

## OVERVIEW: How Houston Benefits from the Arboretum

Since 1967, Houston Arboretum & Nature Center (HANC) has been carefully conserving 155-acres of Gulf Coast habitat, a diverse collection of ecosystems including savanna, prairie, wetland, woodland, and bayou. These ecosystems are maintained by the diligent efforts of HANC's eight-member conservation team and highlight the Gulf Coast region's beautiful plants, grasses, and wildflowers. It is only through the forethought of the original civic-minded leaders that this much-needed habitat has remained home to a wide array of important native plant species and native wildlife, including more than 200 species of birds.

Located only minutes from downtown Houston, the fourth largest city in the nation, the Arboretum plays a vital role in reducing flooding, chemical and bacterial pollutants and the Urban Heat Island Effect<sup>12</sup>.

### Environmental Benefits

As compared to a scenario where the site was instead developed at a similar rate to the surrounding areas

- Decreases **runoff** within 1 mile of the site by **7%** (579.82 acre-feet).
- Decreases **chemical pollutants** by an estimated **13%** (498,104.47 lbs).
- Decreases **bacterial pollutants** by **16%** (553,727.89 million coliforms).

**Step 1:** Developed a scenario where the site was instead developed at a similar rate to the surrounding areas.



Figure 1: 2022, Texas A & M University Department of Landscape Architecture and Urban Planning, Case Study Investigation

## URBAN HEAT ISLAND EFFECT

The A & M study found that during the hottest part of the day, the Arboretum's natural areas witnessed a decreased air temperature by 0.52 degrees Celsius (0.936 degrees Fahrenheit). The diverse natural habitats in the 155 acres reflect an even greater reduction in temperatures up to 1.53 degrees Celsius (2.754 degrees Fahrenheit). Other environmental benefits of the Arboretum found during the study

<sup>1</sup> 2022; Texas A&M University Department of Landscape Architecture and Urban Planning, Case Study Investigation

<sup>2</sup> According to the EPA (Environmental Protection Agency), Urban Heat Islands are the phenomenon whereby urban regions experience warmer temperatures than their rural surroundings because of the replacement of open land and vegetation with buildings, roads, and other infrastructure. Surfaces that were once permeable and moist generally become impermeable and dry.

## Tree-age Program

### *Improving the Resilience of the Arboretum's Old Growth Trees from Extreme Climate Events*

include: a 7 percent decrease in water runoff within 1 mile, a 13 percent decrease of chemical pollutants, and a 16 percent decrease of bacterial pollutants in the surrounding areas.

## FLOOD REDUCTION

Reducing flooding within the areas surrounding the Arboretum and waterflow into Buffalo Bayou, a major waterway that flows through downtown Houston and along several residential areas, is another benefit to the 155-acre natural area. A 2022 Rice University Civil & Environmental Engineering Infiltration Study determined the flood retention benefits of the Arboretum during Tropical Storm Harvey (2017), the Tax Day Flood (2016), and the Memorial Day Flood (2015). While peak flow reduction was observed in all three flood events: Tax Day (75% flow reduction), Memorial Day (67% flow reduction), and Harvey (19% flow reduction). The study points out that the flow reduction of the Memorial Day Flood equaled 34 Olympic-size swimming pools worth of water that infiltrated the Arboretum soil instead of running off into Buffalo Bayou<sup>3</sup>.

Storm	Total Rainfall from Arboretum Gauge (in)	Volume Difference (Olympic-size pools)	Infiltration Net Difference (in)
Harvey	34.68	26.2	2.75
Tax Day	7.08	32.5	3.41
Memorial Day	8.66	33.6	3.52

Figure 2 Forbes, Maddie; 2022; Rice University: Civil & Environmental Engineering Infiltration Study

## STATEMENT OF NEED

Urban forests - such as parks, gardens, and nature preserves - provide important benefits to neighborhoods within cities.<sup>4</sup> As the climate changes, impacts like extreme weather, heat, and soil and air quality changes can stress urban forests. This may affect their ability to provide cooling and other key services, particularly for those people most in need.<sup>5</sup>

The benefits of trees are well documented and, in the case of the Arboretum, scientifically studied to accurately illustrate the health benefits of large areas of forested acreage within urban areas. Often, conserved land must rely on human intervention to step-in when natural occurring disturbances are not possible, such as large animal grazing and naturally occurring fire. Additionally, when extreme climate events, such as droughts, repeated wind, rainstorms, and hurricanes and regularly occurring floods, land stewardship through ecological restoration - the process of assisting the recovery of an ecosystem that

<sup>3</sup> Forbes, Maddie, 2022, Rice University: Civil & Environmental Engineering Infiltration Study

<sup>4</sup> USDA, Forest Service. (N.D.). [Urban forests](#). Retrieved 3/21/2021.

<sup>5</sup> Janowiak, M.K., et al. (2021). Climate adaptation actions for urban forests and human health. USDA, Forest Service, Madison, WI, p. 2.

## Tree-age Program

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has been disturbed - must be initiated to save and better prepare old growth trees for further extreme climate events.

For the Arboretum's conserved 155-acres, the 2022 Vegetation Survey<sup>6</sup> conducted by HANC's conservation team found the back-to-back events of 2008's Hurricane Ike and the 2011 drought resulted in a 50% loss of the Arboretum's tree canopy. Additionally, more trees were damaged or downed by two federally declared disasters, the May Derecho and July's Hurricane Beryl, during Summer 2024.



#### **REQUEST**

Houston's weather has taken a toll on the Arboretum's trees. While the trees have shown their resiliency throughout historically intense summer droughts, hurricanes, and back-to-back freezes, many surviving trees show signs of stress and need specialized arborist and tree husbandry to improve their chances of survival during the next weather event.

With specialized deep root fertilization, pest protection, and pruning for structural integrity against hurricane force winds, sixteen of the Arboretum's most prominent mature trees will have their chance of survival increased.

While the mission to restore and conserve the Arboretum's diverse ecosystems will never end, the use of land stewardship best practices will allow the sanctuary to be increasingly self-sustaining and able to survive future climate disturbances.

*Figure 3 The 2022 Vegetation Survey found that tree mortality of 50% in the Arboretum after extreme drought (red dots).*

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<sup>6</sup> Benigno, S. 2024. Vegetation Survey Analysis 2022: An ecological study at the Houston Arboretum & Nature Center. Unpublished report for the Houston Arboretum & Nature Center. Houston, Texas.