

Sand Deposits and Flooding Along the San Jacinto River

East and West Forks
Near Kingwood, Texas,
after Hurricane Harvey

3/5/2018

Rev8

What Caused Flooding in Kingwood

- To date, news coverage has focused on two major causes:
 - The magnitude of rainfall associated with Harvey
 - The release of water from the Lake Conroe Dam
- Sedimentation, a contributing factor, has been ignored:
 - Reduces carrying capacity of river
 - Blocks drainage ditches
- How bad is it?



Sand up to 10' Deep along Eagle Point Trail in East End Park



Sand Reaches into Tree Tops in Places



Sand has Filled in Wetlands that Once Filtered Runoff Entering Lake Houston



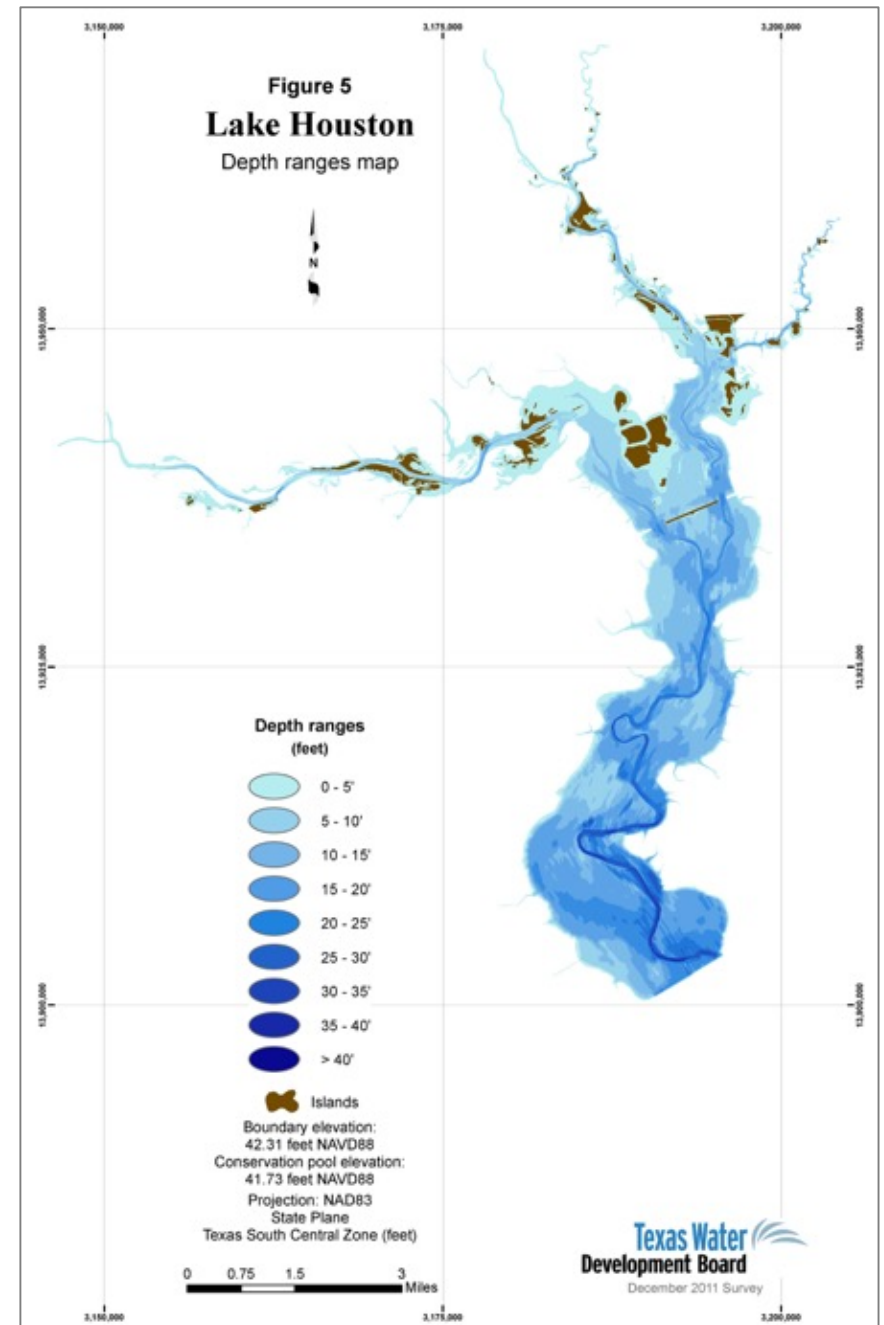
Photo © Google Earth

Sand Now Covers Approximately 30 acres or 20% of East End Park

Average River Depth In Kingwood Area Was Less Than 5 Feet *in 2011*

If we got up to up to ten feet of sand on land,
how much was deposited in the river and
where did it come from?

Source: *Volumetric and Sedimentation
Survey of Lake Houston, 2011 Survey,
Texas Water Development Board, 2013*





YEAR 2017
3000 Acres of Sand Mines
Upstream from Kingwood
- 2350 West Fork
- 650 East Fork

River Grove Park (Private Park)

Photo © Google Earth

Approximate **20X increase** in Sand Mines Adjacent to Kingwood since 1989

Decrease in River/Lake Capacity Over Time

<u>Survey/Year</u>	<u>Total in Acre Feet</u>	<u>Decrease In Acre Feet</u>	<u>Decrease Per Year</u>
Orig., 1955	158,553	Baseline	Baseline
1965	146,769	11,784	1,178
TWDB 1994	136,381	10,388	358
TWDB 2011	124,661	11,720	689

~25%

Capacity is decreasing...
at an increasing rate.

~2X

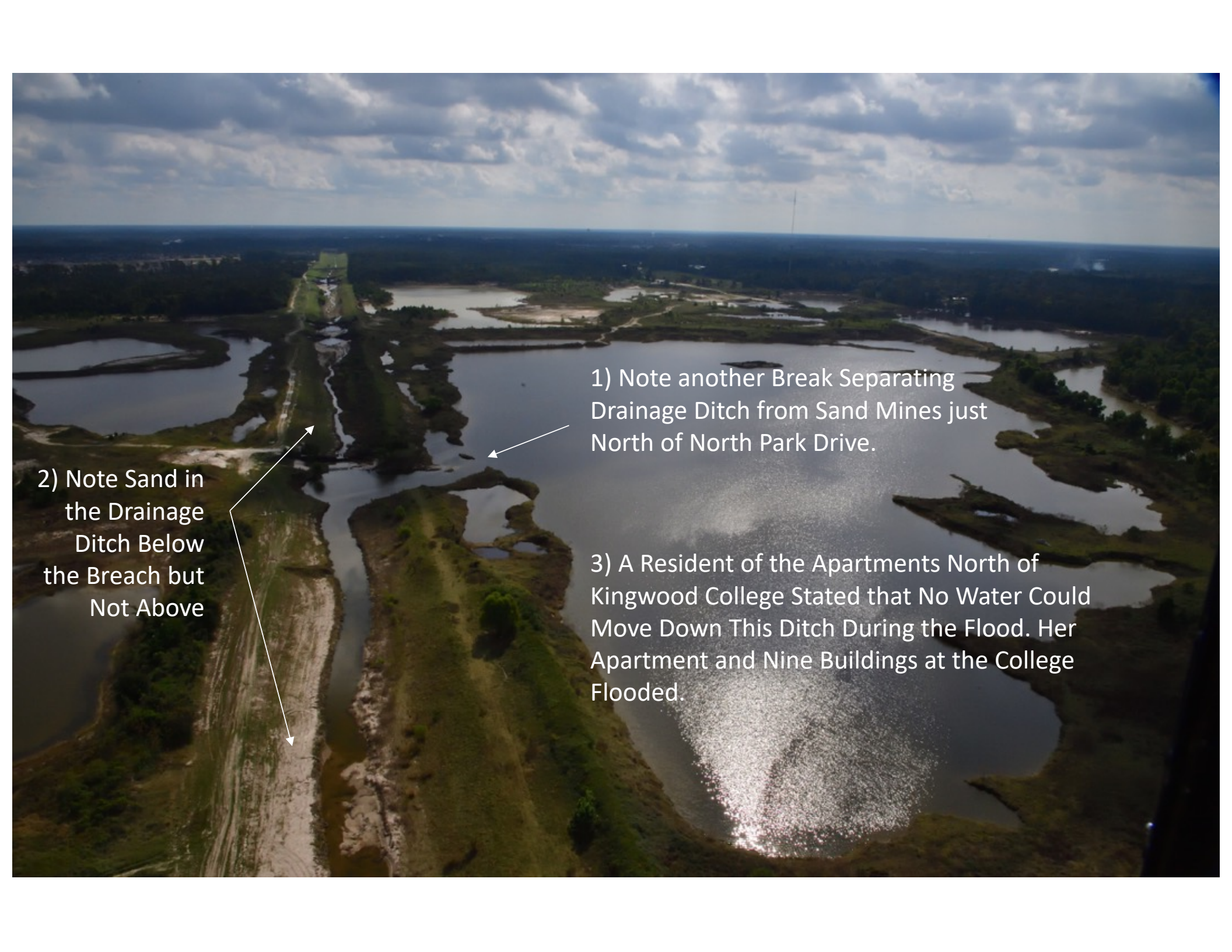
Source: Volumetric and Sedimentation
Survey of Lake Houston, 2011 Survey,
Texas Water Development Board, 2013

The Aerial Photos that Follow...

- Were all taken by Bob Rehak on 9/14/17 from a rented helicopter
- Representative of 450 shots
- Show a direct connection between sand clogging river and upstream sand mining
- Last sedimentation survey done in 2011 showed average river depth adjacent to Kingwood was less than 5 feet
- Much less now in many places
- Note extent of sand deposition in following shots



Sand Mines on West Fork Stretch from Below Kingwood Drive to Riverwalk on FM1314. Note Break in Dike Allowing Sand to Flow Downriver.



2) Note Sand in the Drainage Ditch Below the Breach but Not Above

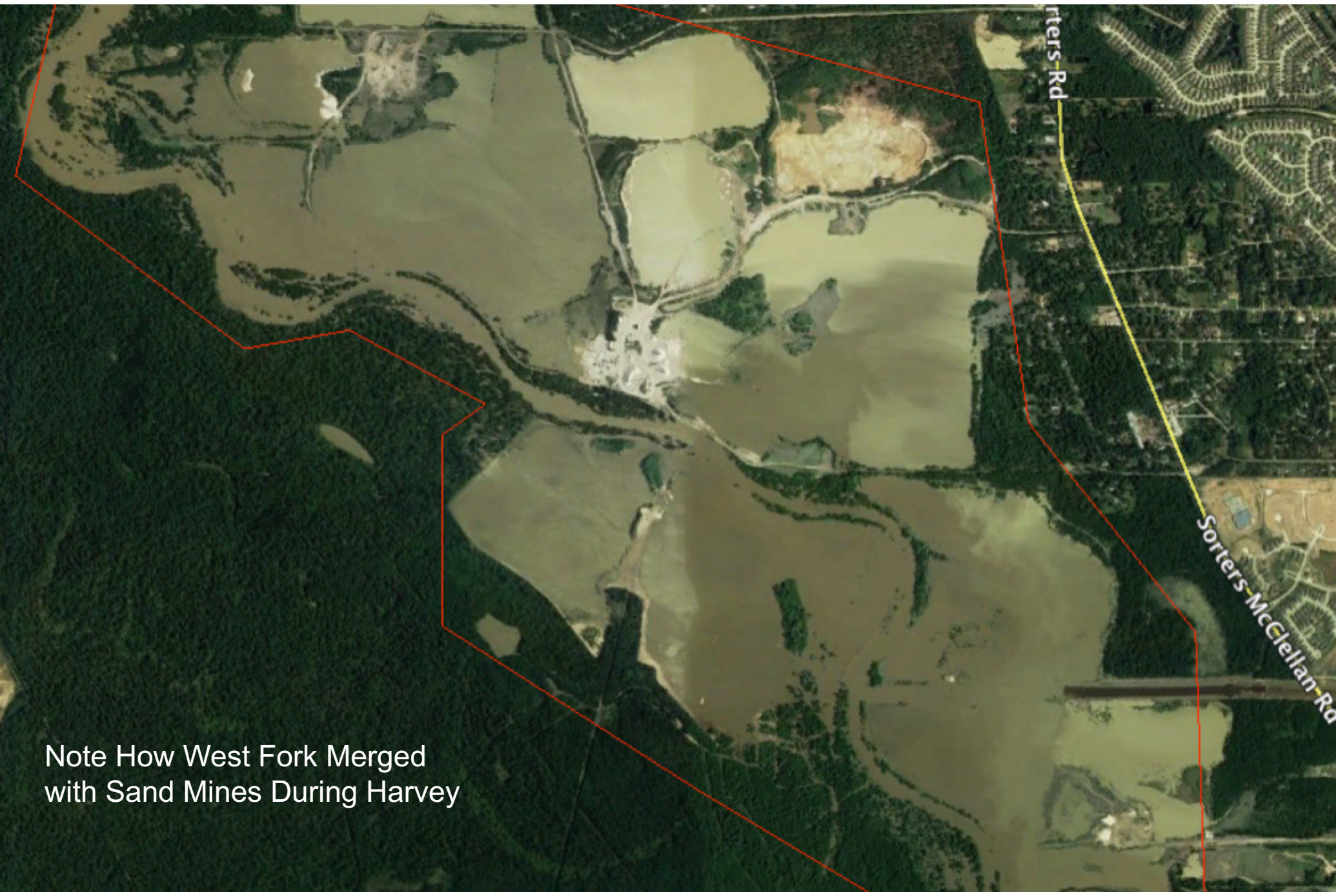
1) Note another Break Separating Drainage Ditch from Sand Mines just North of North Park Drive.

3) A Resident of the Apartments North of Kingwood College Stated that No Water Could Move Down This Ditch During the Flood. Her Apartment and Nine Buildings at the College Flooded.

Note How West Fork Merged
with Sand Mines During Harvey

Sorters Rd

Sorters-McClellan Rd




Sand Mine along West Fork of San Jacinto River by Kingwood College






Sand is Used Primarily in Concrete and Fracking

An aerial photograph showing a wide river with a large, light-colored sandbar in the center. The river is surrounded by dense green forest. In the background, there are several large, rectangular water bodies or reservoirs. The sky is blue with some clouds.

Note in This and Succeeding Photos the Volume of Sand Carried Downriver.


An aerial photograph showing a river winding through a dense forest. A large, light-colored sandbar has formed in the middle of the river, significantly narrowing the waterway. The sandbar is irregular in shape, with some small trees and patches of green grass still visible on its surface. The surrounding forest is thick and green, with some trees appearing to be partially submerged or surrounded by sand. The river's path is forced to change around the sandbar, creating a sharp turn.

Sand Has Reduced Carrying Capacity of River Forcing it Up Faster and Out Farther After Rains



Banks of Sand Mine Covered with Fresh Layer of Sand from Harvey Flooding





Commercial areas adjacent to I-69 flooded all the way to Deerbrook Mall

Areas Above
Sand Mines
Did Not Flood While
Areas Below Did.
Shown Here:
Riverwalk
Subdivision in Porter
off FM 1314. For
Comparison, See
Next Slide.

Note
Difference in
Color of
Water



Nine Buildings at
Kingwood College were
Flooded as were Costco
and areas 1.5 miles
inland from River in
Kingwood.

Lone Star College-Kingwood



I-69 was cut off for days.
Note extensive sanding at base of bridge.



Union Pacific Railroad Bridge Undermined



Fresh Sand Deposits on Both Sides of West Fork at Forest Cove




Apartments in Forest Cove Destroyed



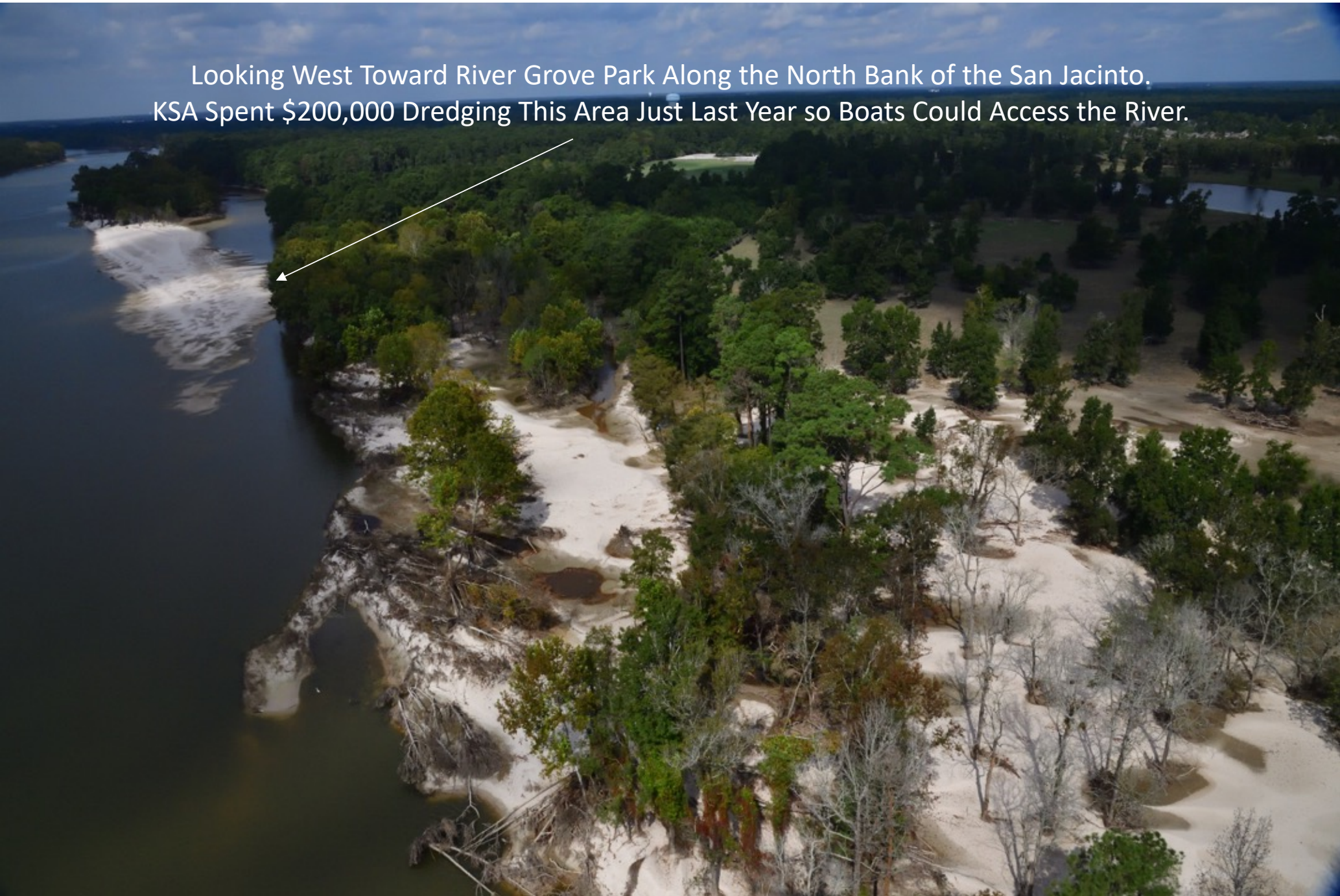


Fresh Sand Deposits in Humble Just East of Forest Cove

An aerial photograph showing a wide river bend. A large, light-colored sand deposit has accumulated along the inner curve of the bend, effectively sealing off a drainage ditch and a boat launch area. The surrounding landscape is lush with green trees and vegetation. In the background, a residential area with houses and a golf course is visible under a blue sky with scattered clouds. Two white arrows point from the text block to the sand deposit and the boat launch area.

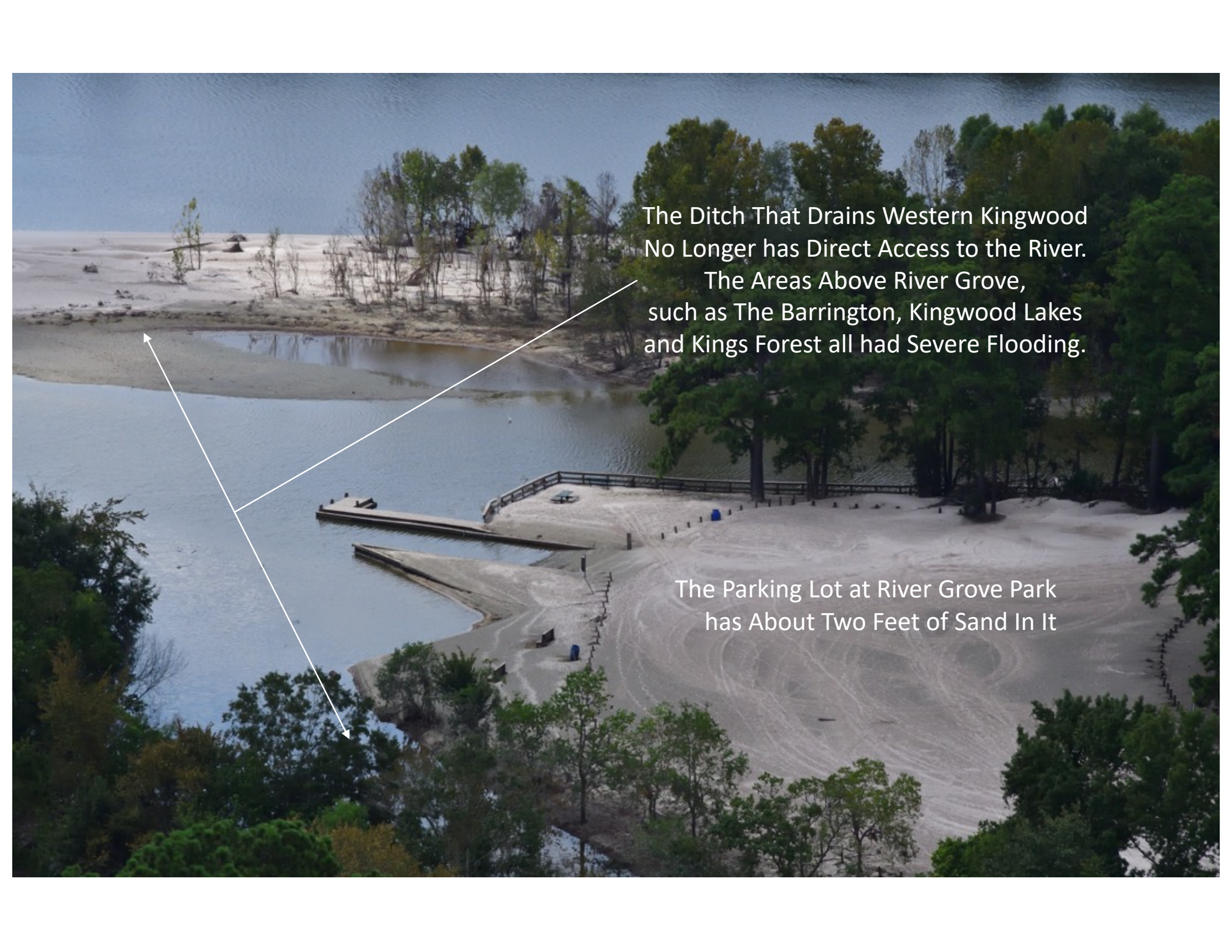
The Drainage Ditch that Empties the West Side of Kingwood
And The Boat Launch in Kingwood's River Grove Park
Have Been Virtually Sealed Off by New Sand Deposits
This area was dredged just last year!

Looking West Toward River Grove Park Along the North Bank of the San Jacinto.
KSA Spent \$200,000 Dredging This Area Just Last Year so Boats Could Access the River.



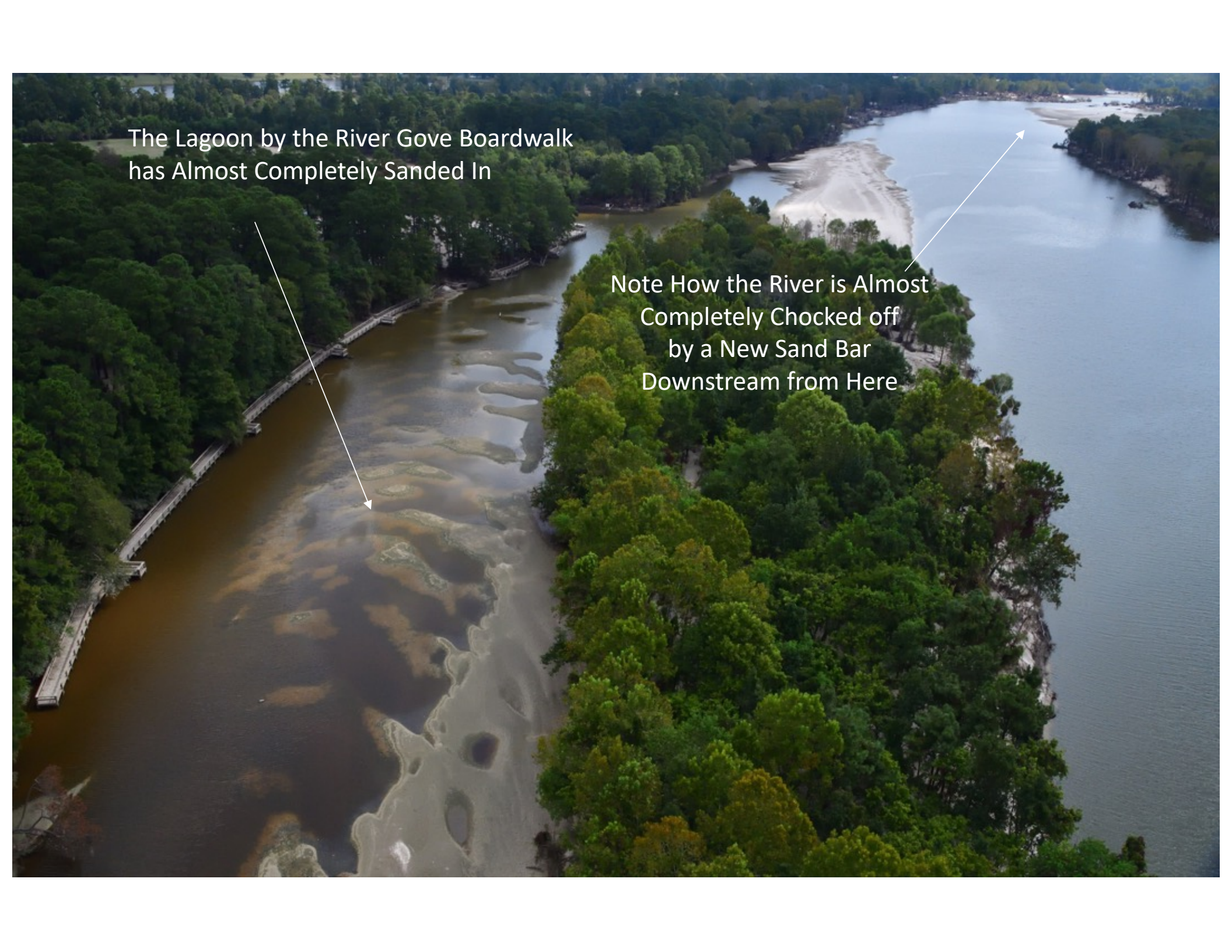


The Lacrosse Fields at the South End
of River Grove Park are Completely Sanded In



The Ditch That Drains Western Kingwood
No Longer has Direct Access to the River.
The Areas Above River Grove,
such as The Barrington, Kingwood Lakes
and Kings Forest all had Severe Flooding.

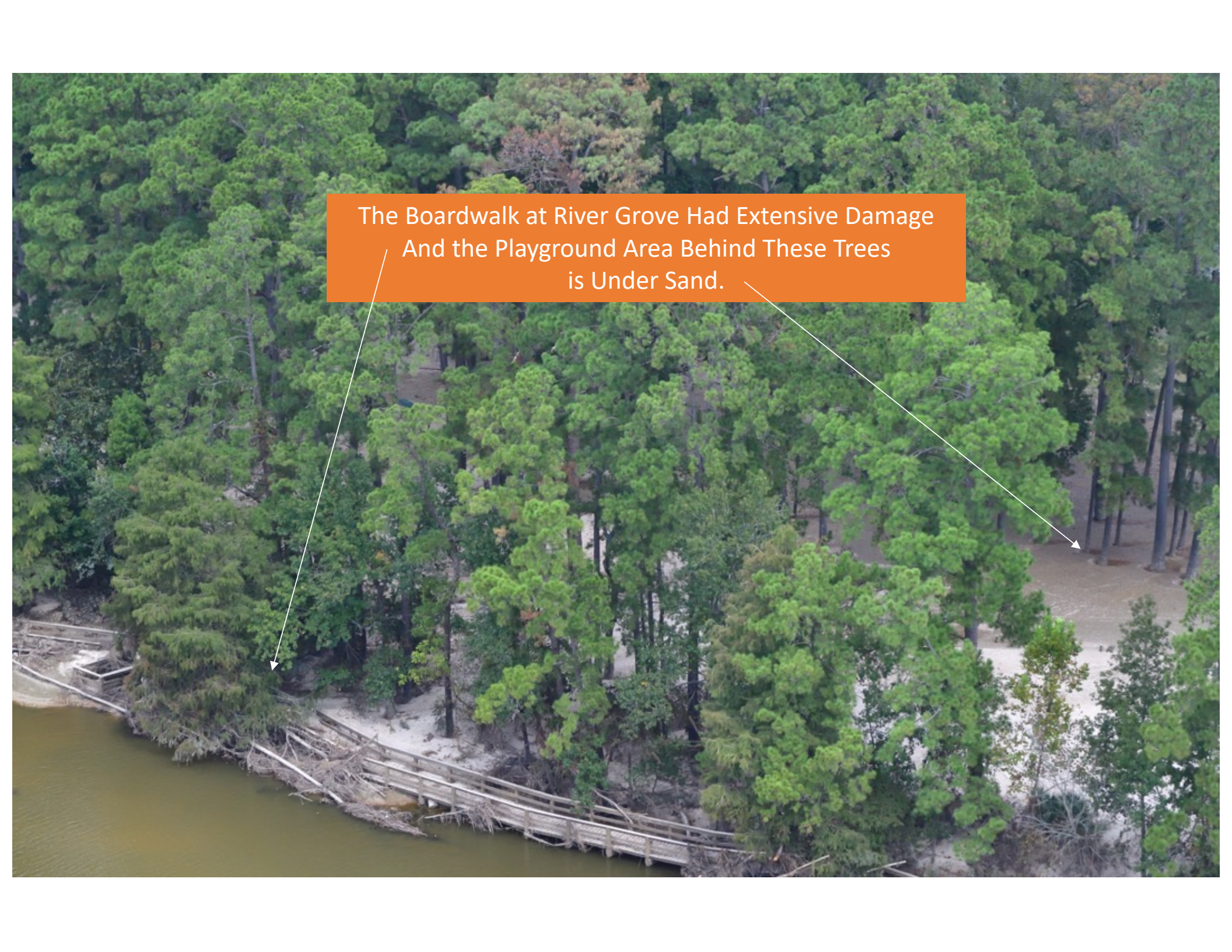
The Parking Lot at River Grove Park
has About Two Feet of Sand In It



The Lagoon by the River Gove Boardwalk
has Almost Completely Sanded In


An aerial photograph showing a river and a lagoon. On the left, a long wooden boardwalk runs along the shore of a lagoon. The lagoon is filled with brown water and has several large, irregular sand bars visible. A line of trees separates the lagoon from the river. The river flows from the top right towards the bottom right. A large sand bar is visible in the middle of the river, narrowing the channel. The river continues to flow past this bar. The surrounding area is densely forested with green trees.

Note How the River is Almost
Completely Choked off
by a New Sand Bar
Downstream from Here



The Boardwalk at River Grove Had Extensive Damage
And the Playground Area Behind These Trees
is Under Sand.


This aerial photograph shows a river in the bottom left corner. A wooden boardwalk runs along the riverbank, with significant sections missing or collapsed, leaving a path of debris. Behind the boardwalk is a dense forest of tall, green trees. In the background, behind the trees, a large area of light-colored sand is visible, which has covered the playground area. Two white arrows originate from the orange text box: one points to the damaged boardwalk on the left, and the other points to the sandy area in the background on the right.

An aerial photograph of a wide river. A large, light-colored sand bar dominates the center-left of the frame, partially blocking the river's flow. The bar has several small channels or depressions in it. The river continues to the right and then curves away into the distance. The banks are lined with dense green trees. In the foreground, there is a text overlay with three white arrows pointing to different parts of the sand bar and the river channel below it.


Just Downstream from River Grove Park
is a New Sand Bar. It Almost Completely
Blocks the River. Note How Shallow
the Three Possible Channels Are;
Area Upstream May No Longer be Navigable.



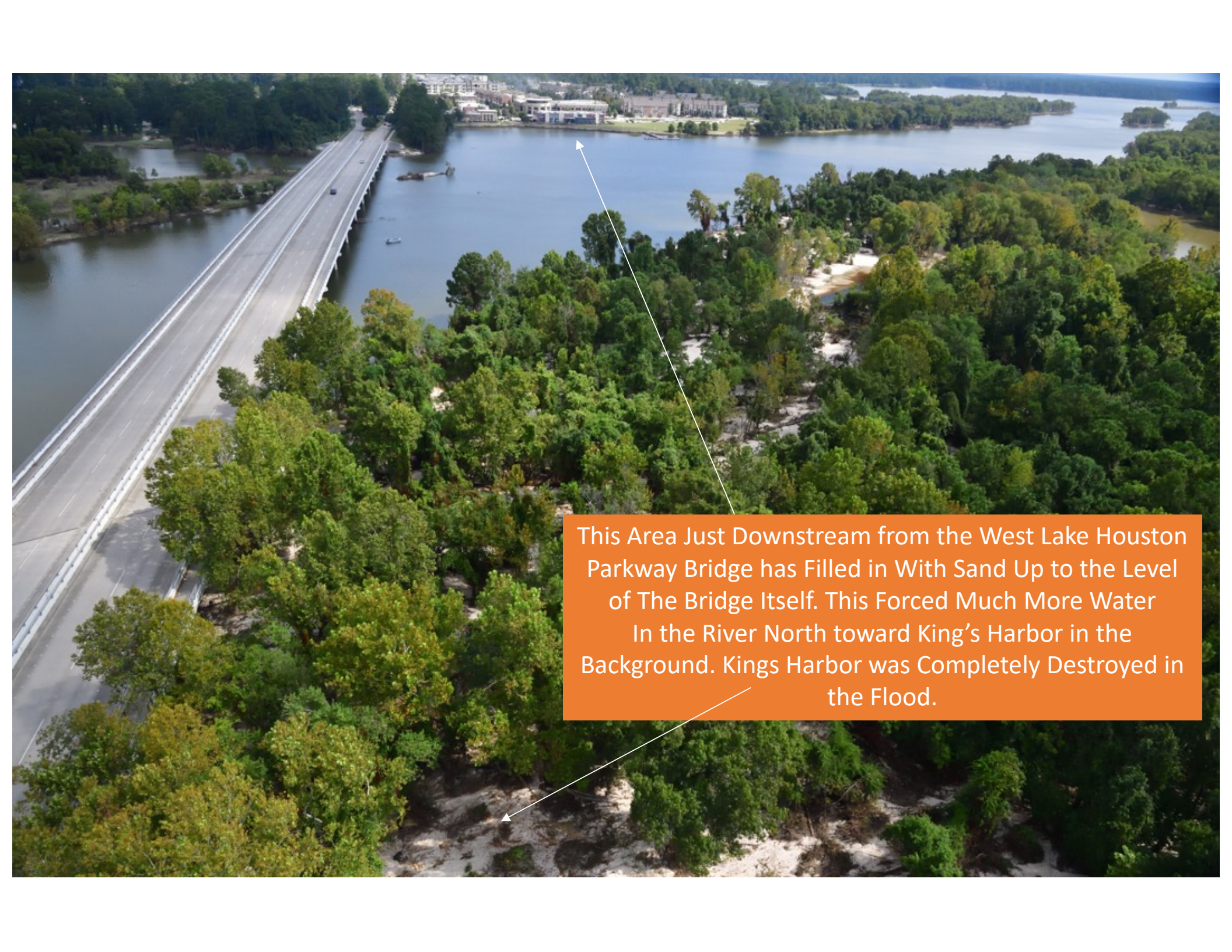
All Along the River, Old Sand Bars like This One Have Expanded, Reducing the River's Carrying Capacity.

An aerial photograph of a river system. The river flows from the top left towards the bottom right. A large, light-colored sand bar is prominent in the lower half of the image, partially blocking the river's path. Several smaller sand bars and inlets are visible along the riverbanks. The surrounding area is densely forested with green trees. Two white arrows point to specific areas: one points to a sand bar on the right bank, and the other points to a sand bar in the lower left. The text is overlaid on the left side of the image.

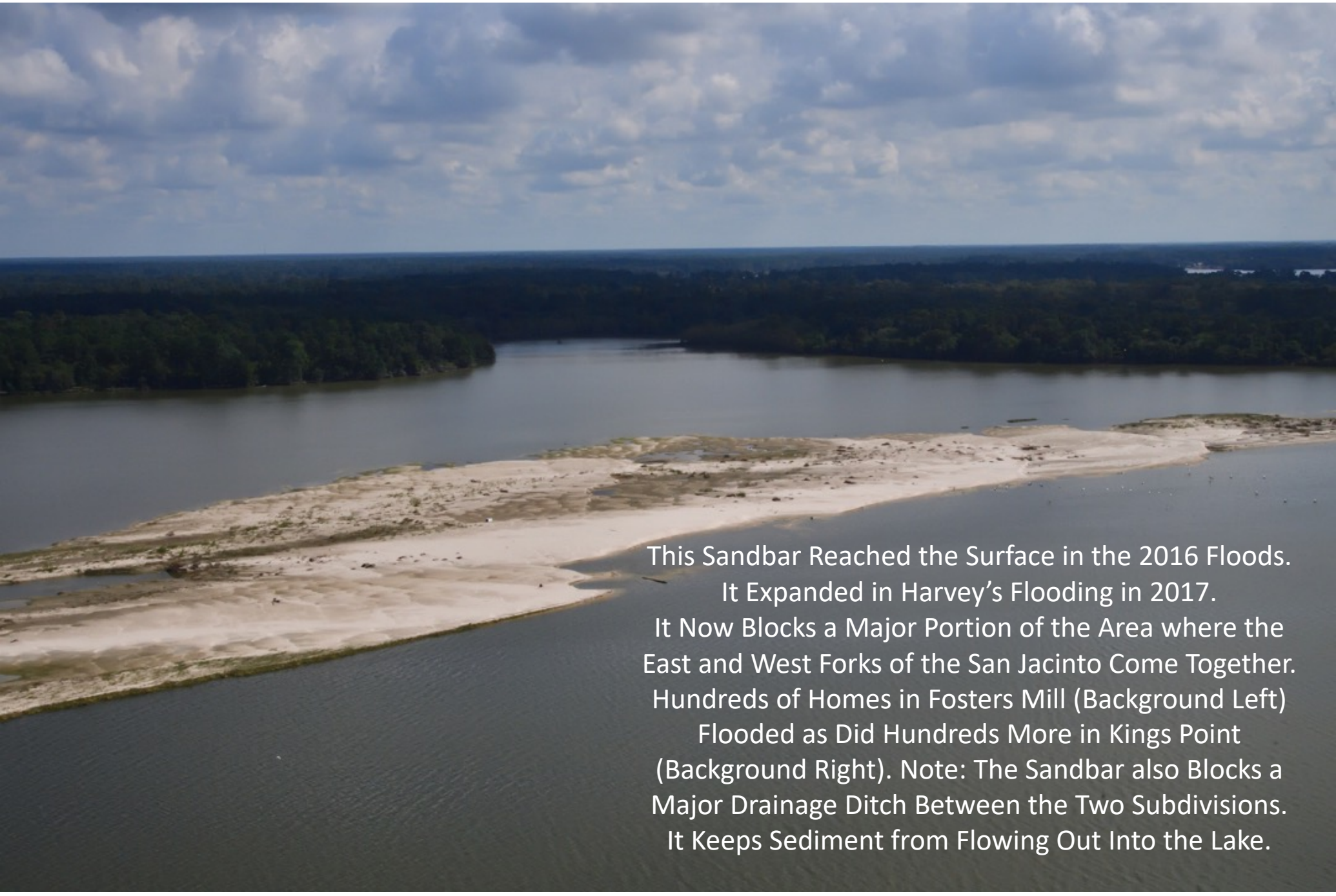
The Area Adjacent to Kingwood Country Club.
Note How Inlets have Filled With Sand and New Sand
Bars Have Formed Here, Too. This Further Reduces
the River's Carrying Capacity.

An aerial photograph showing a large body of water, likely a bayou or river, with a dense forest of green trees along its banks. A long bridge spans the water in the background. In the foreground, a narrow, winding channel of water is visible, with a white arrow pointing to it from the text below. The water appears slightly murky or silty. A power line tower is visible on the left side of the image.


The Series of Bayous Just Upstream from
the West Lake Houston Parkway Bridge
Are Silting In – *Completely in Some Cases.*

An aerial photograph showing a multi-lane highway bridge crossing a body of water. To the right of the bridge, a large area of land is covered in dense green trees. A significant portion of this wooded area is filled with sand, which has reached the level of the bridge deck. In the background, across the water, a small town or village is visible on a peninsula. Two white arrows originate from the text box: one points towards the flooded area, and the other points towards the town in the background.

This Area Just Downstream from the West Lake Houston Parkway Bridge has Filled in With Sand Up to the Level of The Bridge Itself. This Forced Much More Water In the River North toward King's Harbor in the Background. Kings Harbor was Completely Destroyed in the Flood.




This Sandbar Reached the Surface in the 2016 Floods.
It Expanded in Harvey's Flooding in 2017.
It Now Blocks a Major Portion of the Area where the
East and West Forks of the San Jacinto Come Together.
Hundreds of Homes in Fosters Mill (Background Left)
Flooded as Did Hundreds More in Kings Point
(Background Right). Note: The Sandbar also Blocks a
Major Drainage Ditch Between the Two Subdivisions.
It Keeps Sediment from Flowing Out Into the Lake.

An aerial photograph of Lake Houston. In the foreground, a large, light-colored sandbar extends from the left towards the center. The water around the sandbar is shallow and reflects the sky. In the background, the FM1960 Bridge spans the lake. The sky is overcast with grey clouds. The text is overlaid in the lower-left quadrant of the image.


This Shows the Same Sandbar (from the Previous Slide), but Looking South Toward the FM1960 Bridge over Lake Houston. Note How Areas Around the Sandbar are Also Reaching the Surface.

Heading Up the East Fork of the San Jacinto now...
Note All the New Sand Deposits



An aerial photograph showing a dense green forest covering a hillside. A white water tower with a tall antenna on top is visible on the left side of the hill. In the foreground, a large, calm body of water, likely a reservoir or lake, reflects the sky. The shoreline is irregular, with some small islands and peninsulas. The water appears slightly murky. The sky is clear and blue.

KSA's East End Park (Right of Water Tower) was
Under 10-15 Feet of Water. The Park Suffered
Extensive Trail Damage.

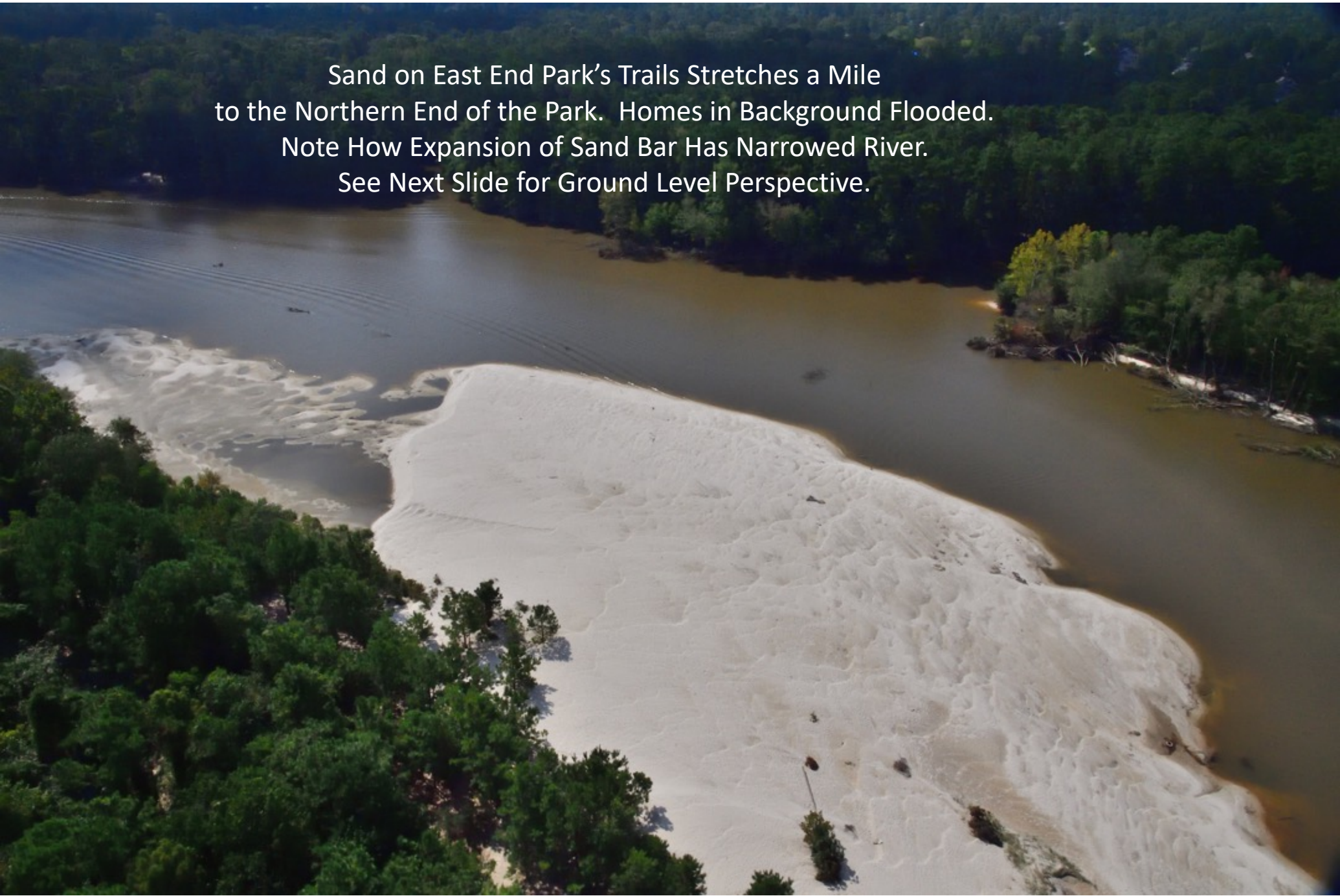


This is the Same Area Shown from the Ground in Slides 1-6.
The Trails in This Area Were Under as Much as Six Feet of Sand.

An aerial photograph of a dense forest. The trees are mostly green, but there are several large, irregular patches of light-colored sand visible on the ground, reaching up to the canopy in some areas. The sand appears to be a result of a natural event, likely a storm surge or hurricane impact. The text overlay is an orange rectangle with white text.

Adjacent to the Trails, Sand Reaches the Treetops.
There was No Sand in this Area Before Harvey.

Sand on East End Park's Trails Stretches a Mile
to the Northern End of the Park. Homes in Background Flooded.
Note How Expansion of Sand Bar Has Narrowed River.
See Next Slide for Ground Level Perspective.




New "Beach" on North Side of West Fork Opposite East End Park

New Sand Deposited During Harvey

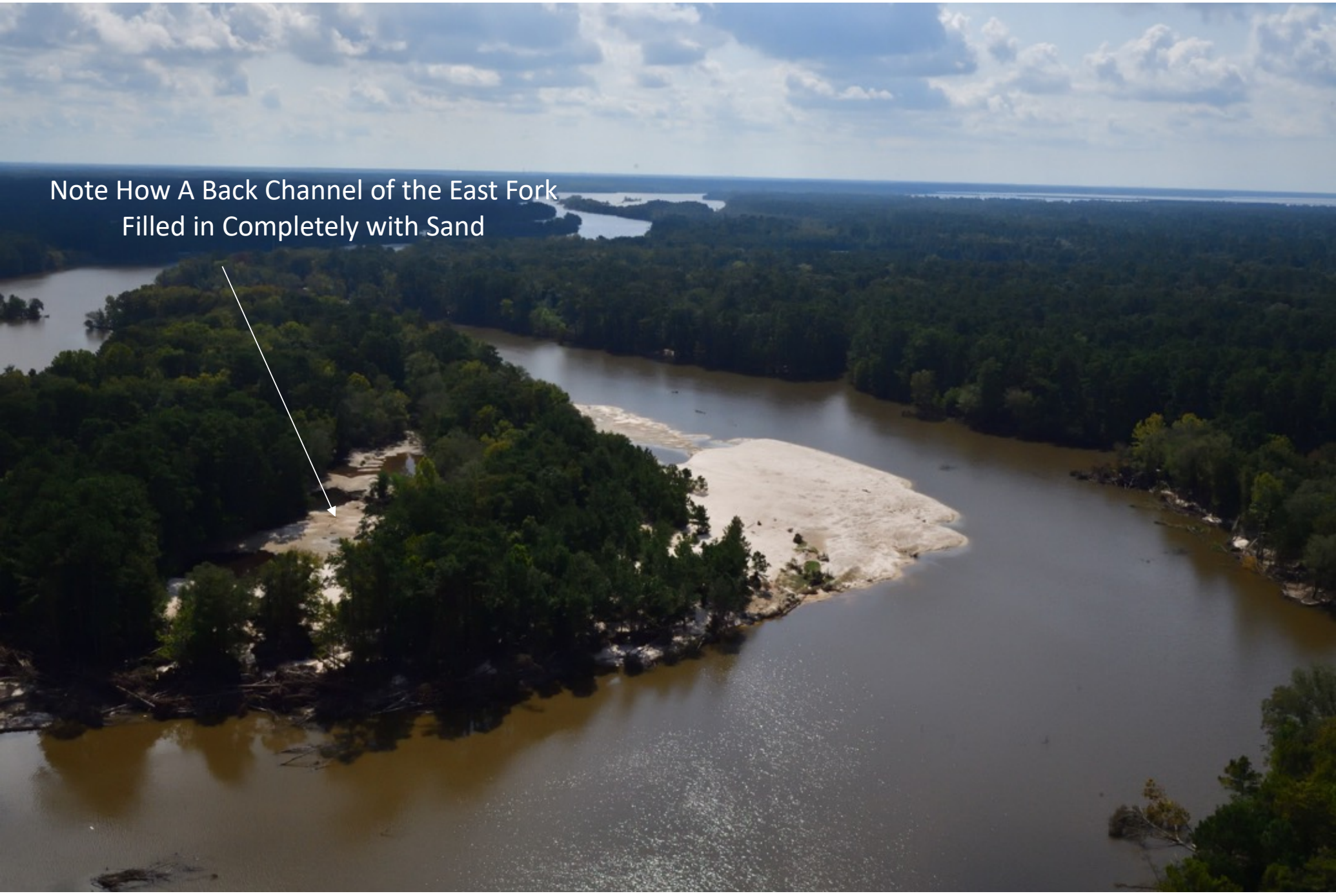
Depth of Old Beach



An aerial photograph of a river winding through a dense green forest. A large, light-colored sandbar is prominent in the foreground, partially submerged in the brown water. The river flows from the foreground towards the background, where a small body of water is visible. The surrounding landscape is covered in thick, green trees. The sky is a clear, pale blue.

Looking North Along Caney Creek.
Note New Sandbar in Foreground.

Note How A Back Channel of the East Fork
Filled in Completely with Sand



An aerial photograph showing a wide river, Caney Creek, flowing through a dense green forest. The river has a large, light-colored sand bar on its right bank. In the background, a large industrial sand mining operation is visible, with extensive sand piles and heavy machinery. The sky is blue with scattered white clouds.

New Sand Deposits along Caney Creek and their Source:
600+ Acres of Sand Mines in Porter/Montgomery County.
Legal Descriptions of This Property Total More than
1000 Acres, Indicating These Mines Could Expand.



Here, too, the Sand is Mined by Dredging.











Lack of Ground Cover Contributes to Rapid Erosion
Of the Loose, Unconsolidated Sand

Summary

- Two “500-Year” storms since last sediment survey (2011)
- 3000 acres of sand mines adjacent to Kingwood on East and West Forks of San Jacinto breached during storms
- Thousands of tons of sand carried downstream, further reducing already limited carrying capacity of river
- *16,000 homes below sand mines in Kingwood flooded*
- *Homes above sand mines in Riverwalk did NOT flood*
- *Suggests sedimentation was important contributing factor, and should be studied and addressed*

Recommendations

- Update sedimentation survey
- Dredge *river and drainage ditches* to restore carrying capacity
- Add tainter gates at Lake Houston dam to lower lake faster in anticipation of future storms
- Eliminate sand mining near river
- Force mine operators to remediate.

Other people and property owners have the right to public health and safety.