



Strategic Property Buyouts To Enhance Flood Resilience

Creating a Model for Flood Risk Reduction, Community Protection and Environmental Gains

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Project Goals and Objectives

Hurricane Harvey inundated hundreds of thousands of homes with an estimated damage of USD 125 billion.

Damages to some of these properties could have been prevented if they were previously identified as having important natural values and bought-out or acquired prior to the flood event.

Existing land acquisition and buyout programs are often initiated in a reactionary manner after a flooding event has occurred, resulting in open spaces that does little to protect environmental assets or prevent long term flooding for structures in vulnerable locations.



Project Goals and Objectives

This study addresses the problem by developing a proactive framework for identifying candidate parcels for acquisition in advance of storm events by prioritizing important natural features.

This approach enables the selection of properties with the potential of being restored to open spaces as well as serve important natural flood attenuation purposes.



Existing Buyouts in Harris County

Harris County Buyouts Summary since 1997



Total number of buyouts:
3,100



Amount spent by Federal grants:
\$ 150 million



Amount spent Local and State grants:
\$ 190 million



Total Acres restored to floodplain:
1,060

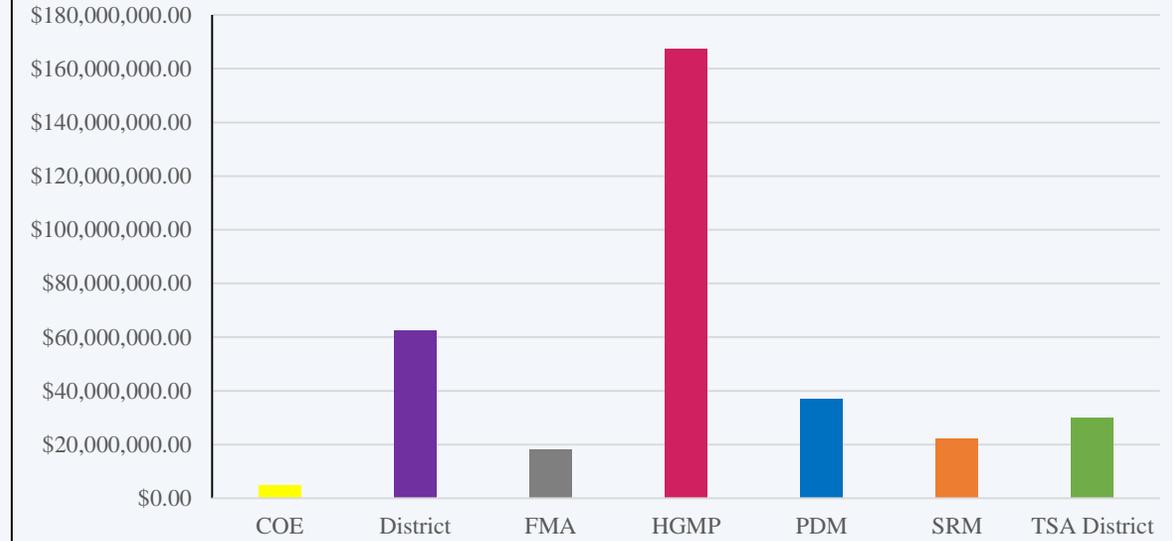


Avoided Damages and ROE from Hurricane Harvey:
\$300 million
ROE 1.61

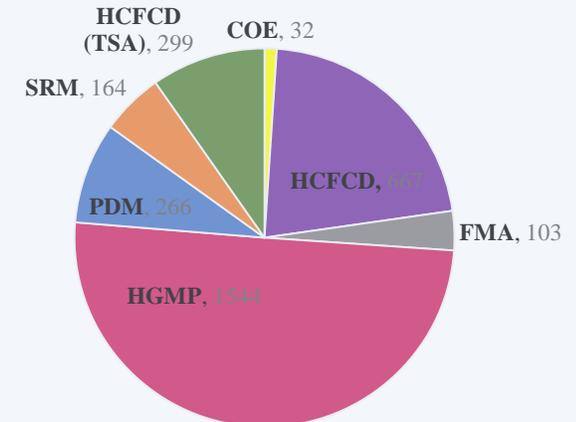
Source:
ProPublica & Harris County Flood Control District

COE: Army Corp of Engineers
HGMP: Hazard Mitigation Grant Program
District: Harris County Flood Control District
FMA: Flood Mitigation Assistance
TSA: Transitional Sheltering Assistance
PDM: Pre-Disaster Mitigation Grant Program

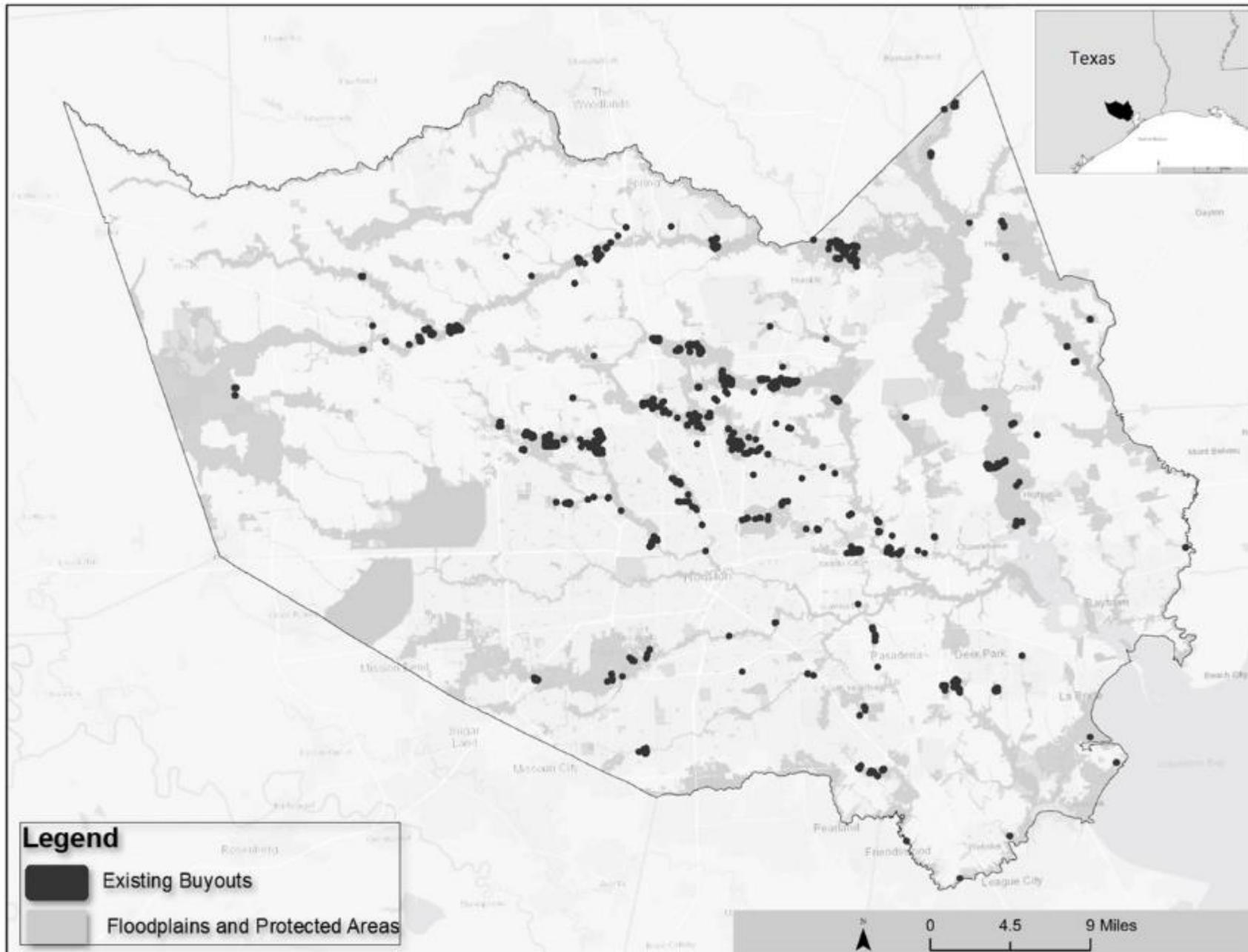
Buyouts Funding in Harris County since 1997



Number of Buyouts in Harris County since 1997



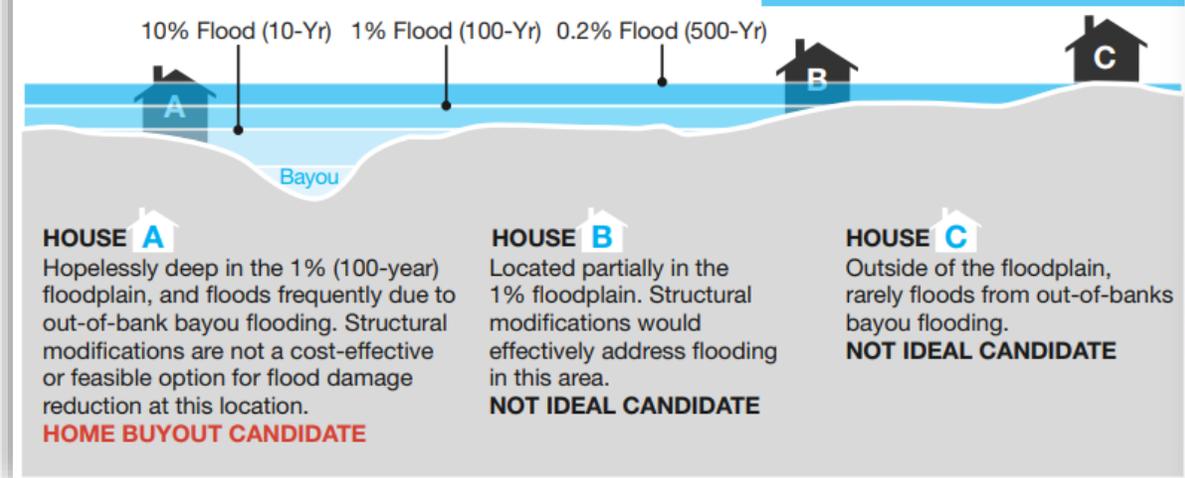
Existing Buyouts in Harris County



Existing Buyout Requirements in Harris County

Flood Control District Home Buyout Considerations

BEFORE



The Floodplain and Probability
 Different flood events have different chances of occurring in any given year in any given location:

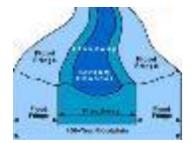
- 10-Year Flood: 10% Chance
- 100-Year Flood: 1% Chance
- 500-Year Flood: 0.2% Chance



Cypress Creek Watershed, Voluntary Home Buyout Before and After.

Source: Harris County Flood Control District

Some Shortfalls



Priority is given to structures deep within the 100-yr floodplain



Only Structures with repetitive flood damages usually determined from insured flood claims are considered



Properties outside the floodplain and in proximity to important ecological services are not considered

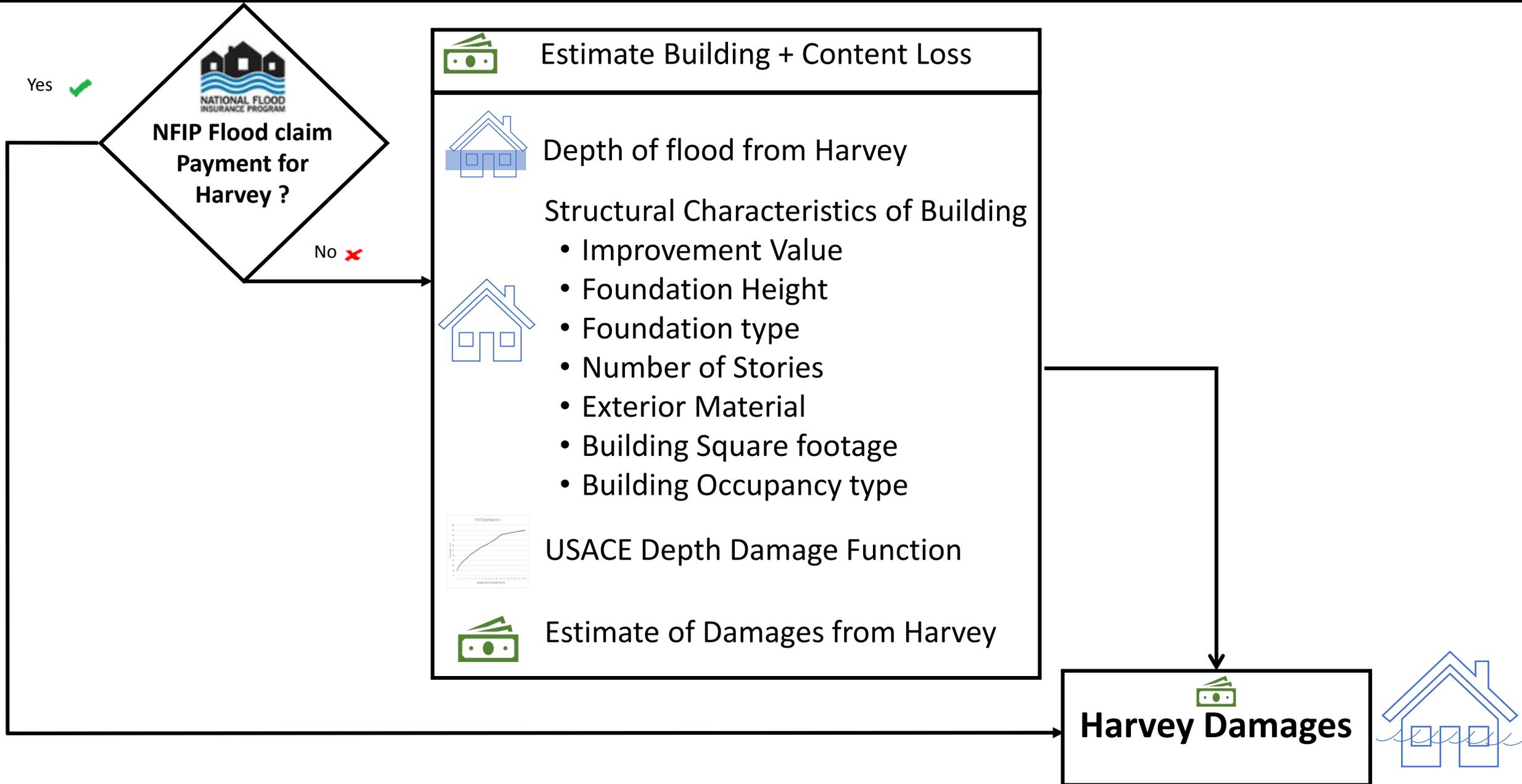


Poor consideration for proximity to existing buyouts

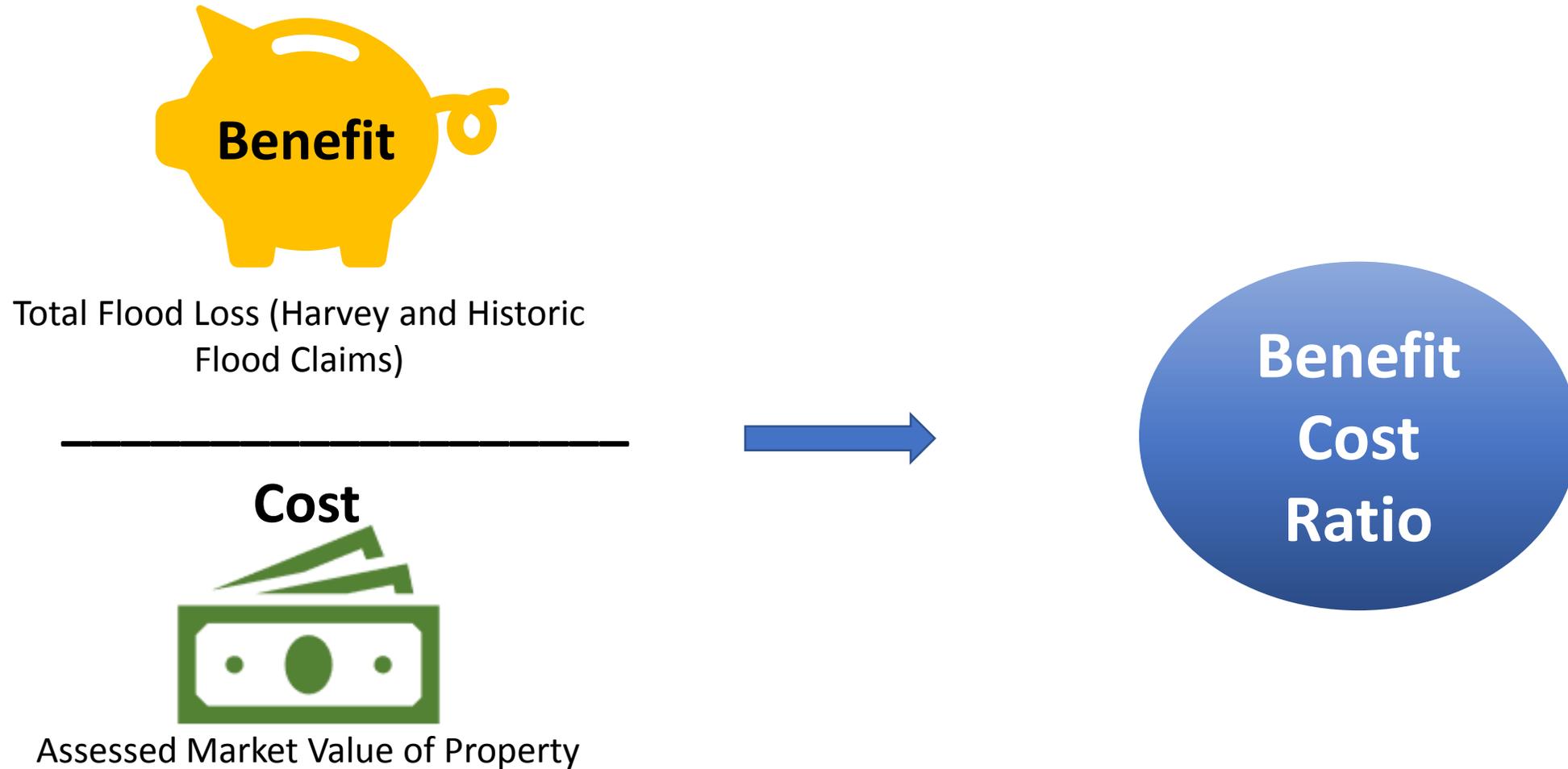
Conceptual Framework For Candidate Buyout Selection

Property affected by Harvey	Distance to Natural Features	Additional Locational Variables	Eligible Candidate For Buyout
			
<p>We begin with all properties inundated by Hurricane Harvey with significant damage to both structure and contents of the building</p>	<p>We measure distance to various natural features from the affected property</p>	<p>* We prioritize properties in census tracts with a SVI score of ≥ 0.5 determined from CDC social vulnerability database * We also prioritize properties with repetitive flood claims</p>	<p>Properties that meet the eligibility criteria for different scenario are selected as candidates for future buyouts and property acquisition</p>

Flood Damage Modeling:



Benefit-Cost Calculation



We assume that a ratio higher than 1 indicates that the scenario would have a net financial benefit to the community.

Buyout Selection Scenarios

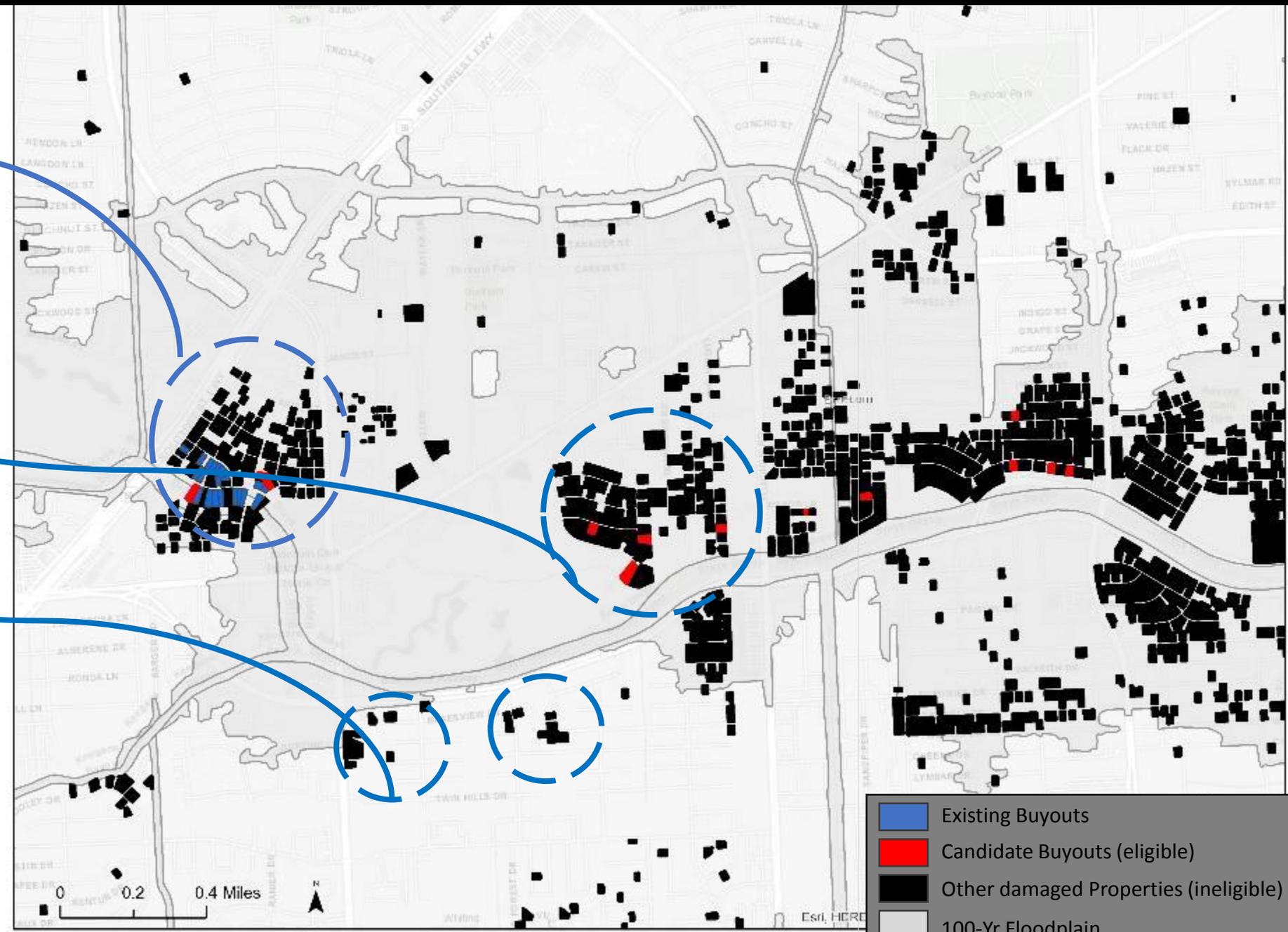
Scenario	Measures	Description
Current Practice	Flooding Source	Riverine flooding
	Repetitive Loss	Whether property loss is repetitive
	Floodplain	Whether property is in the floodplain
Wetlands, Floodplains and Buyouts	SFHA distance	Distance of property to edge of floodplain
	NWI Distance	Distance of property to edge of Wetland
	Buyout Distance	Distance of property to nearest existing buyout
Parks, Protected Areas, and Buyouts	Park distance	Distance of property to parks
	Conservation	Distance of property to conservation east.
	Protected Areas	Distance of property to protected areas
	Buyout Distance	Distance of property to nearest existing buyout
All Natural Features and Buyouts	SFHA distance	Distance of property to edge of floodplain
	NWI Distance	Distance of property to edge of Wetland
	Park distance	Distance of property to parks
	Conservation	Distance of property to conservation east.
	Protected Areas	Distance of property to protected areas
	Buyout Distance	Distance of property to nearest existing buyout

Business as Usual: Existing Requirements in Harris County: Example Area

Some candidate buyouts in proximity to existing buyouts

Only few eligible parcels despite location within the floodplain

Not Eligible Outside the floodplain



Result

 Total number of candidate buyouts: 362	 Total Damages from Harvey and other floods: \$ 113 million	 Market Value of Properties: \$ 42 million
 Damages—Market Value Ratio: 2.67	 Total Acres restored to ecological: 117	

	Existing Buyouts
	Candidate Buyouts (eligible)
	Other damaged Properties (ineligible)
	100-Yr Floodplain

4b: All Natural Features and Buyouts (1000 ft)

Selection Criteria



Existing Buyouts Distance



Park Distance \leq 1000 ft



Wetland Distance \leq 1000 ft



Protected Area Distance \leq 1000 ft



Floodplain Distance \leq 1000 ft



Result



Total number of candidate buyouts:
290



Total Damages from Harvey and other floods:
\$ 44 million



Market Value of Properties:
\$ 24 million



Damages–Market Value Ratio:
1.81

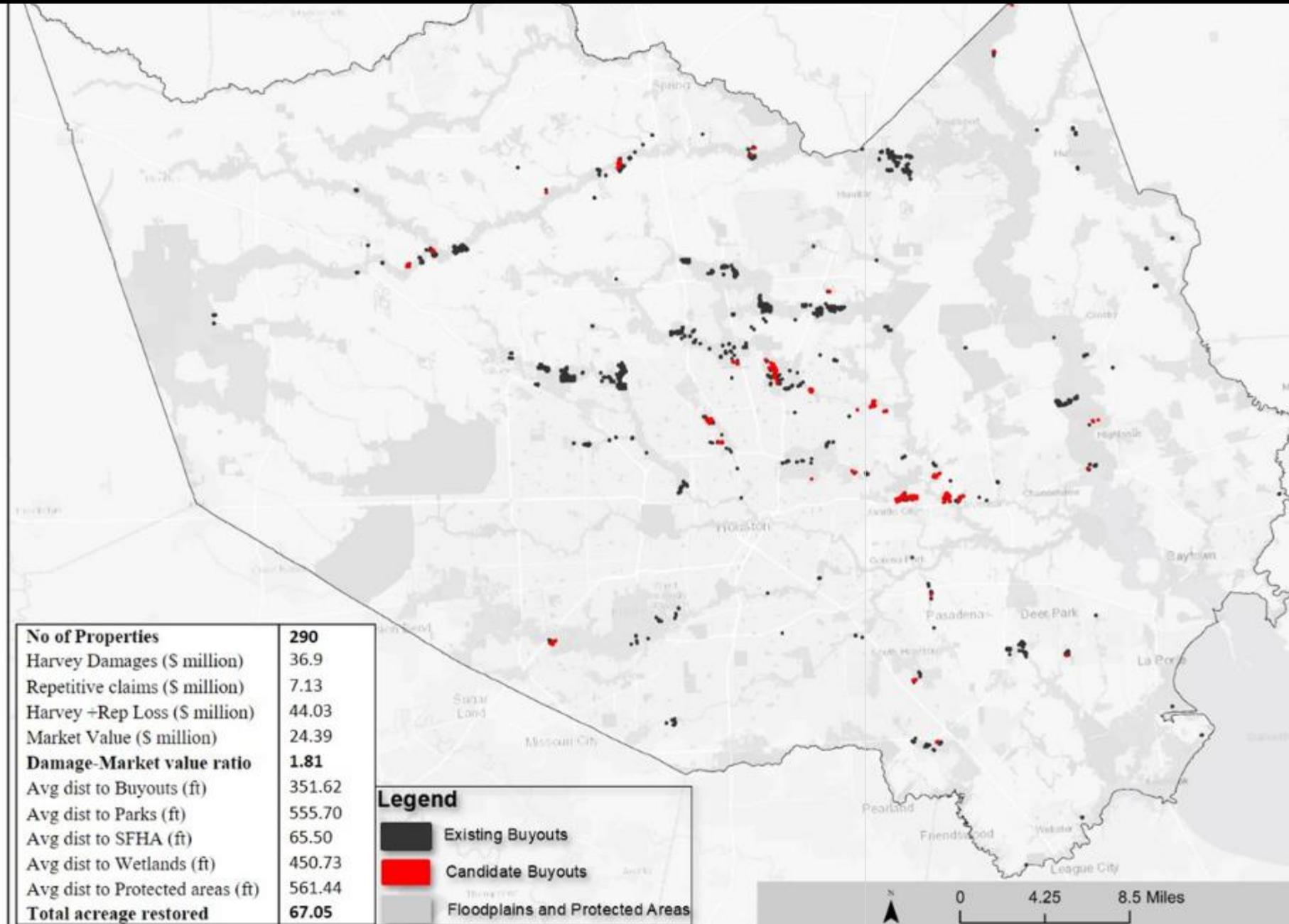


Total Acres restored to ecological:
67

No of Properties	290
Harvey Damages (\$ million)	36.9
Repetitive claims (\$ million)	7.13
Harvey +Rep Loss (\$ million)	44.03
Market Value (\$ million)	24.39
Damage-Market value ratio	1.81
Avg dist to Buyouts (ft)	351.62
Avg dist to Parks (ft)	555.70
Avg dist to SFHA (ft)	65.50
Avg dist to Wetlands (ft)	450.73
Avg dist to Protected areas (ft)	561.44
Total acreage restored	67.05

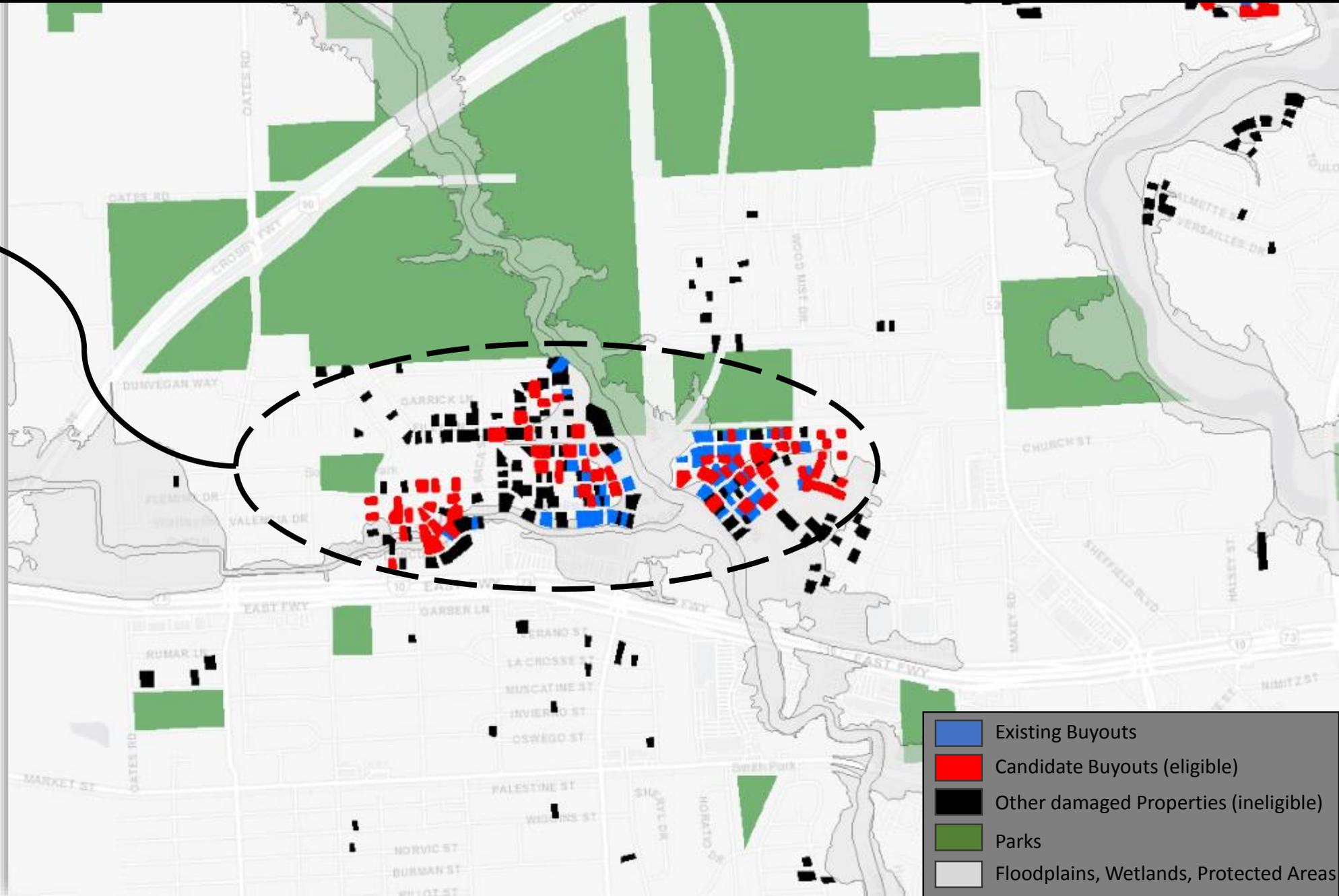
Legend

-  Existing Buyouts
-  Candidate Buyouts
-  Floodplains and Protected Areas



4b: All Natural Features and Buyouts (1000 ft): Example Area

Candidate buyouts are located near natural features and existing buyouts



Result



Total number of candidate buyouts: **290**



Total Damages from Harvey and other floods: **\$ 44 million**



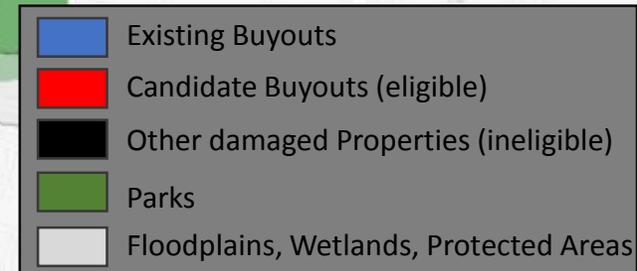
Market Value of Properties: **\$ 24 million**



Damages-Market Value Ratio: **1.81**



Total Acres restored to ecological: **67**



4b: All Natural Features, Buyouts and Social vulnerability

Selection Criteria



Existing Buyouts Distance



Park Distance ≤ 1000 ft



Wetland Distance ≤ 1000 ft



Protected Area Distance ≤ 1000 ft



Floodplain Distance ≤ 1000 ft



Social Vulnerability ≥ 0.5



Result



Total number of candidate buyouts:
192



Total Damages from Harvey and other floods:
\$ 30 million



Market Value of Properties:
\$ 14 million



Damages–Market Value Ratio:
2.12

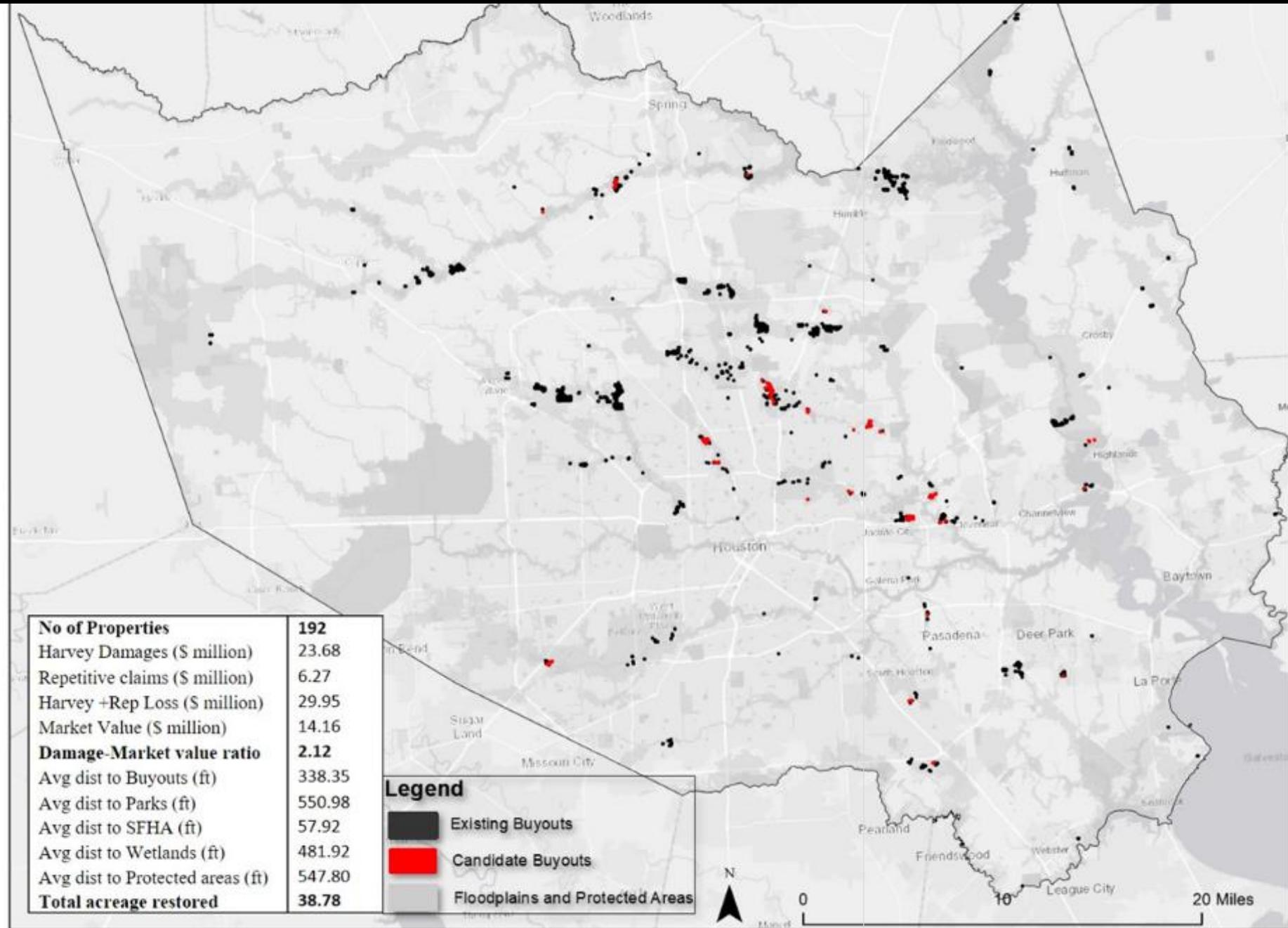


Total Acres restored to ecological:
38

No of Properties	192
Harvey Damages (\$ million)	23.68
Repetitive claims (\$ million)	6.27
Harvey +Rep Loss (\$ million)	29.95
Market Value (\$ million)	14.16
Damage-Market value ratio	2.12
Avg dist to Buyouts (ft)	338.35
Avg dist to Parks (ft)	550.98
Avg dist to SFHA (ft)	57.92
Avg dist to Wetlands (ft)	481.92
Avg dist to Protected areas (ft)	547.80
Total acreage restored	38.78

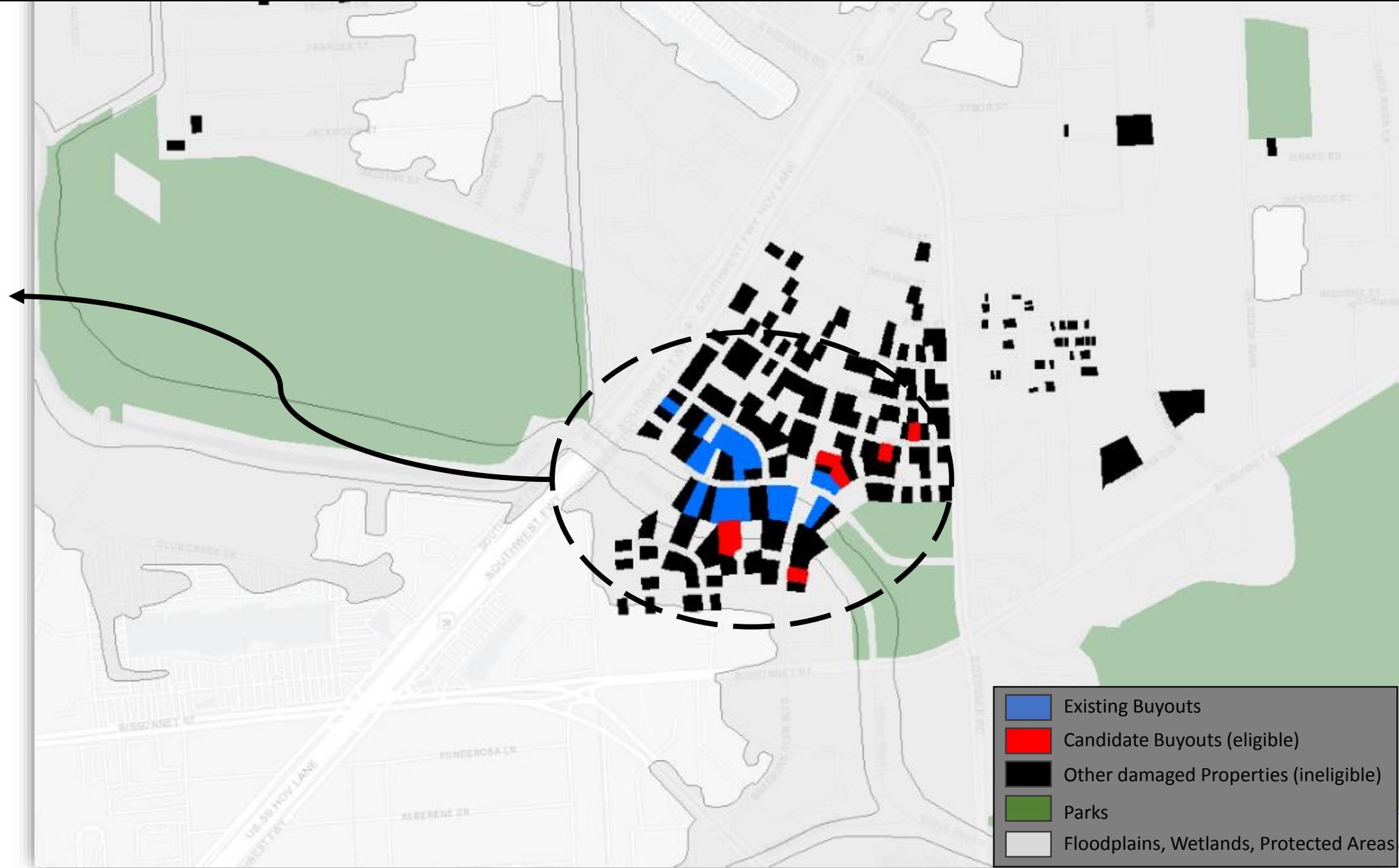
Legend

- Existing Buyouts
- Candidate Buyouts
- Floodplains and Protected Areas



4b: All Ecological Features, Buyouts and social vulnerability (1000 ft): Example Area

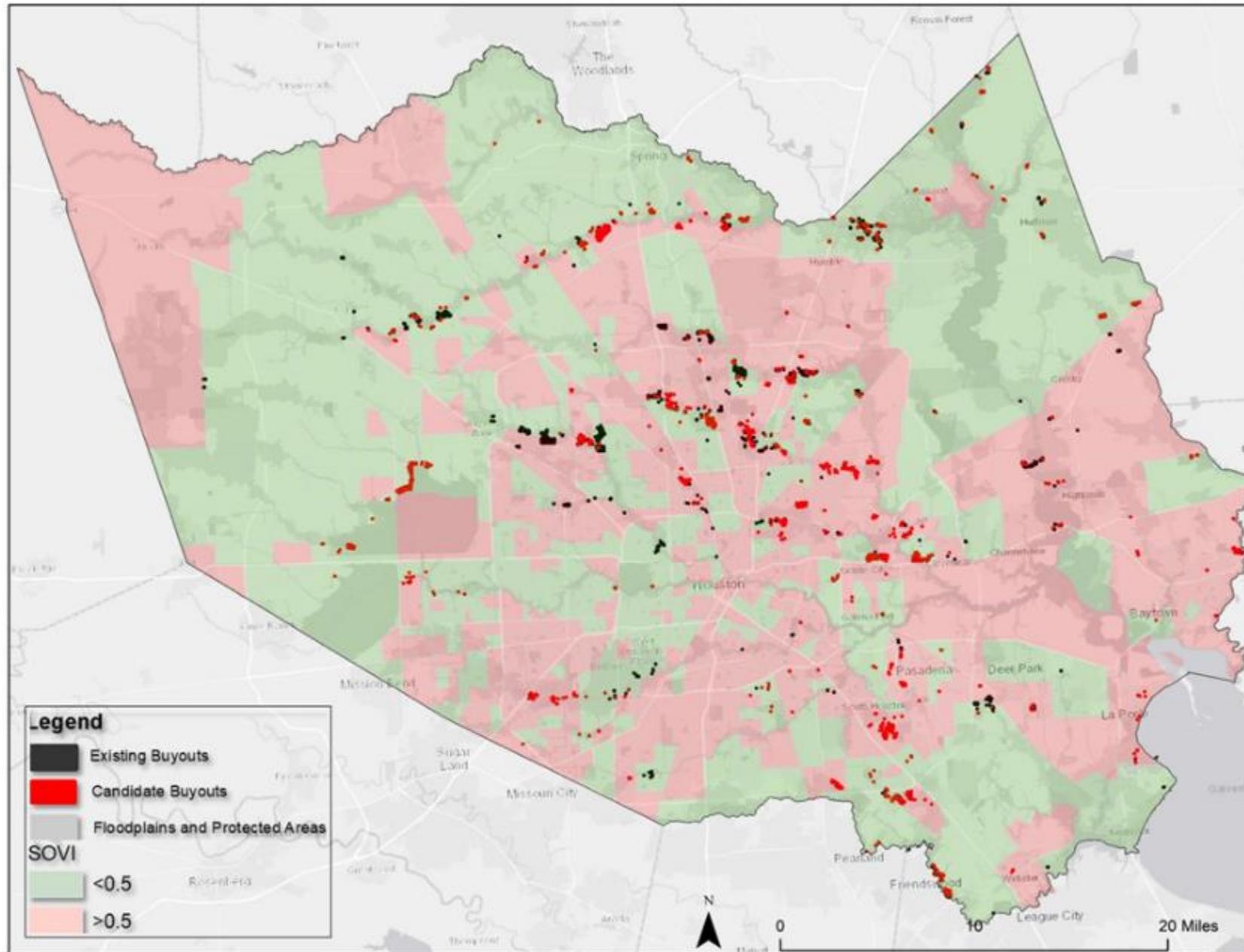
Proximity to all ecological features including existing buyouts and high Housing and Transportation Social Vulnerability



Result

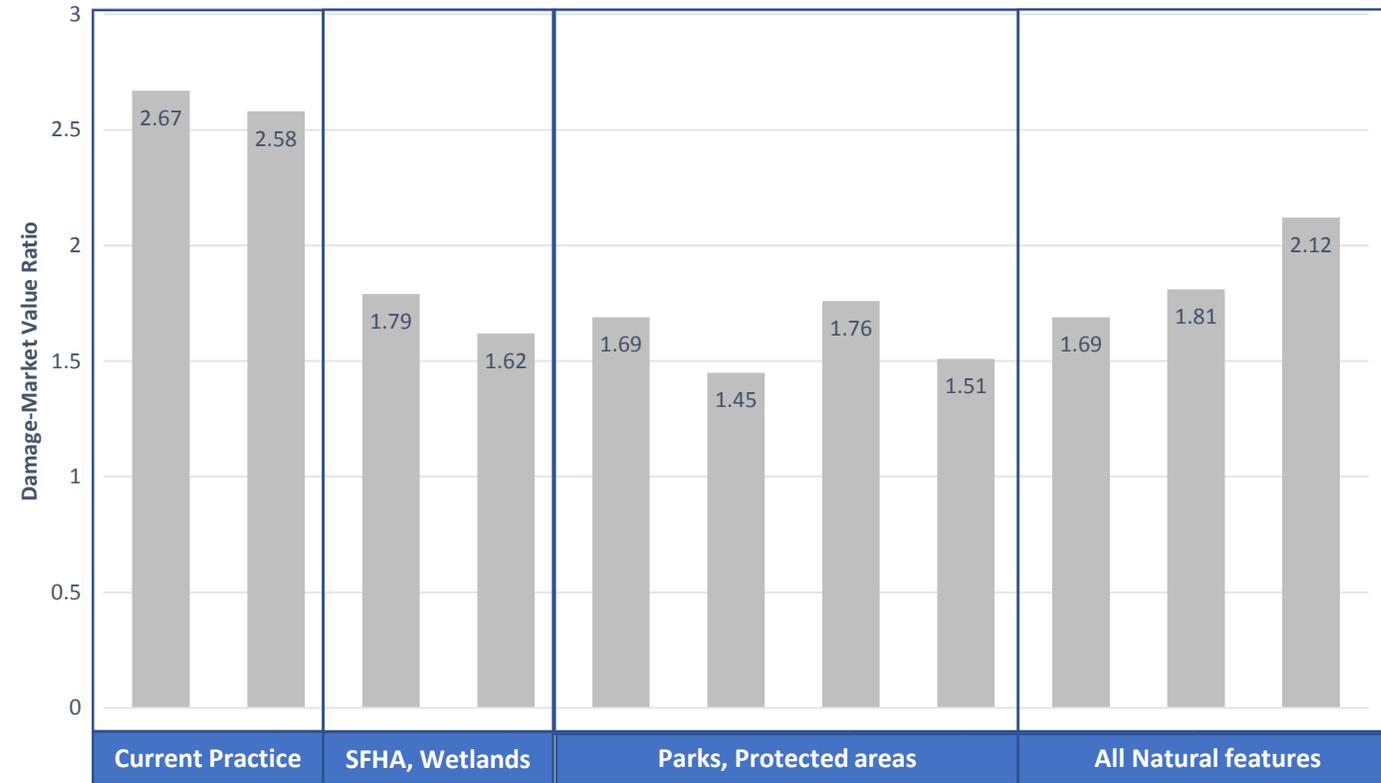
 Total number of candidate buyouts: 192	 Total Damages from candidate buyouts: \$ 30 million	 Market Value of Properties: \$ 14 million
 Damages—Market Value ratio: 2.12	 Total Acres restored to ecological: 38	

4b: All Ecological Features and Buyouts (1000 ft): Example Area



Economic Benefits from Candidate Buyout Scenarios

Damage-Market Value Ratio



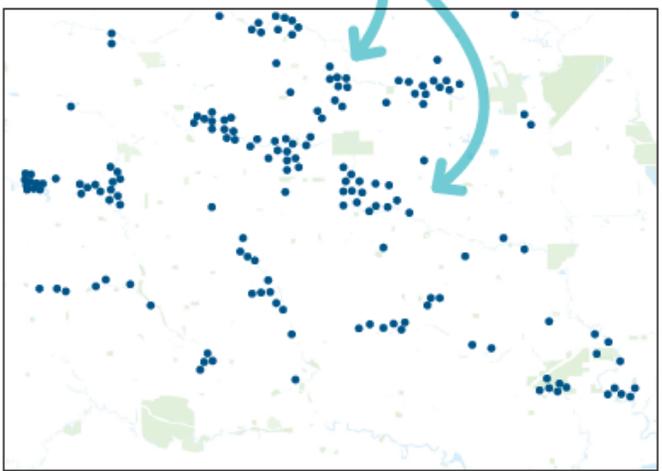
BUSINESS AS USUAL



Cost effective flood mitigation



Buyouts are scattered



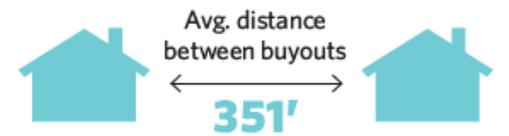
Summary

The proactive model prioritizes clustered buyouts that are close to natural features and ultimately can result in fewer, larger patches of open space that can be restored to benefit people and nature.

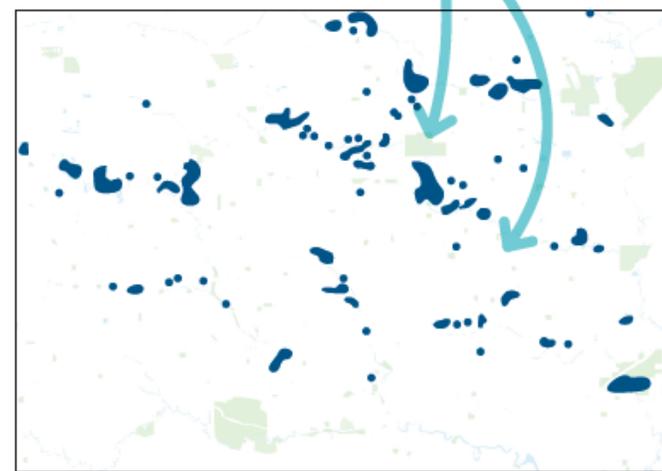
A PROACTIVE MODEL



Cost effective flood mitigation with multiple benefits



Buyouts are clustered together



Benefits of Strategic Buyouts



- ◀ Over time, can lead to clusters of open space that can be used as green infrastructure to restore the functions of floodplains, absorb and clean storm water, provide space for outdoor recreation and improve the visual character of urban areas
- As cost effective as traditional buyouts

- Less expensive to manage fewer, larger areas with multiple functions rather than scattered, empty lots
- › Added benefits for people and wildlife



Benefits of Strategic Buyouts



◀ From 1992-2010, Houston lost wetlands that could detain 4 billion gallons of storm water (\$600 million in lost storm water detention).

- The \$2.5b flood bond passed on Harvey's anniversary in August included funding for both traditional infrastructure repair as well as taking a look at things like detention ponds restoration.

- Research shows that every square meter of Houston pavement equates to \$4,000 in extra flood damage. (Sam Brody/TAMU)

Thank you

For additional information or to request the full technical report, please contact:

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