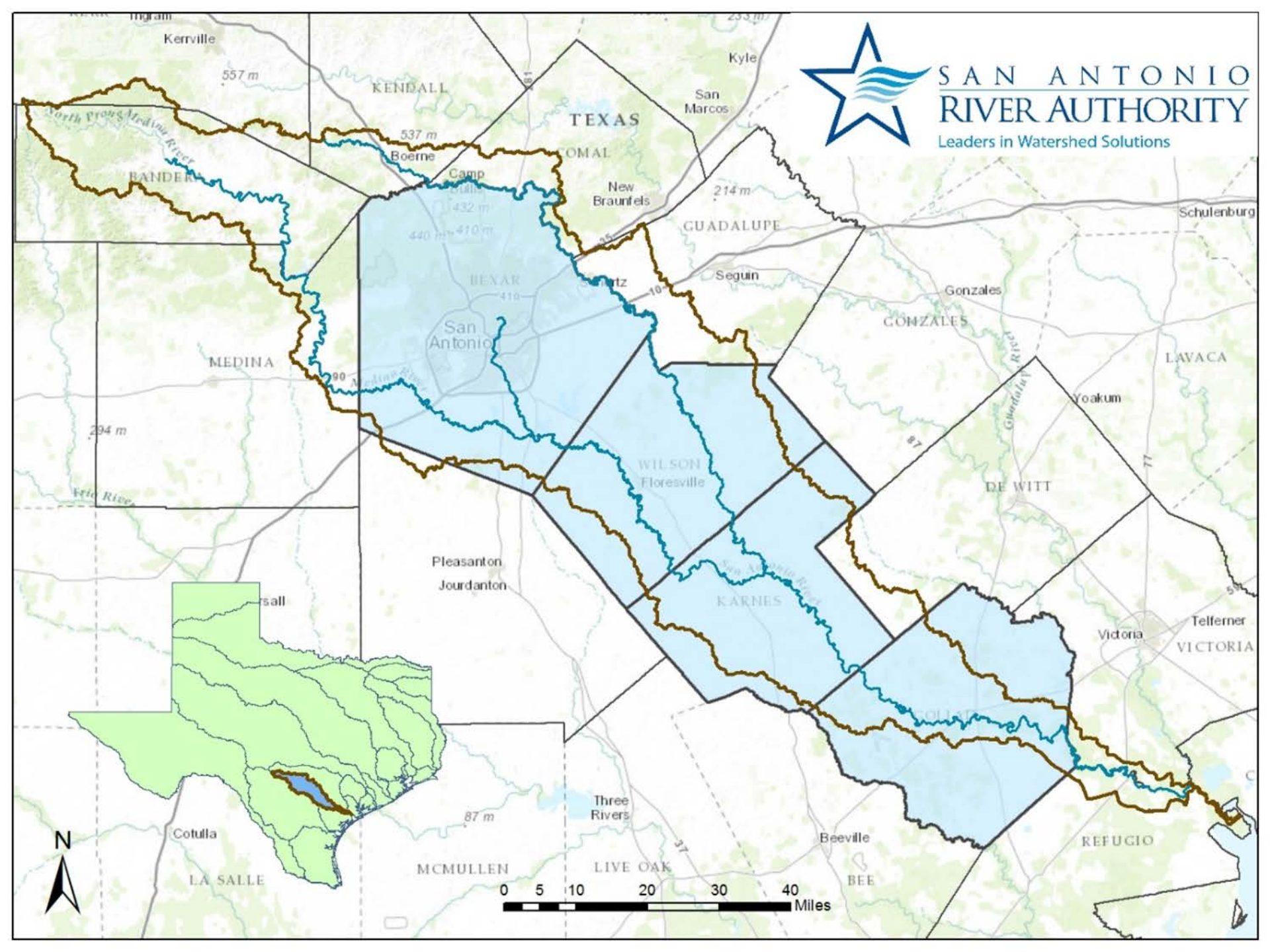
SAN ANTONIO RIVER AUTHORITY

Leaders in Watershed Solutions

Assessing & Visualizing Watershed Risk

July 9, 2017


SAN ANTONIO
RIVER AUTHORITY
Leaders in Watershed Solutions
Kerrville
Kyle
San Marcos
KENDALL
TEXAS
Boerne
Camp
New Braunfels
GUADALUPE
Schulenburg
BANDERA
BEXAR
San Antonio
Seguin
Gonzales
GONZALES
MEDINA
LAVACA
Yoakum
WILSON
Floresville
DE WITT
Pleasanton
Jourdanton
KARNES
Telferner
Victoria
VICTORIA
Cotulla
Three Rivers
Beeville
REFUGIO
LA SALLE
MCMULLEN
LIVE OAK
BEE
N
0 5 10 20 30 40
Miles

San Antonio River Authority

- **Vision**: Inspiring Actions for Healthy Creeks & Rivers
- **Mission**: Protect and enhance our creeks and rivers through service, leadership and expertise.

Agency Goals

- Reduce **flood** risk
- Improve **stormwater** mgmt. and reduce runoff, using an LID approach
- Improve **water quality**
- Increase **nature-based recreation** and encourage watershed **stewardship**
- Protect, restore and/or improve natural watershed ecological **functions**

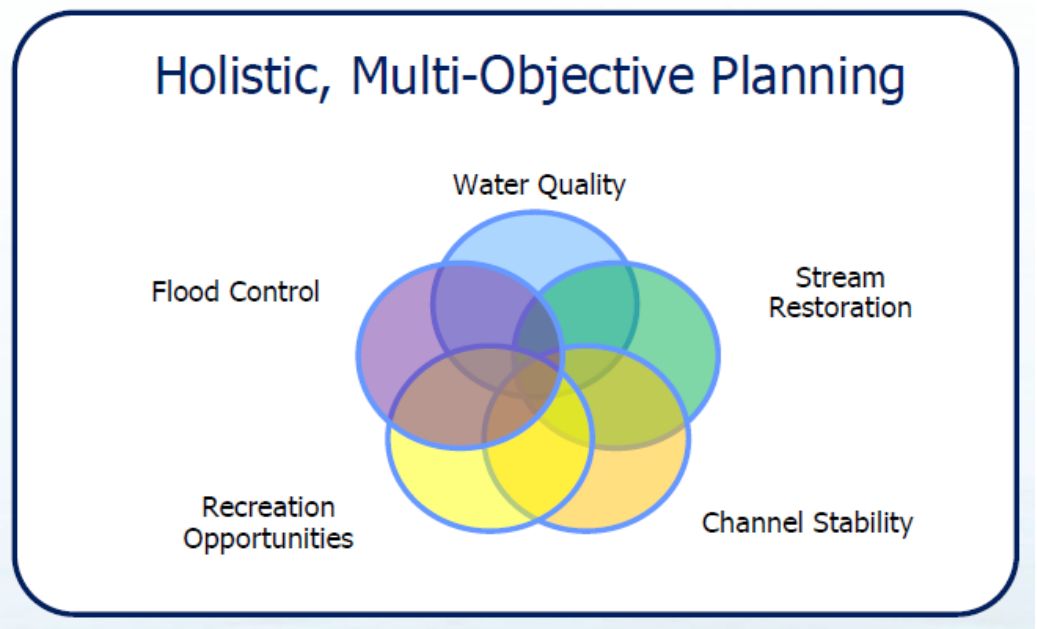
Partners & Stakeholders

TEXAS COMMISSION
ON ENVIRONMENTAL QUALITY

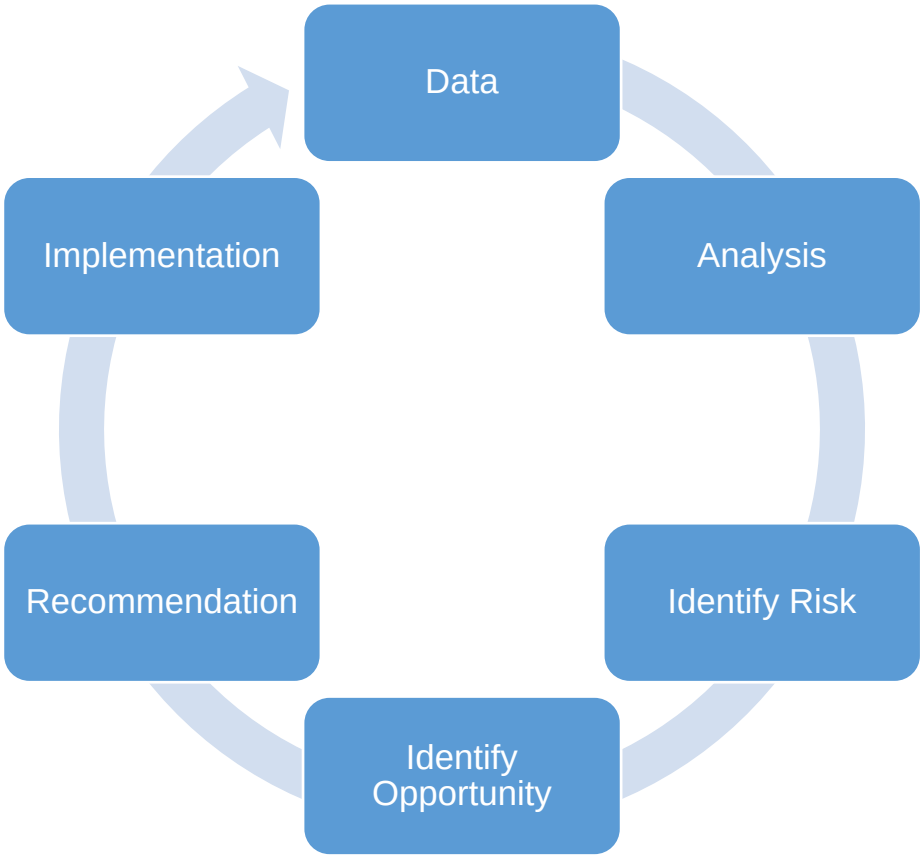
US Army Corps
of Engineers®

Assessment Goals

- Identify & prioritize target areas for holistic watershed improvement activities

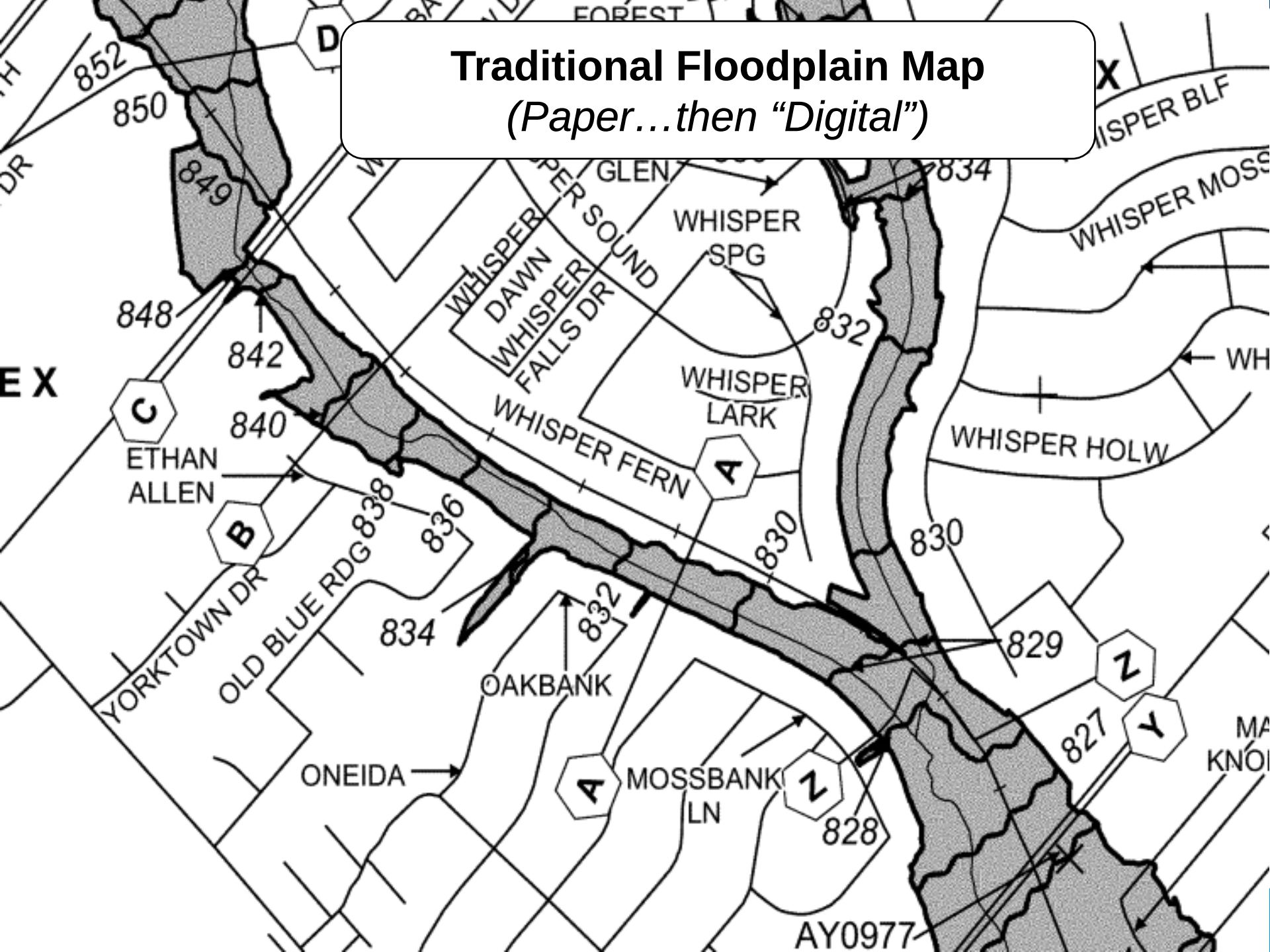


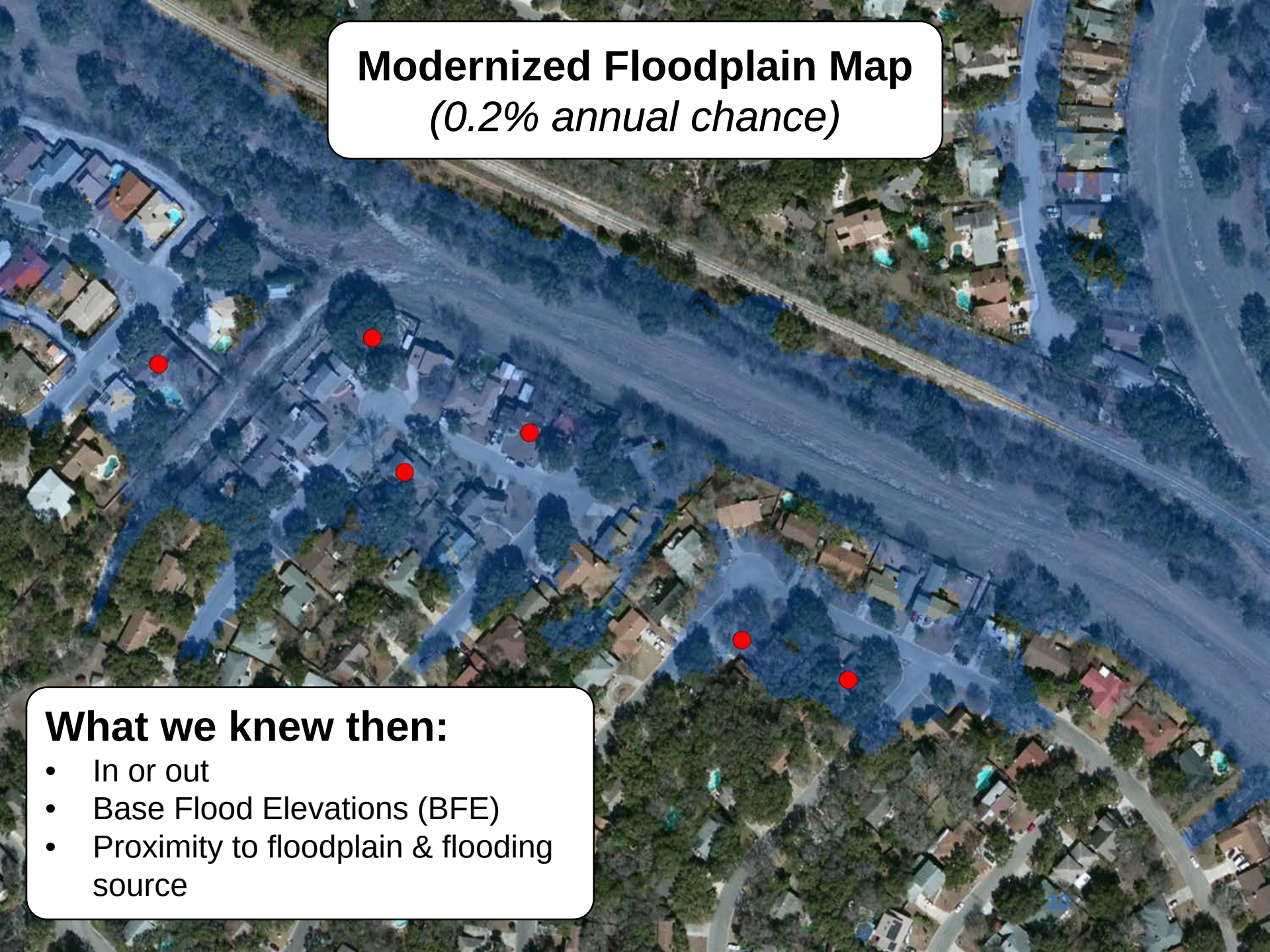
Workflow

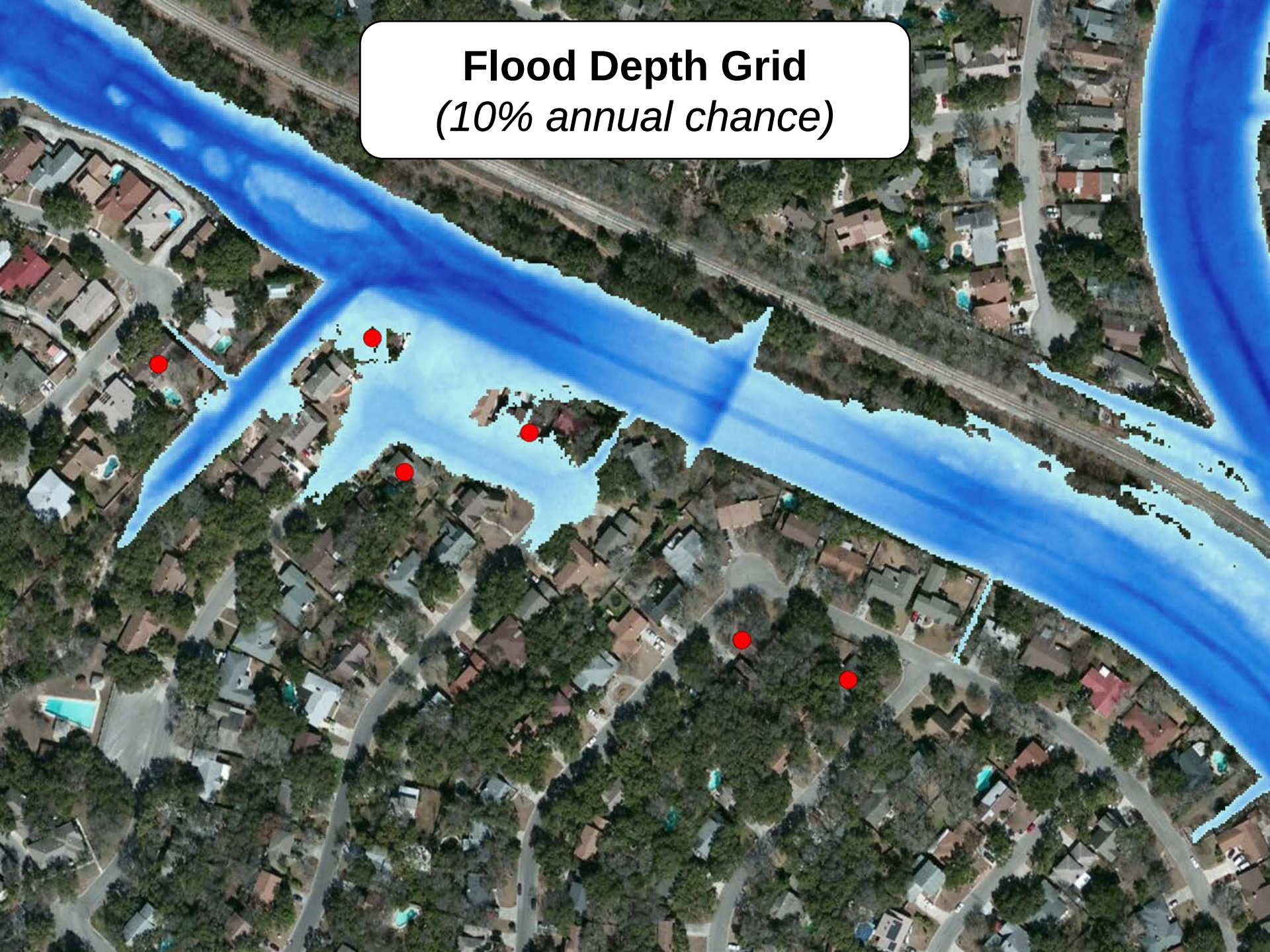

Data
Analysis
Identify Risk
Identify Opportunity
Recommendation
Implementation

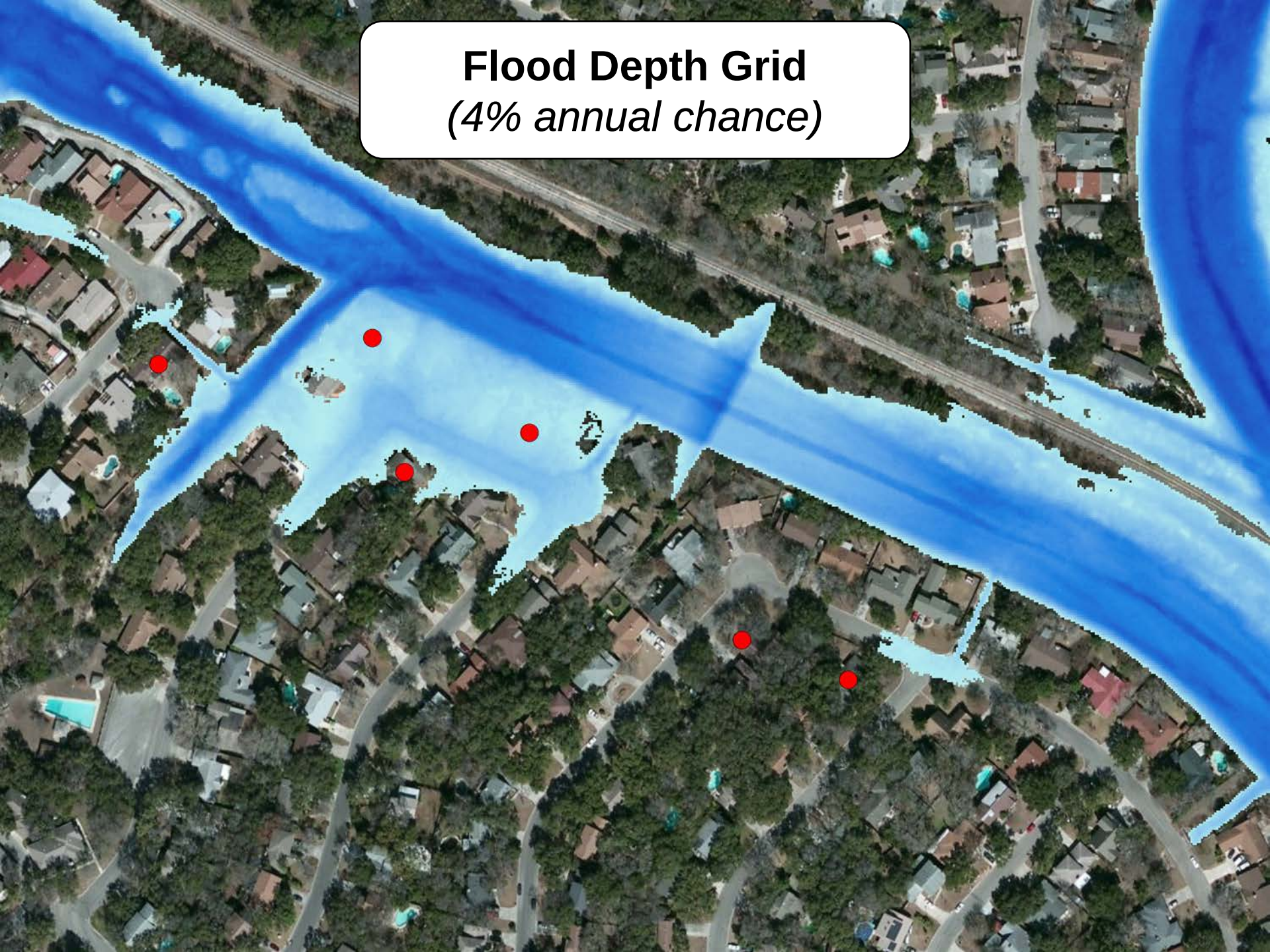
Flood Mitigation as the Catalyst

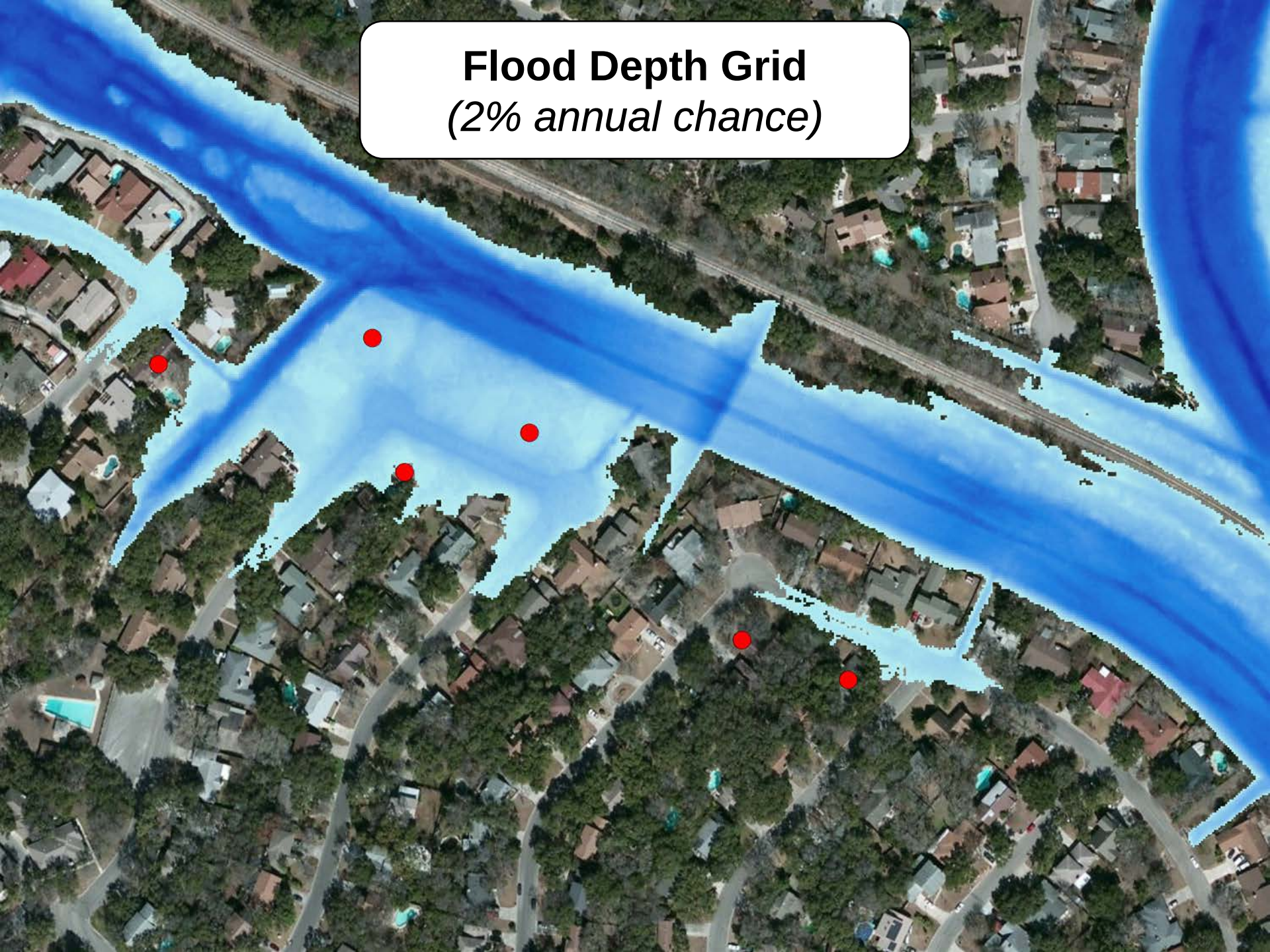
- Visible issue
- Endangers life and property
- Mitigation is a core function of local government
- Availability of funding
- Solutions vary in size
- **Risk MAP's** – Flood Risk Products

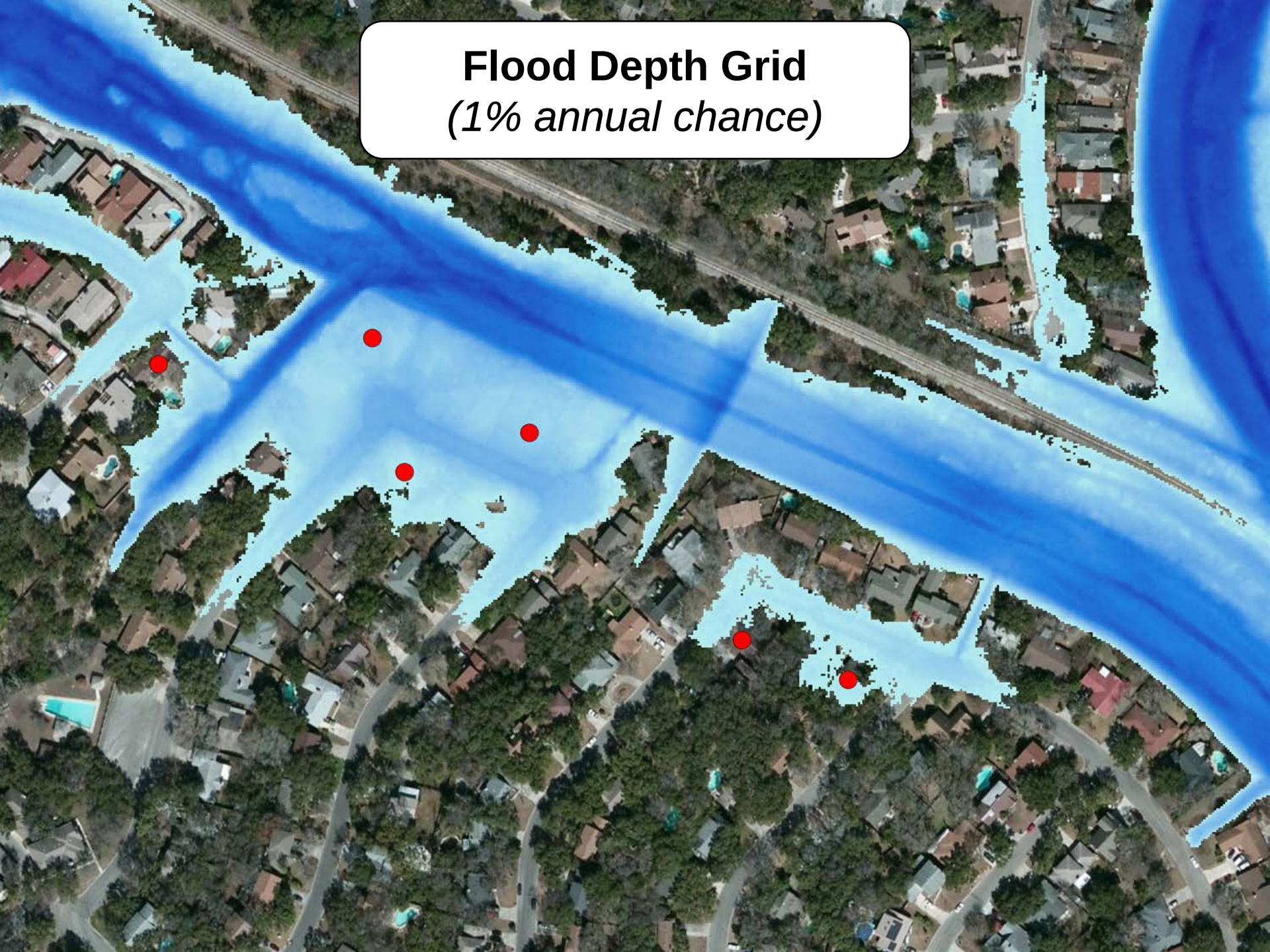

Traditional Floodplain Map
(Paper…then "Digital")
852
850
849
848
842
840
838
836
834
832
830
829
828
827
GLEN
WHISPER SPG
WHISPER DAWN
WHISPER FALLS DR
WHISPER SOUND
WHISPER LARK
WHISPER FERN
WHISPER HOLW
WHISPER BLF
ETHAN ALLEN
YORKTOWN DR
OLD BLUE RDG
OAKBANK
ONEIDA
MOSSBANK LN
AY0977
A
B
C
D
Z
Y

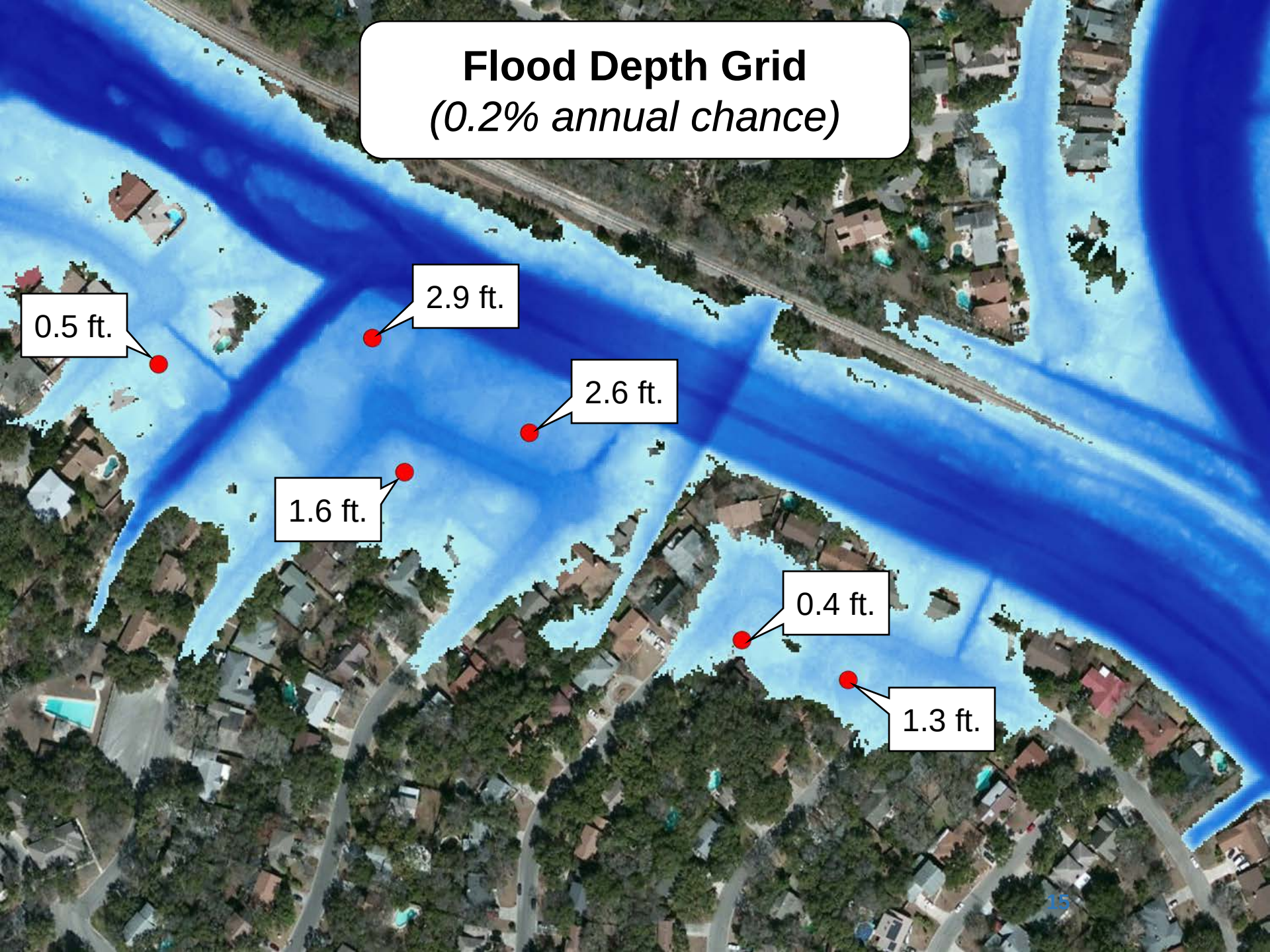

Modernized Floodplain Map
(0.2% annual chance)
What we knew then:
• In or out
• Base Flood Elevations (BFE)
• Proximity to floodplain & flooding source

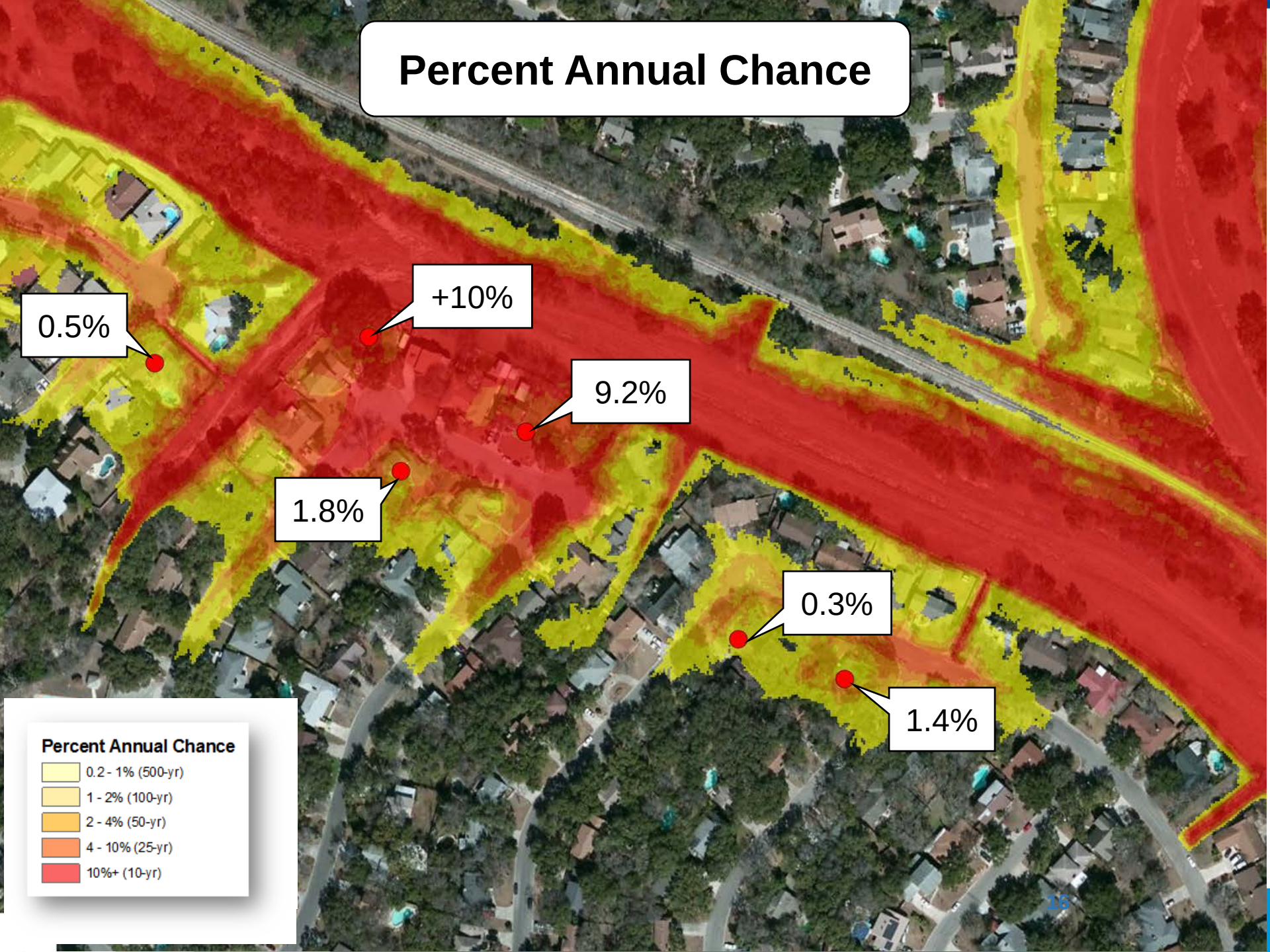

Flood Depth Grid
(10% annual chance)

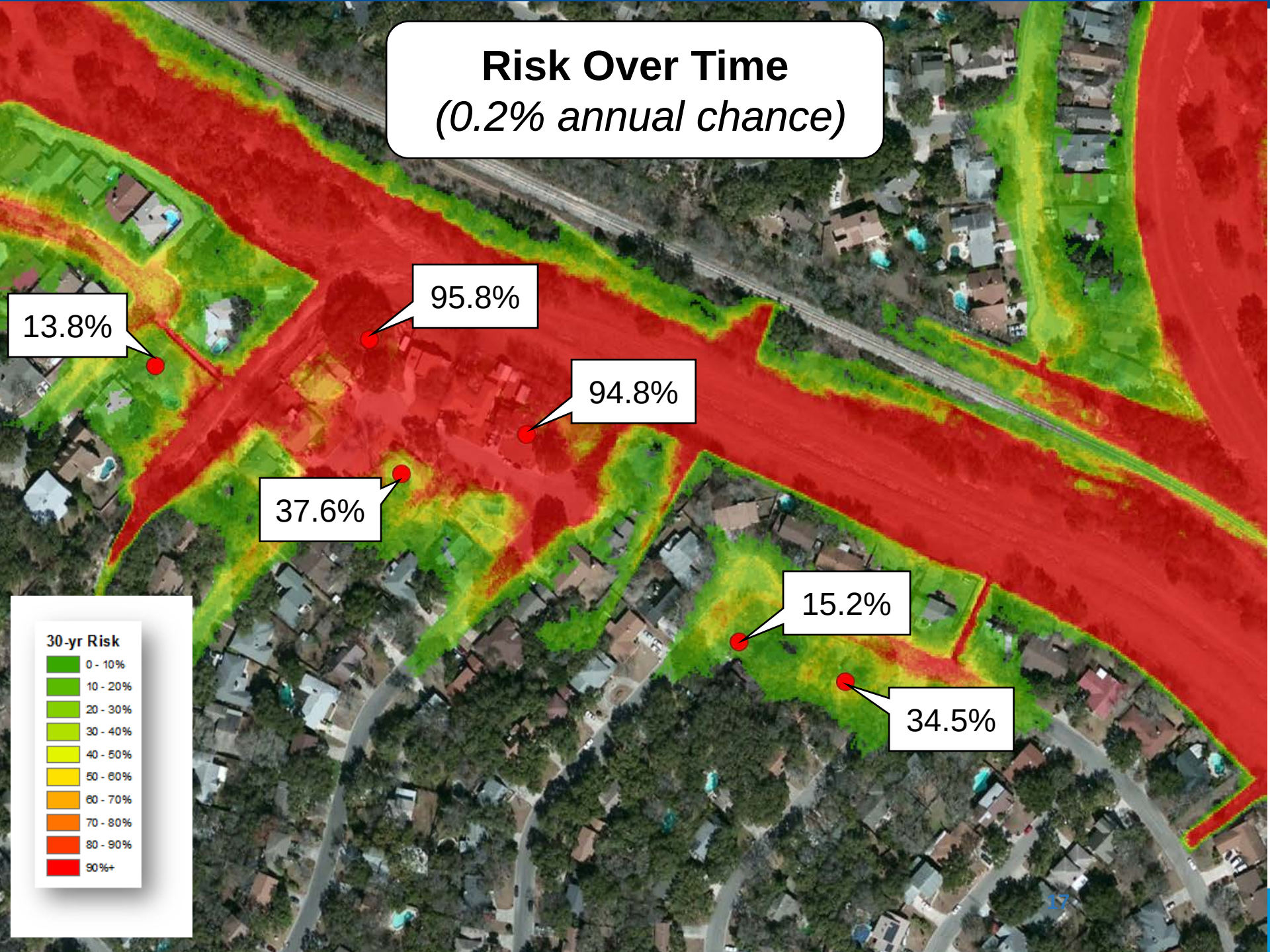

Flood Depth Grid
(4% annual chance)


Flood Depth Grid
(2% annual chance)

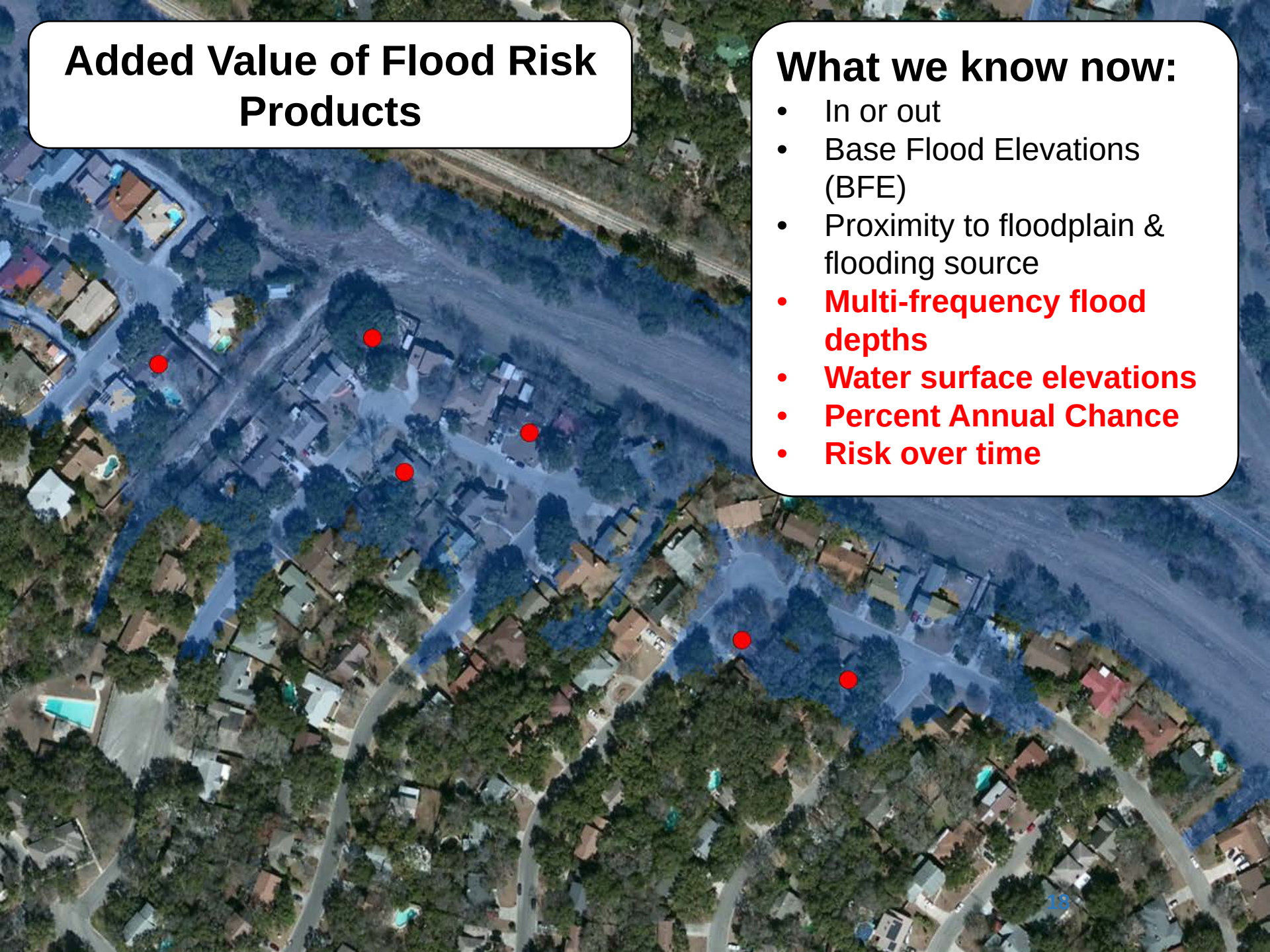

Flood Depth Grid
(1% annual chance)


Flood Depth Grid
(0.2% annual chance)
0.5 ft.
2.9 ft.
2.6 ft.
1.6 ft.
0.4 ft.
1.3 ft.


Percent Annual Chance
0.5%
+10%
9.2%
1.8%
0.3%
1.4%
Percent Annual Chance
0.2 - 1% (500-yr)
1 - 2% (100-yr)
2 - 4% (50-yr)
4 - 10% (25-yr)
10%+ (10-yr)


Risk Over Time
(0.2% annual chance)
13.8%
95.8%
94.8%
37.6%
15.2%
34.5%
30-yr Risk
0 - 10%
10 - 20%
20 - 30%
30 - 40%
40 - 50%
50 - 60%
60 - 70%
70 - 80%
80 - 90%
90%+

Added Value of Flood Risk Products



What we know now:

- In or out
- Base Flood Elevations (BFE)
- Proximity to floodplain & flooding source
- **Multi-frequency flood depths**
- **Water surface elevations**
- **Percent Annual Chance**
- **Risk over time**

Assessing Flood Impacts and Risk

Quantity

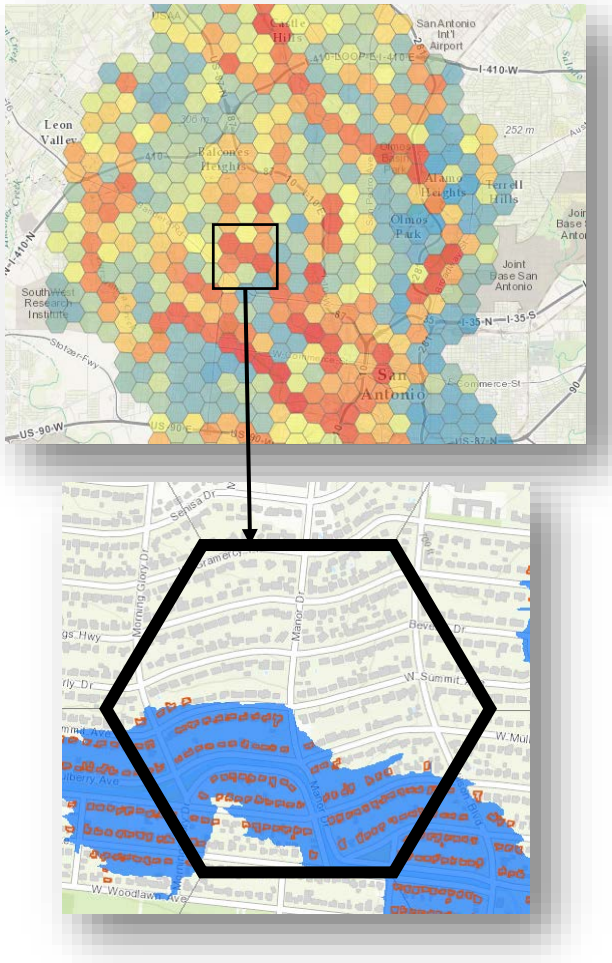
- Homes & businesses impacted

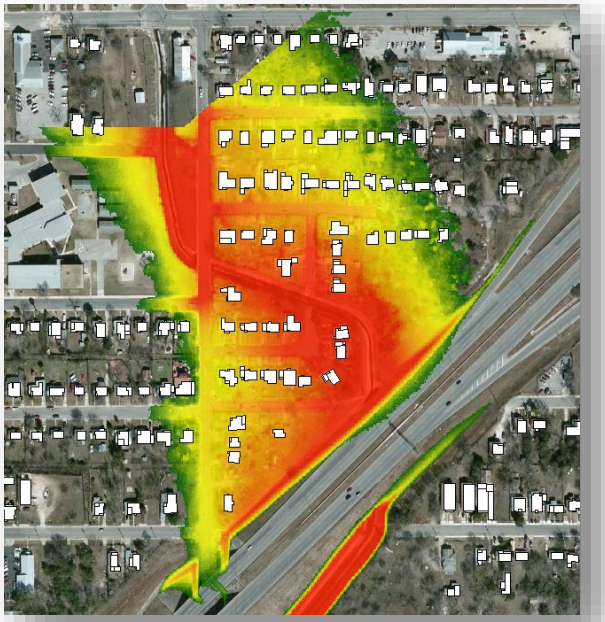
Monetary Loss

- Damages
- Average annualized loss (AAL)

Exposure to Risk

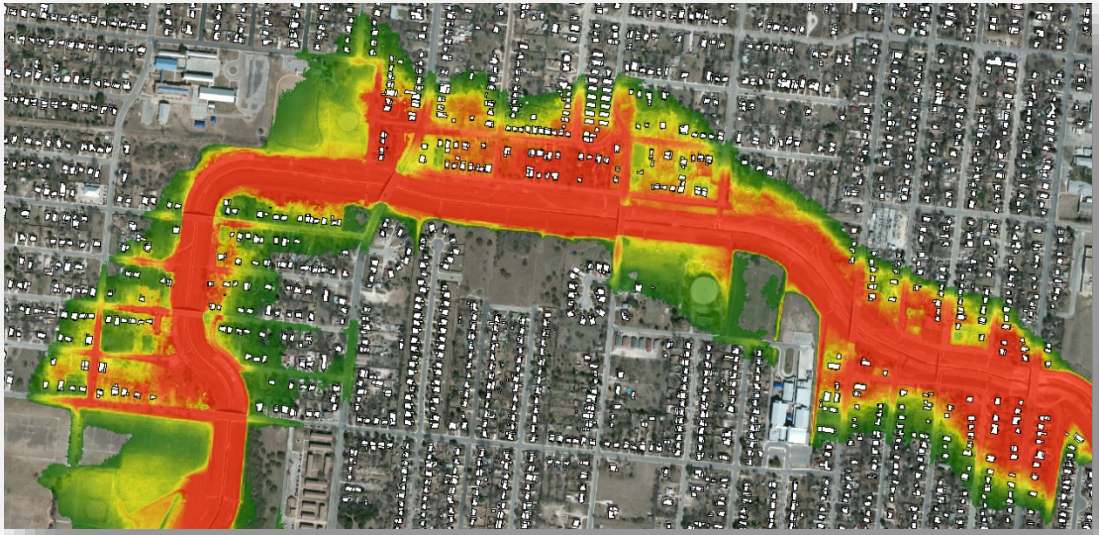
- Annual Risk
- Risk over time

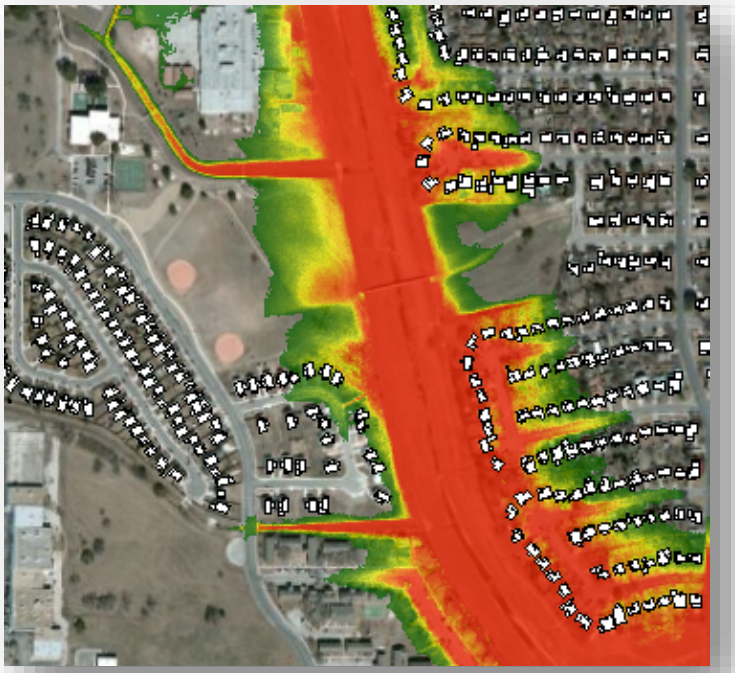


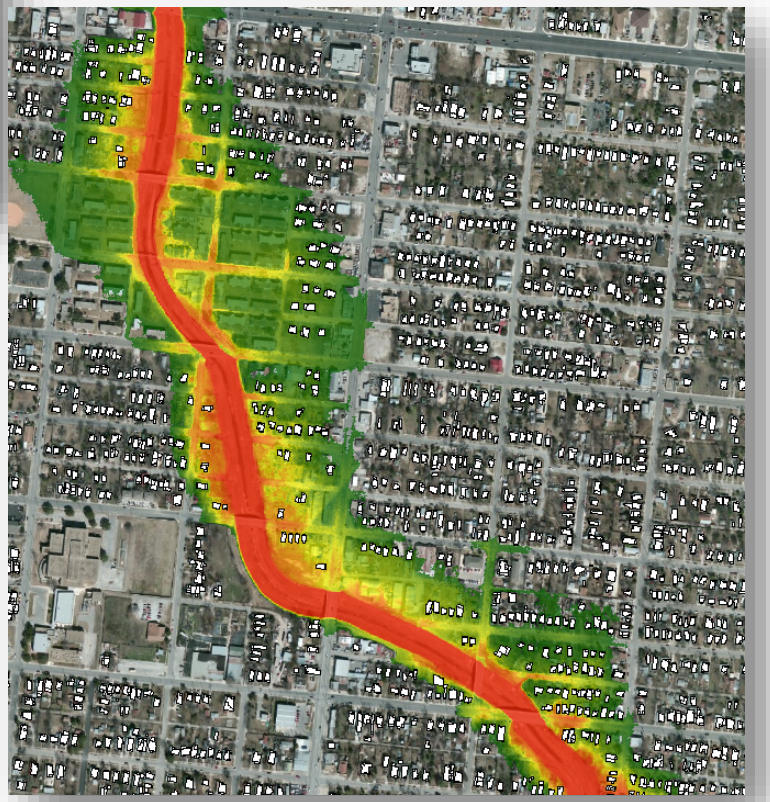


6% 95%

30 year Risk



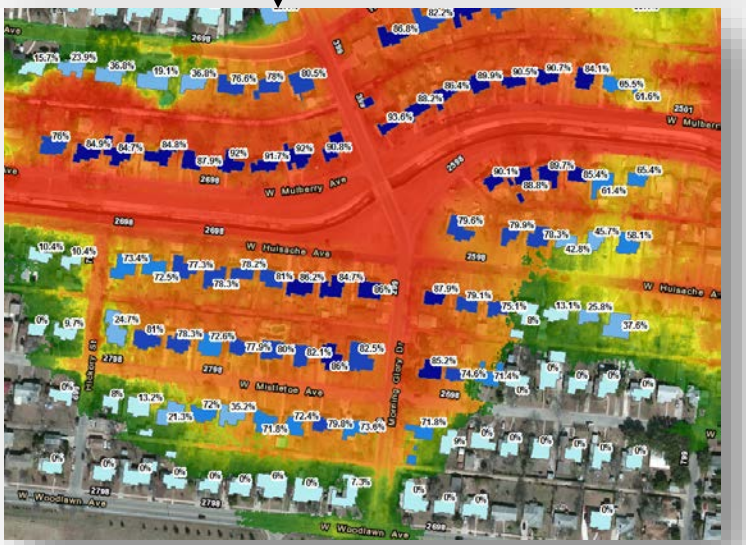




6%

95%

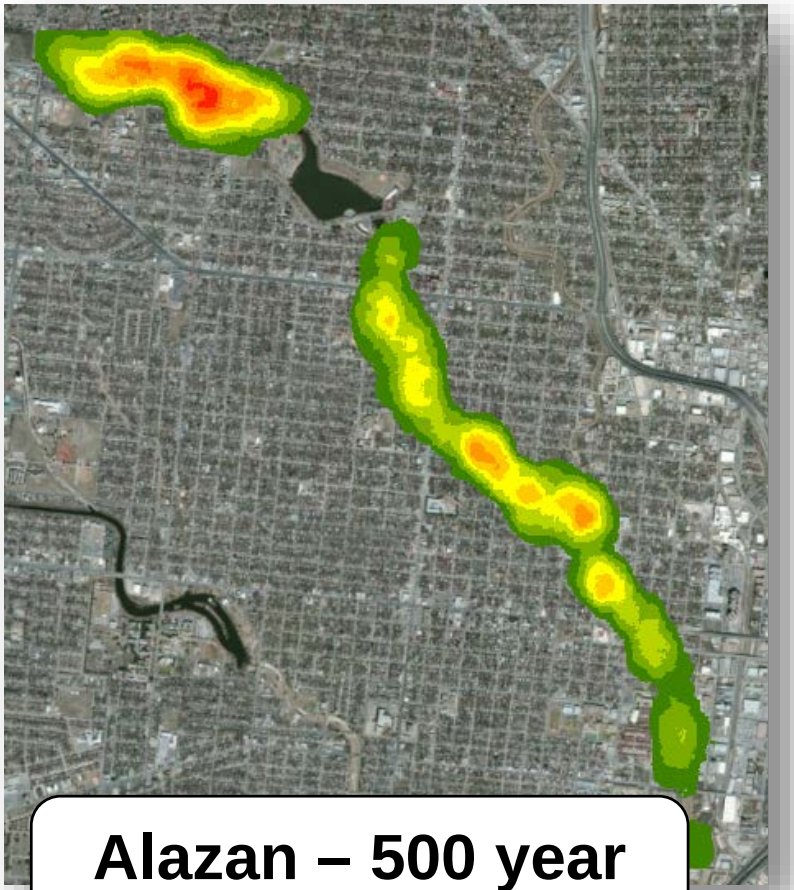
30 year Risk



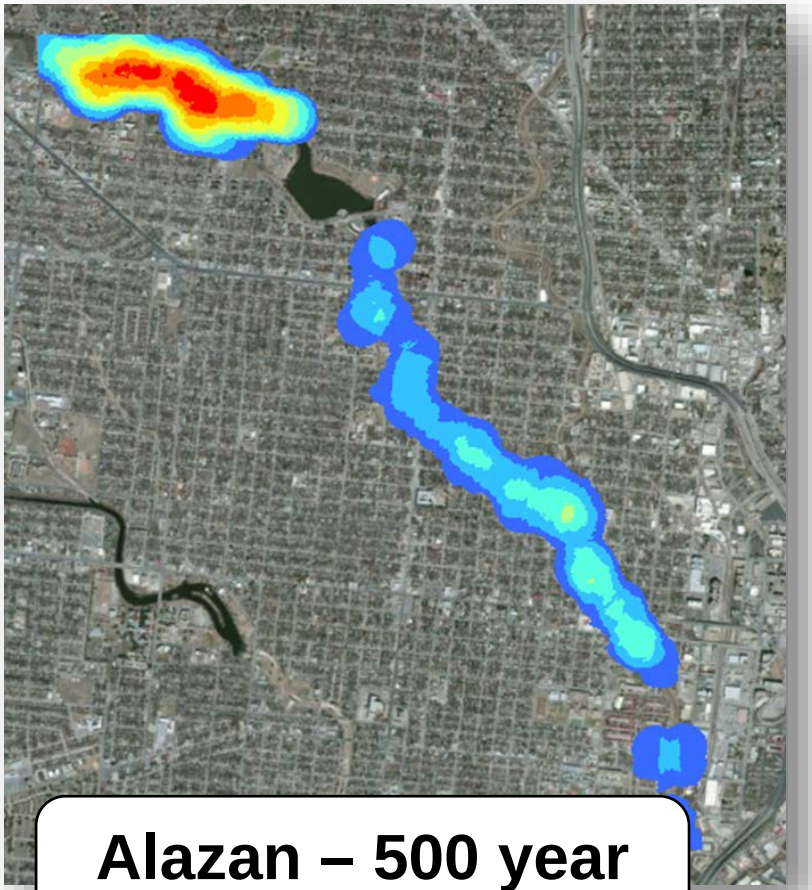
6% 95%

30 year Risk

Visualizing Impacts

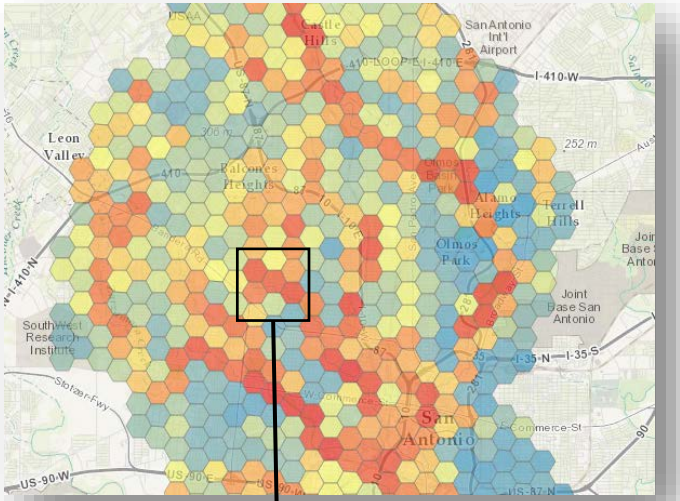


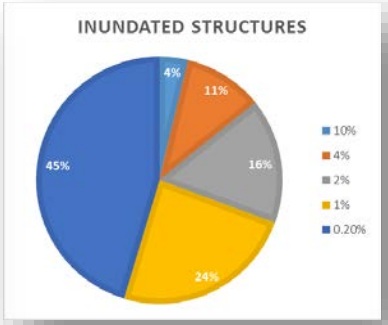
Alazan – 500 year
(weighted by depth)

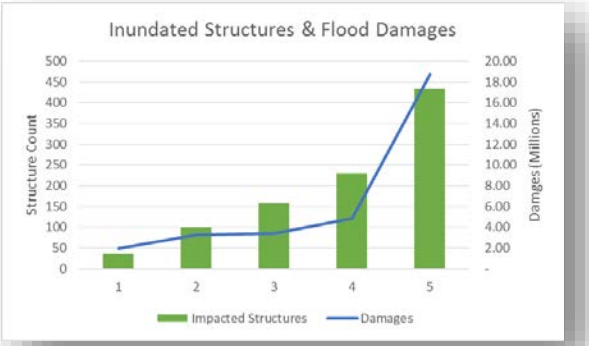


Alazan – 500 year
(weighted by damage)

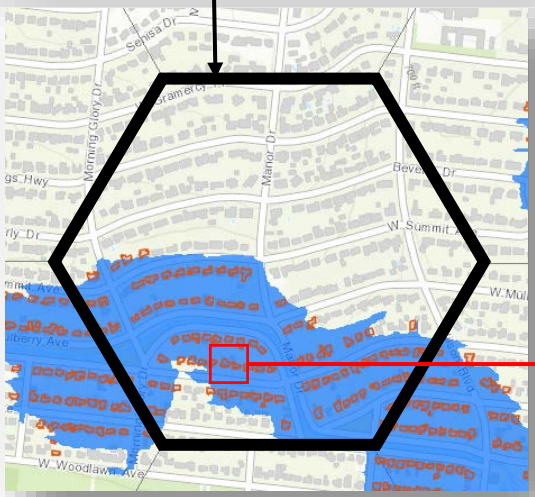
Enhanced Metrics by Hex

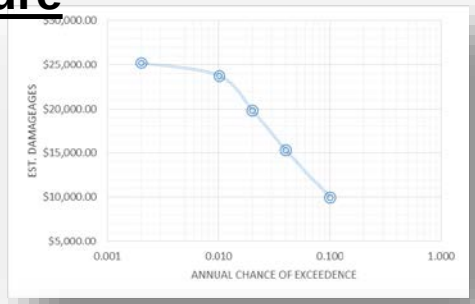


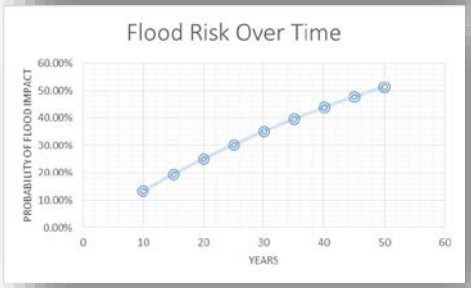




Enhanced Metrics by Structure







Bexar County, Texas
(Laddie Place)

Source: http://www.bexarfloodcontrol.org/uploads/4-TFMA_Laddie-Place_Final.pdf

Source: http://www.bexarfloodcontrol.org/uploads/4-TFMA_Laddie-Place_Final.pdf

Project AOI - 2011

Project AOI - 2017

Final Thoughts…

- Flood control as conduit for multi-objective projects (not the only option)
  - Water Quality
  - Recreation
  - Conservation
  - Stream Restoration
- Overlapping Opportunities vs. Specific Risks
- Considering long-term added value
  - Social benefit
  - Ecosystem services

Questions?

John Refolo, GISP, CFM, CAPM

210-302-3277

jrefolo@sara-tx.org