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To whom it may concern,

This comment highlights environmental justice concerns regarding the proposed One Lake project, as presented in the 2018 Draft Environmental Impact Statement (DEIS), *Pearl River Basin, Mississippi, Federal Flood Risk Management Project Hinds & Rankin Counties*.

Pages 15 through 25 show that the most disadvantaged communities in the study area are along the creek valleys in West Jackson. The distribution of flood reduction benefits suggests that these communities might receive marginal benefits. However, an analysis of gage measurements and predicted stage-curve data raises the prospect that the One Lake could exacerbate flash flooding along these communities.

Pages 27 to 40 show that predominantly Black or African American communities in North East Jackson will receive flood reduction benefits from the project. However, these communities are the most vulnerable to river flooding in the study area, and the flood reduction benefits provided would be insufficient. The benefits would, instead, be focused downstream, along less vulnerable, wealthier, and Whiter communities. Furthermore, the distribution of flood reduction benefits could spur development that may worsen flooding for these predominantly Black or African American communities in Northeast Jackson.

This report is not comprehensive. There are other known environmental justice issues not discussed, such as the One Lake's potential to worsen downstream communities' water resource issues or the local sponsor's criticized public engagement.

Lastly, this report is part of a larger environmental justice campaign sponsored by a grant from Healthy Gulf, formally the Gulf Restoration Network. I am grateful for the organization's investment in the well-being of the Metro's residents. I bear sole responsibility for all statements and typos made in this comment.

Respectfully,

Juan David Fernandez



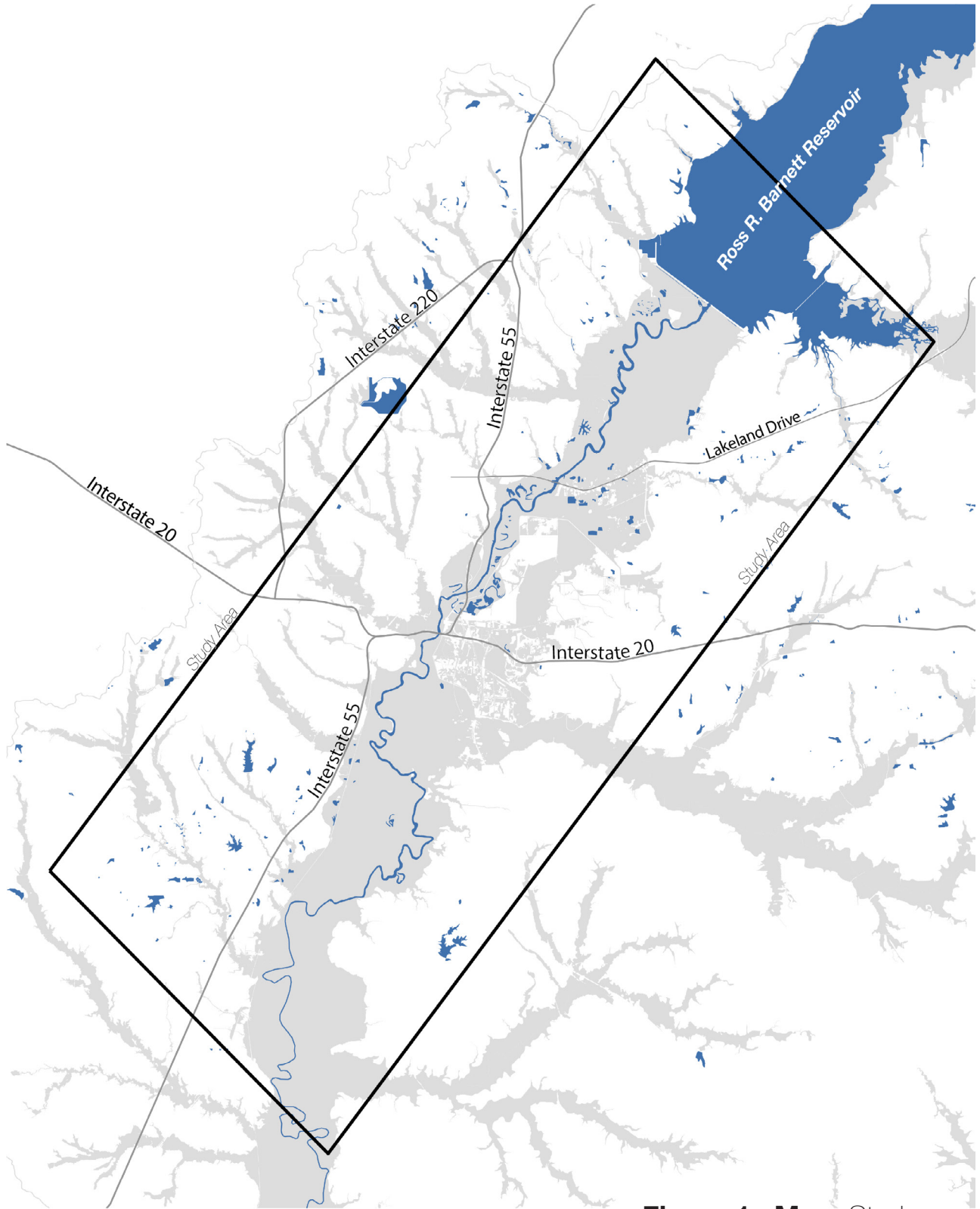
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**Figure 1: Map.** Study area

## Mapping the study area (Reference)

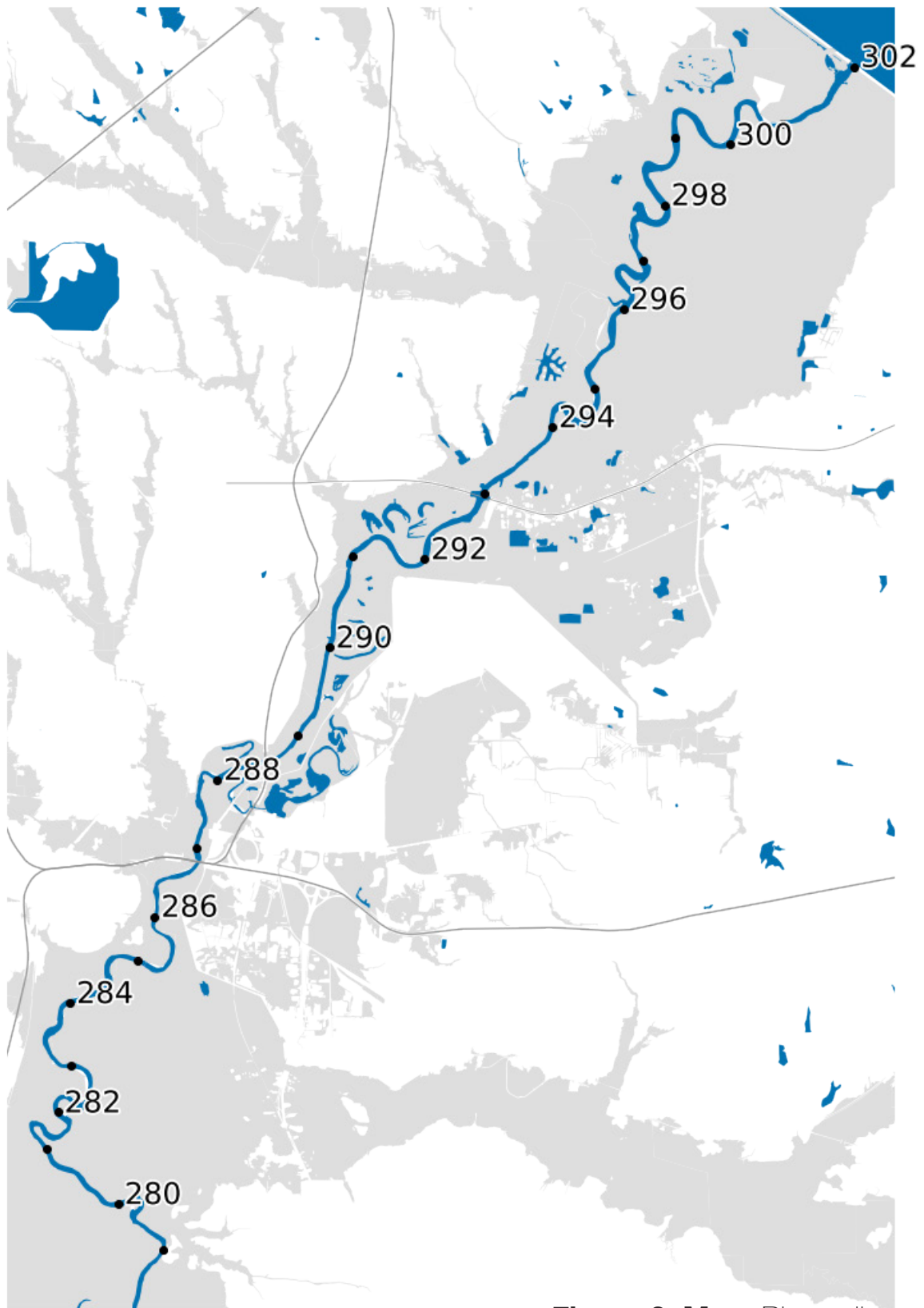
Section 4103 of the 2007 Water Resources Development Act authorized the Pearl River Basin Federal Flood Risk Management Project.

The Assistant Secretary of the Army is authorized “to construct the project generally in accordance with the plan described in the ‘Pearl River Watershed, Mississippi, Feasibility Study Main Report, Preliminary Draft’.”

The referenced feasibility study describes a study area as the Pearl River Basin from River Mile 270, just south of Byram, to the Ross Barnett Reservoir Dam at River Mile 372. This area is mapped on the left.

The blue represents the Pearl River, the reservoir, and other water impoundments. The light gray region is the FEMA-defined 1.0% chance exceedance event zone, also known as the 100-year floodplain. It visualizes the flood hazard posed by the river and its tributaries.

The map shows the region’s interstate highways and Lakeland Drive for reference. The rectangle represents the *study area*, which has been loosely defined by ellipses in maps produced by the Rankin-Hinds Pearl River Flood and Drainage Control District and by the U.S. Army Corps of Engineers.



**Figure 2: Map.** River miles



## Flood reduction along the Pearl River (Reference)

The relocation of the Rankin County levee and the large-scale excavation operation included in the One Lake will lower flood peaks along the river during high-flow events. The level of reduction varies by location.

Table 3-3 of the 2018 DEIS, Appendix C, shows the anticipated flood peak reductions. The table on the right shows those reductions for a 1.0% annual chance exceedance event, also called a 100-year flood. The table can be cross-referenced with a map of the Pearl River showing River Miles (RM).

The most significant flood reduction benefits will be between the J.H. Fewell Water Plant, RM 291, and the area just upstream of Meadowbrook Lake, RM 295. The U.S. Army Corp of Engineer's Agency Technical Review of the project considers this 5 to 8 foot drop atypical and "remarkable." (See 2020 ATR, Comment 8284198.)

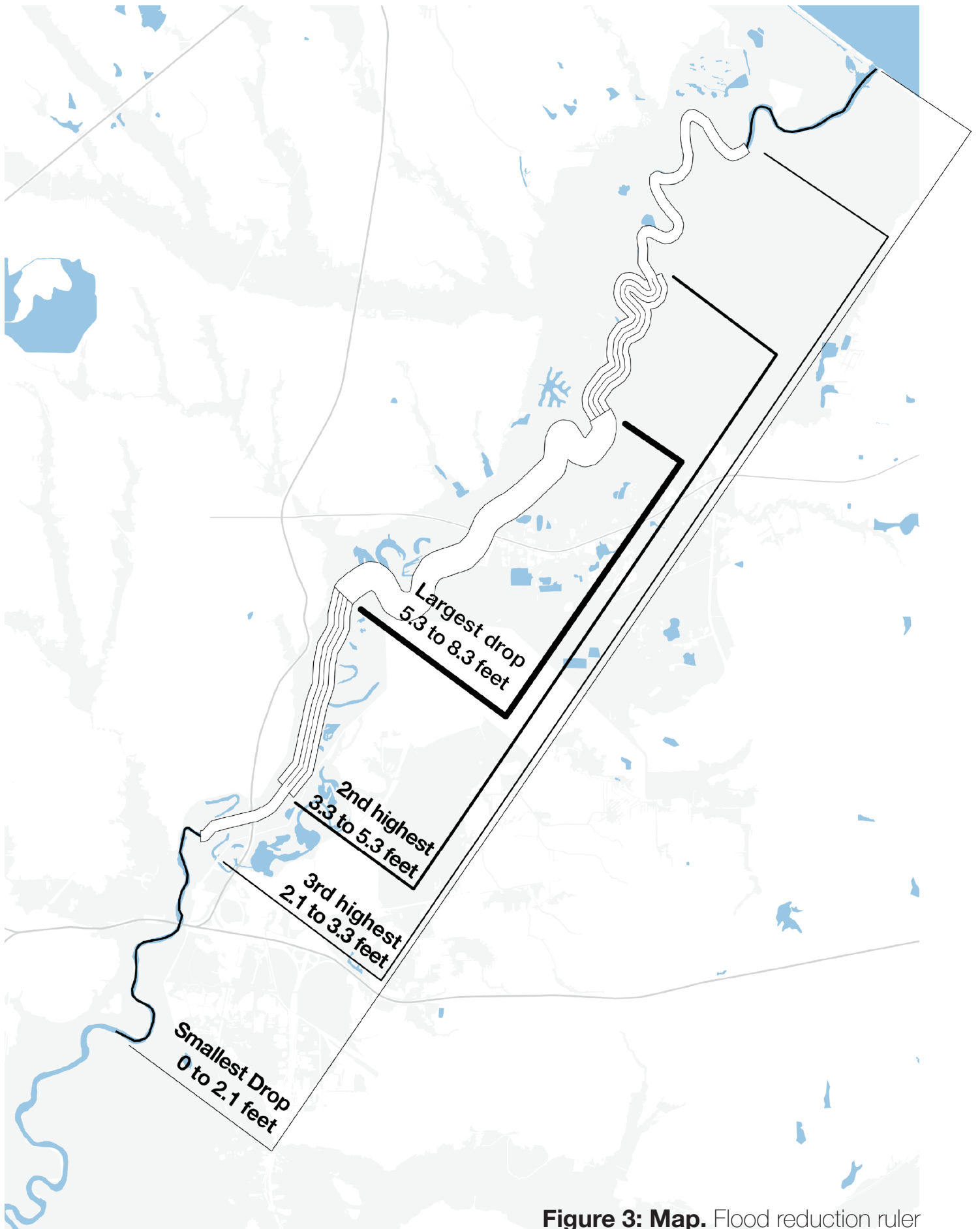
River Mile	Reduction
302	1.6 feet
301	2.0
300	2.4
299	2.6
298	2.8
297	3.6
296	4.5
295	7.0
294	8.3
293	7.1
292	5.8
291	5.4
290	5.0
289	4.0
288	3.0
287	1.8
286	0.8
285	-0.1



Flood reduction tables digitized:

<https://tinyurl.com/OneLakeReductions>  
or use the QR code.

Table 1: Flood peak reduction for a 100-year flood. Copied from Table 3-3 in the 2018 DEIS, App. C

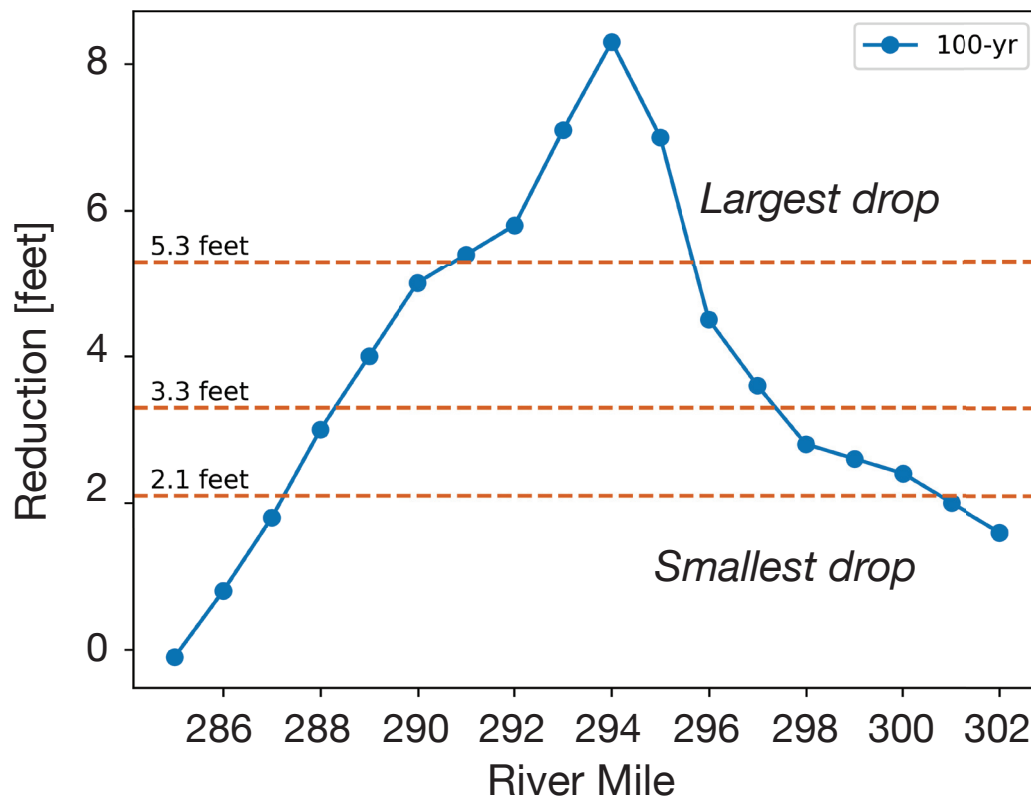


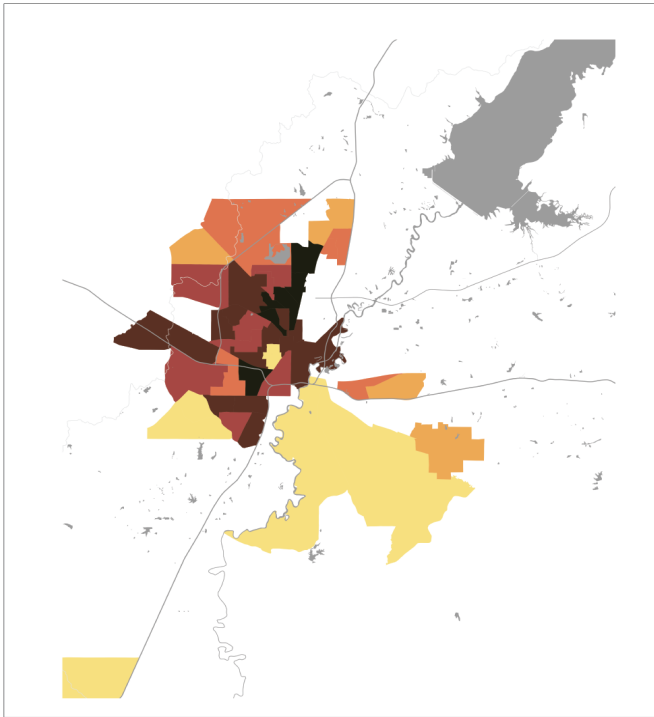
**Figure 3: Map.** Flood reduction ruler

## Visualizing the flood reduction along the Pearl River: The Flood Reduction Ruler

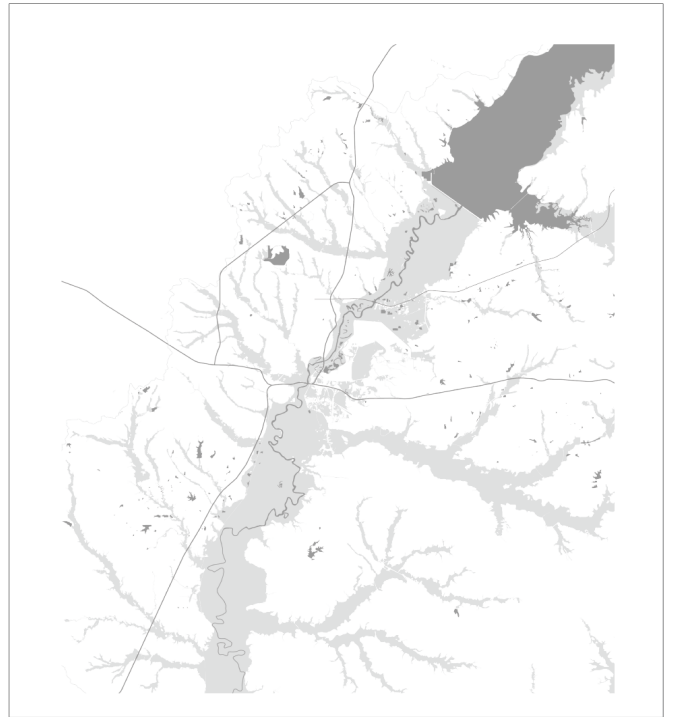
To visualize what communities receive the greatest levels of flood reduction benefits, the data is divided into four quantiles: The “largest drop” quantile, the “smallest drop” quantile, and two intermediary quantiles.

These quantiles can then be mapped along the river, as shown on the map the left. This flood reduction ruler is used in the following demographic maps.

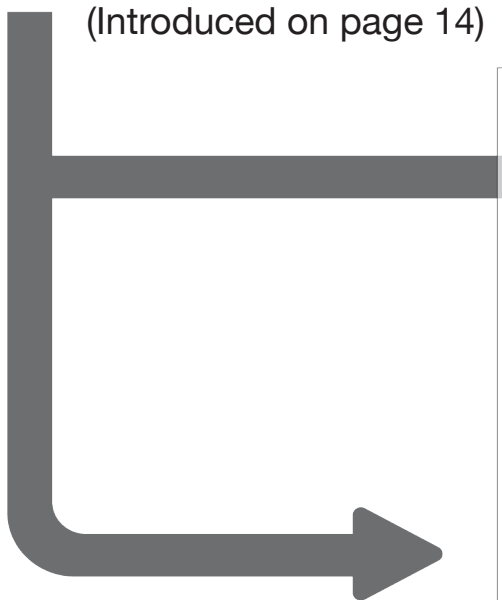




CEJST Burden Map  
(Introduced on page 14)

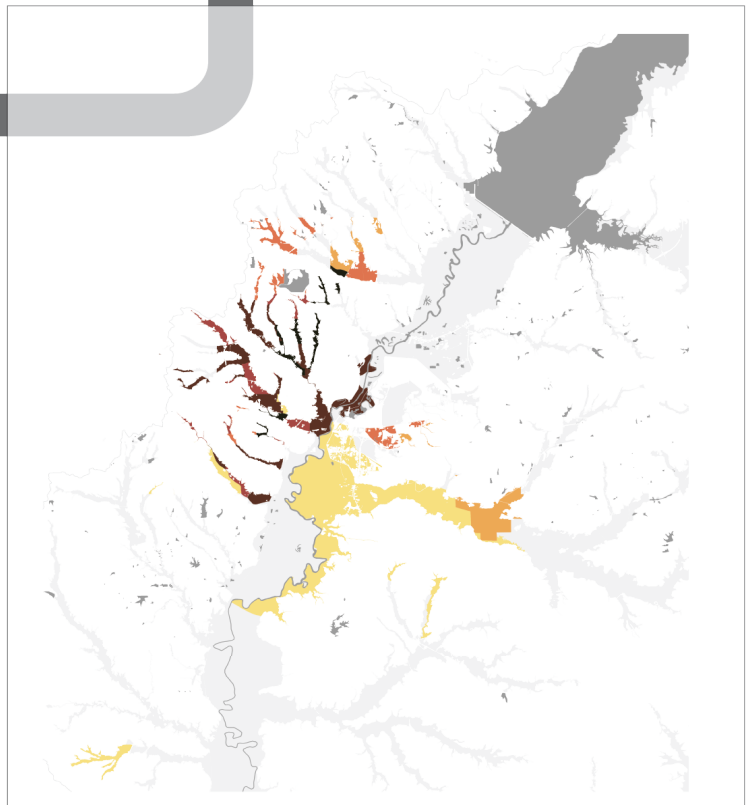


FEMA floodplain map



CEJST Burden Map  
clipped with floodplain

(Full size on page 28)



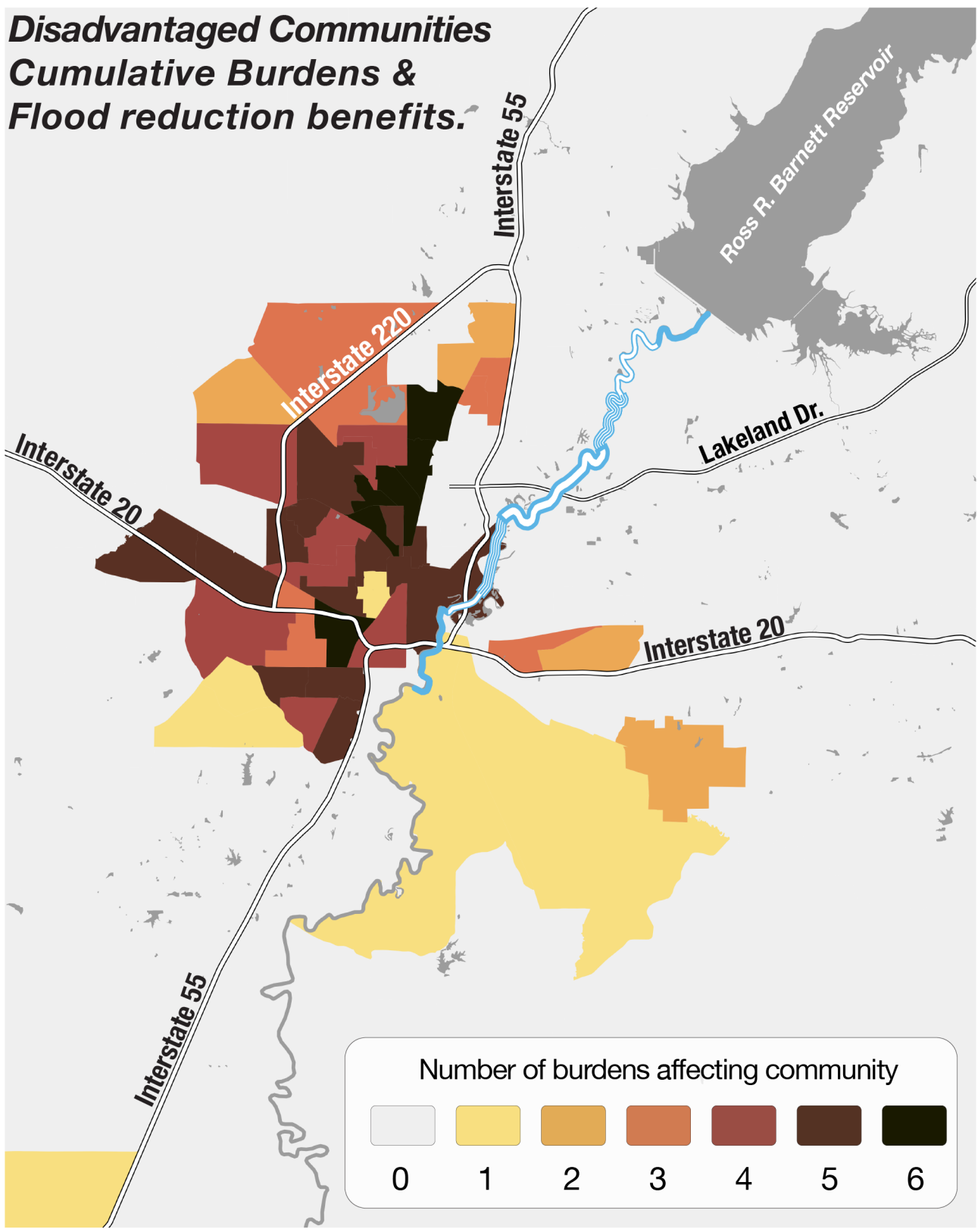
**Figure 4:** Summary of clipping operation

## **Geospatial Clipping and Floodplain demographics**

The communities most impacted by the flood reduction benefits of any project are likely those already within in the floodplain. The maps in the following pages approximate the demographics of these communities through *geospatial clipping*. Only the parts of a demographic map overlapping the floodplain are shown.

The clipping operation is summarized in Figure 4 on the opposite page.

**Disadvantaged Communities  
Cumulative Burdens &  
Flood reduction benefits.**



**Figure 5: Map.** Disadvantaged communities: cumulative burdens and flood reduction benefits

## Mapping social, economic, and climate vulnerabilities with the Climate and Economic Justice Screening Tool (CEJST)

The CEJST is a mapping tool developed under the directive of Presidential Executive Order 14008 to help national decision-makers identify communities vulnerable to problems caused by climate, economic, or climate changes.

The tool uses about 30 metrics from various databases to define eight categories of *burdens*. For example, a community has a workforce development burden if a large portion of the adult population in its census tract does not have a high school degree and at least one of four social conditions are met. Data for this burden are pulled from the American Community Survey of the United States Census.

**A community is “disadvantaged” if it is in a census tract affected by one or more burdens.**

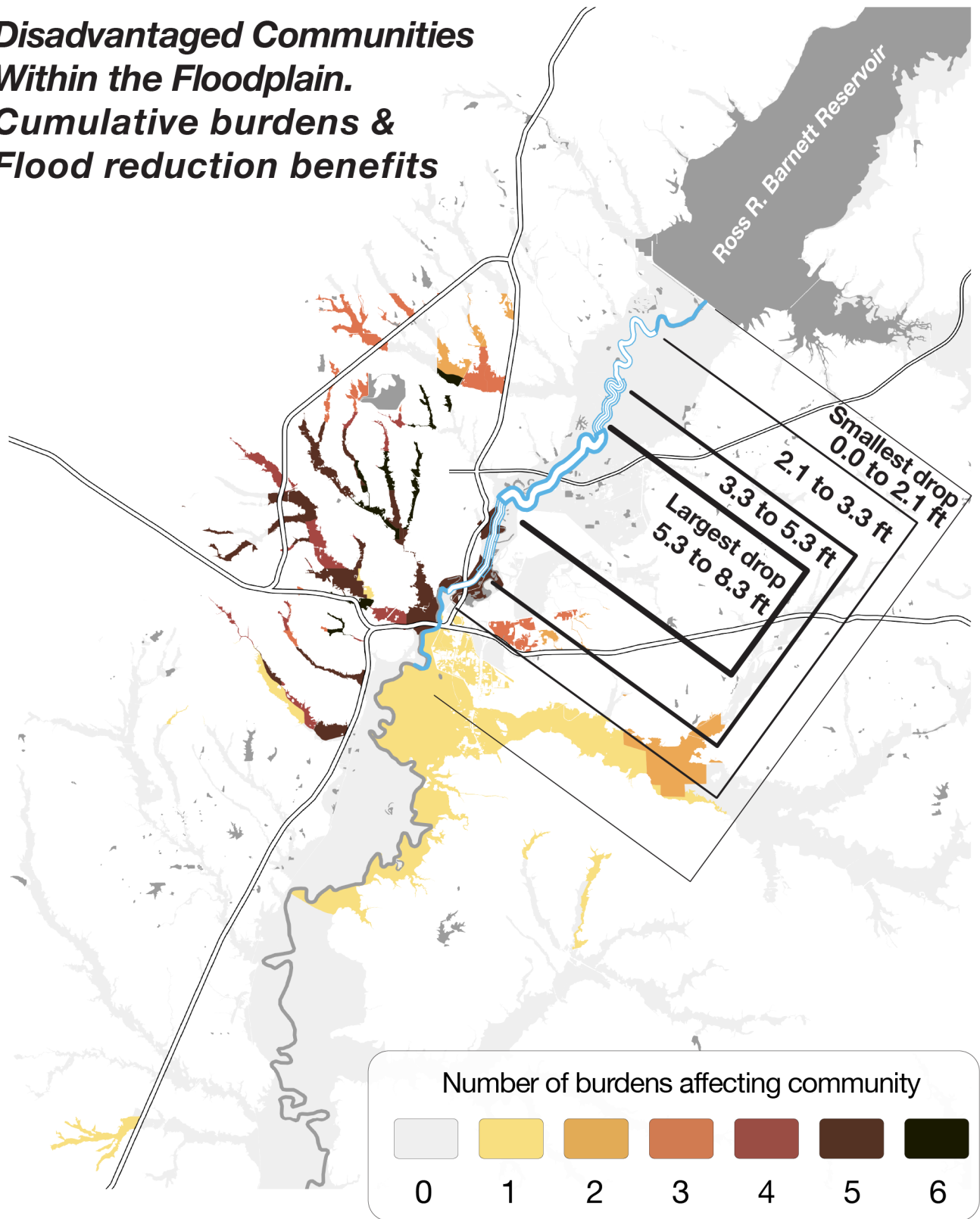
**The map on the left shows disadvantaged communities within the Pearl River Flood Risk Management Project Area.** Beyond what’s shown in the official CEJST, the map also shows the number of burdens affecting each community. Several communities in Hinds and Rankin Counties are disadvantaged, and at least one burden. Much of Jackson west of Interstate 55 is burdened by four to six.

The map also shows the flood reduction ruler.



To see the official CEJST, which is updated periodically, please visit <https://screeningtool.geoplatform.gov/> or use the QR code.

**Disadvantaged Communities  
Within the Floodplain.  
Cumulative burdens &  
Flood reduction benefits**

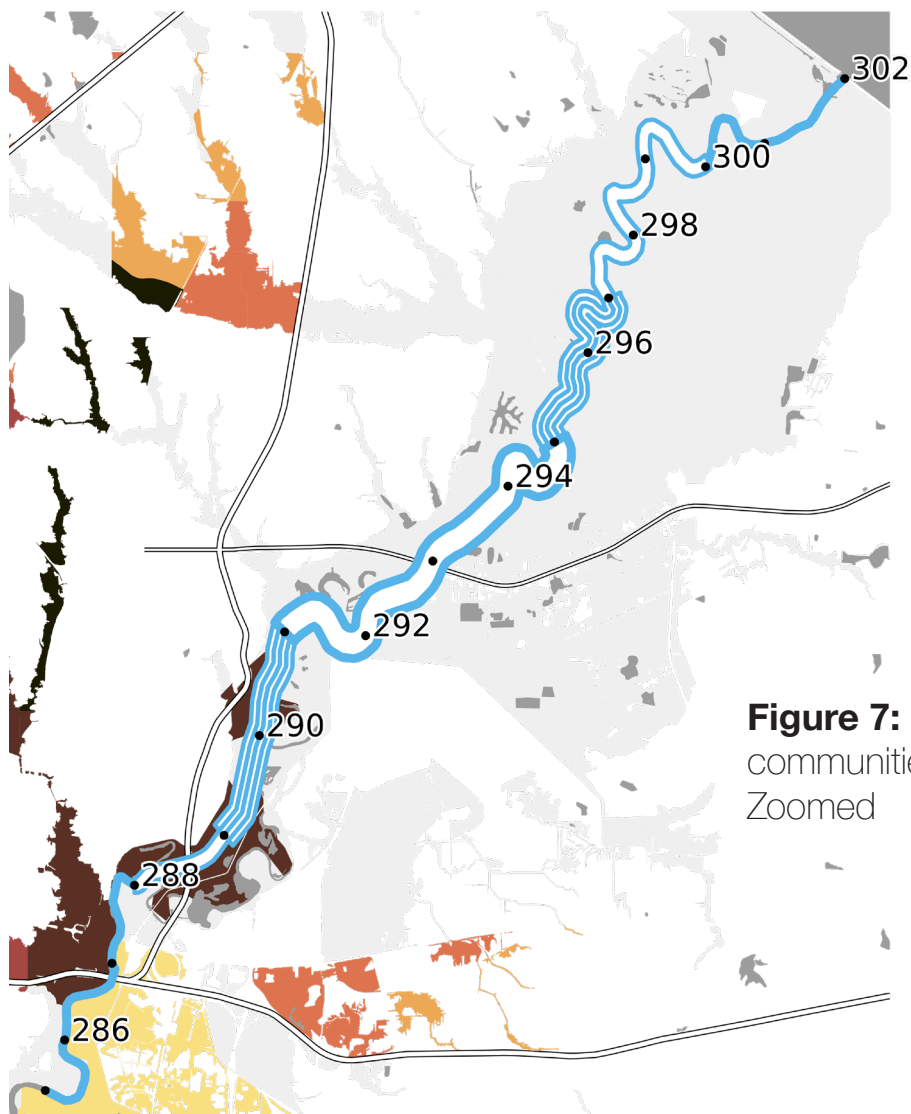


**Figure 6: Map.** Disadvantaged communities within floodplain: cumulative burdens and flood reduction benefits



**The peak flood reduction benefits are within a region that does not meet any disadvantaged metrics. The most-disadvantaged communities in the study area surround the tributaries in West Jackson.**

The One Lake could provide some flood reduction benefits to those surrounding Lynch and Town Creeks. Their mouths are between River Mile 286 and 288; the expected level of flood reduction in a 100-year flood within this stretch of the river ranges from 0.0 to 2.1 feet.



**Figure 7: Map.** Disadvantaged communities within floodplain. Zoomed

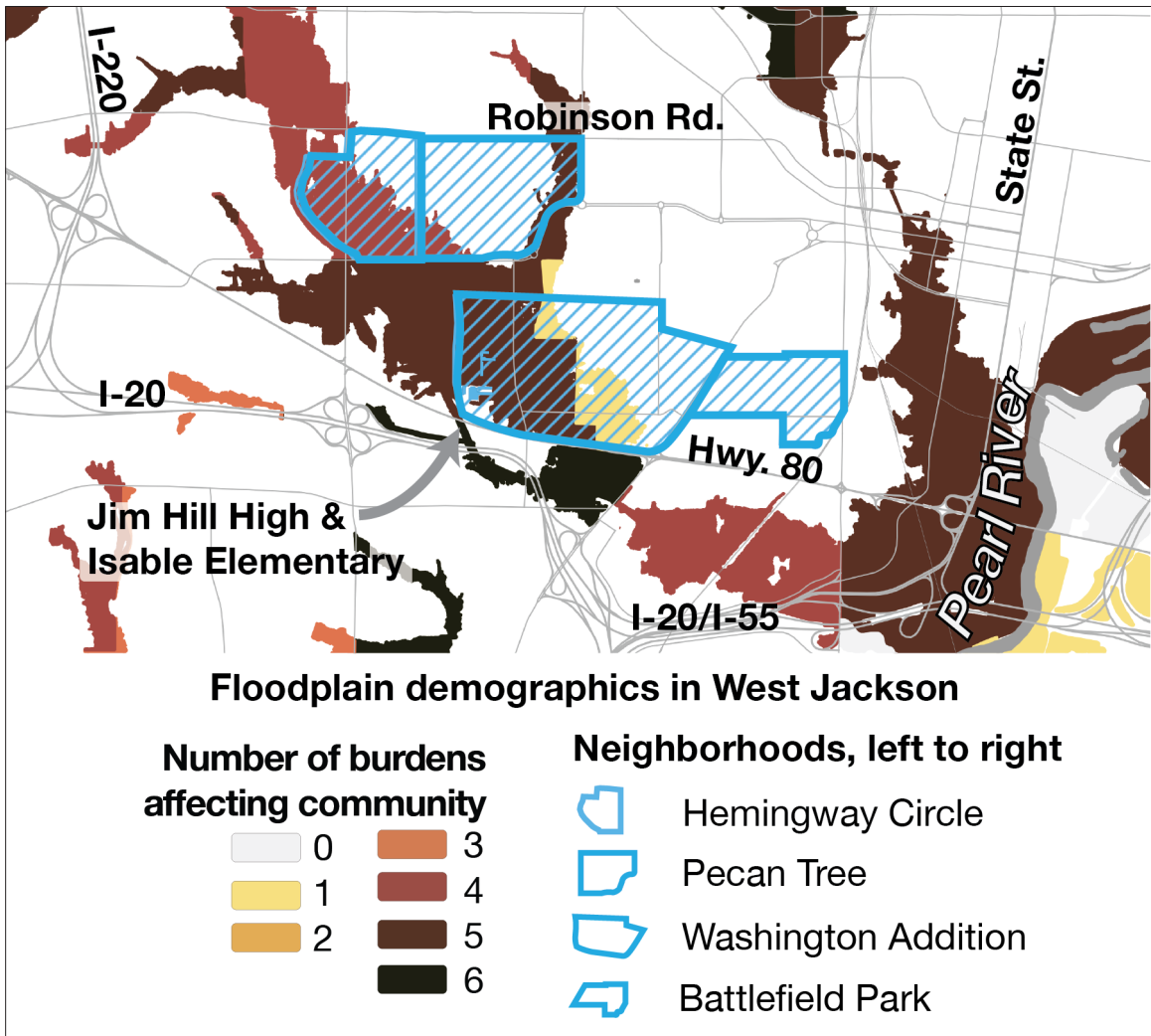
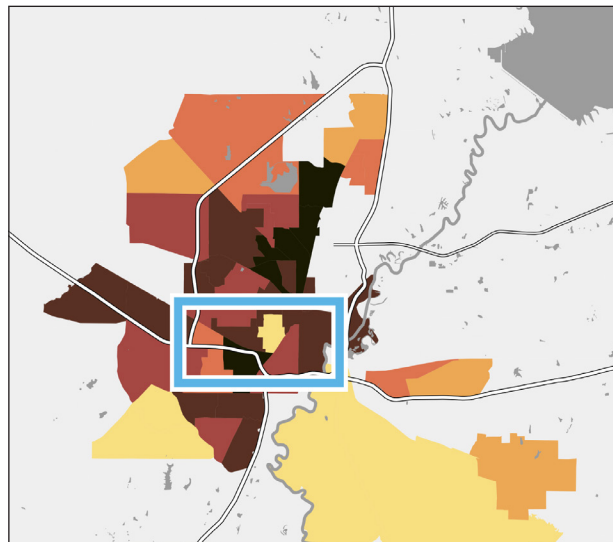


Figure 8: **(Above) Map.** Four of the West Jackson neighborhoods referenced in the public engagement meetings and cumulative burdens within floodplain. Jim Hill and Isable are discussed later in this comment. • **(Right) Map.** Location of above map on the cumulative burdens map.



## The One Lake and West Jackson

### *Summary*

West Jackson floods along its creeks. Some elected officials support the One Lake because it might reduce backwater-induced flash flooding. The U.S. Army Corps of Engineers must assess this presumed flood risk reduction benefit and explicitly communicate the results to decision-makers and the public.

Furthermore, this comment uses USGS data to show that a backwater effect could worsen flood risks in West Jackson. This analysis reinforces the need for a more thorough analysis of backwater impacts on the tributaries.

### *The One Lake as a solution to West Jackson flooding*

**West Jackson floods.** A State Representative spoke at Jackson's second U.S. Army Corps of Engineers public engagement meeting on May 24, 2023. They said the flood-prone communities in West Jackson face a "glaring environmental justice issue." Residents were harmed by flooding on January 2020, and the existing levee system on the Pearl River may have exacerbated the problem. The representative concluded their statement by endorsing the One Lake as a solution.

**West Jackson is affected by creek flooding.** The map on the opposite page shows four of the neighborhoods mentioned by the State Representative and the cumulative burdens within the floodplain. The Lynch Creek floodplain dominates this area.

### *The One Lake as a solution to West Jackson flooding (Cont'd)*

**The basis of the Representative's conclusion is presumably the One Lake's potential to reduce backwater impacts on the tributaries during extreme events**, as suggested in the 2020 USACE Agency Technical Review (ATR), comment 7059420, exchanges 1-0 and 2-0. However, the 2018 Draft Environmental Impact Statement (DEIS) did not examine the creekside flood reduction benefits provided by the One Lake project. Exchanges 2-1 and 3-0 also show that the project delivery team (i.e., the One Lake planners) dismissed the opportunity to study tandem storm systems akin to those that caused the West Jackson floods.

Despite the lack of validation, other elected officials have “pitched” the One Lake project in response to the January 2020 flooding in West Jackson [1]. **It may be the case that the project is the “Locally Preferred Plan” due to unverified claims. Potential creekside flood reduction benefits, or lack of them, should be explicitly stated in the 2023 DEIS to inform decision-makers and the public.**

### *Gage analysis of Lynch Creek flooding*

**The remainder of this comment considers the assumption that the One Lake's backwater can affect the referenced West Jackson communities.** Three documented floods at Jim Hill High and Isable Elementary Schools provide reference points. The schools are in the Washington Addition neighborhood, approximately 2 miles upstream from the mouth of Lynch Creek. **Data from these events suggest backwater effects, if present, could have exacerbated the floods.**

Local news networks televised the floods. The three images on the opposite screen are screenshots from the coverage.



**May 9  
2019**



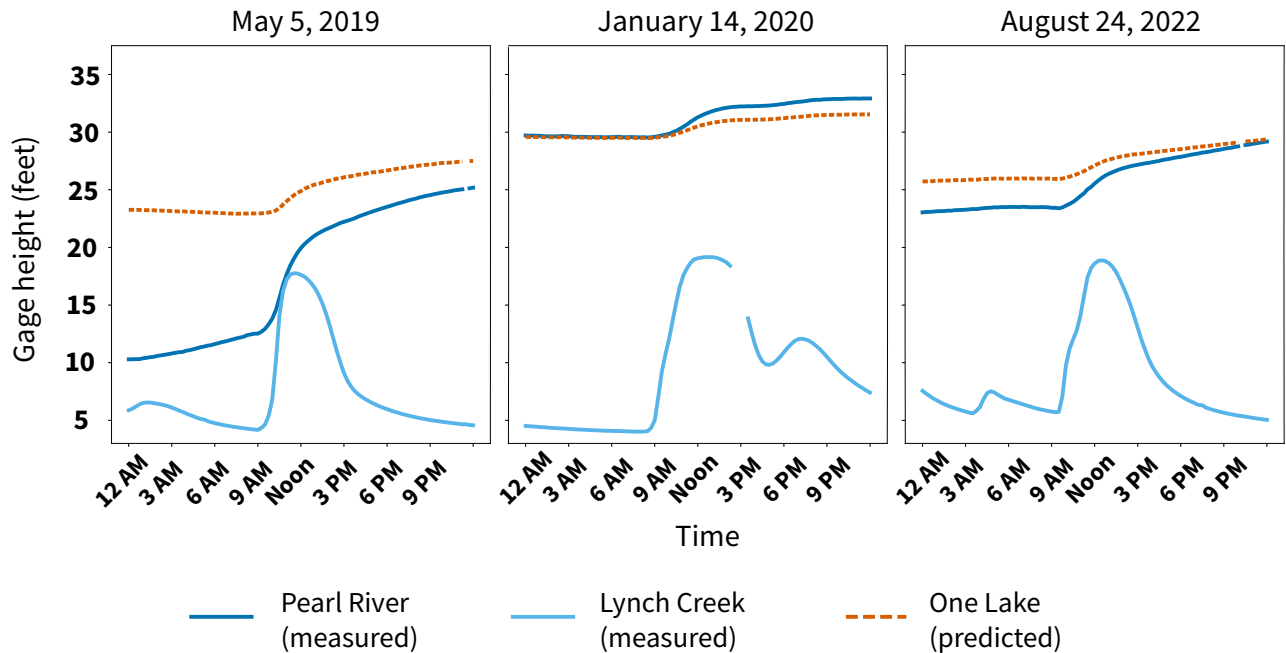
**January 14  
2020**



**August 24  
2022**

**Figure 9:** Three floods at Jim Hill High and Isable Elementary, as covered by local news networks.

**USGS gage data and predicted One Lake water surface elevation during The 3 Floods at Jim Hill High and Isable Elementary Schools**



**Figure 10:** Three floods at Jim Hill High and Isable Elementary, gage data and One Lake predictions

***Gage analysis of Lynch Creek flooding (Cont'd)***

**The graphs above plot creek and river data measured during the school flooding events. The graphs also show predicted river surface elevation levels near the mouth of Lynch Creek (River Mile 287.14) if the One Lake had been in place during the events.**

### *Gage analysis of Lynch Creek flooding (Cont'd)*

**The light blue line shows creek levels on Lynch Creek during these floods, as measured about a quarter mile downstream of the schools** (USGS gage #02486100). The creek data shows why these floods caught the media's attention. The creek rose and peaked during school hours, damaging vehicles [2], causing "chaos and confusion" during early dismissals [3], and forcing students and parents to wade in "dirty" water [4].

**The darker blue line shows the river level as measured from Highway 80** (USGS gage #02486000). Appendix C suggests that this gage reading is within 1.5 feet of the river's water surface elevation at the mouth of Lynch Creek. The 2019 data proves that the schools can flood, even when the river is between 10 to 20 feet.

**The dashed orange line shows the predicted river surface elevation with the One Lake in place.** This prediction was generated using discharge measurements from the Pearl River and the stage-curve data from River Mile 287.14. The latter was found in Appendix K of the 2018 DEIS. (See PDF page 67, table 6).

In two of these floods, 2019 and 2022, the river's surface level at the mouth of Lynch Creek would have been higher with the One Lake in place. On the third event, 2020, the flood reduction benefits of the project would not be registerable until the creek was already reaching its peak. ***If backwater effects impact the school, then the lake could exacerbate the "damage," "chaos", and "confusion."***

Date	Time	Month	Day of the week	Creek stage (feet)	WSE Difference (feet)	School hours
2019-05-09	11:30	May	Thursday	17.76	5.52	TRUE
2020-01-02	19:30	January	Thursday	18.6	2.32	FALSE
2020-01-11	10:00	January	Saturday	17.56	-0.79	FALSE
2020-01-14	12:30	January	Tuesday	19.16	-0.91	TRUE
2020-04-23	3:45	April	Thursday	18.6	0.66	FALSE
2021-04-09	23:45	April	Friday	18.56	5.22	FALSE
2022-04-17	19:45	April	Sunday	17.29	1.01	FALSE
2022-08-24	12:30	August	Wednesday	18.88	1.36	TRUE
2023-03-26	19:15	March	Sunday	17.24	8.72	FALSE

Table 2: Lynch Creek gage peaks above 17-feet since March 2019.

### *Gage analysis of Lynch Creek flooding (Cont'd)*

**The creek peaked nine times at similar gage heights in the past four years. Potential backwater impacts of the One Lake could increase them.** Three of these peaks occurred during the three documented school floods. The six other peaks may have corresponded with under-documented bank overtopping. Unlike the three televised floods, the other six peaks occurred outside school hours.

The above table shows measured peaks greater than 17 feet since March 2019. It also shows the expected water surface elevation (WSE) difference at the mouth of Lynch Creek due to the construction of the One Lake. It indicates that the WSE difference would have been higher during 7 of the 9 peaks, with ranges from half a foot to nearly 9 feet. It shows that the WSE difference would have been lower during two peaks, and the decrease would be no more than a foot.



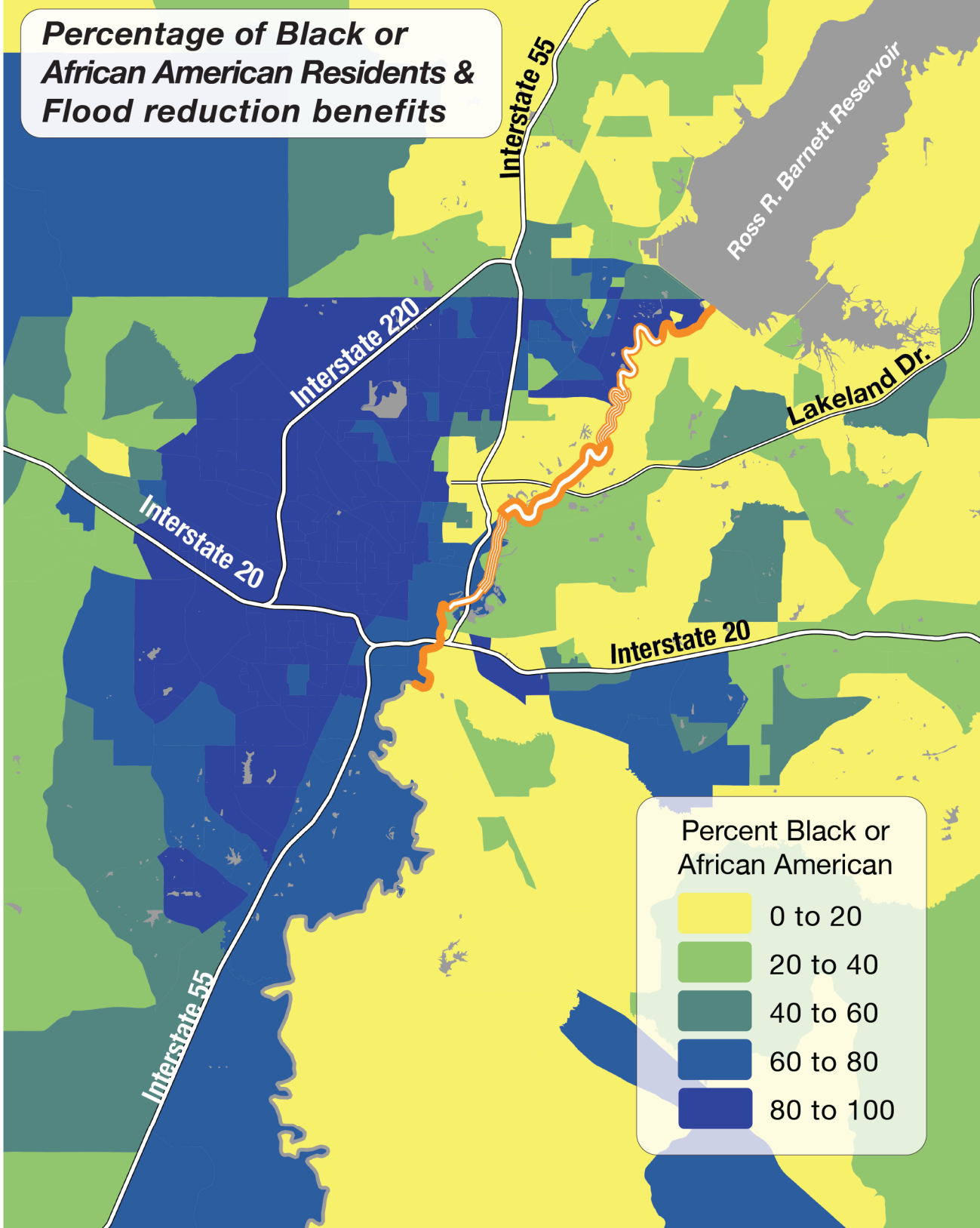
### ***Gage analysis of Lynch Creek flooding (Cont'd)***

Appendix C in the 2018 DEIS assessed the potential for bank overtopping along this creek, but only for a 10-year storm at normal lake elevations. The floods at Jim Hill and Isable along with the peak study demonstrate the damaging flood risks along Lynch Creek with existing conditions. They also demonstrate the need for a more thorough assessment including a wider range of storms (e.g, 50-yr, 100-yr, etc).

### ***Conclusion (Same as summary on page 19)***

West Jackson floods due to creek flooding. Some elected officials support the One Lake because it might reduce backwater-induced flash flooding. The U.S. Army Corps of Engineers must assess this presumed flood risk and explicitly communicate the results to decision-makers and the public.

Furthermore, this comment uses USGS data to show that a backwater effect could worsen flood risks in West Jackson. This analysis reinforces the need for a more thorough analysis of backwater impacts on the tributaries.



**Figure 11: Map.** Percent of Black or African American Residents & Flood reduction benefits

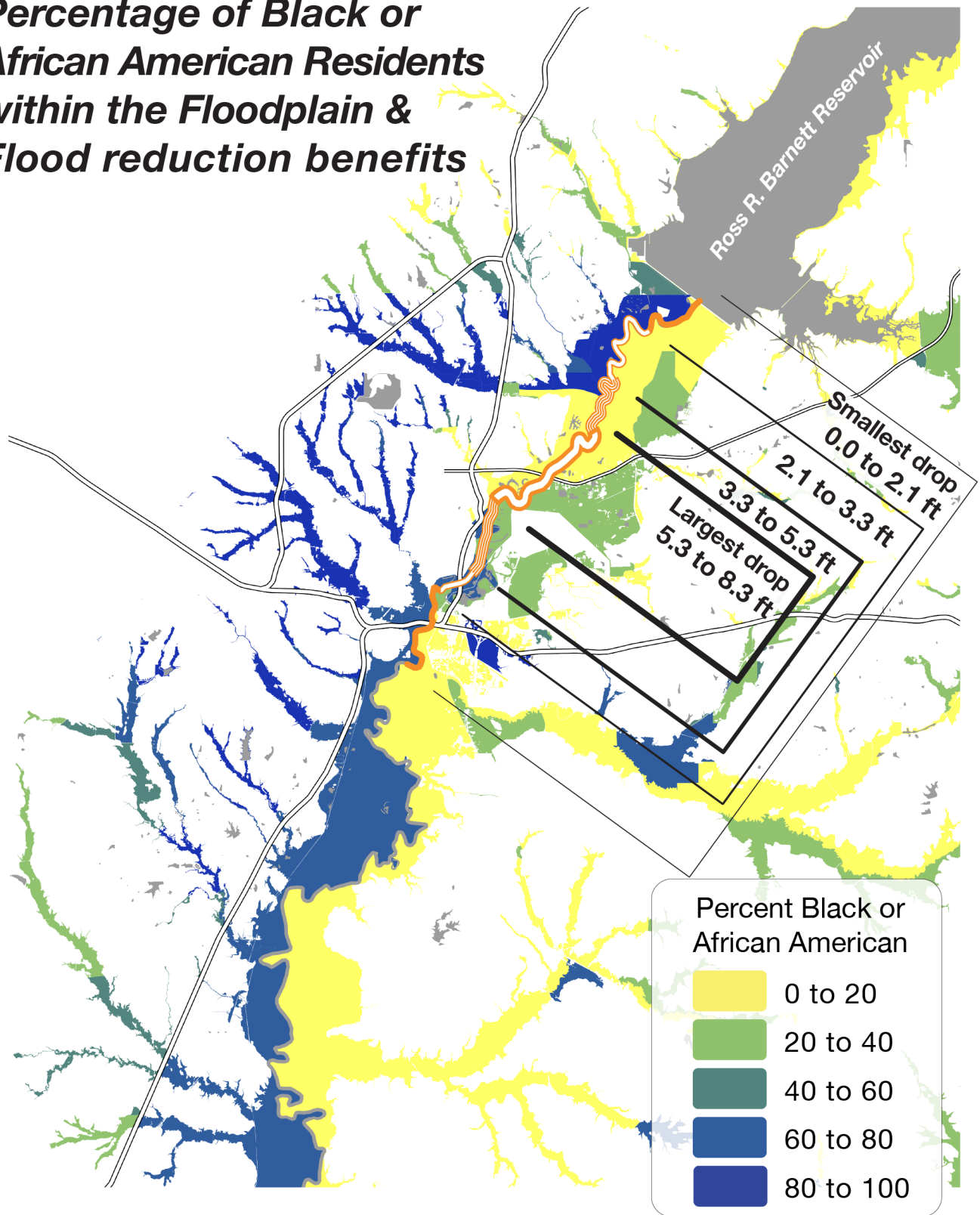
## Mapping the study area's racial demographics

Race matters. Black, Latine, and other People of Color are exposed to higher levels of environmental hazards compared to their White counterparts. At least one researcher has suggested that this elevated risk is caused by development and consumption patterns of White populations. [5]

At least two Presidential Executive Orders aim to curb this environmental racism. Executive Order 12898 requires that federal agencies identify and address “disproportionately high and adverse health or environmental effects of its programs, policies, and activities on minority and low-income populations.” Executive Order 13985 asserts “that the Federal Government should pursue a comprehensive approach to advancing equity for all, including people of color...”

The map on the opposite page shows the percentage of Black or African American residents per census block. It also shows the One Lake flood reduction ruler.

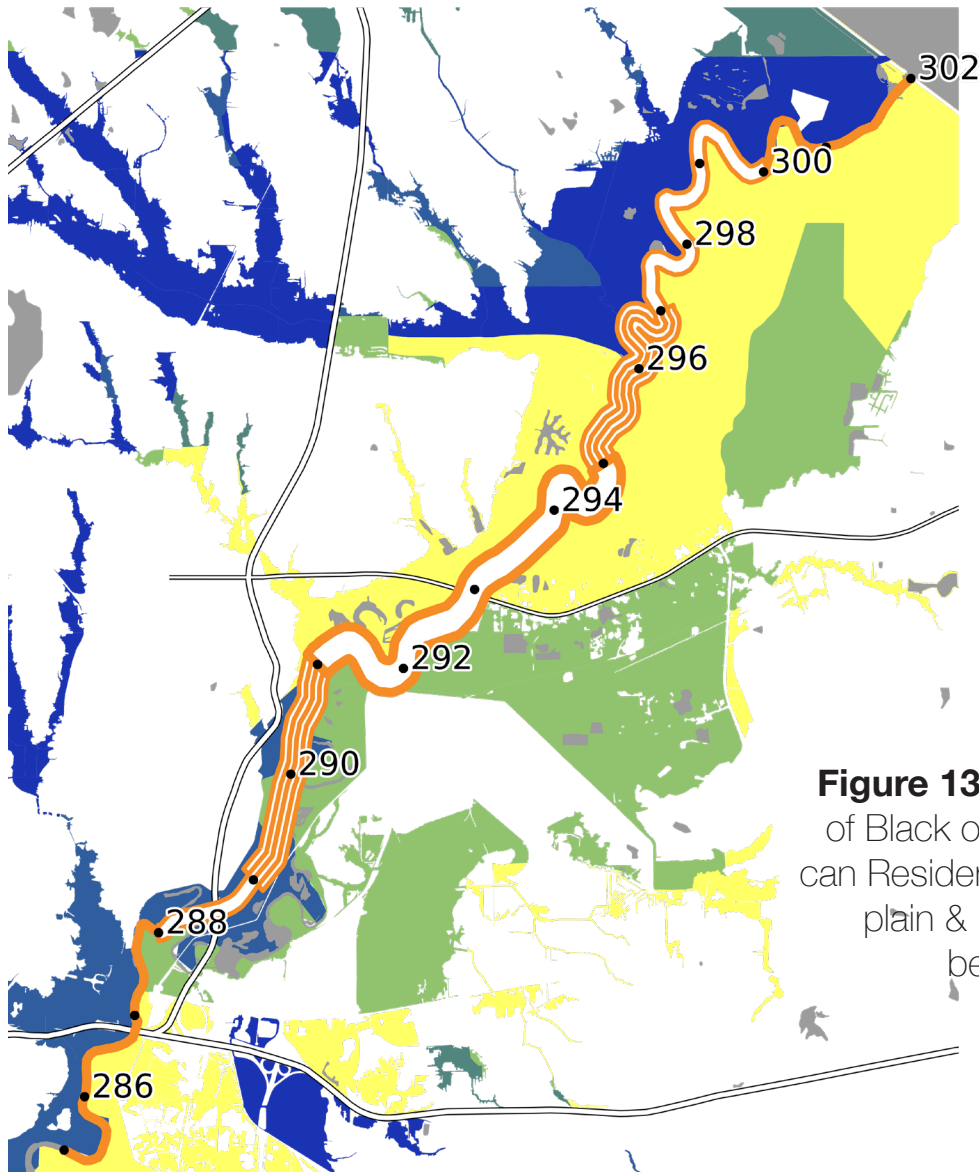
**Percentage of Black or African American Residents within the Floodplain & Flood reduction benefits**



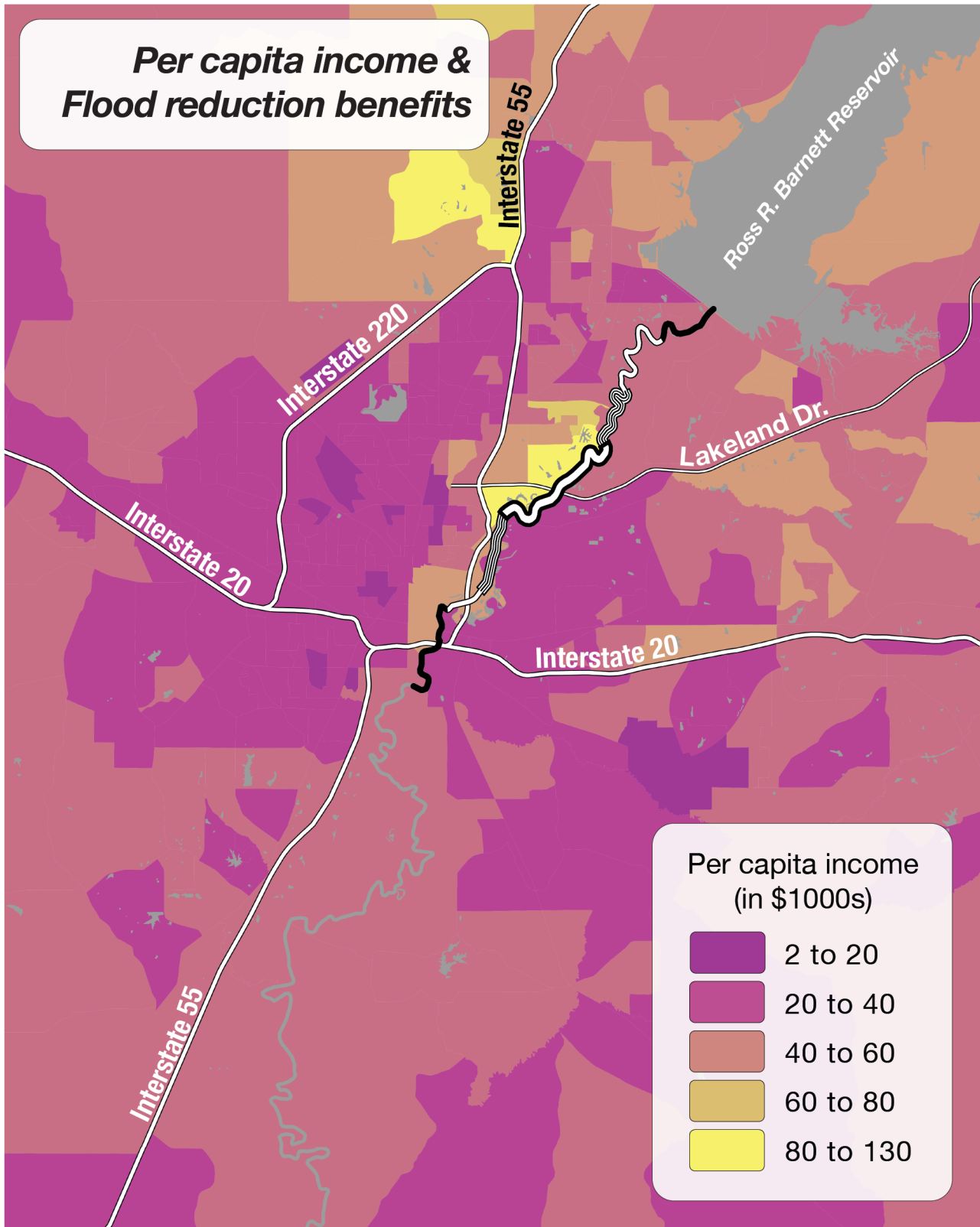
**Figure 12: Map.** Percent of Black or African American Residents within floodplain & Flood reduction benefits

**The flood reduction benefits peak along predominantly White communities. Flood reduction benefits are offered to predominantly Black communities immediately south of Downtown Jackson and in Northeast Jackson.**

Flood reduction benefits south of Downtown are questioned in pages 19 through 25. The benefits provided to the predominantly Black communities in Northeast Jackson are also questionable and discussed on pages 35 through 40.



**Figure 13: Map.** Percent of Black or African American Residents within flood-plain & Flood reduction benefits. Zoomed



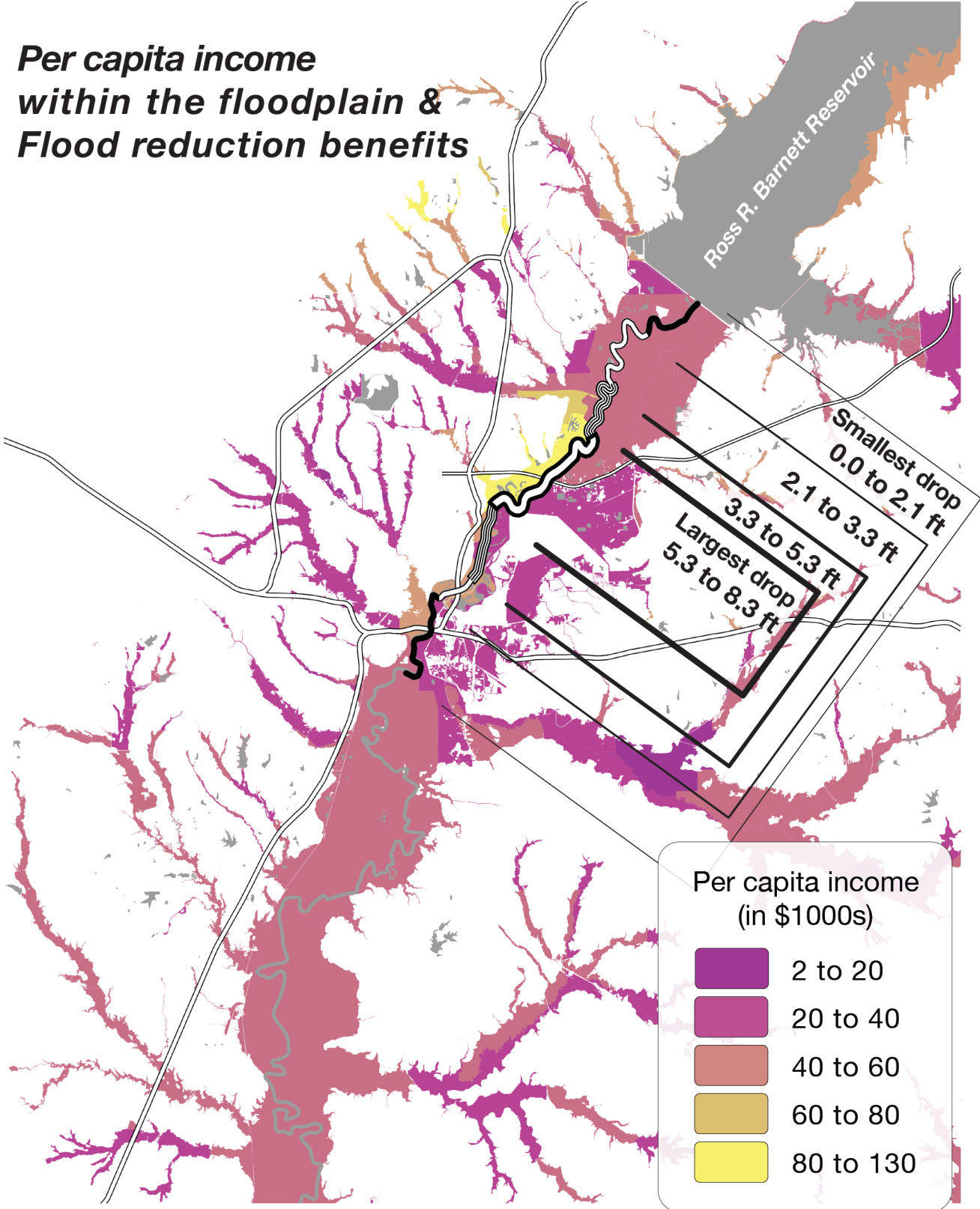
**Figure 14: Map.** Per capita income & Flood reduction benefits

## **Mapping the study area's income demographics**

Wealth is a metric heavily weighed in the CEJST (see page 15). It is also highlighted in Executive Order 12898. Understandably, wealth can enable a person to purchase homes in less hazardous communities. Hypothetically, the wealthiest can even develop in the river's floodway and convince the Federal Government to reduce flood peaks along their neighborhood.

The map on the opposite page shows the per capita income of the study area. It also shows the One Lake flood reduction ruler.

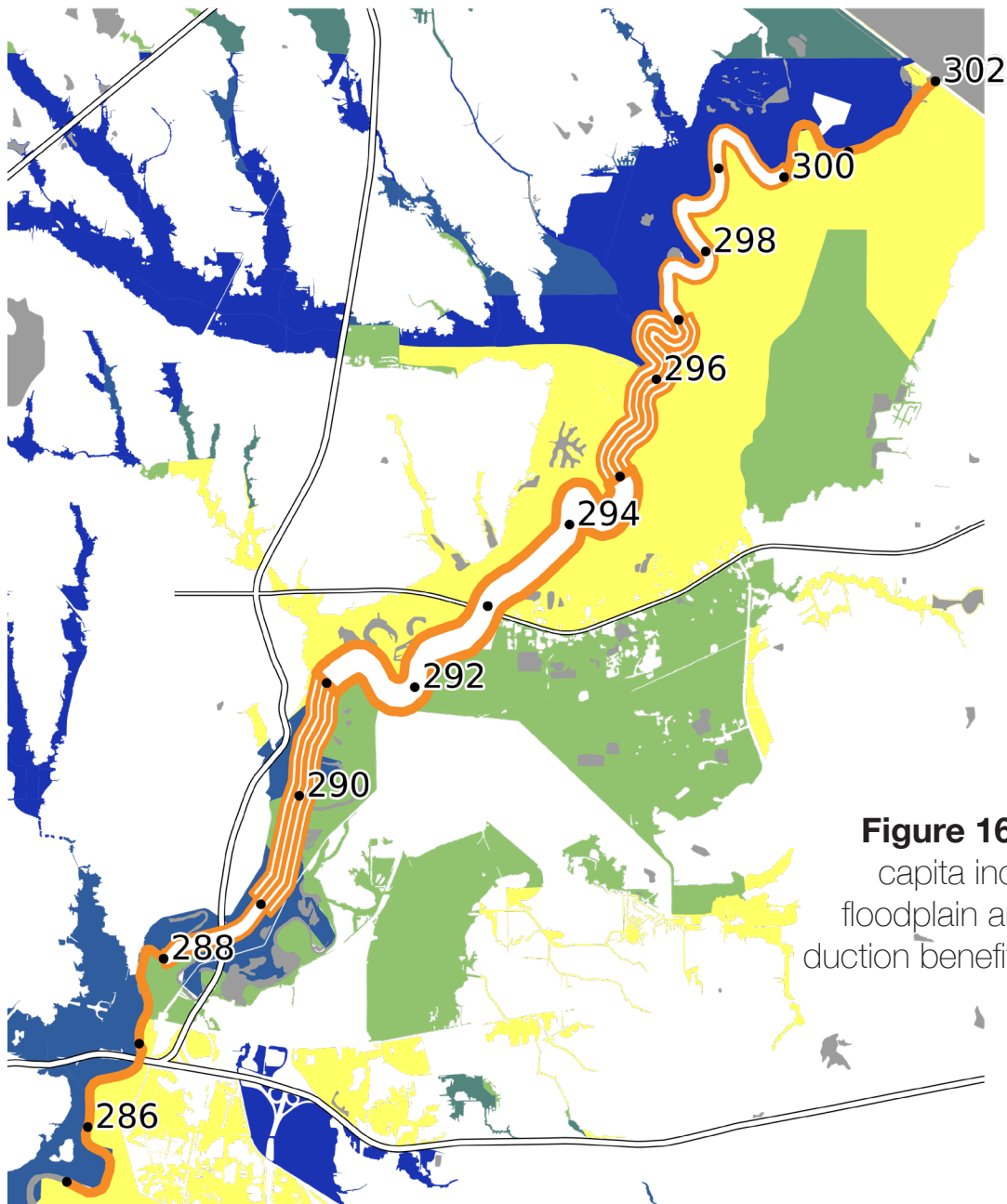
**Per capita income  
within the floodplain &  
Flood reduction benefits**



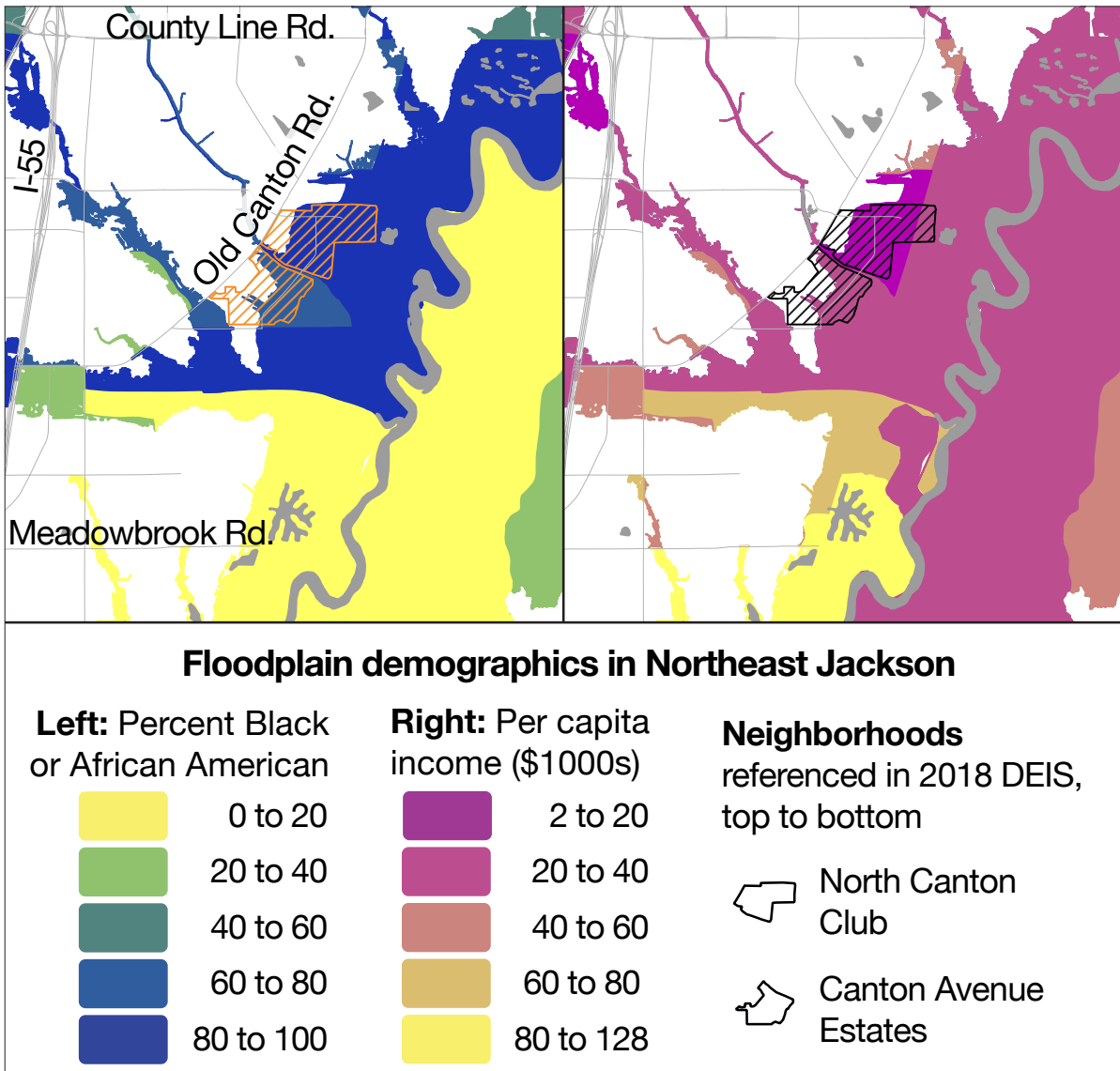
**Figure 15: Map.** Per capita income within floodplain & Flood reduction benefits



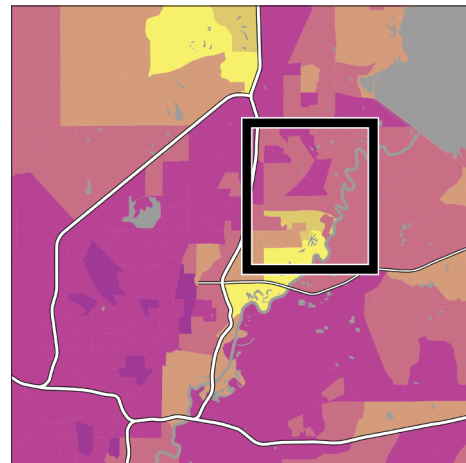
The flood reduction benefits peak along the wealthiest communities in Jackson. Flood reduction benefits are offered to No direct benefits might be granted to poorer communities with per capita incomes less than \$20,000.



**Figure 16: Map.** Per capita income within floodplain and flood reduction benefits. Zoomed



**Figure 17: (Above) Map.** Floodplain demographics of Northeast Jackson and two neighborhoods referenced in the 2018 Draft Environmental Impact Statement (DEIS), Appendix E. • **(Right):** Location of above map on the per capita income map



## The One Lake and Northeast Jackson

### *Summary*

North Canton Club is a predominantly Black or African American neighborhood in Northeast Jackson that floods. The study area's greatest concentration of structures vulnerable to river flooding might be those in this neighborhood and surrounding Black or African American predominant communities. These neighborhoods would still flood under the One Lake. The project skews flood reduction benefits to the whiter and wealthier side of town, downstream by four miles.

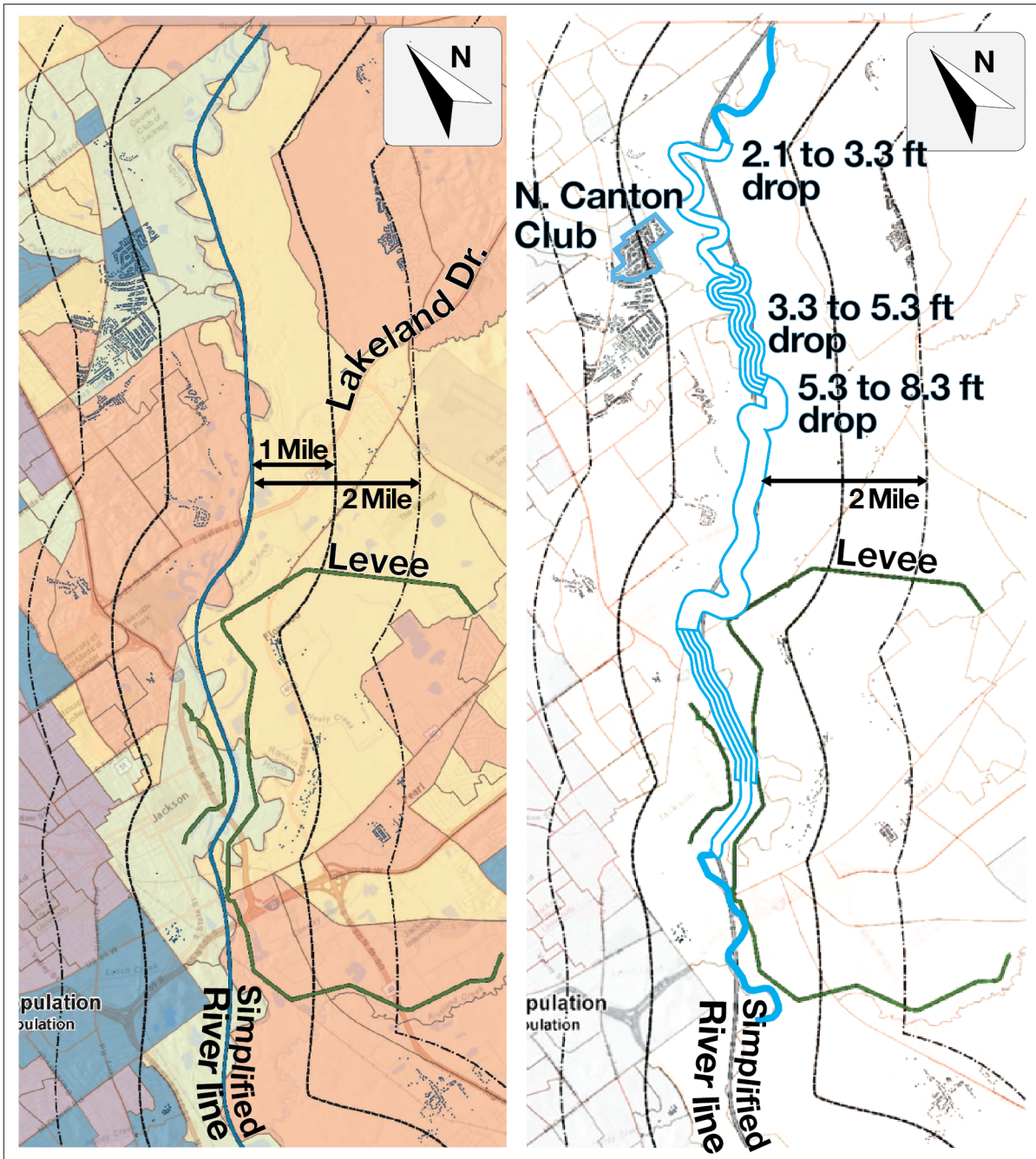
Does the project offer a greater level of protection to predominantly White, wealthier, and less vulnerable communities? Will the project create conditions for worsening of flood risks for Northeast Jackson?

The approved plan should provide a more balanced level of environmental protections and avoid unintended consequences. The One Lake may perpetuate racial and income inequalities.

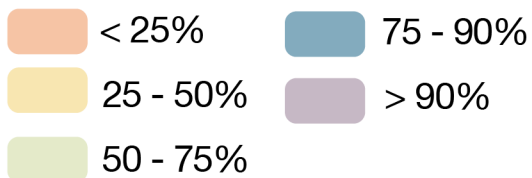
### *Predominantly Black*

**North Canton Club is a predominantly Black neighborhood in Northeast Jackson that floods.** The 2018 DEIS references it in Appendix E: "Environmental Justice." The U.S. Army Corps of Engineers' title slide for public engagement meetings shows the neighborhood's eastern end.

The image on the opposite side shows two neighborhoods mentioned in Appendix E and the floodplain demographics of Northeast Jackson.



**Left:** Percent minority population. The image is a cutout of Figure 5, in the 2018 DEIS, Appendix E.



**Right:** Structures vulnerable to flood damages and the flood reduction ruler. Structures are represented by black blotches. North Canton Club (top left) is outlined.

The image is a high-contrast and reduced hue version of the image on the left.

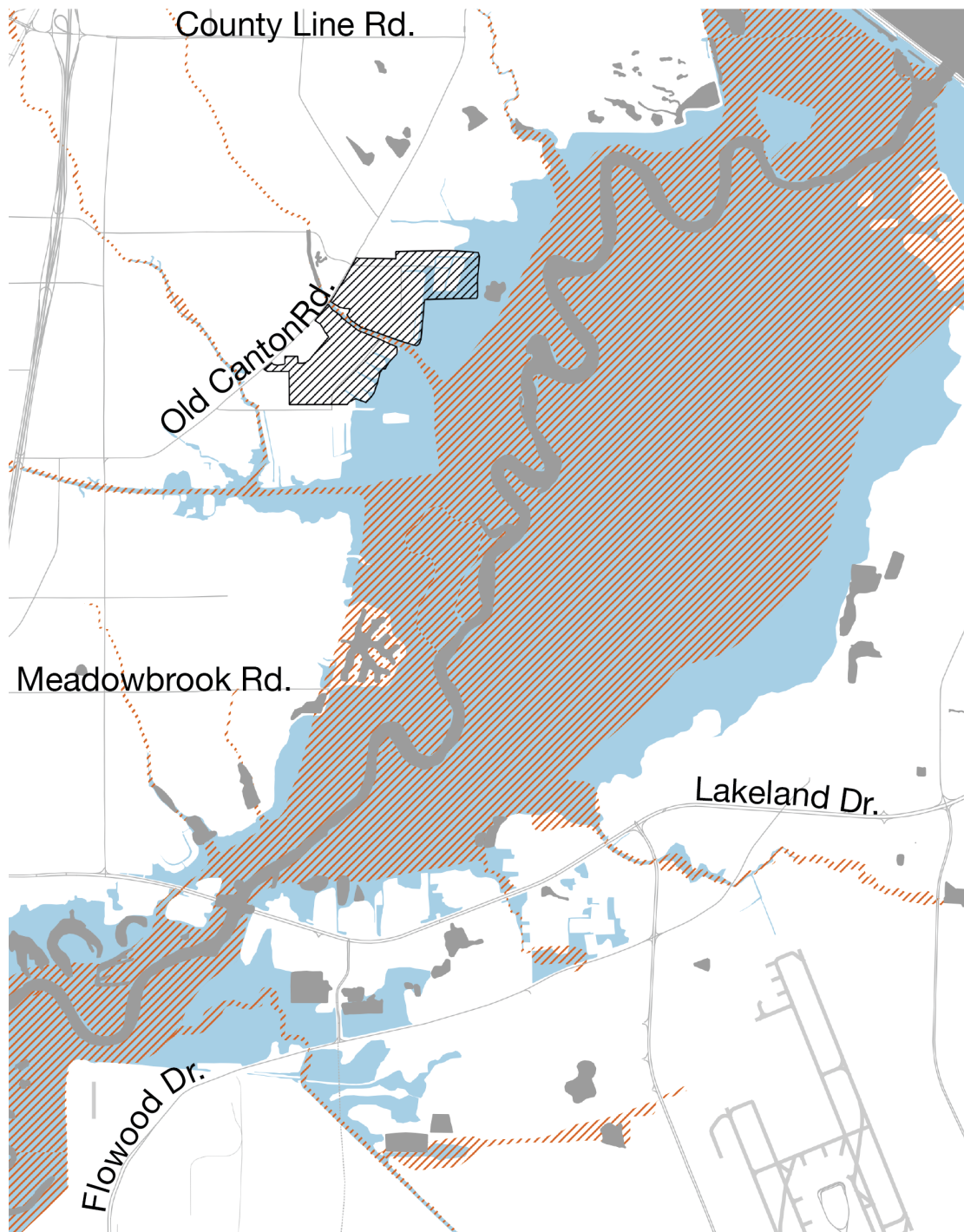
**Figure 18:** Cutouts of DEIS Appendix E, Fig. 5

### *Vulnerable to flood damages*

**The study area's greatest concentration of structures vulnerable to river flooding in the study area might be those in Northeast Jackson's predominantly Black communities.** Figure 4 in Appendix E of the 2018 DEIS shows the commercial and residential structures surveyed to determine the finished floor elevations in areas susceptible to flooding. Figure 5 shows a subset of these structures, but the report does not explain how that subset was generated. It might represent the structures with finished floor elevations lower than the 100-year floodplain within 2 miles of the river. Northeast Jackson was developed before the region had adopted floodzone ordinances [6]. Newer construction, like that on Lakeland Drive, has higher first-floor elevations [7]. Figure 5 likely shows the structures most vulnerable to flood damages. This vulnerability may be why, according to Appendix E, Northeast Jackson "currently faces the highest risk of realizing economic damages from flooding." (See PDF page 16.)

The figure on the opposite page shows two cutouts of Appendix E, Fig. 5. The version on the left illustrates the percent minority population along the river. The version to the right is a recreation with reduced color saturation, increased color luminance, and increased contrast. It highlights the distribution of structures vulnerable to flood damages. The densest and largest clusters are mostly in tracts with a 50 to 90% minority population. These are the predominantly Black neighborhoods in Northeast Jackson. The right image outlines North Canton Club for reference.

The second image also includes the flood reduction ruler. The cluster of vulnerable structures in predominantly Black or African American Northeast Jackson would receive the project's 2nd- and 3rd-tier flood reduction benefits, 2.1 to 5.3 feet.



**Northeast Jackson, downstream chokepoints, and the extent of a 36-foot flood.**

 Areas flooded at 36 feet

 FEMA-defined floodway

 N. Canton Club & Canton Ave. Estates, Flooded

### *Vulnerable due to floodplain mismanagement*

**A disregard for floodplain zoning allowed the construction of these neighborhoods in the 1960s and 1970s.** A 1970s U.S. Army Corps of Engineers reported that these neighborhoods, “in the northern sector of the city, portions of several subdivisions infringe upon flood lands.” [6]

Residents are aware of this historical context. One resident reports being told by a city engineer that their neighborhood should not be there.

**Downstream development may have worsened river flooding.** The Hinds County Emergency Manager noted that the river crested higher than expected upstream of Lakeland Drive in the February 2020 Flood [8]. A 1986 Clarion-Ledger article, “Experts: Development could worsen flooding,” predicted this higher crest. The article noted how the increased development along Lakeland Drive alarmed floodplain managers. One of them summarized the problem. Development is “ignoring the fact that there's another group of people being damaged by it, and that is those people that are now going to be subject to increased flood elevations.”

There were also concerns that the development on the floodway off Meadowbrook Road would exacerbate flooding [9]. The impact of these developments have not been verified but could have contributed to the worsened flooding in February 2020.

The map on the opposite page shows the extent of flooding when the Jackson gage is at 36 feet, which approximately corresponds with a 10-year flood. It also shows the FEMA-defined floodway. Predominantly Black neighborhoods flood during this type of event. The map shows that the conveyance channel is choked at Lakeland Drive. It also shows that the floodway off Meadowbrook Road does not convey water at this stage, possibly elevating water surface levels.

### *Will continue to flood*

**North Canton Club is one of multiple predominantly Black neighborhoods that would continue to flood, albeit less severely, with the One Lake.** Homes there would “experience benefits” with the One Lake but would “continue [to] be at risk” from 25-year and above events. The DEIS proposed a voluntary buy-out to compensate for the lack of protection. (See PDF pages 18 and 19 of Appendix E.)

### *Better over there*

The One Lake will reduce flood peaks by upwards of 8 feet along wealthier and predominantly White communities. **Does the project offer a greater level of protection to wealthier and Whiter communities than those offered to less wealthy and predominantly Black communities?** The “remarkable” 8 foot drop may also promote increased floodplain occupation downstream.<sup>1</sup> **Could this uncaringly lead to more flooding in Northeast Jackson?**

**The approved plan should provide a more balanced level of environmental protections, whether through a completely different plan or a Lake combined with floodproofing or levees. By itself, the One Lake may perpetuate racial and income inequalities.**

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<sup>1</sup> The term remarkable was used in the 2020 ATR, comment 8284198. “If the project’s results are firm, the case of the 100-year flood being lowered 5-8 ft is remarkable and should be written up in the executive summary and similar paragraphs of the [DEIS]”



## References

### Citations

- [1] **Newspaper article.** Nick Judin. “West Jackson Creek Woes Become ‘One Lake’ Pitch.” *Jackson Free Press*. 19 February 2020. Available online at <https://www.jacksonfreepress.com/news/2020/feb/19/west-jackson-creek-woes-become-one-lake-pitch/>
- [2] **News video.** “Jim Hill parkinglot flooded. Cars towed away.” *16 WAPT News*, 9 May 2019. Available online at <https://www.wapt.com/article/jim-hill-parking-lot-flooded-cars-damaged/27422329>
- [3] **News video.** “Parents describe Jim Hill’s early dismissal as ‘chaos’.” *12 WJTV News*, 24 August 2022. Available online at <https://www.wjtv.com/mississippi-flooding/parents-describe-jim-hills-early-dismissal-as-chaos/>
- [4] **News video.** “Flooding approaches Jim Hill High School.” *16 WAPT News*, 14 January 2020. Available online at <https://www.youtube.com/watch?v=97ESN9k51sg>
- [5] **Journal article.** Christopher Tessum, et al. “Inequity in consumption of goods and services adds to racial–ethnic disparities in air pollution exposure” *Proceedings of the National Academies of Sciences of the U.S.A.* 11 March 2019.
- [6] **Journal article.** Rutherford Platt. “The Jackson Flood of 1979 A Public Policy Disaster.” *Journal of American Planning Association*. Spring 1982.
- [7] **Newspaper article.** Beverly Canerdy. “Experts: Development Could Worsen Floods.” *Clarion-Ledger*. 21 December 1986.
- [8] **Storymap.** “The Pearl River Flood of 2020.” National Weather Service. 20 March 2020. Available online: [www.tinyurl.com/PearlRiver2020](http://www.tinyurl.com/PearlRiver2020)
- [9] **Newspaper article.** Bruce Reid. “Residents wary of development” *Clarion-Ledger*. 11 April 1999.

## *Predicting One Lake levels near the mouth of Lynch Creek*

Predicting river elevations with the One Lake in place. Summary of process. This algorithm was used to calculate the dashed line in figure page 22. The code used to generate the graphs is available on Google Colab. <https://tinyurl.com/JimHillAnalysis>

1. Digitize the stage curve data from Appendix K of the DEIS. A copy is available on Google Sheets. <https://tinyurl.com/OneLakeReductions>
2. Calculate the WSE difference between the Alt C curve and the Existing Conditions curve. For example, at a discharge of 10,000 cfs between Hwy. 80 and I20, the One Lake WSE is 259.89 ft and the existing WSE is 254.29. ft. The WSE difference is 5.6 ft.

See Google Sheet doc above, under the tab titled, “app k • state discharge difference,” lines 12 through 20.

3. Using the WSE difference, generate a function that will take in a discharge value and will output a WSE difference value. I used a function with a cubic interpolator and no extrapolation. This step may be replicated with the following Python code snippet.

```
import numpy as np
import pandas as pd
from scipy import interpolate
url = 'https://docs.google.com/spreadsheets/d/e/2PACX-1vT19q5_EMqYLjr6ugGyYt-7daBJJNbxTBUR7Samo1HystrOsEIodxzzJEAvGxBa7lQd3TfrWwNp701wN/pub?output=csv'
altc_curve = pd.read_csv(url)# read the stage curve data; a column already includes the WSE difference
f = interpolate.interp1d(altc_curve.discharge,
                        altc_curve.difference,
                        kind="cubic",
                        bounds_error=True,
                        fill_value=np.nan)
```

4. Read USGS discharge data; feed this data into the WSE difference function. This generates a predicted WSE difference. For example, if the discharge is 10,000 cfs, then the WSE difference will be 5.6 feet.
5. Add the data generated in the previous step to the USGS measured gage level. Continuing the example from the previous step, if the river gage is at 20 feet, then the predicted One Lake level will be 25.6 feet.

