Searching for the original meanders of Buffalo Bayou: examination of land use and the riparian environment

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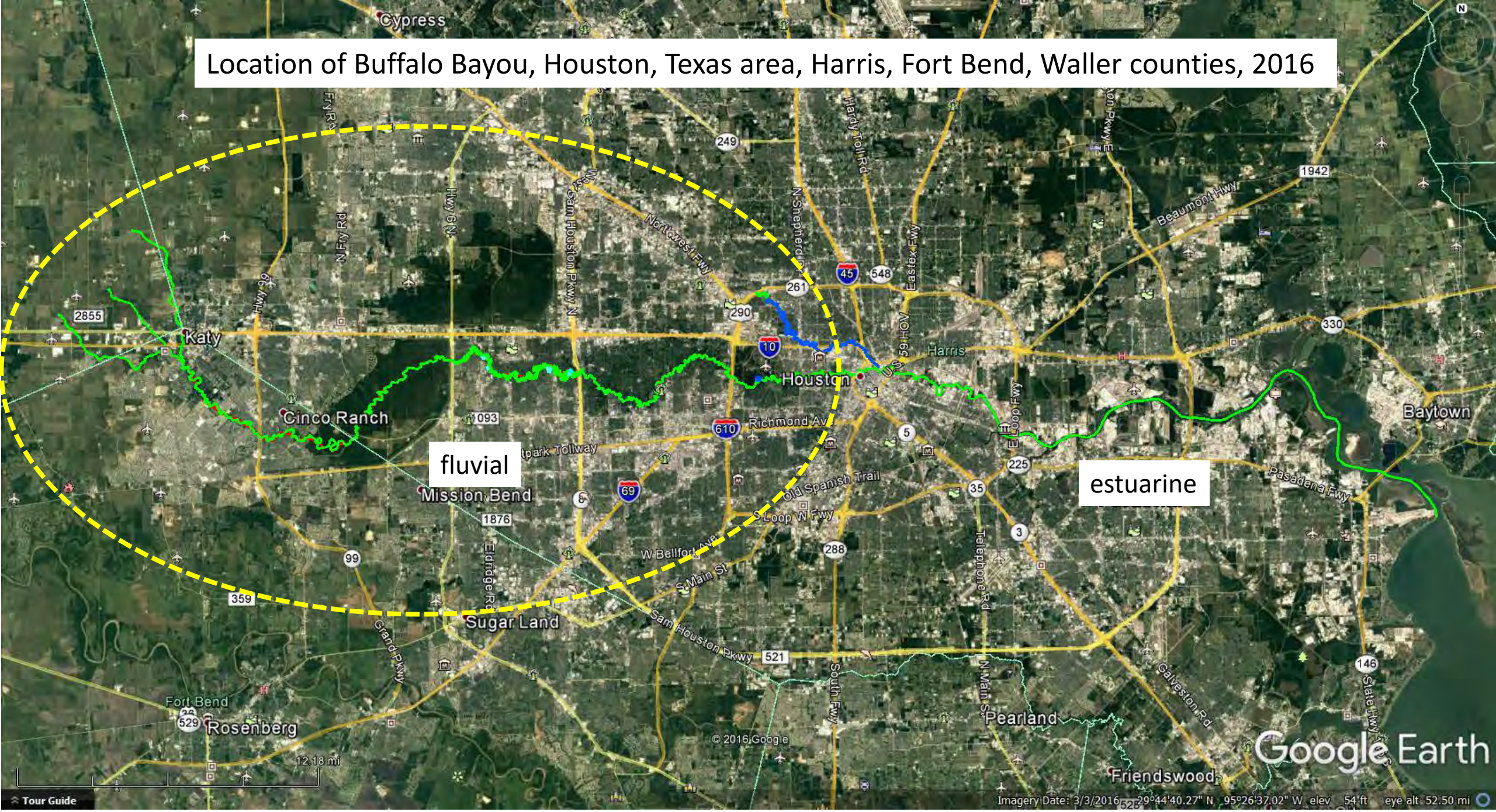
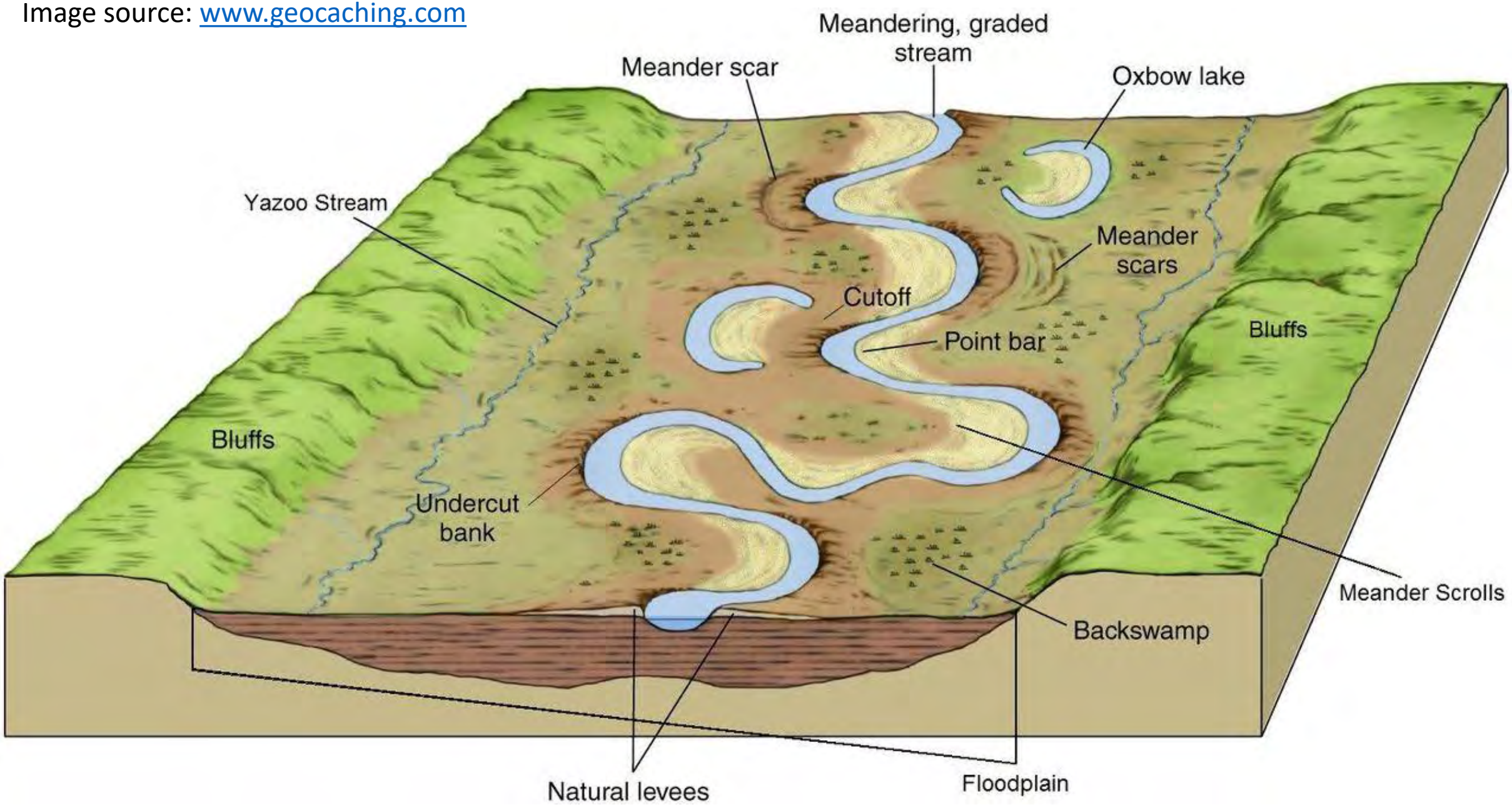

Location of Buffalo Bayou, Houston, Texas area, Harris, Fort Bend, Waller counties, 2016
fluvial
estuarine
Cypress
Katy
Cinco Ranch
Mission Bend
Sugar Land
Fort Bend
Rosenberg
Houston
Harris
Baytown
Pearland
Friendswood
Richmond Ave
Old Spanish Trail
S Loop W Fwy
W Bellfort Ave
S Main St
Sam Houston Pkwy
Northwest Fwy
Eastex Fwy
Beaumont Hwy
Pasadena Fwy
Galveston Rd
Telephone Rd
N Main St
South Fwy
E Loop Fwy
Hardy Toll Rd
N Shepherd Dr
W Sam Houston Pkwy N
Hwy 6 N
N Fry Rd
Fry Rd
Eldridge Rd
Grand Pkwy
State Hwy
12.18 mi
© 2016 Google
Google Earth
Tour Guide
Imagery Date: 3/3/2016 29°44'40.27" N 95°26'37.02" W elev 54 ft eye alt 52.50 mi

Generalized diagram of a meandering river and associated landforms.
Image source: www.geocaching.com



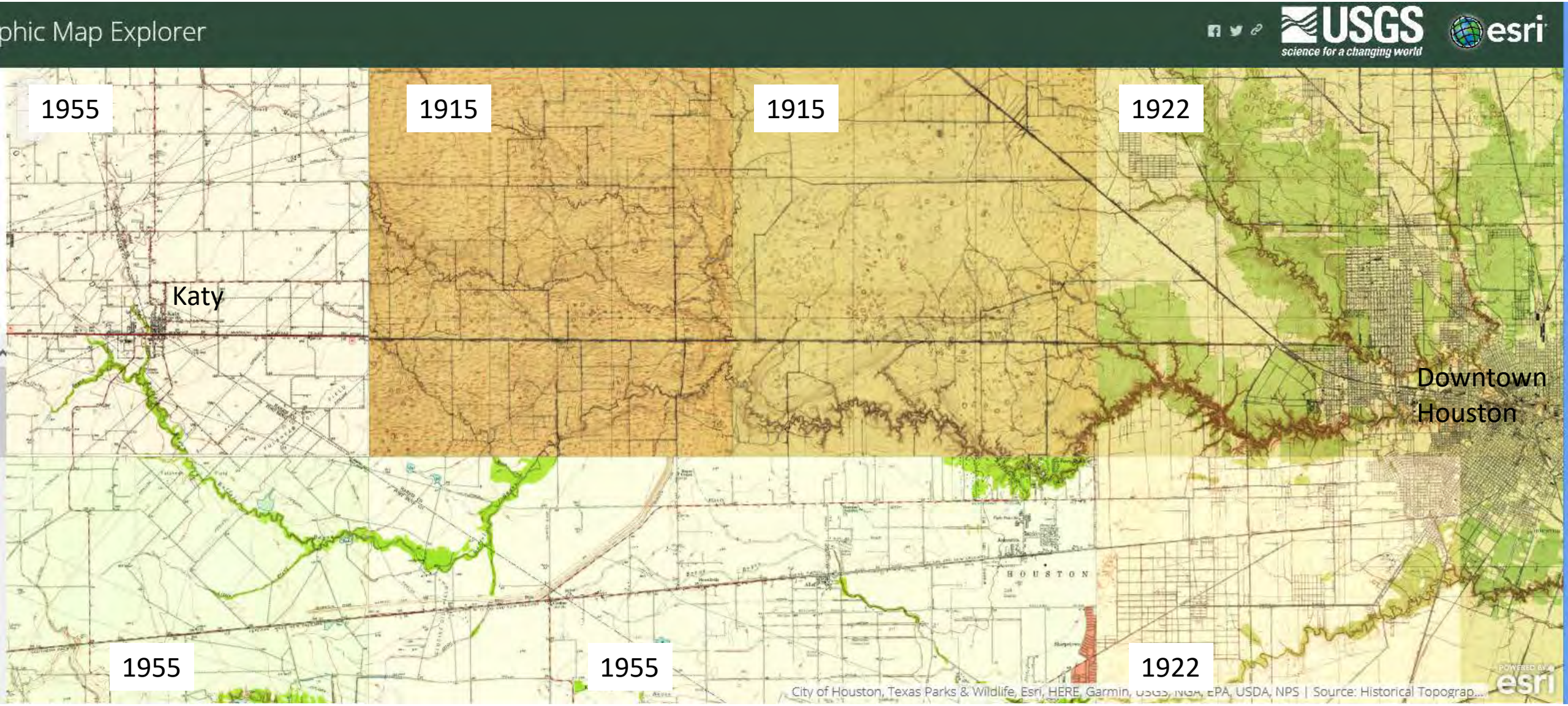
Why search for old meanders?

- Document existence and maintain knowledge of original meander pattern to understand local and regional fluvial dynamics, and how these have changed over time with urban development
- Identify structural controls on original drainage patterns, interpretations of geological faults and shear zones, locations of unstable fill materials, hazard mitigation for planning and development both on public and private land
- Preservation of wildlife habitat and natural water detention capacity - cutoff meanders are now oxbow lakes and wetlands, and serve as wildlife refuges and corridors
- Remind the public that Buffalo Bayou is a “natural stream”, valuable asset, and wildlife habitat; document and share knowledge of what we’ve lost and what we have left; activate public support for protection of remaining connected meanders and green space

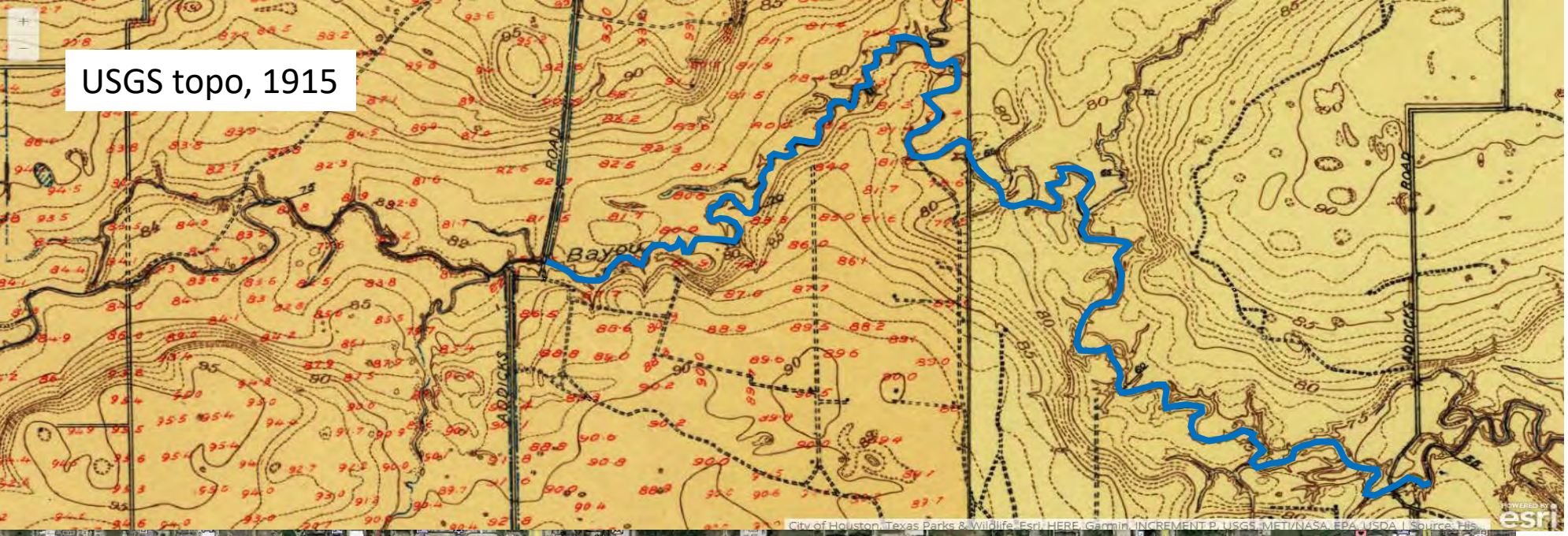
methods

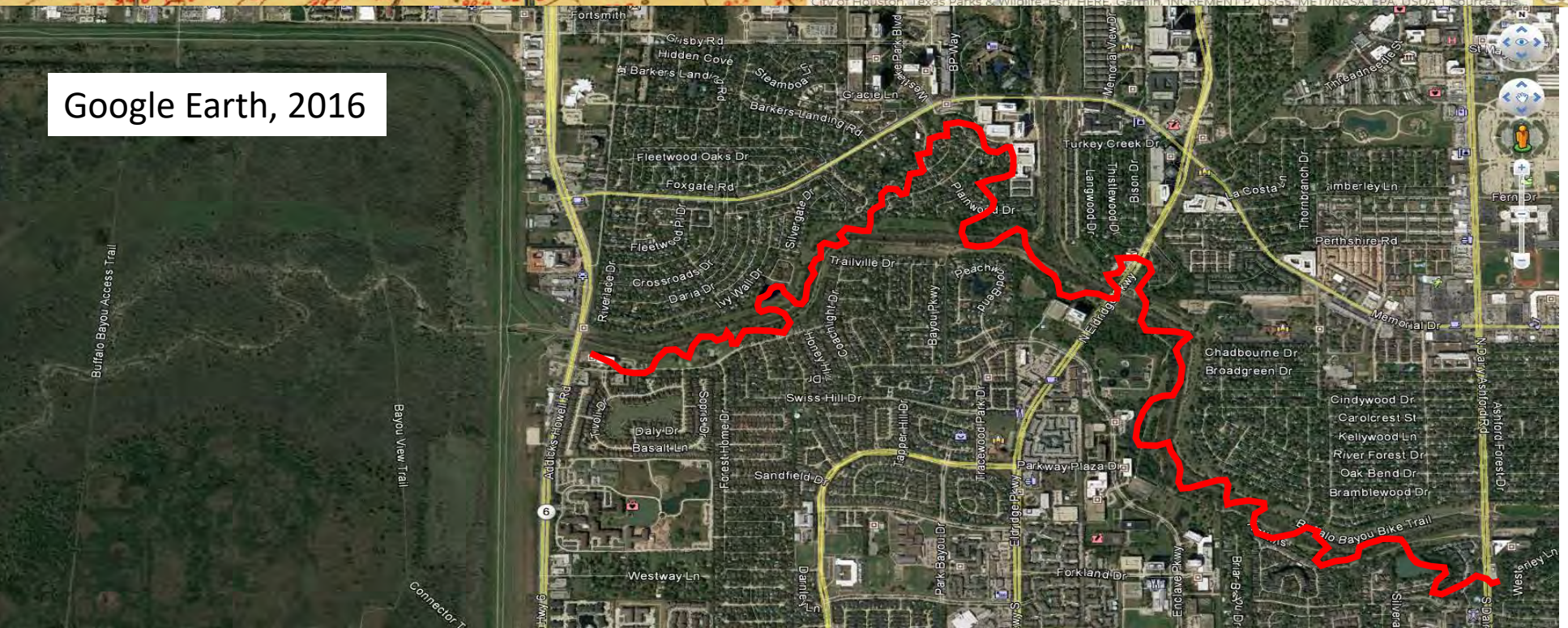
- Focus on fluvial reaches of Buffalo Bayou (Katy area to downtown).
- Interpret and compare/contrast channel morphologies on historical aerial and and modern satellite images, available on Google Earth. (Earliest vintage 1944.)
- Compare historical topographic maps (available on USGS website) with modern landscapes. (Earliest vintage 1915.) Cross check with air photos.
- Query literature in reference to geologic faulting patterns in Houston area.
- Map and classify meander types in regard to degree of fill and connectivity.
- Field visits to areas of interest.
- interviews with landowners adjacent to old meanders.

Fluvial reaches and tributaries of Buffalo Bayou, Katy Texas to central Houston Texas, prior to major modifications.



USGS topographic map montage, mixed vintages (1915, 1922, 1955)

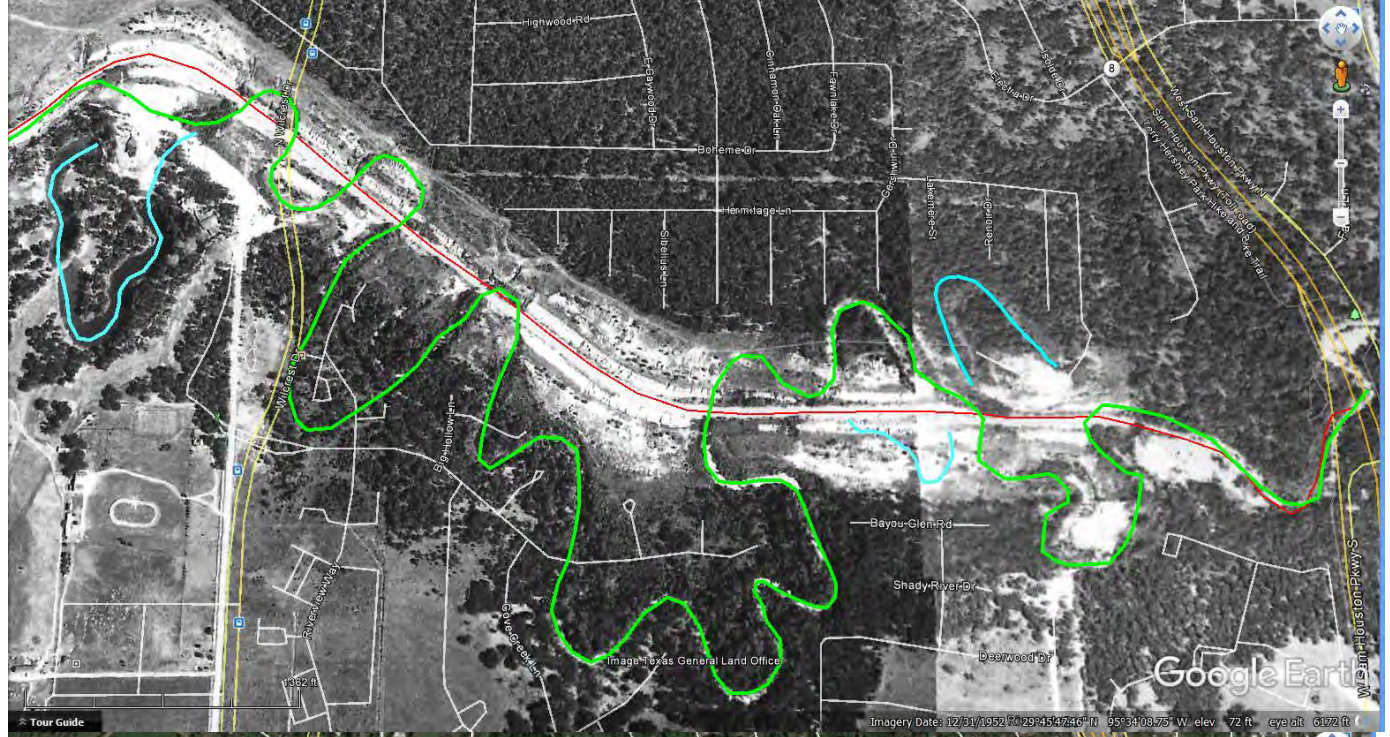




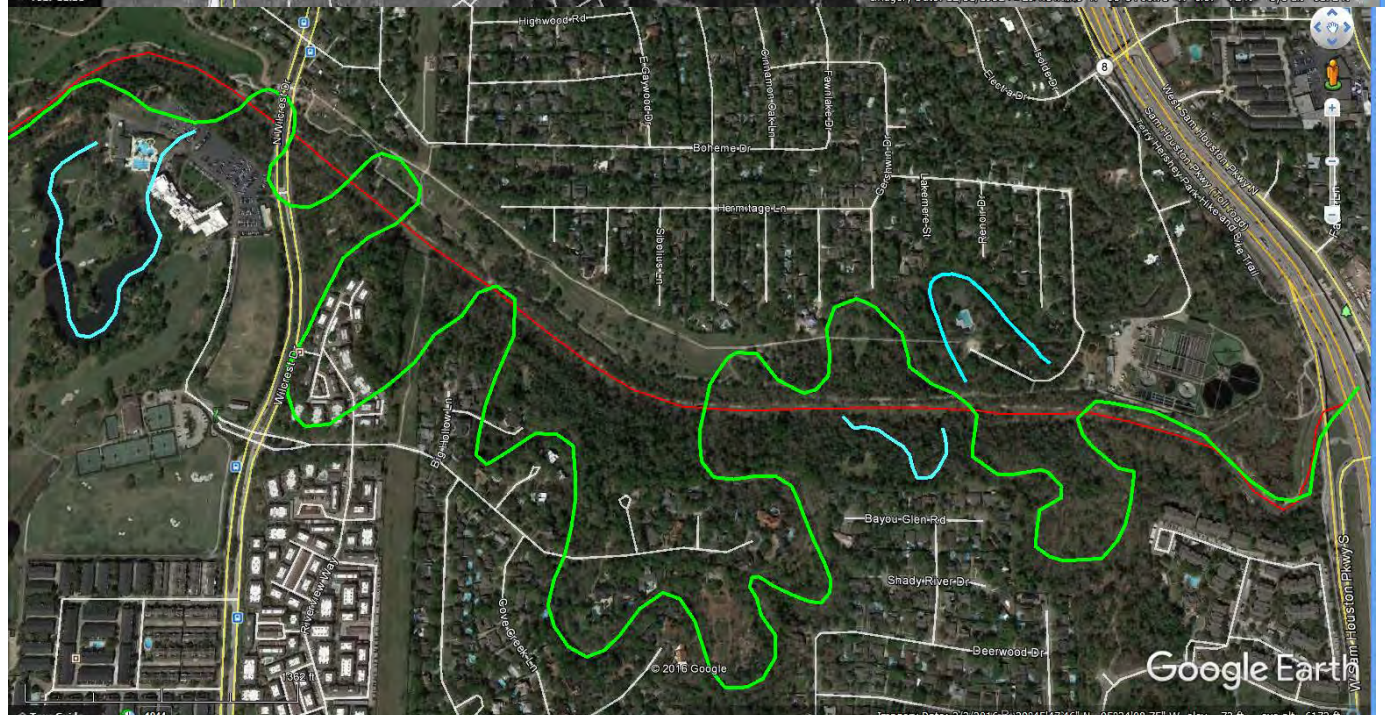
Data example:

1915 topo map vs. 2016 satellite photo

Example comparison of 1915 Buffalo Bayou Channel to modern. West Houston, Barker Reservoir to Dairy Ashford



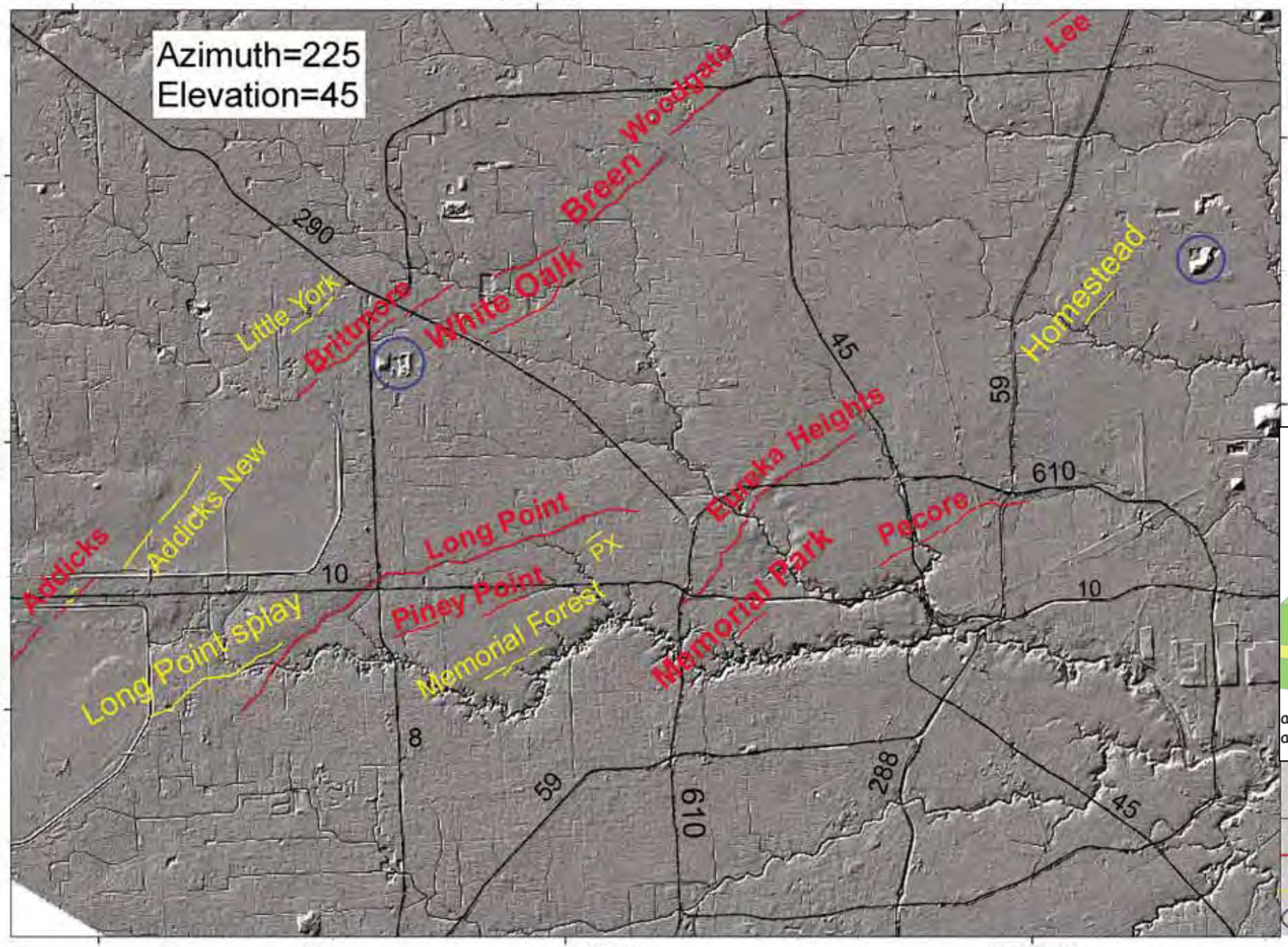
1953

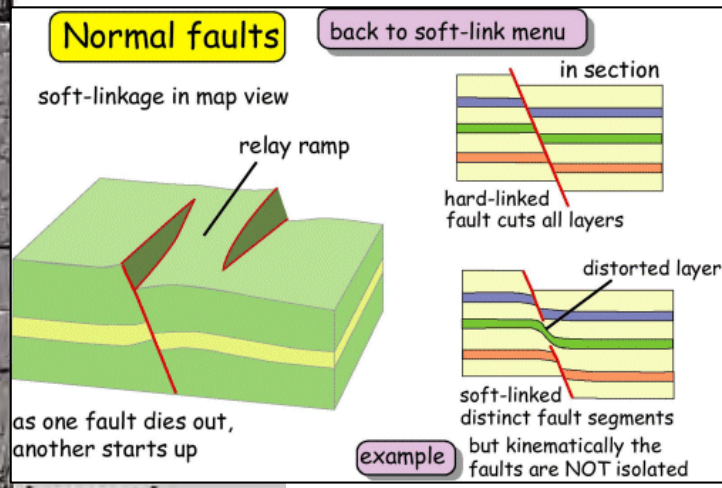


2016

Data example:
Historic air photos vs.
modern satellite images

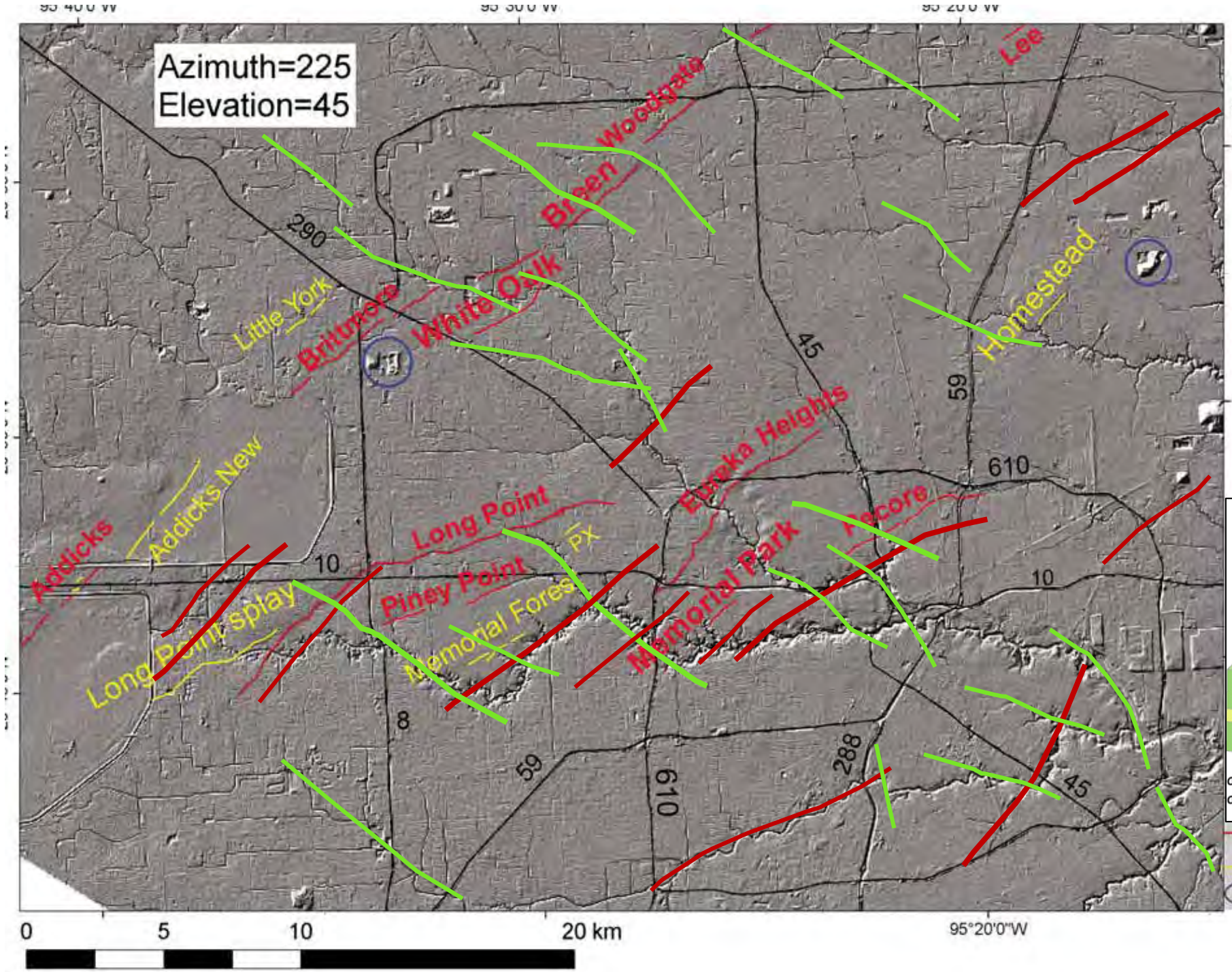
Documented published faults in Houston Texas. Image source: *Geosphere,* Engelkemeir and Khan, 2008.





Legend

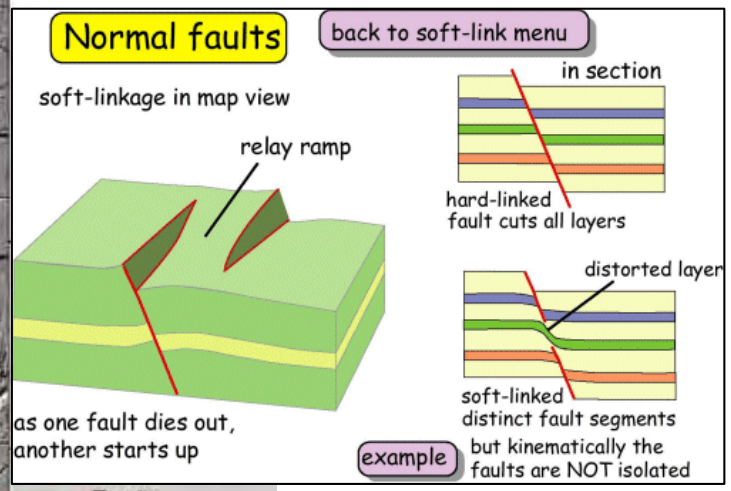
- Highways
- Faults
- Unconfirmed
- DEM anomalies



Documented published faults in Houston Texas. Image source: *Geosphere,* Engelkemeir and Khan, 2008.

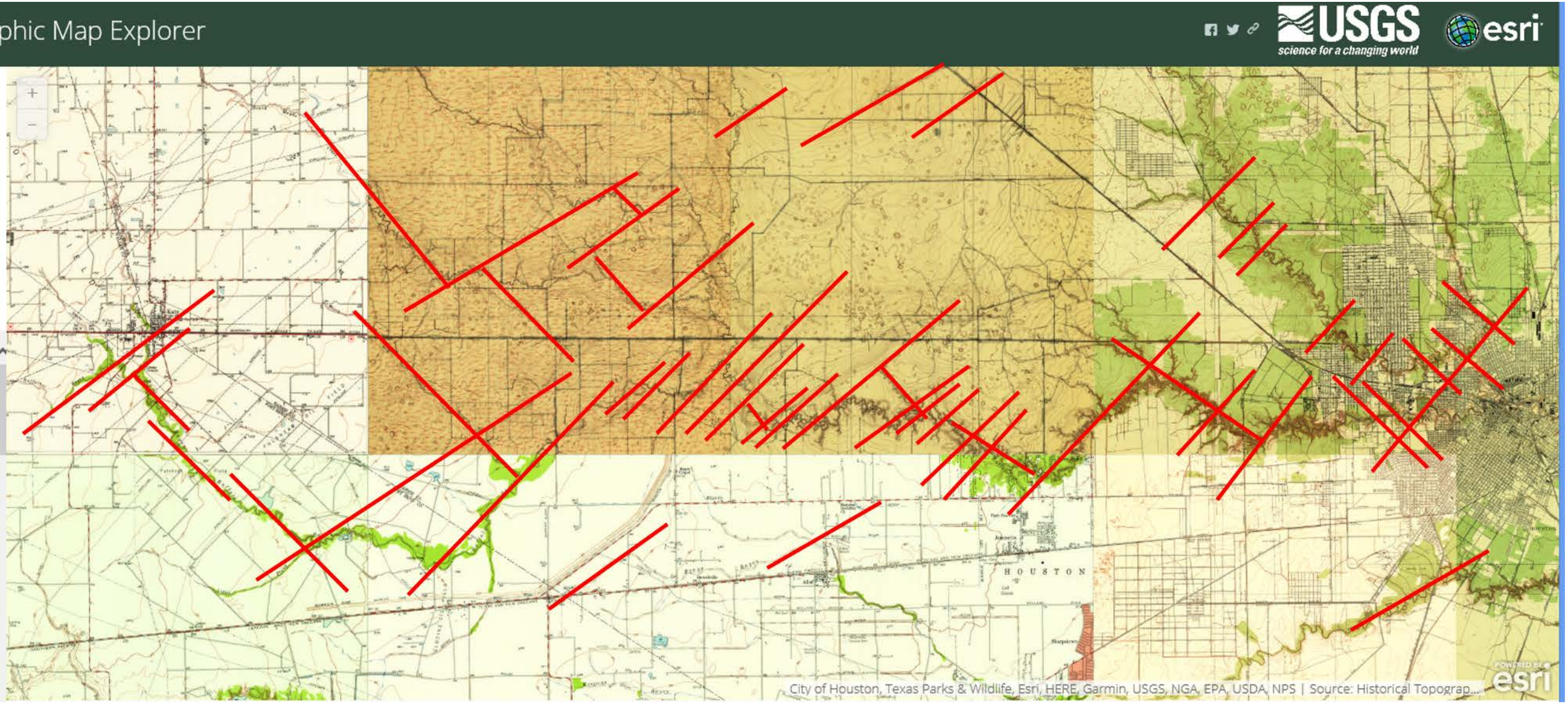
Additional interpreted faults in bold red (NE-SW) and light green (NE-SW) by TMH.

Drainage patterns and meander belt orientations suggest a possible link to area faulting.

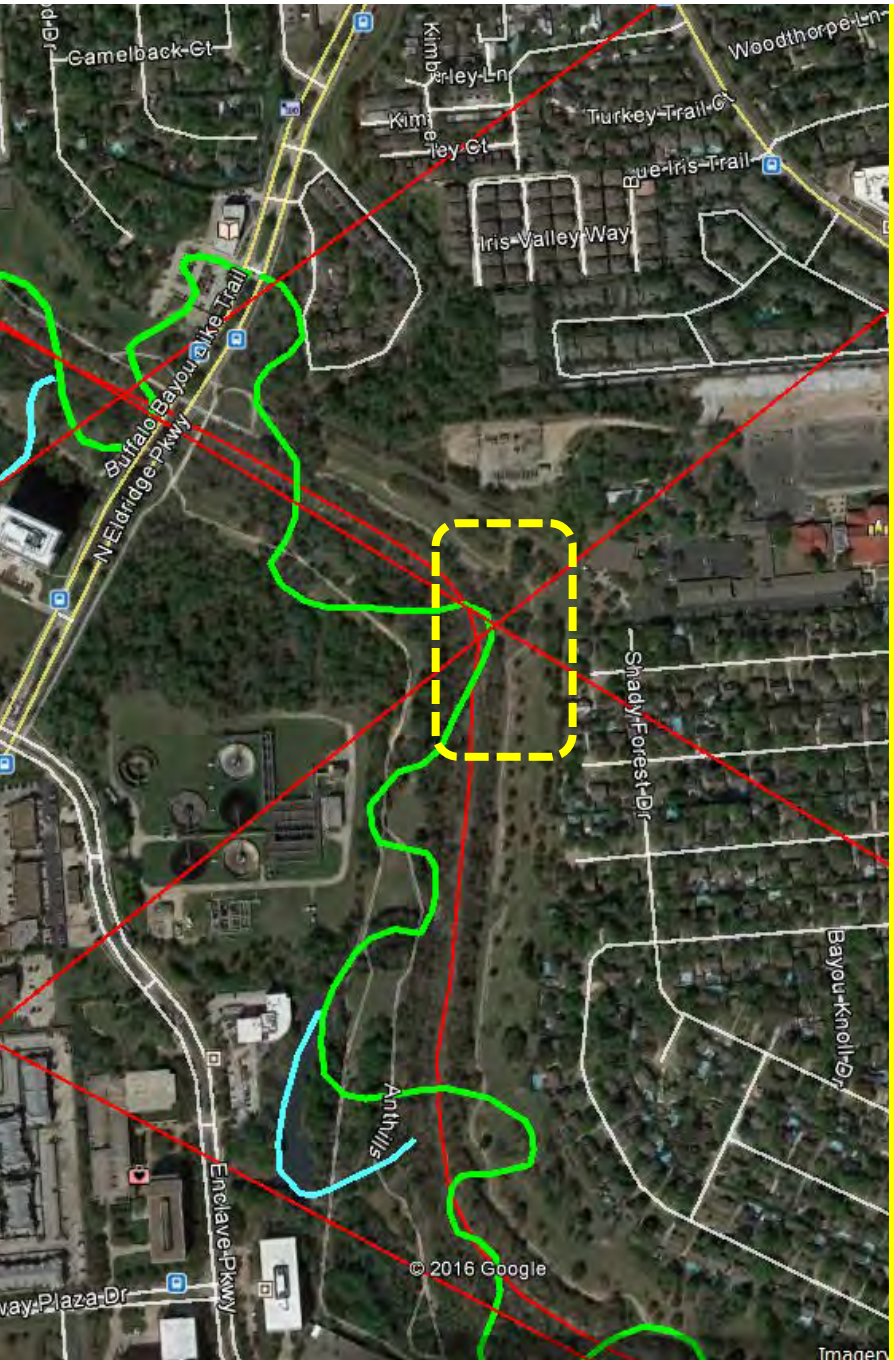


Faults
Unconfirmed
DEM anomalies

Interpret possible faults on old topo maps. Potential connection between drainage patterns and faulting observed…..?



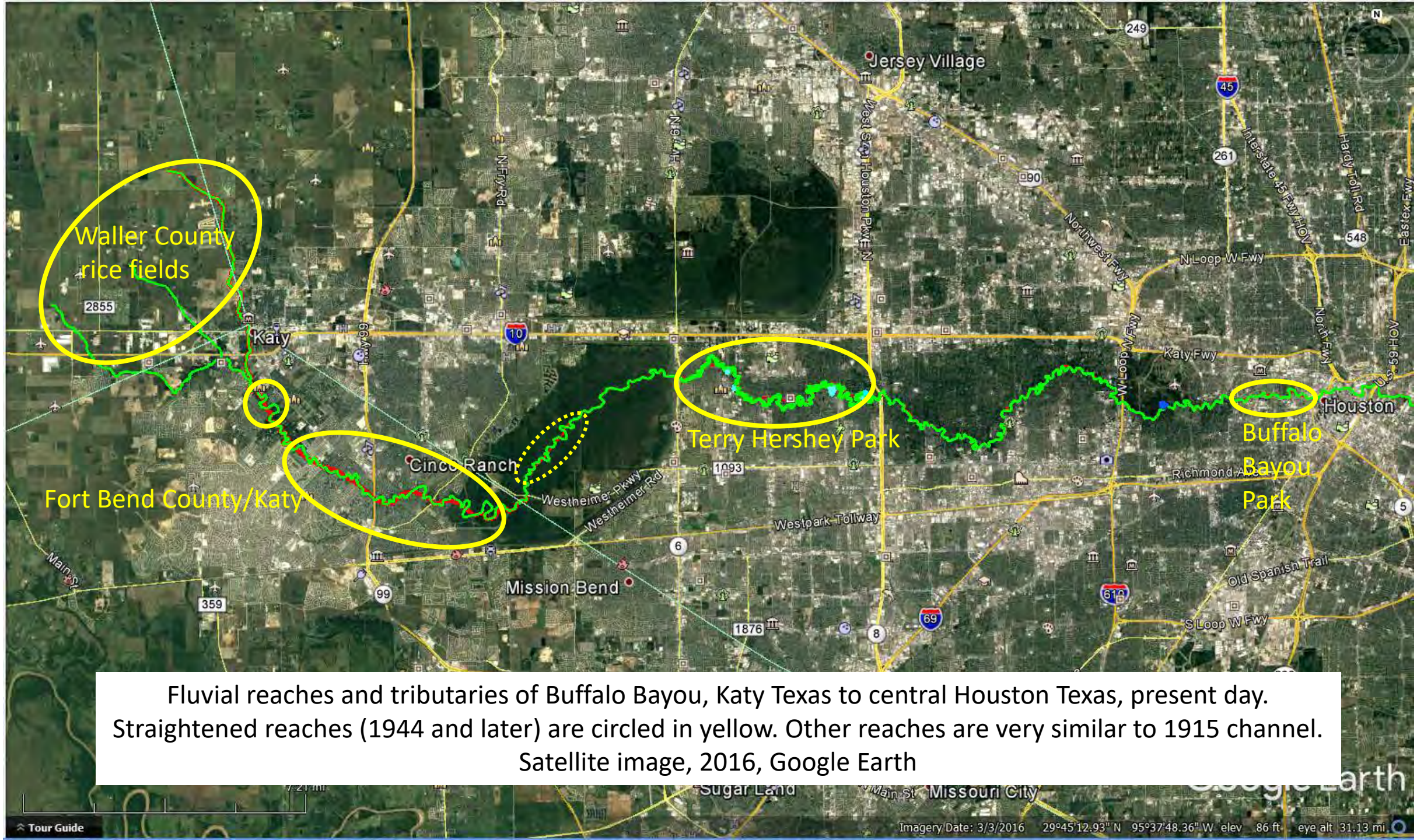
Possible fault interpretation – Eldridge Parkway area



Isolated “crack swarms”
in proximity to interpreted faults

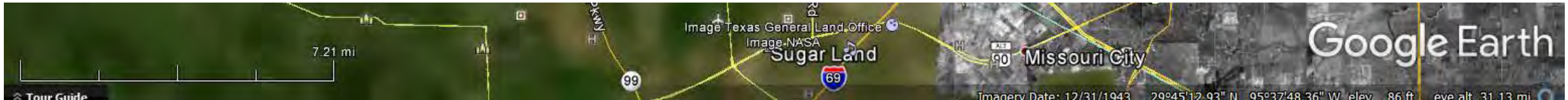
Back to the meanders…..

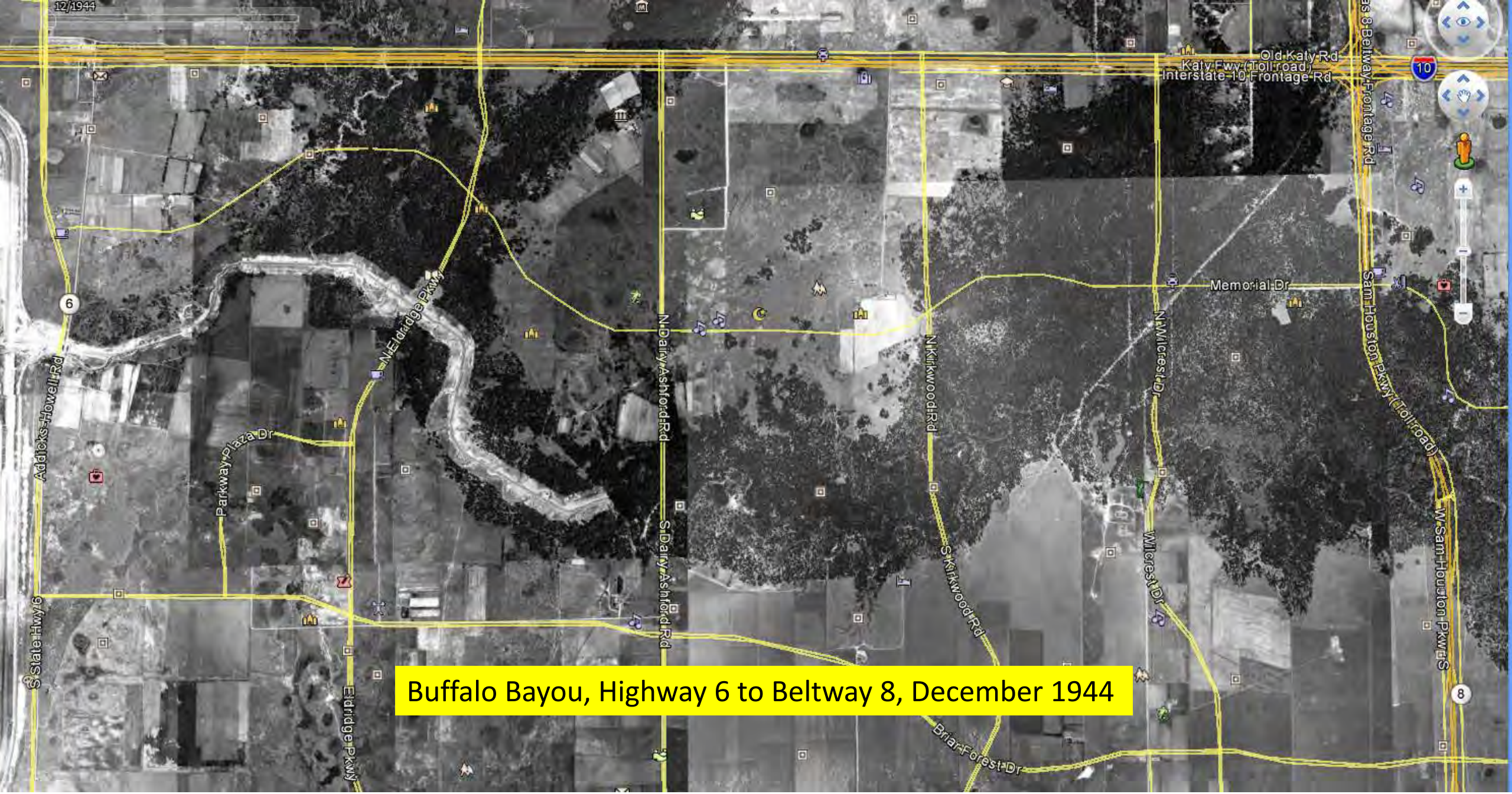
Straightening of Buffalo Bayou, 1944-53, Hwy 6 to BW 8



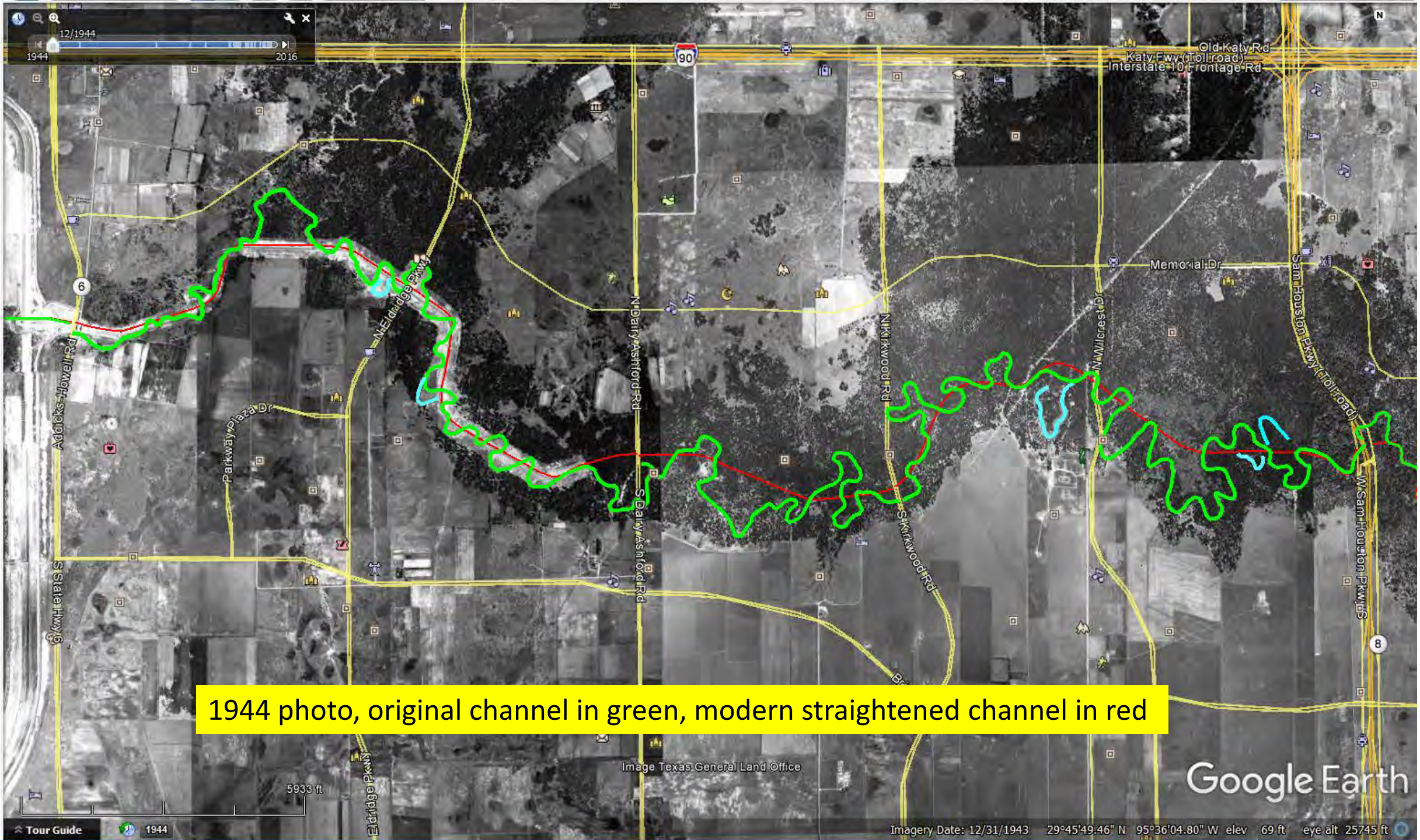
Fluvial reaches and tributaries of Buffalo Bayou, Katy Texas to central Houston Texas, present day. Straightened reaches (1944 and later) are circled in yellow. Other reaches are very similar to 1915 channel. Satellite image, 2016, Google Earth

Fluvial reaches and tributaries of Buffalo Bayou, Katy Texas to central Houston Texas, beginning stage of major modifications. Aerial photo montage, 1944, Google Earth. Modern roadways posted for geographic reference.

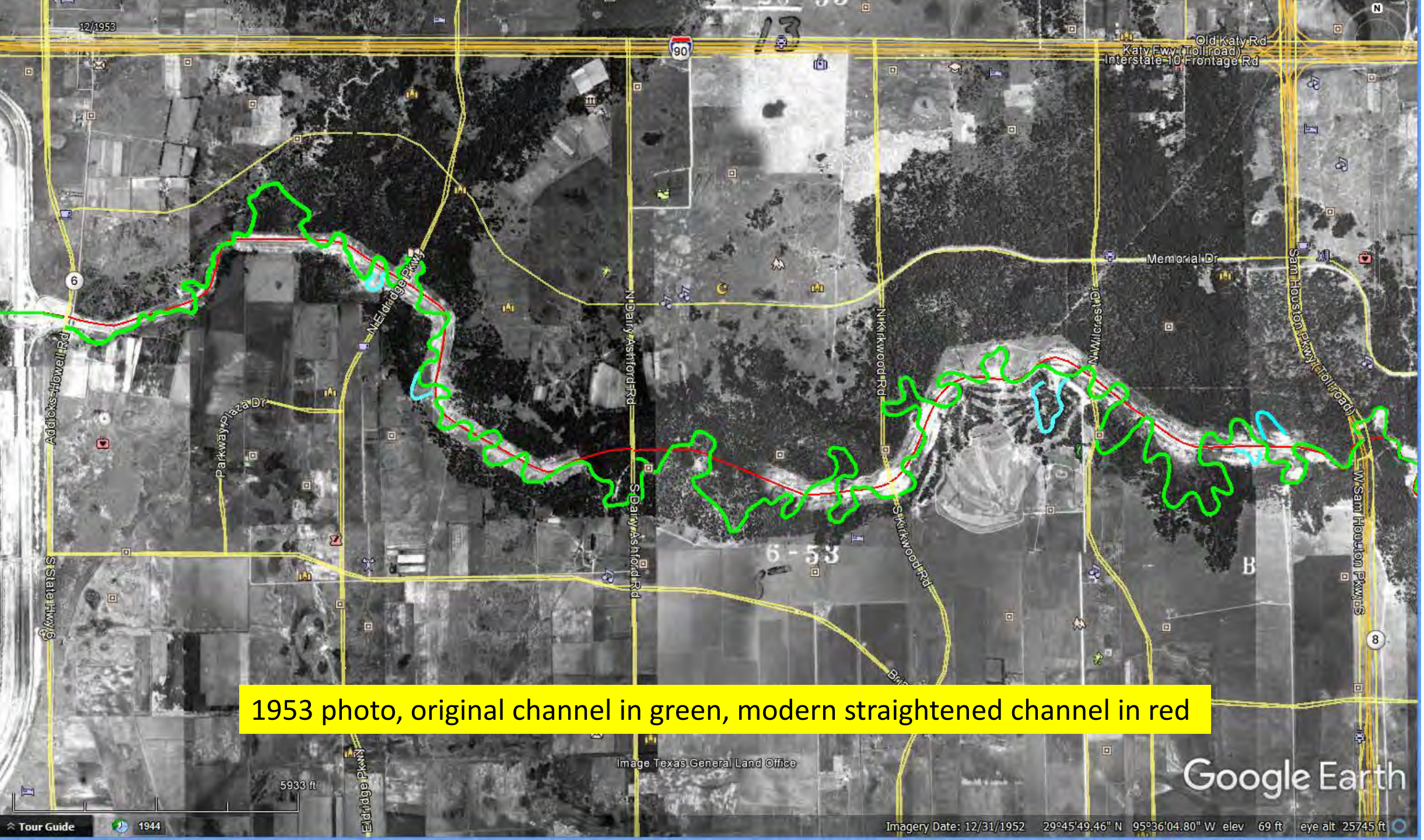




Buffalo Bayou, Highway 6 to Beltway 8, December 1944

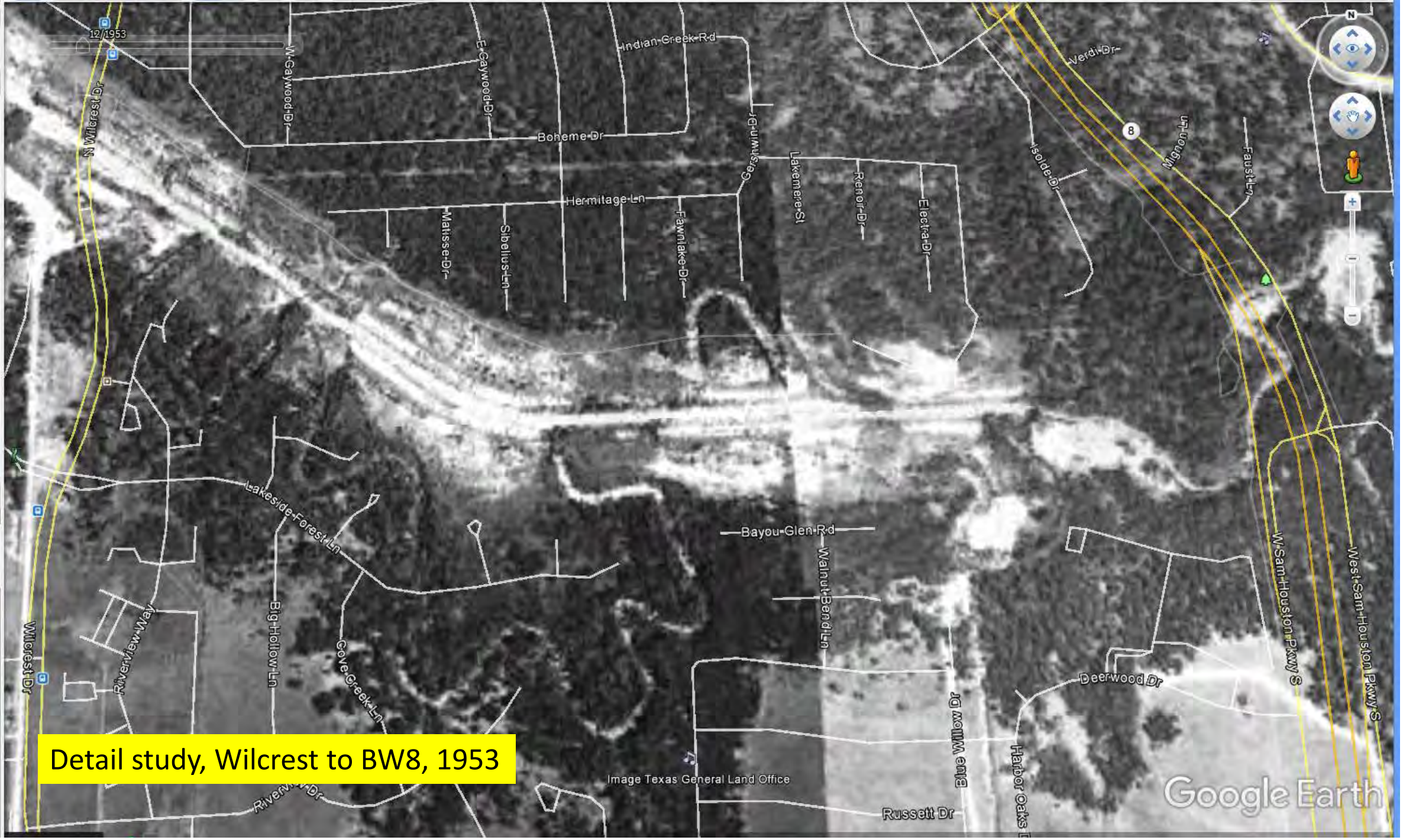


1944 photo, original channel in green, modern straightened channel in red



1953 photo, original channel in green, modern straightened channel in red

Detail study, Wilcrest to BW8, 1944



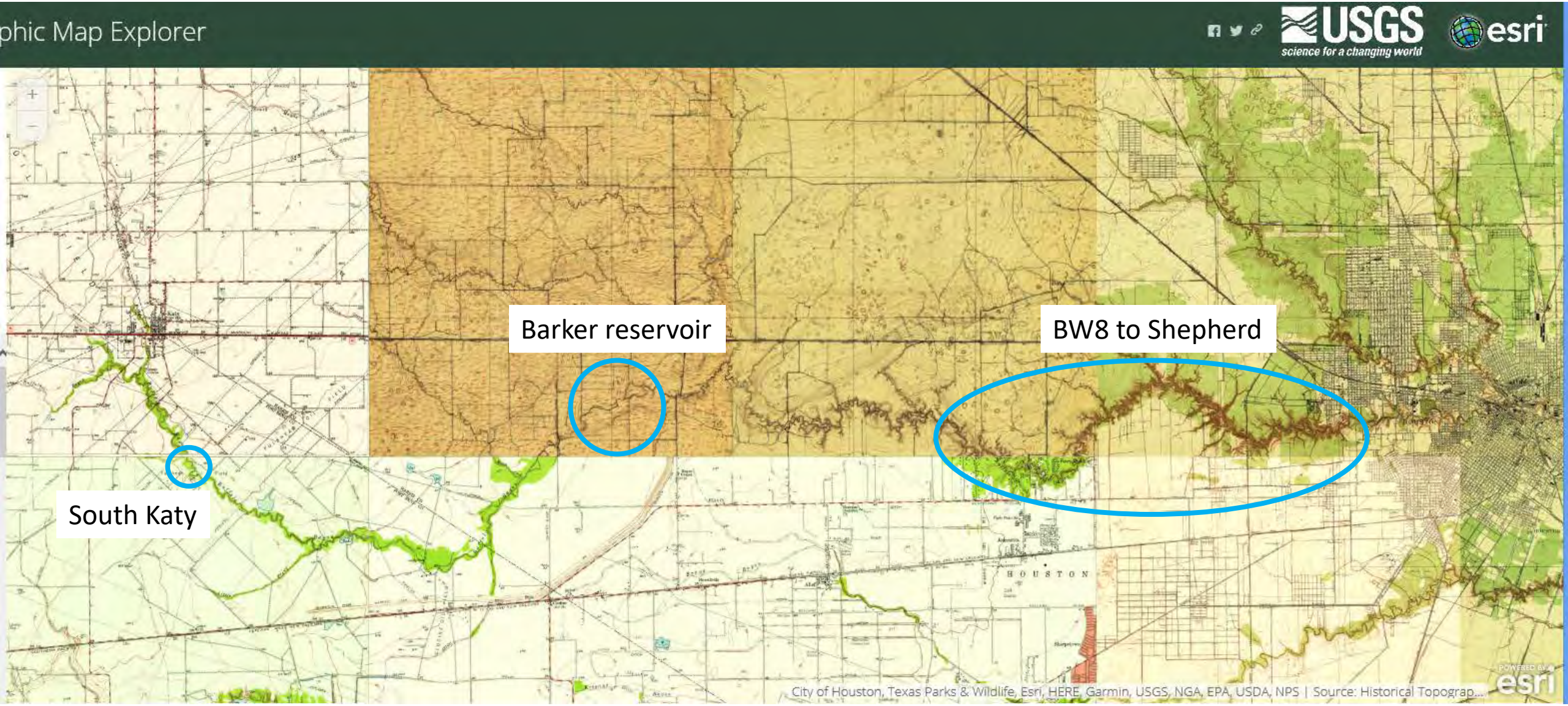
Detail study, Wilcrest to BW8, 1953

Meander conditions observed on Buffalo Bayou in 2017

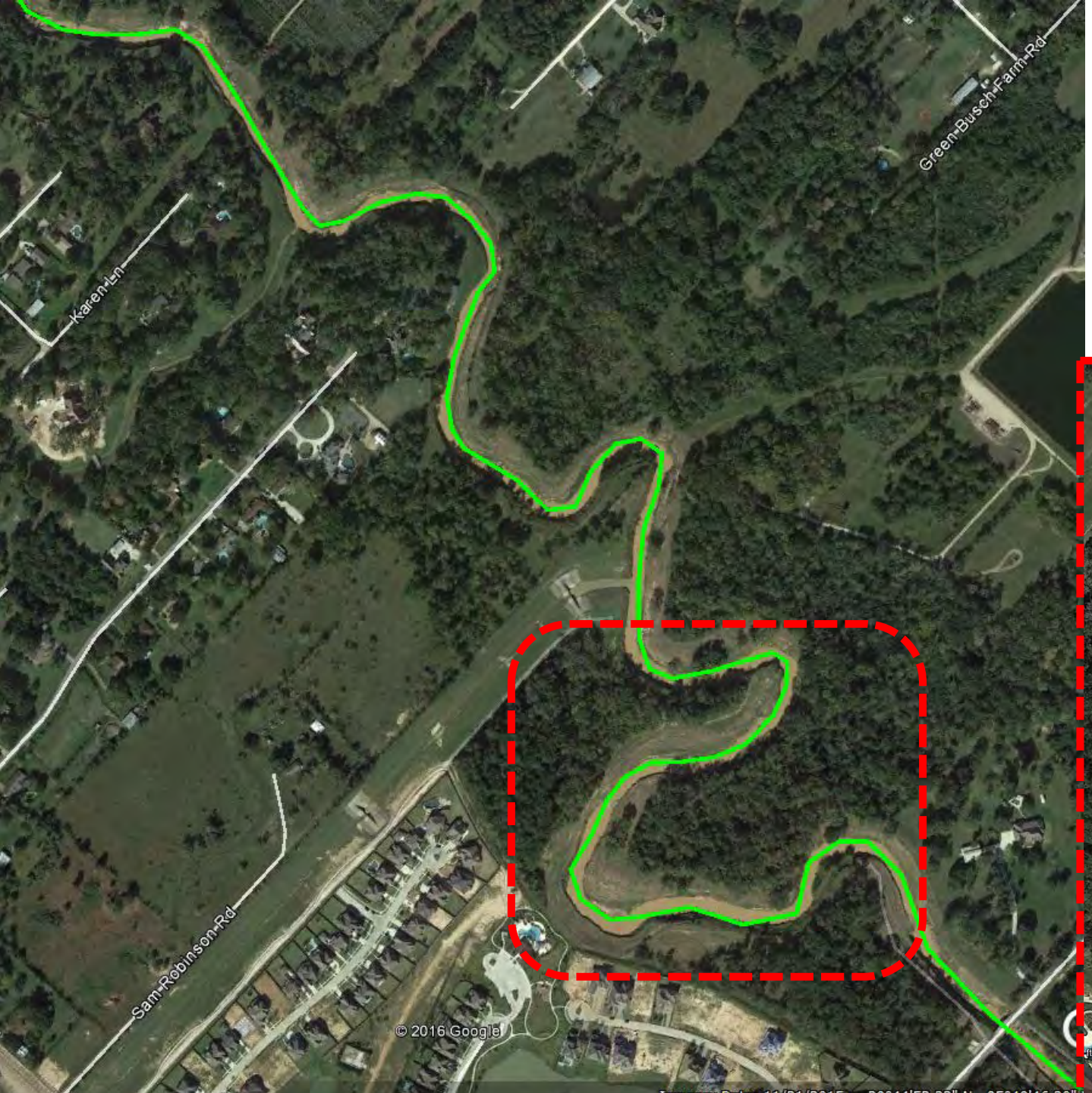
- Unfilled meanders: connected to main channel vs. partially connected vs. disconnected, includes unaltered flowing bayou meanders, also includes old unfilled meanders contained within housing developments. Most contain forms of riparian environments.
- Filled meanders: partially or completely filled and isolated. Current conditions include mowed and partially forested parkland, “hanging valleys” with isolated riparian vegetation, or completely filled and buried beneath concrete.
- Lakes: disconnected from channel, includes former oxbows. Some contain vestiges of riparian environments.

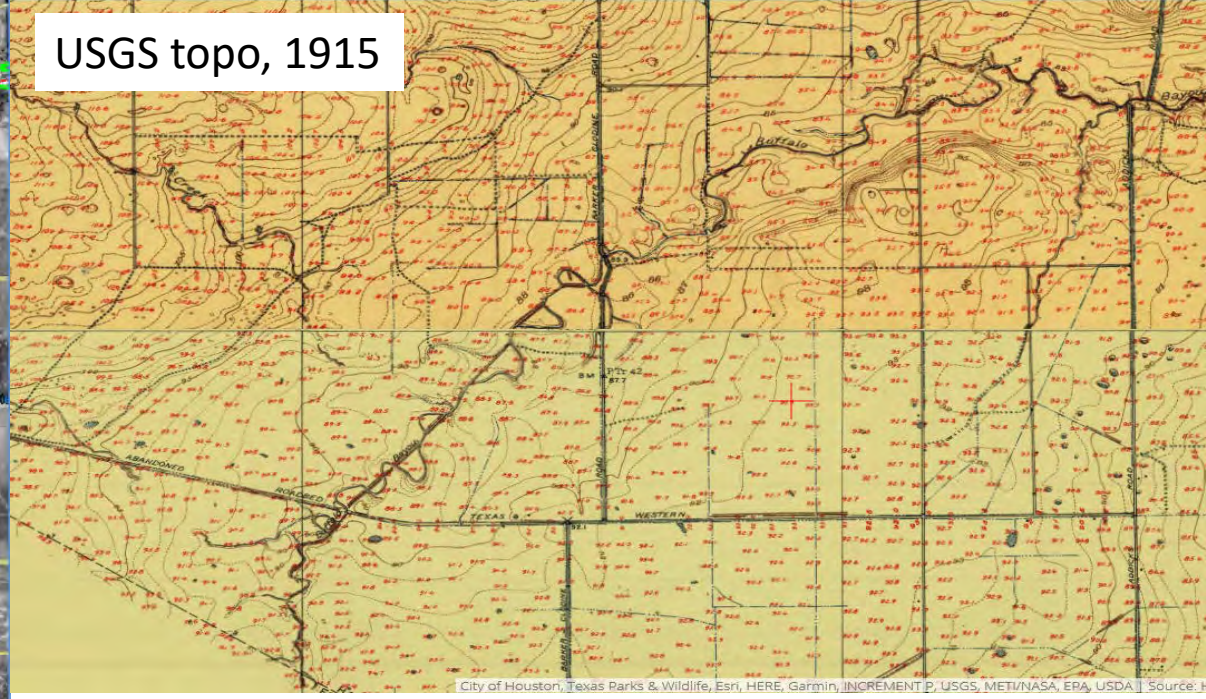
Unfilled, connected meanders:
water flows freely through channel, and in most cases riparian vegetation thrives on the banks.

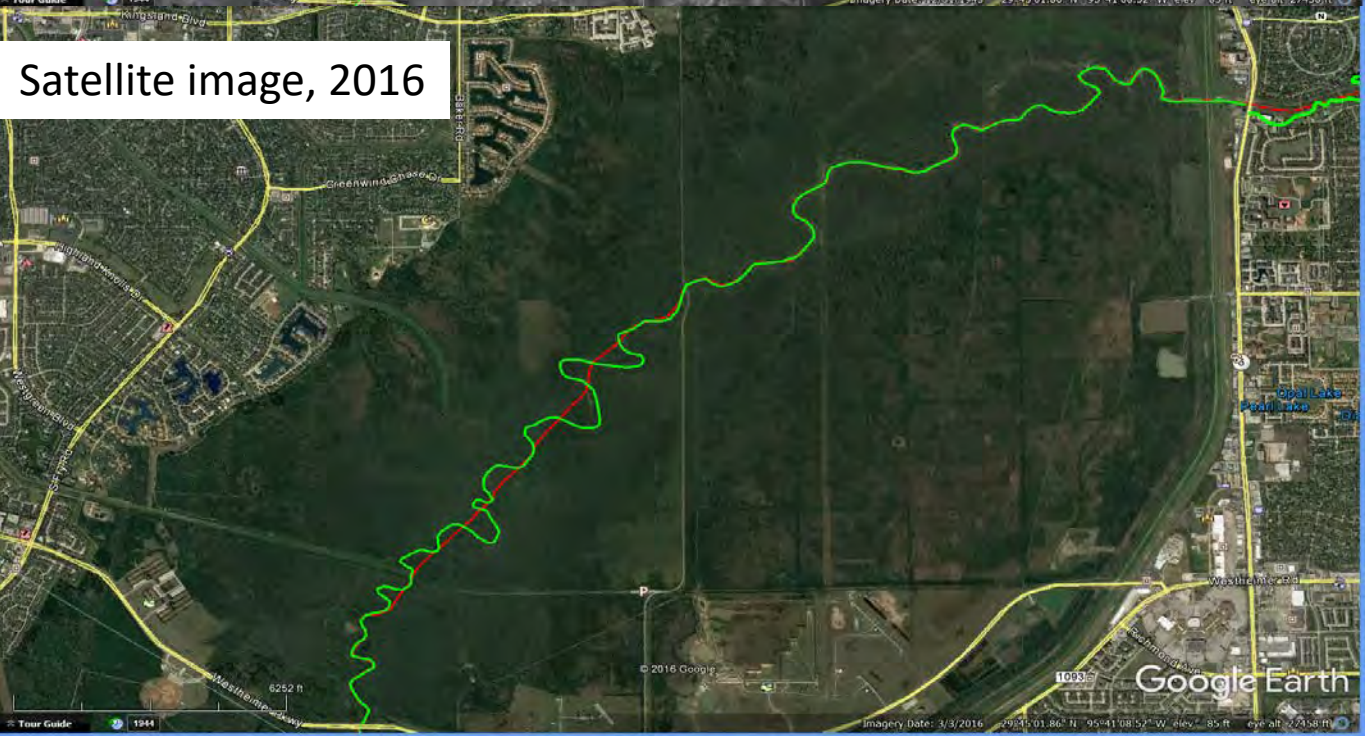
Buffalo Bayou: locations of remaining fully connected meanders



Buffalo Bayou, south of Katy.
Large trees intact, but bank slopes are kept mowed





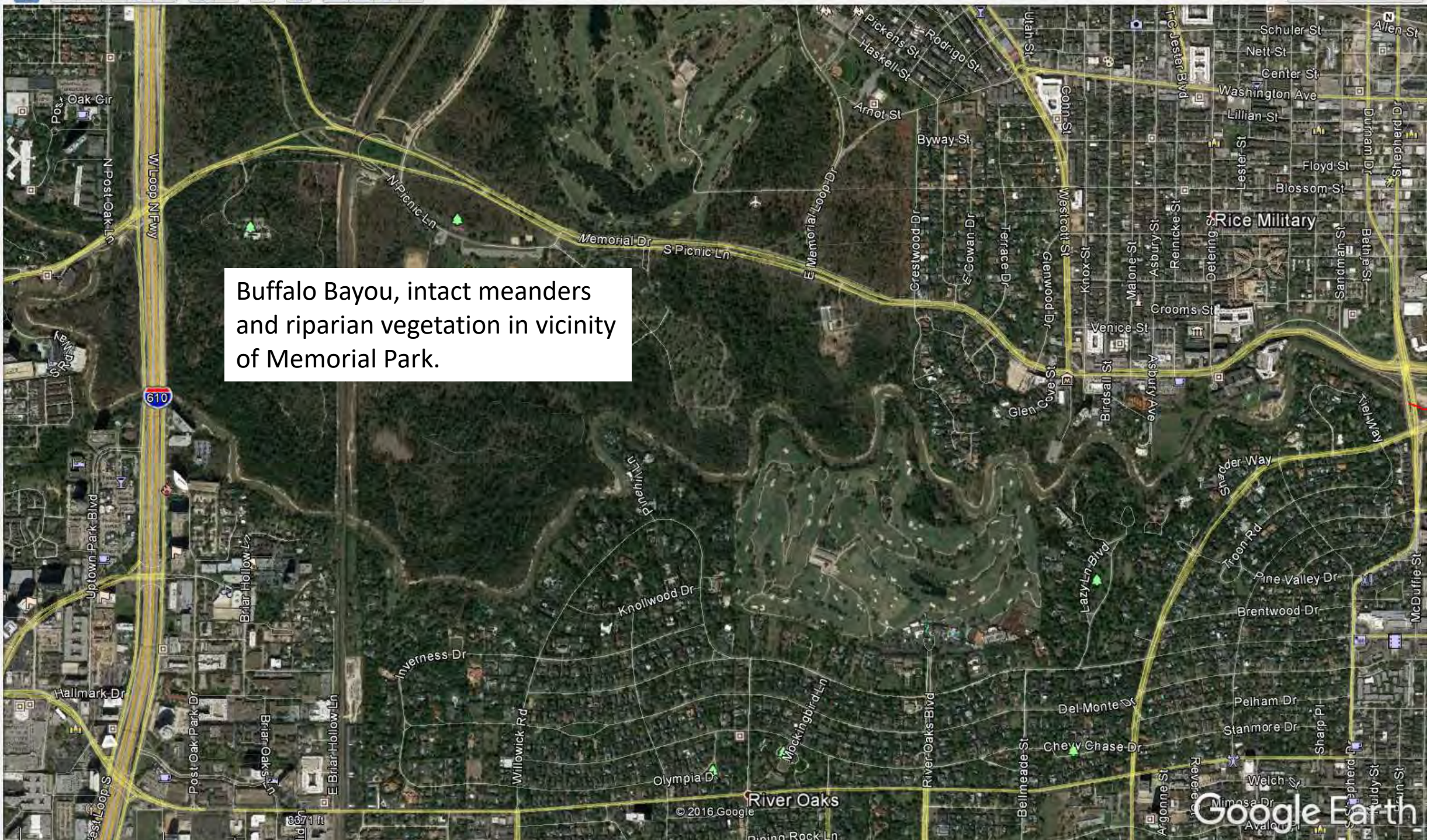


Buffalo Bayou, west Houston, Barker Reservoir. South reach of waterway had already been straightened in 1915, but the meanders are still connected to the straightened channel.

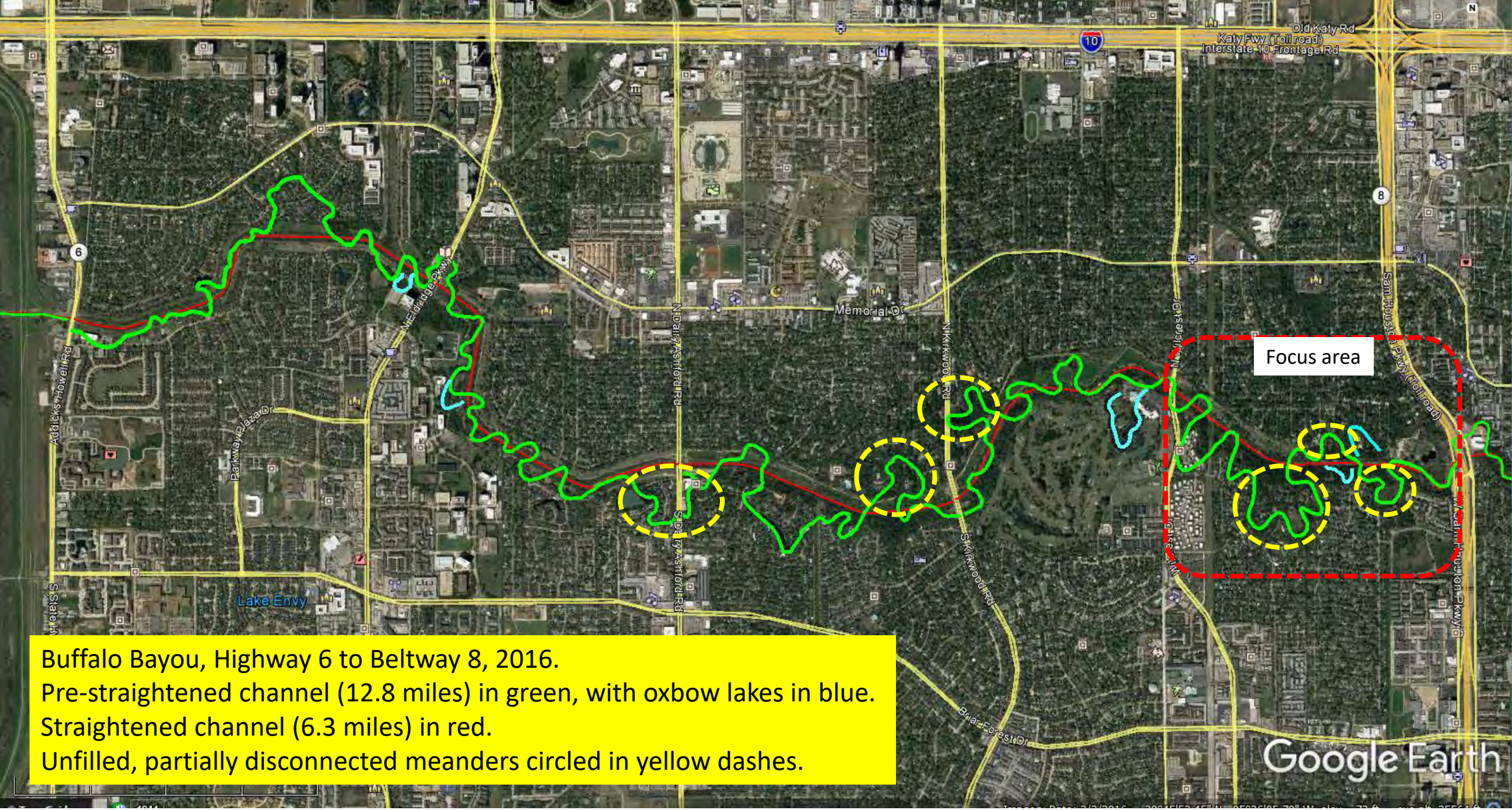
Meanwhile…..Barker Reservoir has mostly returned to wilderness. Area along waterway contains mature riparian forest, wetlands, and abundant wildlife.


Buffalo Bayou connected meanders, Villages and Memorial Park: Beltway 8 to Shepherd. Bayou meanders mostly intact for 17 river miles, although development encroaches uncomfortably close in some cases.
Long Point Rd
Hilshire Village
Westview Dr
Katy Fwy (Toll road)
Hedwig Village
Taylorcrest Rd
Hunters Creek Village
Bunker Hill Village
Piney Point Village
Greenbay St
Blalock Rd
Hedwig Rd
Voss Rd
Gessner Rd
Briar Forest Dr
Sam Houston Pkwy (Toll road)
Woodway Dr
Fountain View Dr
Bering Dr
Chimney Rock Rd
S Post Oak Ln
Post Oak Blvd
W Loop N Fwy
Memorial Dr
Washington Ave
Westcott St
Katy Fwy
San Felipe St
Westheimer Rd
Richmond Ave
Southwest Fwy
Westpark Dr
Bissonnet St
Edloe St
Dunlavy St
S Shepherd Dr
N Shepherd Dr
Dunvale Rd
Fondren Rd
Hillcroft St
S Gessner Rd
Briarpark Dr
Harwin Dr
Rogerdale
Gulfton St
S Rice Ave
West Loop S
Weslayan St
University Blvd
West University Place
©2016 Google
Google Earth
Tour Guide
1944
Imagery Date: 3/3/2016 29°45'27.44" N 95°29'00.48" W elev 63 ft eye alt 46529 ft

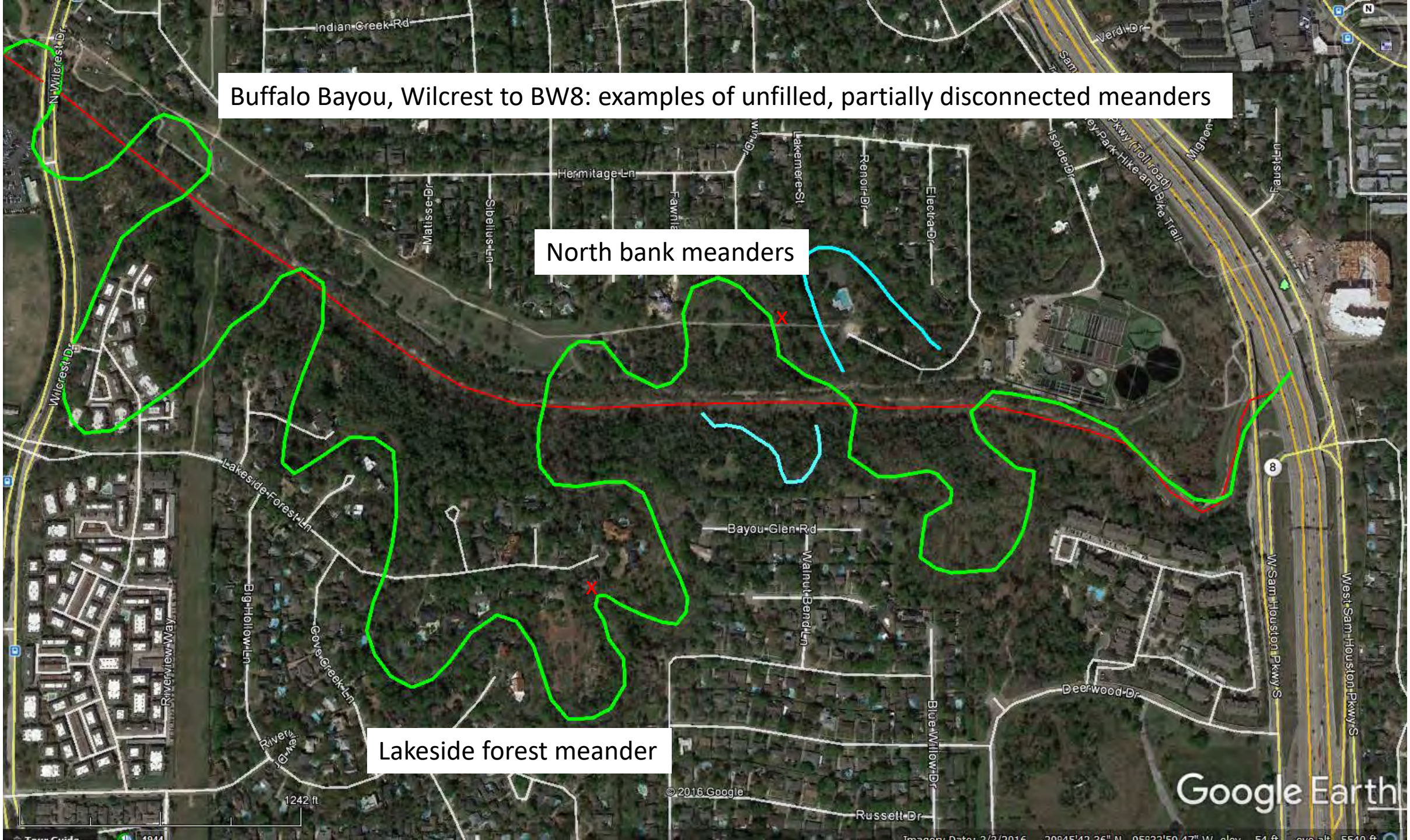
Buffalo Bayou, intact meanders and riparian vegetation in vicinity of Briar Bend Park.


Buffalo Bayou, intact meanders and riparian vegetation in vicinity of Memorial Park.
Memorial Dr
S Picnic Ln
N Picnic Ln
E Memorial Loop Dr
W Loop N Fwy
N Post Oak Ln
Post Oak Cir
610
Uptown Park Blvd
Briar Hollow Ln
Hallmark Dr
Post Oak Park Dr
Briar Oaks Ln
E Briar Hollow Ln
Knollwood Dr
Inverness Dr
Willowick Rd
Mockingbird Ln
Olympia Dr
River Oaks
© 2016 Google
River Oaks Blvd
Bellmeade St
Del Monte Dr
Chevy Chase Dr
Lazy Ln Blvd
Pine Valley Dr
Brentwood Dr
Pelham Dr
Stanmore Dr
Welch St
Mimosa Dr
Argonne St
Shepherd Dr
McDuffie St
Troon Rd
Shadder Way
Kiel Way
Rice Military
Crooms St
Venice St
Glen Cove St
Birdsall St
Asbury Ave
Knox St
Maione St
Asbury St
Reinicke St
Detering St
Lester St
Sandman St
Bethe St
Durham Dr
Floyd St
Blossom St
Washington Ave
Lillian St
Center St
Nett St
Schuler St
Allen St
Byway St
Arnot St
Haskell St
Pickens St
Rodrigo St
Utah St
Cohn St
Wescott St
Glenwood Dr
Terrace Dr
E Cowan Dr
Crestwood Dr
Google Earth

Unfilled, partially disconnected meanders:
At least one end of meander (usually upstream) is blocked, bayou may flow in during high flows.
Riparian environment may exist, oxbow lake analog



Buffalo Bayou, Highway 6 to Beltway 8, 2016.
Pre-straightened channel (12.8 miles) in green, with oxbow lakes in blue.
Straightened channel (6.3 miles) in red.
Unfilled, partially disconnected meanders circled in yellow dashes.


Buffalo Bayou, Wilcrest to BW8: examples of unfilled, partially disconnected meanders
North bank meanders
Lakeside forest meander
Indian Creek Rd
N Wilcrest Dr
Wilcrest Dr
Hermitage Ln
Mathesson Dr
Sibelius Ln
Fawnlake
Lakemere St
Renoir Dr
Electra Dr
Isolde Dr
Verdi Dr
Mignon
Lakeside Forest Ln
Bayou Glen Rd
Walnut Bend Ln
Big Hollow Ln
Riverview Way
Gove Creek Ln
Riverview Dr
Blue Willow Dr
Deerwood Dr
Russett Dr
W Sam Houston Pkwy S
West Sam Houston Pkwy S
8
1242 ft
© 2016 Google
Google Earth

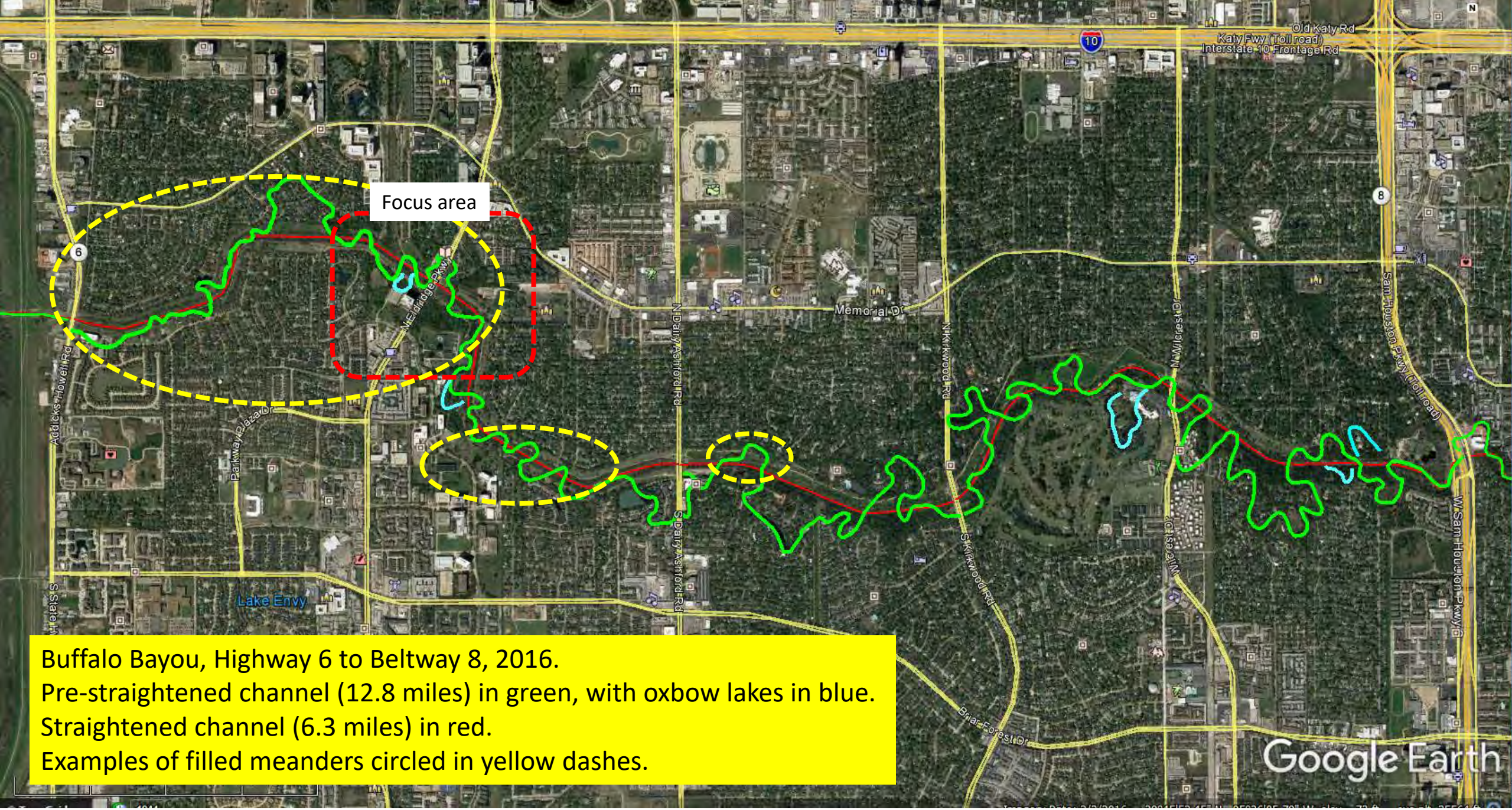
Lakeside forest meander in February 2017

This landowner thinks so.

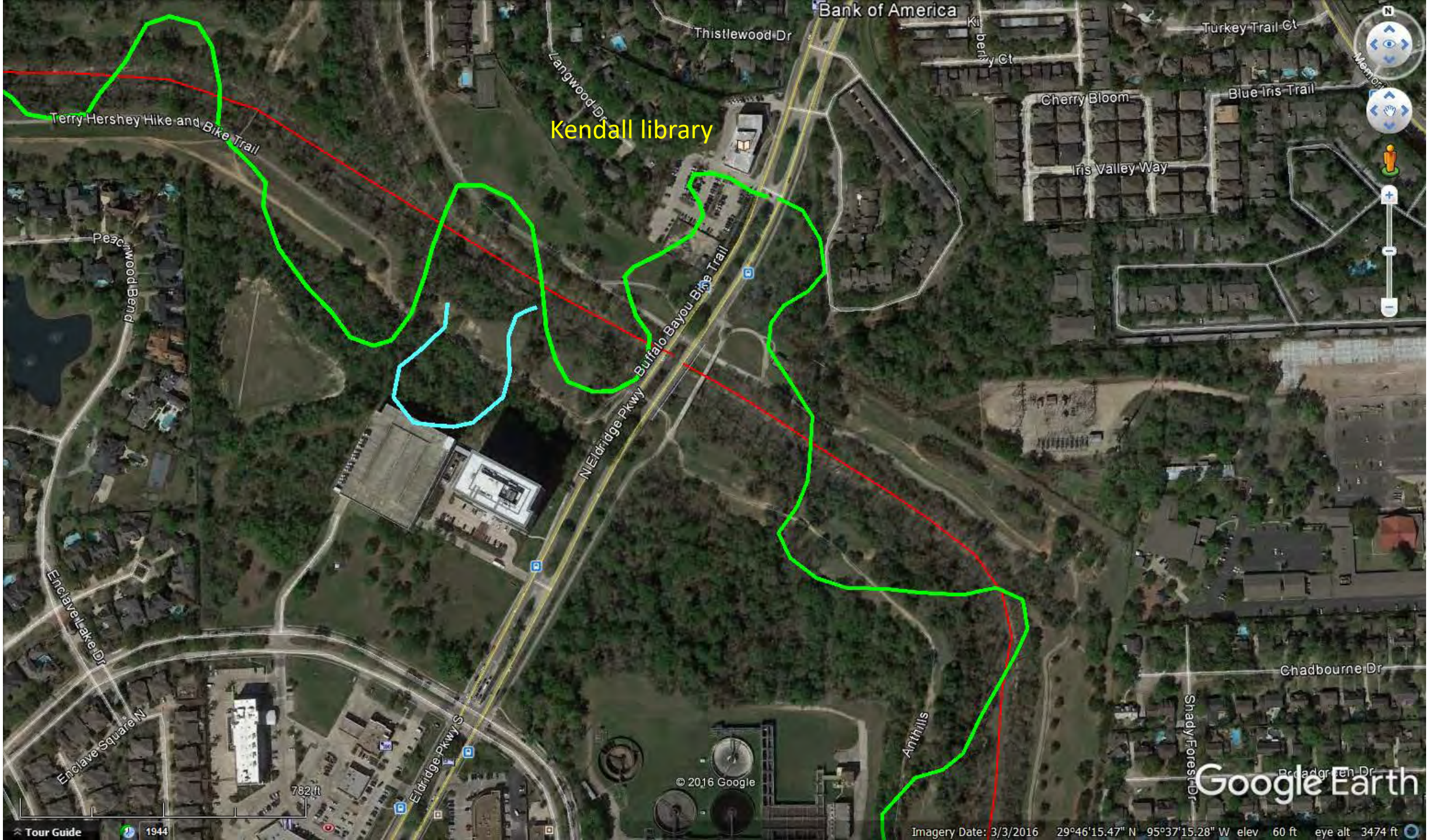
Natural habitat worth protecting?


North bank meander in October 2016

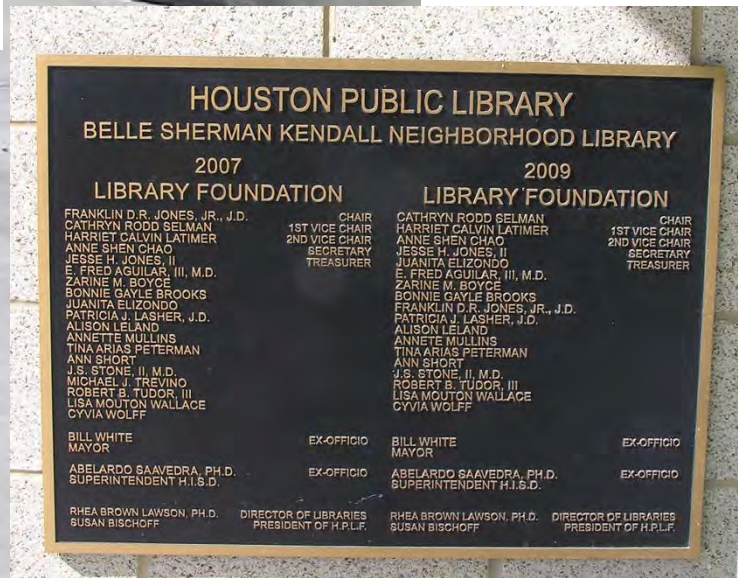
Examples of filled meanders:
partially or completely filled and isolated. Current conditions include parkland, “hanging valleys” with riparian vegetation, or completely filled and buried beneath concrete or buildings.



Buffalo Bayou, Highway 6 to Beltway 8, 2016.
Pre-straightened channel (12.8 miles) in green, with oxbow lakes in blue.
Straightened channel (6.3 miles) in red.
Examples of filled meanders circled in yellow dashes.


Kendall library
Bank of America
Thistlewood Dr
Langwood Dr
Turkey Trail Ct
Cherry Bloom
Blue Iris Trail
Iris Valley Way
Terry Hershey Hike and Bike Trail
Peachwood Bend
Buffalo Bayou Bike Trail
N Eldridge Pkwy
Enclave Lake Dr
Enclave Square N
Eldridge Pkwy S
782 ft
© 2016 Google
Anthills
Chadbourne Dr
Shady Forest Dr
Google Earth
Tour Guide
1944
Imagery Date: 3/3/2016 29°46'15.47" N 95°37'15.28" W elev 60 ft eye alt 3474 ft

Kendall Library, located on top of a filled meander on Eldridge Parkway. Old meander runs under parking lot and under building. So far so good?



Across street from library…..
Wooded parkland on filled
former meander…filled with what?

Random chunks of concrete

Mystery rusted storage drum

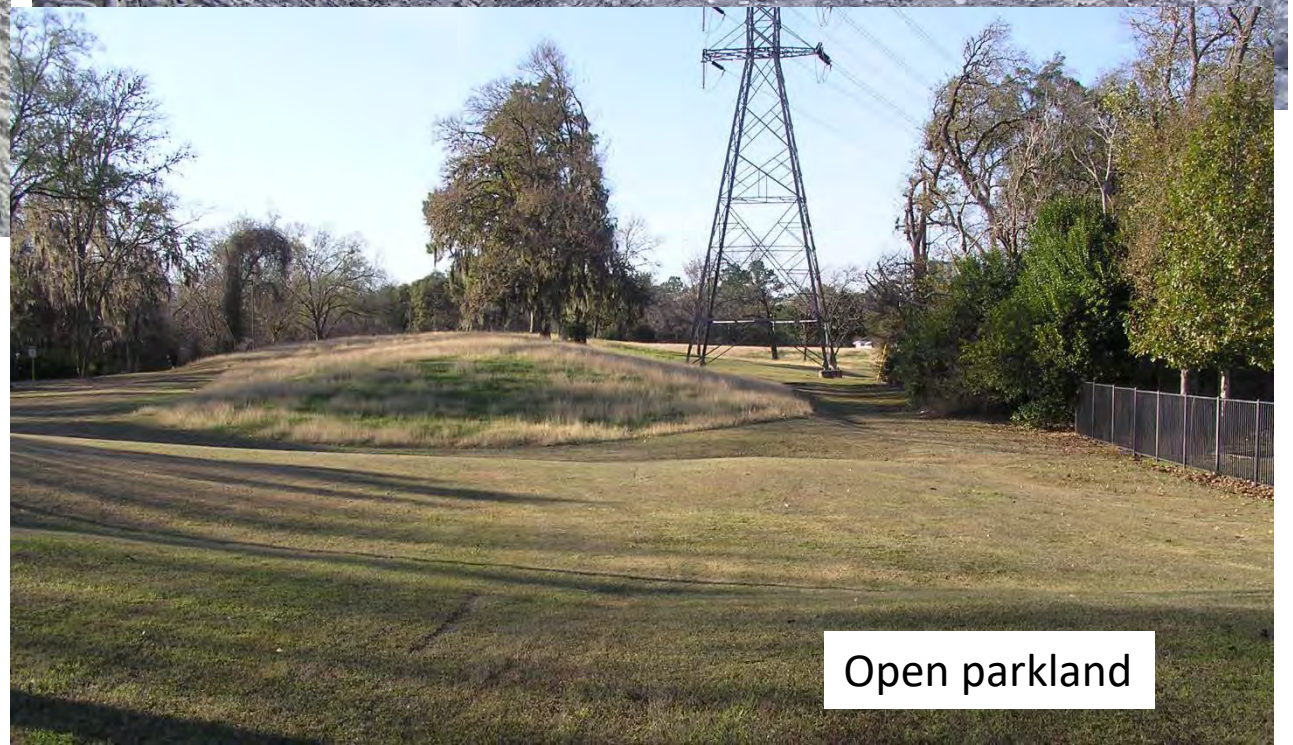
“Hanging valley”…old meander isolated by straightened and deepened channel, probably partially filled from above by 70 years of eroded spoil material.

Filled meanders, Eldridge Parkway area

Raccoon tracks in sand

Hanging valley

Hanging valley



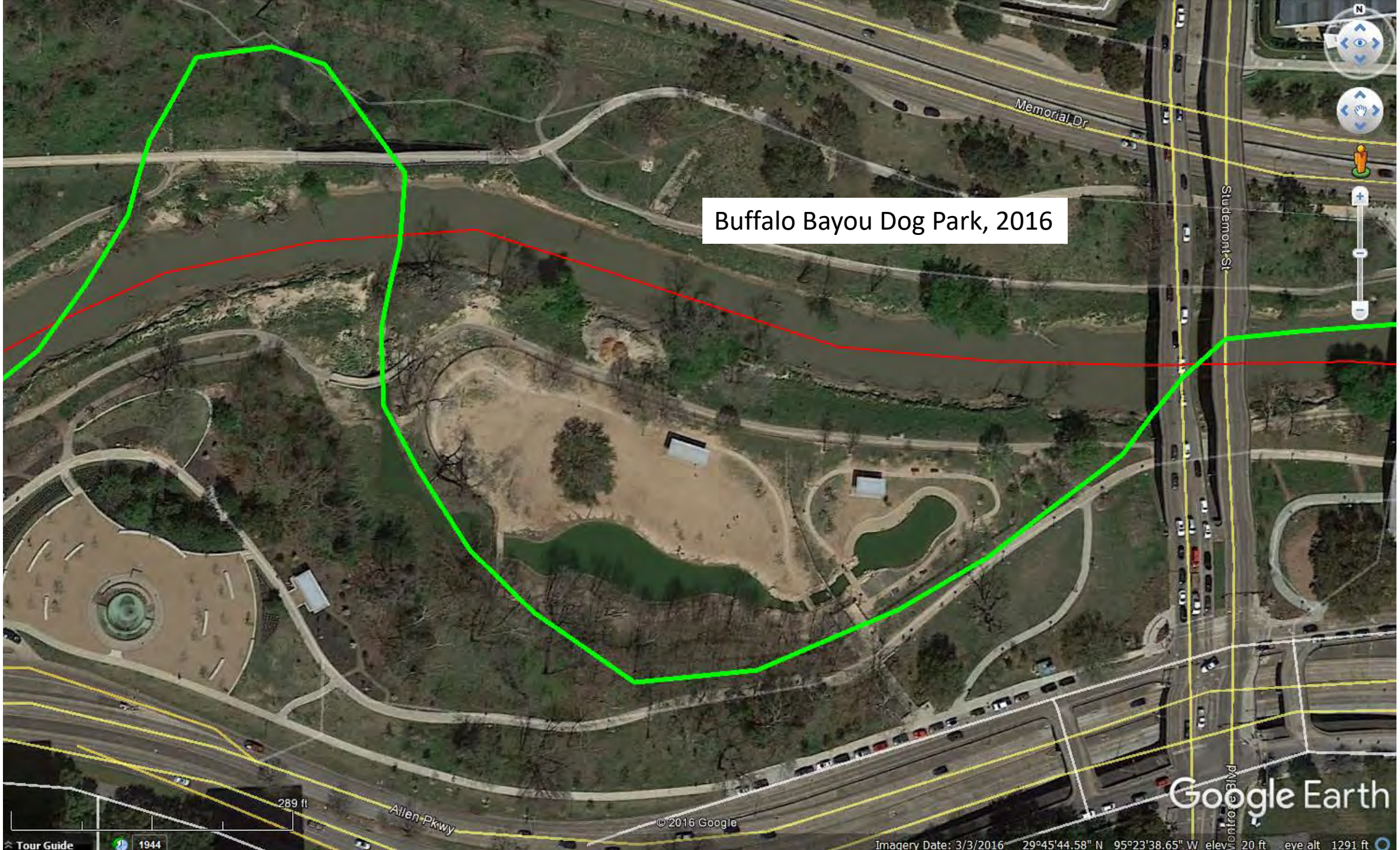
Open parkland

Examples of former meanders that are now bayou-side lakes


12/1944
1944
2016
1259 Enclave Parkway
1944
Antbills
Image Texas General Land Office
Google Earth
268 ft
Tour Guide
1944
Imagery Date: 12/31/1943
29°45'55.83" N 95°37'13.05" W elev 73 ft eye alt 1257 ft

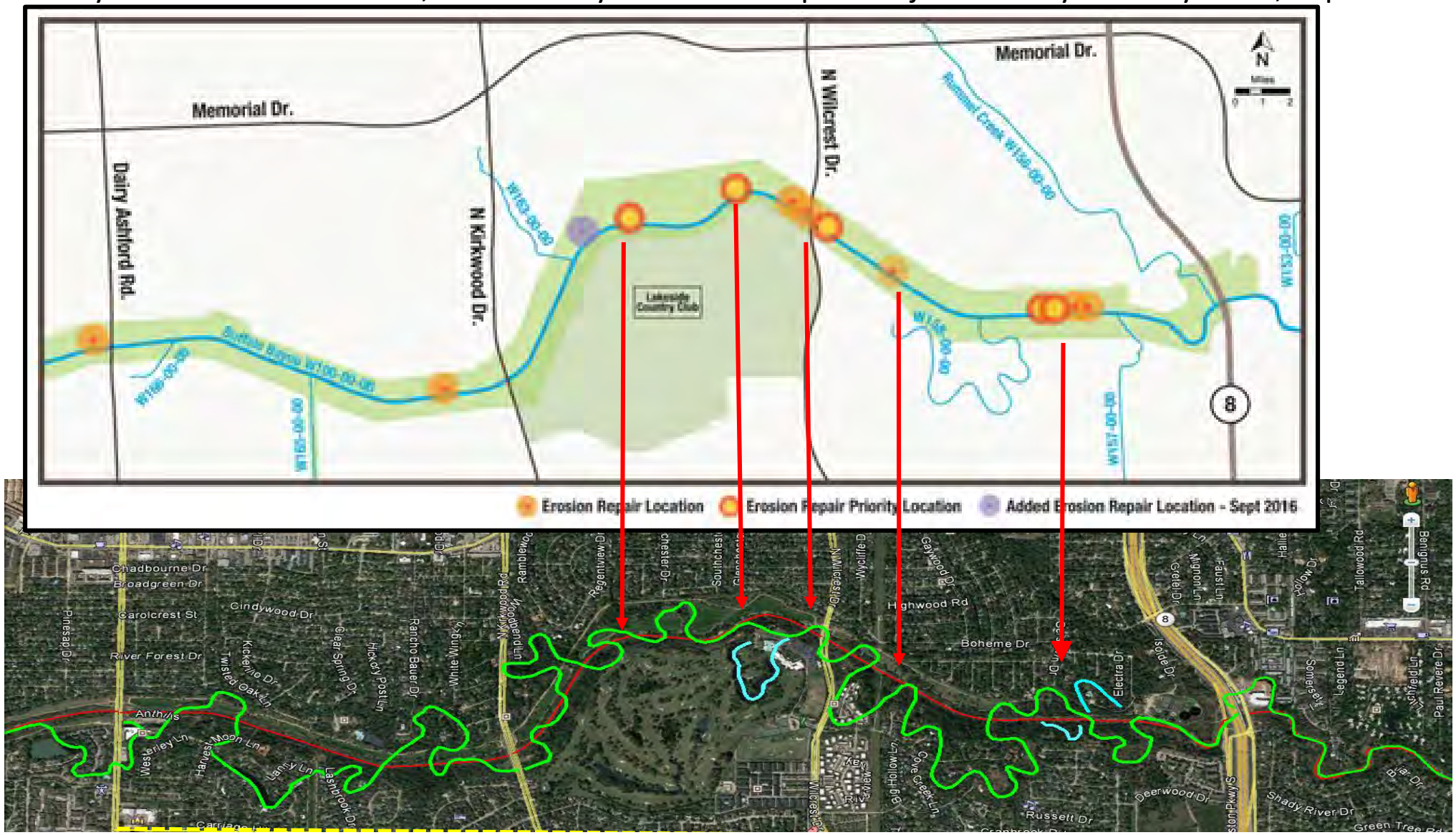

1259 Enclave Parkway
2016
Enclave Pkwy
Arthills
© 2016 Google
Google Earth
Tour Guide
1944
Imagery Date: 3/3/2016 29°45'56.01" N 95°37'13.04" W elev 74 ft eye alt 1284 ft


Buffalo Bayou park, 1944
12/1944
Memorial Dr
Studemont St
Montrose Blvd
Allen Pkwy
289 ft
Image Texas General Land Office
Google Earth
Tour Guide
Imagery Date: 12/31/1943 29°45'44.58" N 95°23'38.65" W elev 20 ft eye alt 1291 ft


Buffalo Bayou Dog Park, 2016
Memorial Dr
Studemont St
Allen Pkwy
289 ft
© 2016 Google
Google Earth
Tour Guide
1944
Imagery Date: 3/3/2016 29°45'44.58" N 95°23'38.65" W elev 20 ft eye alt 1291 ft

Artificial meander fills prone to damage?

From Harris County Flood Control website, “Buffalo Bayou Erosion Repair Project in Terry Hershey Park”, September 2016

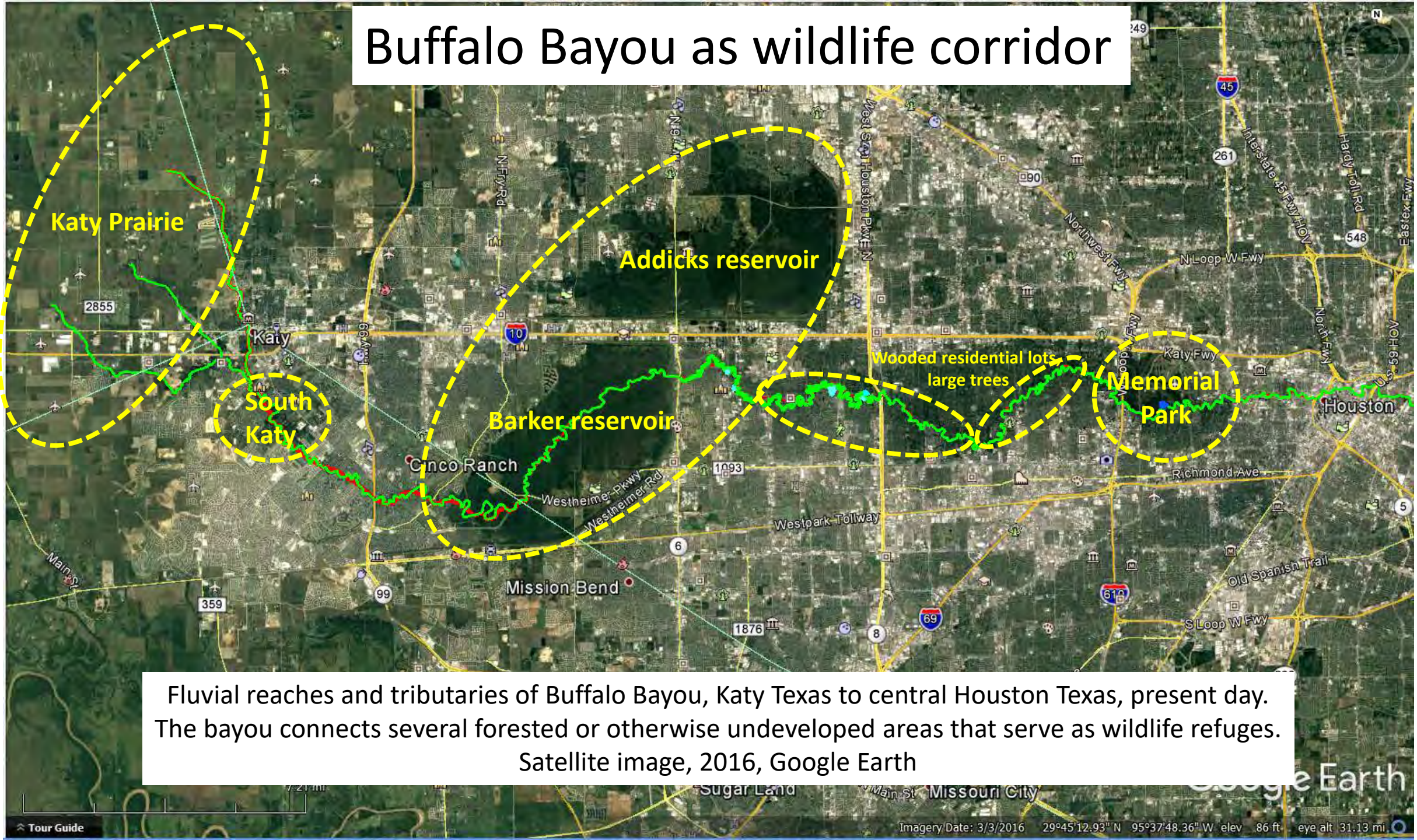


Damage locations are coincident in many cases with old meander crossings over modern channel.
Who knows what the quality of meander fill plug material was in the 1950’s……..

Examples of trail damage in locations of old meander fill

Buffalo Bayou as wildlife corridor

Buffalo Bayou as wildlife corridor



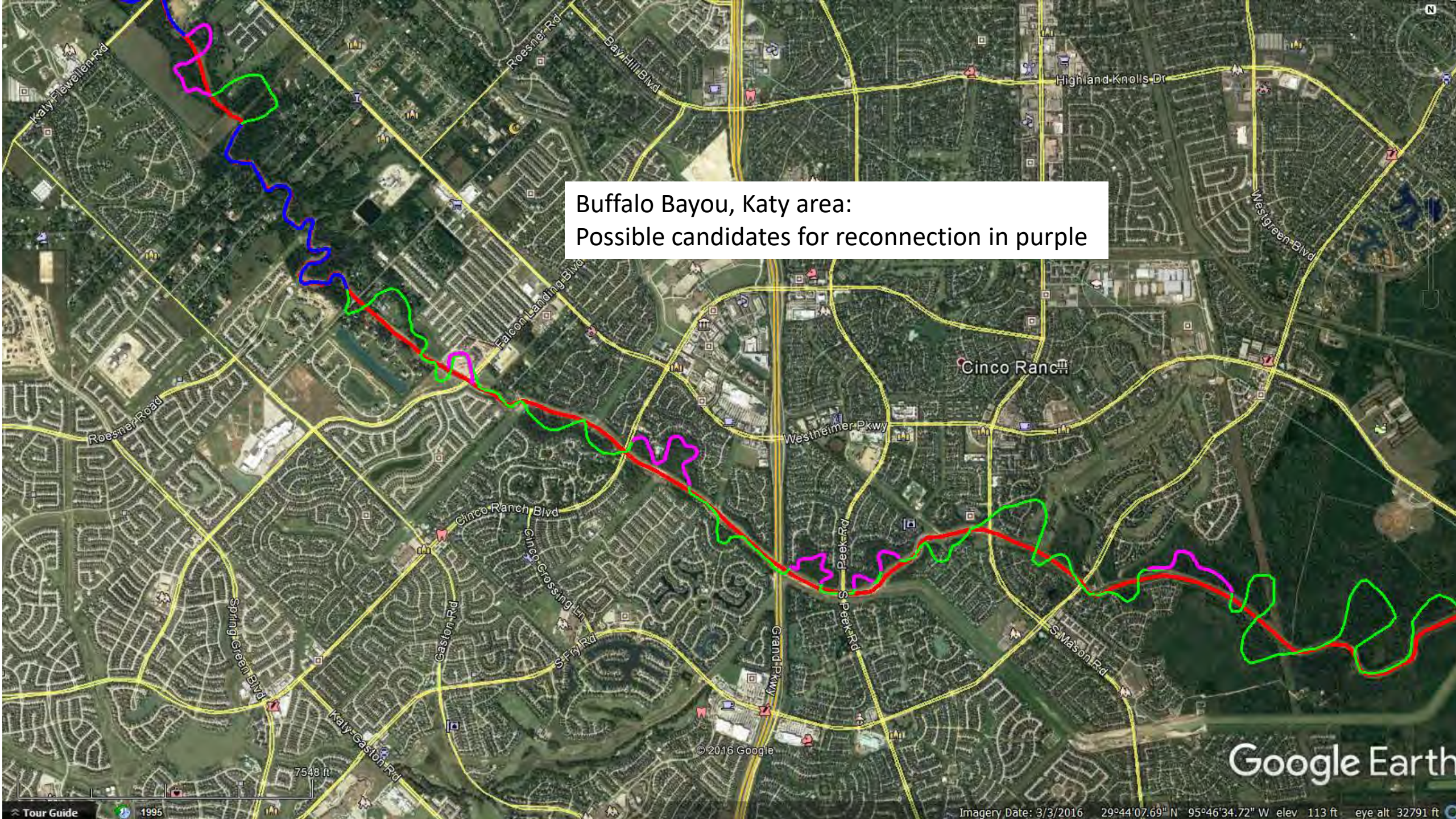
Fluvial reaches and tributaries of Buffalo Bayou, Katy Texas to central Houston Texas, present day. The bayou connects several forested or otherwise undeveloped areas that serve as wildlife refuges. Satellite image, 2016, Google Earth

Buffalo Bayou 2016: possible reconnection to old meanders

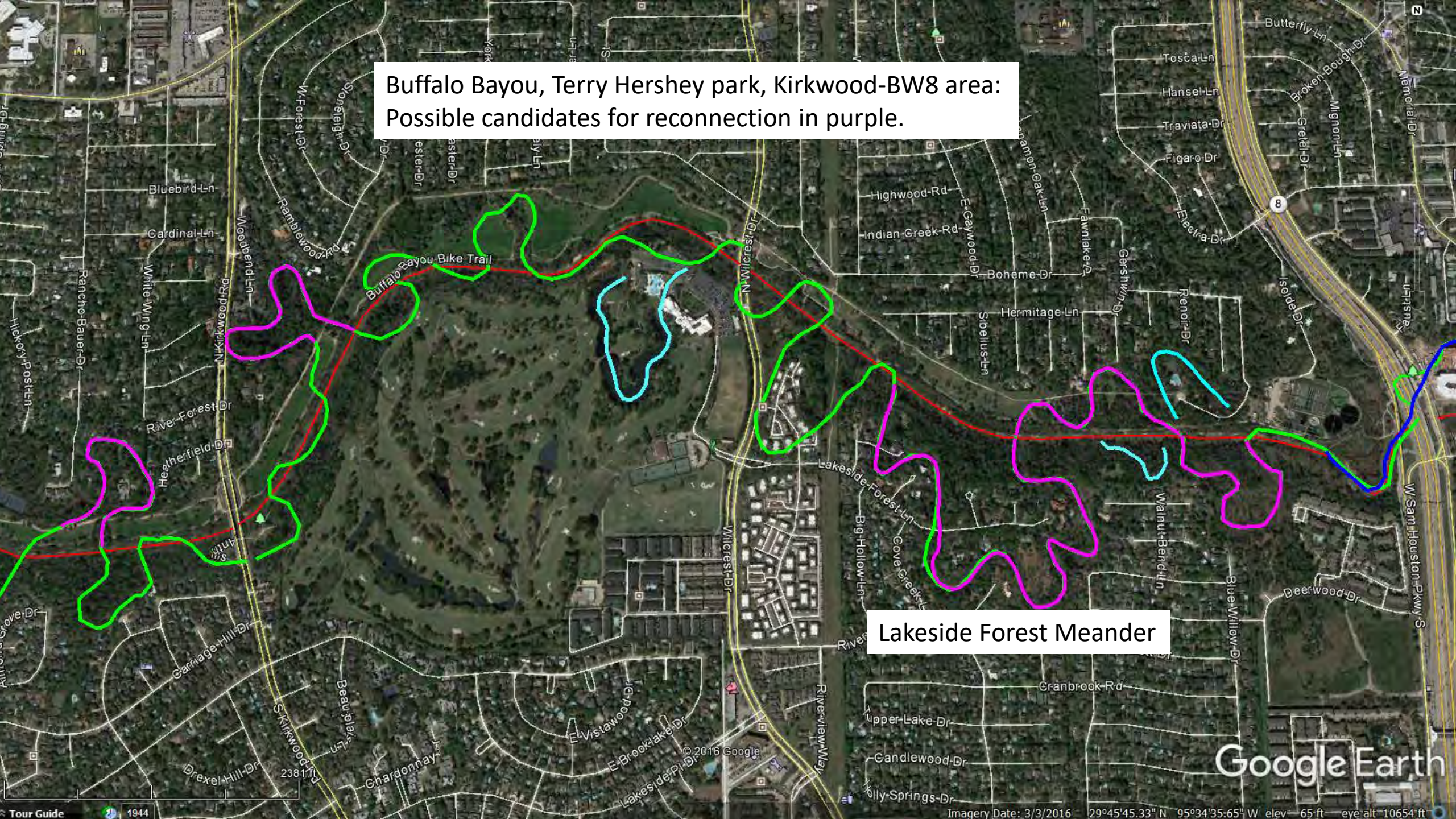
Blue: extant meanders connected to modern channel

Green: former meanders, completely or partially filled, potentially reconnectable but would be expensive

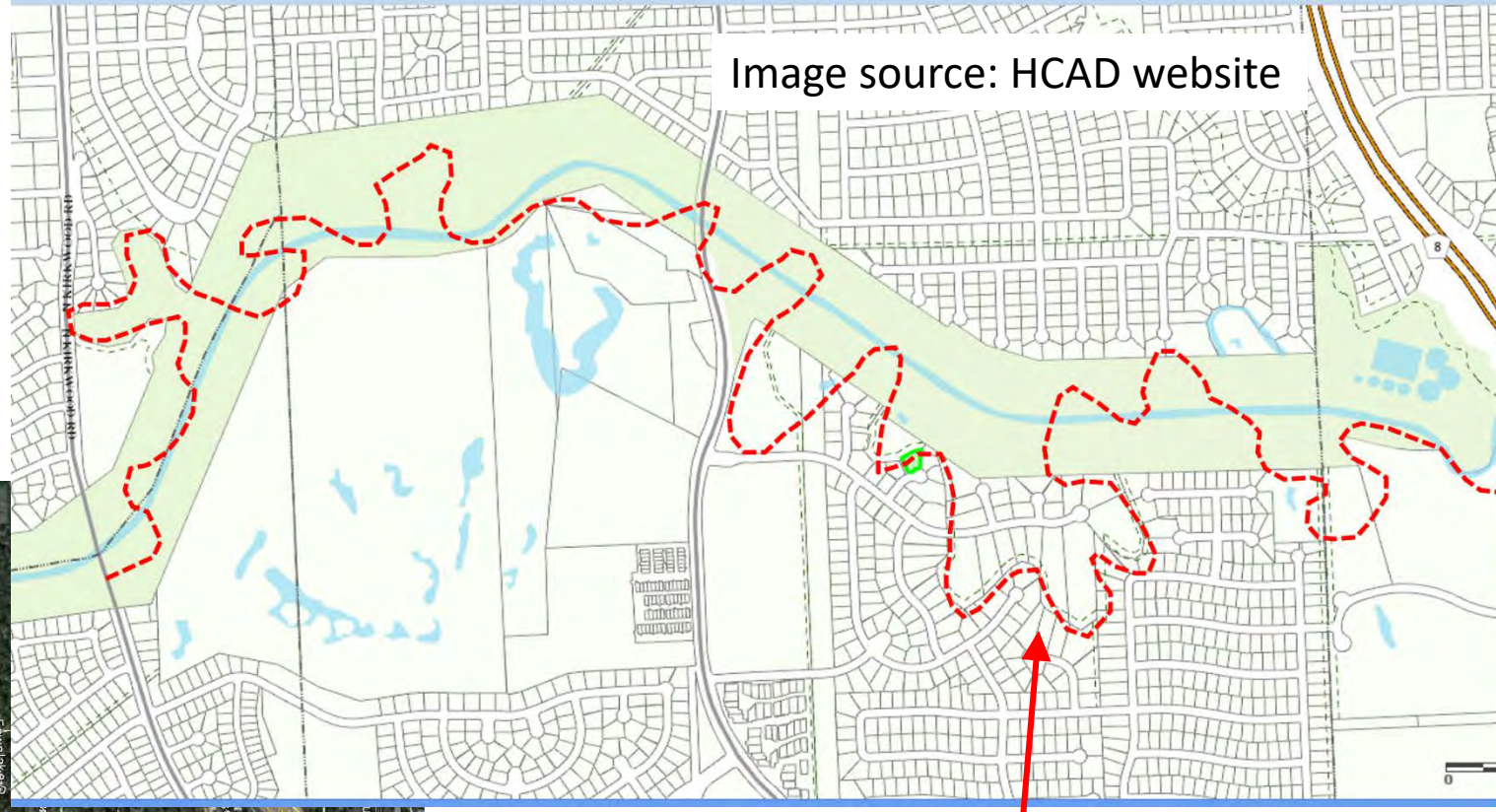
Purple: former meanders, could potentially be reconnected without serious difficulty

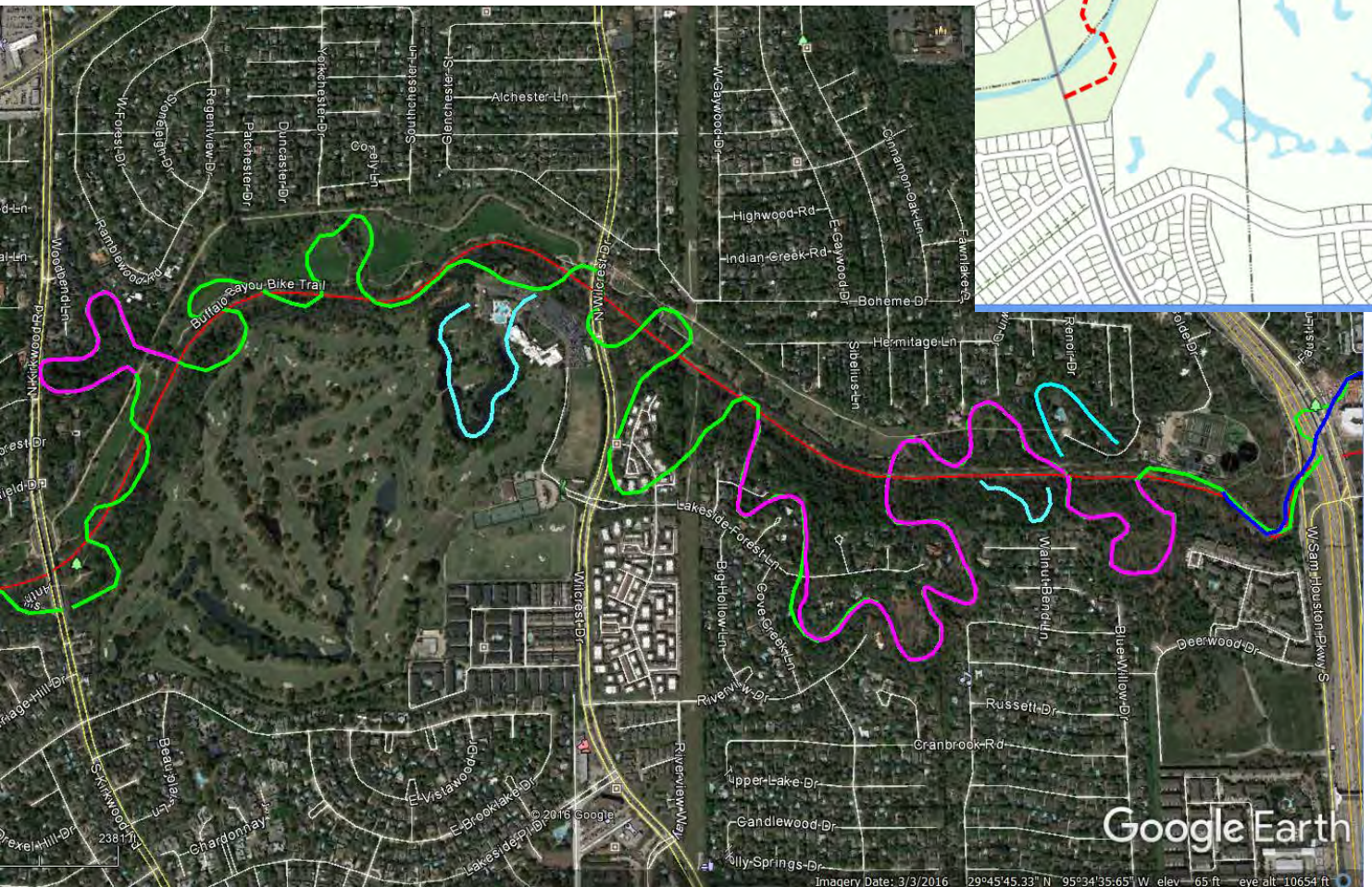

Buffalo Bayou, Katy area:
Possible candidates for reconnection in purple
Katy-Flewellen Rd
Roesner Rd
Bay Hill Blvd
Highland Knolls Dr
Westgreen Blvd
Falcon Landing Blvd
Cinco Ranch
Roesner Road
Westheimer Pkwy
Cinco Ranch Blvd
Cinco Crossing Ln
Peek Rd
S Peek Rd
Spring Green Blvd
Gaston Rd
S Fry Rd
Grand Pkwy
S Mason Rd
Katy-Gaston Rd
© 2016 Google
7548 ft
Google Earth
Tour Guide
1995
Imagery Date: 3/3/2016 29°44'07.69" N 95°46'34.72" W elev 113 ft eye alt 32791 ft

Buffalo Bayou, Terry Hershey park, Kirkwood-BW8 area:
Possible candidates for reconnection in purple.



By Texas law, navigable waterways, and the banks up to the high water mark are public access.



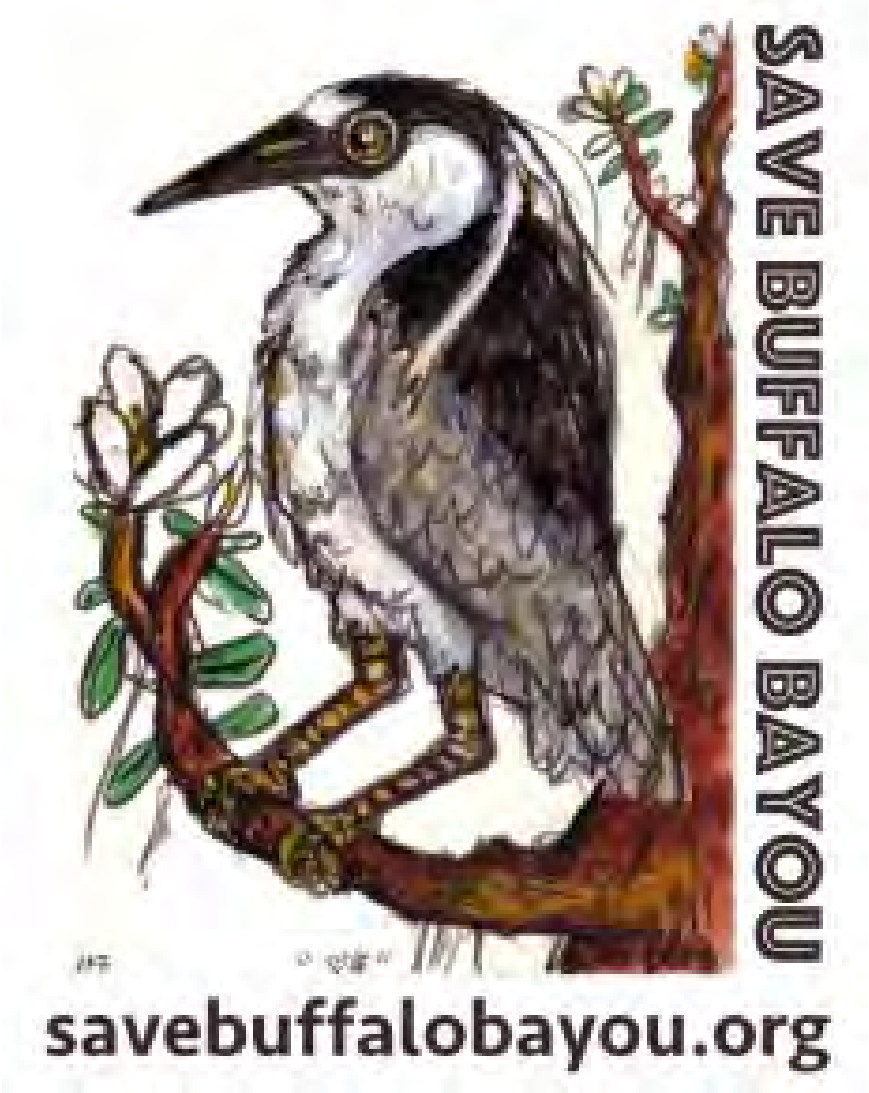


Reconnection of this meander to the navigable bayou would be politically “interesting”….

conclusions

- Using publicly available free online data, it is possible to map the locations of Buffalo Bayou's early 20th century meanders.
- While significant reaches of the bayou have been straightened, approximately 50% of Buffalo Bayou's fluvial channel retains natural characteristics.
- Although many of the meanders in the straightened section have been partially or fully filled, many remain naturally vegetated, and several are still partially connected to the bayou and act as oxbow lakes.
- Significant portions of Buffalo Bayou, whether straightened or not, retain a sense of riparian character and wildlife habitat near the banks. Although these environments are fragmented, there is a possible wildlife corridor all the way from the Katy Prairie to Downtown Houston.
- Although Buffalo Bayou is located in the middle of a highly urbanized area, and has been mistreated in the past, the waterway and remaining associated forests are enjoyed by the public, and deserves protection from any further degradation.

Thank You.



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