Institute for Ecological Resilience

UH ENERGY

The New Frontier for Nature-based Solutions

Presented by Jaime González
UH IER Executive Director

The quantity and health of the nature around helps to determine the health, resilience, economic vitality, wellbeing, and even longevity of Greater Houston residents.

Let’s work together.

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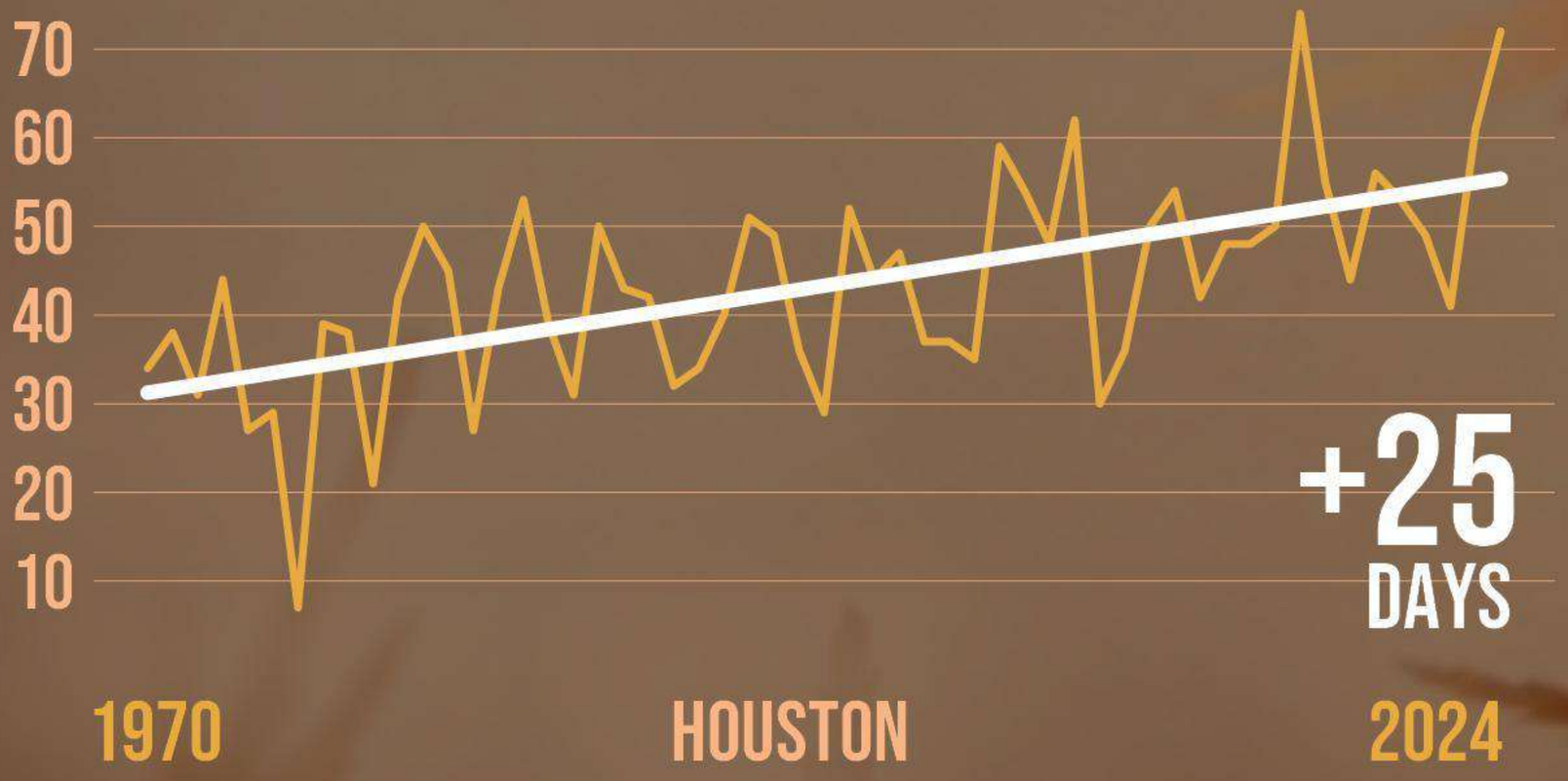
MORE WARM FALL DAYS

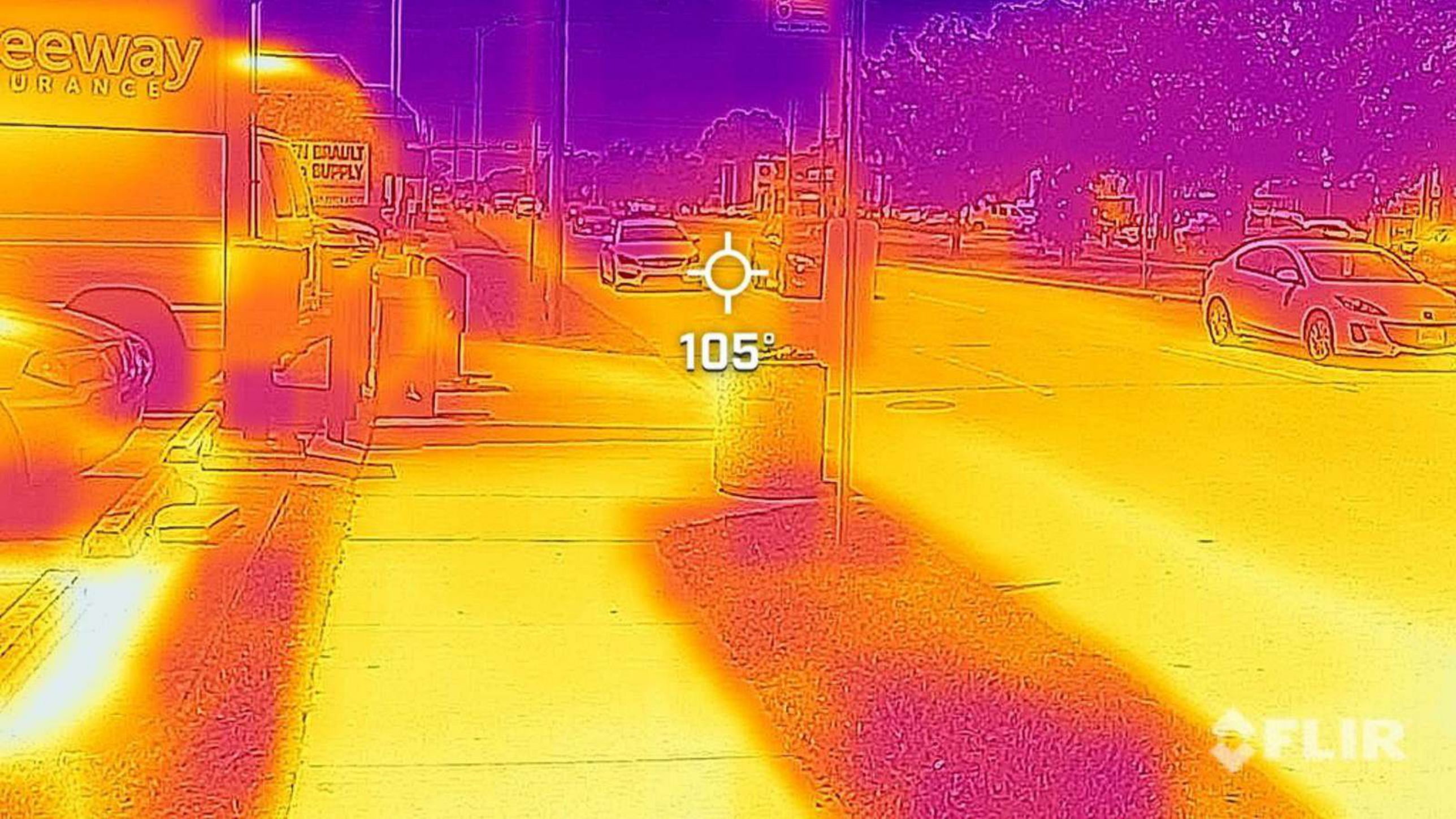
DAYS ABOVE NORMAL

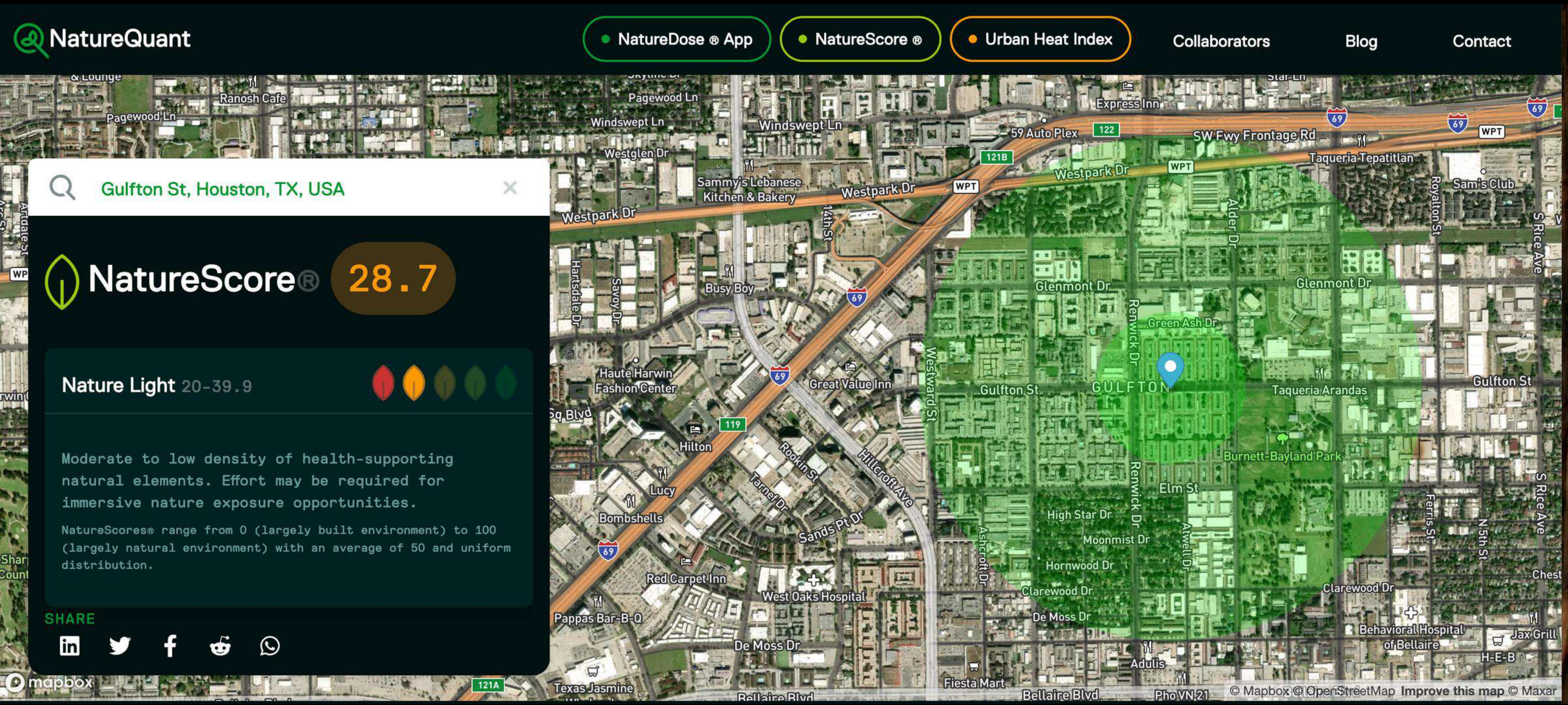


Annual fall (September, October, November) days above NCEI 1991-2020 climate normal.
Source: NOAA (ACIS)

CLIMATE CENTRAL

Many Greater Houston communities, such as Gulfton, lack access to abundant, healthy natural spaces. As a result, these areas experience higher temperatures, greater flood risk, poorer air quality, and reduced biodiversity—all of which affect community health. Nature-based solutions can help reverse these trends.


eeway
URANCE
105°
FLIR


NatureQuant
NatureDose ® App
NatureScore ®
Urban Heat Index
Collaborators
Blog
Contact
Gulfton St, Houston, TX, USA
NatureScore® 28.7
Nature Light 20-39.9
Moderate to low density of health-supporting natural elements. Effort may be required for immersive nature exposure opportunities.
NatureScores® range from 0 (largely built environment) to 100 (largely natural environment) with an average of 50 and uniform distribution.
SHARE
Ranosh Cafe
Pagewood Ln
Windswept Ln
Westglen Dr
Sammy's Lebanese Kitchen & Bakery
Westpark Dr
14th St
Busy Boy
Hartsdale Dr
Savoy Dr
Haute Harwin Fashion Center
Great Value Inn
Hilton
Lucy
Bombshells
Red Carpet Inn
Pappas Bar-B-Q
Texas Jasmine
Rookin St
Tarnef Dr
Sands Pt Dr
West Oaks Hospital
De Moss Dr
Bellaire Blvd
Hillcroft Ave
Westward St
59 Auto Plex
Express Inn
SW Fwy Frontage Rd
Taqueria Tepatitlan
Sam's Club
Royalton St
Alder Dr
S Rice Ave
Glenmont Dr
Renwick Dr
Green Ash Dr
GULFTON
Gulfton St
Taqueria Arandas
Burnett-Bayland Park
Elm St
High Star Dr
Moonmist Dr
Hornwood Dr
Clarewood Dr
Ashcroft Dr
Atwell Dr
Ferris St
N 5th St
Behavioral Hospital of Bellaire
Jax Grill
H-E-B
Adulis
Fiesta Mart
Pho VN 21
121A
121B
122
119
69
WPT
mapbox
© Mapbox © OpenStreetMap Improve this map © Maxar

Shrinking Biodiversity

Global wildlife has declined 69 percent since 1970. This includes drops in populations of mammals, birds, fish, reptiles, and amphibians.

Source: WWF, Living Planet Report 2022

The old-growth prairies at the UH Coastal Center, including the Aumann Prairie, are extremely rare and ecologically valuable. The University of Houston began acquiring the site in 1960, and its current footprint was established in 1972.

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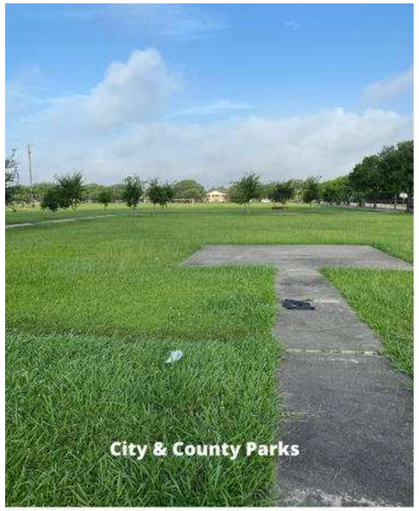
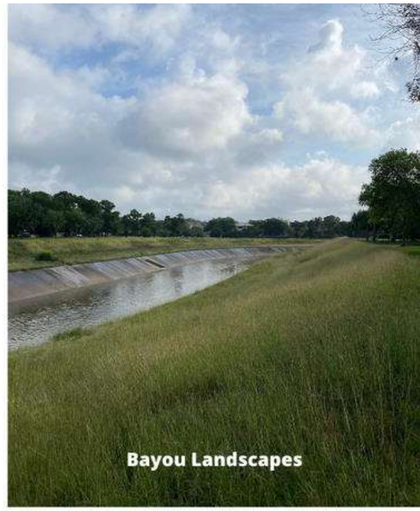
WE NEED MORE SOLUTIONS

THE CHALLENGE

UNSUSTAINABLE, COSTLY, UNHEALTHY LANDSCAPES





LET'S TRANSFORM OUR UNDERPERFORMING LANDSCAPES

All around us we find costly, unnecessarily hot, uninspiring landscapes that instead of improving community health or resilience add to air pollution. Hidden in these same spaces is the potential to become vibrant forests, pocket prairies, gardens, stormwater wetlands, or urban farms, all living systems that promote community well-being and economic empowerment.

NATURE-BASED SOLUTIONS

HEALTH**IER**
HAPP**IER**
LEAF**IER**
SPONG**IER**
HARD**IER**
UNIF**IER**

OUR LOCAL ECOSYSTEMS, A BEACON FOR RESILIENCE

We draw inspiration, knowledge, and material directly from our local ecosystems, such as coastal prairies, forests, and wetlands, which serve as living models and seed sources for our work. Through nature-based solutions, we integrate the wisdom gleaned from these ancient ecologies to address modern challenges: improving the health and resilience of communities, enhancing air and water quality, and restoring ecological vitality.

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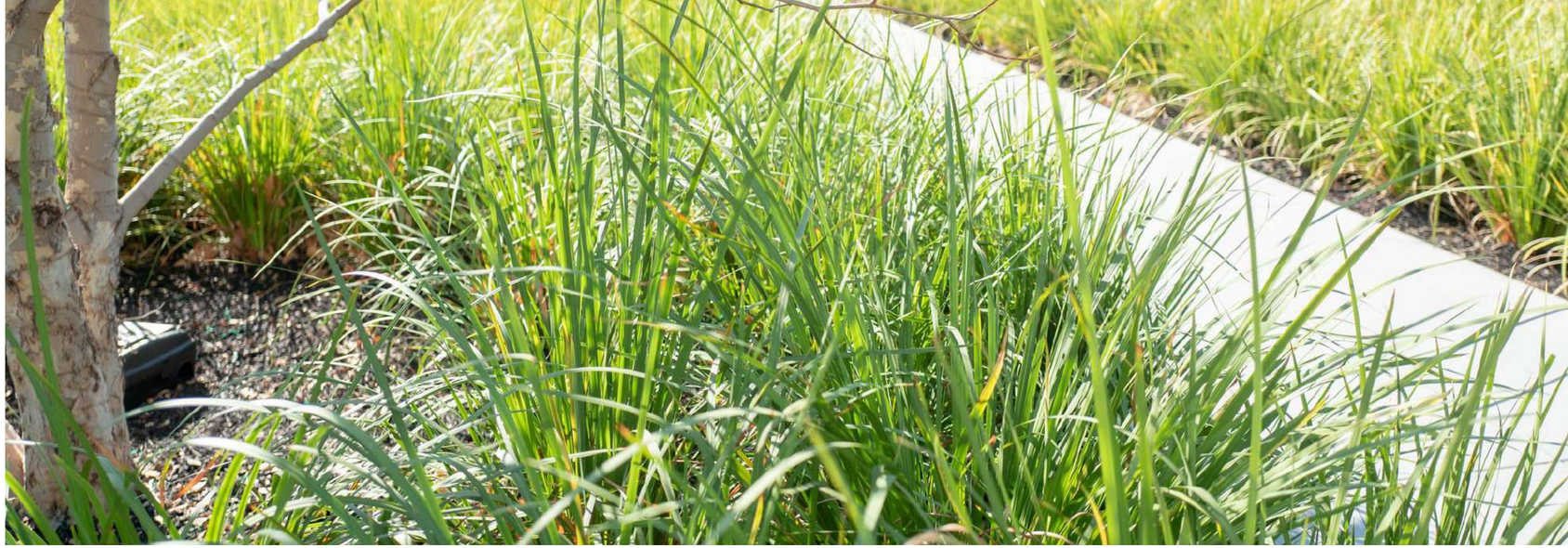
WHY RESILIENCE MATTERS



RESILIENCE

Resilience is the capacity to adapt, recover, and thrive amid change — turning disruption into renewal.

ECOLOGICAL RESILIENCE

Ecological resilience is the capacity of natural systems to absorb disturbance, adapt to change, and continue sustaining life's essential processes. When healthy, diverse ecosystems exist in and around human communities, they enhance our collective resilience, health, and prosperity.

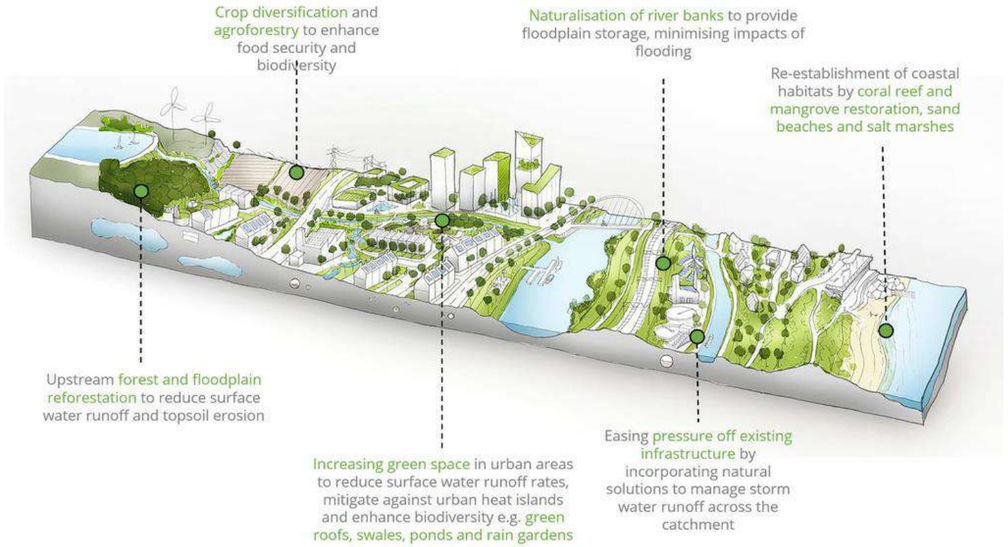
DISCIPLINES

- Artitecture
- Arts
- Communications
- Ecology
- Economics & Finance
- Education
- Energy
- Engineering
- Law
- Public Policy
- Public Health
- Other Disciplines

OPPORTUNITIES

- On-the-ground Community Impact
- Multi-sectoral Collaboration
- Funding
- Workforce & Professional Training

WHY NOW
WHY US



Why Now

- The Houston-Galveston region sits at the frontline of climate, urbanization, nature equity, and biodiversity loss pressures.
- Nature-based solutions reduce flooding and heat, improve air and water quality, restore biodiversity, and strengthen community and economic resilience – we can be a major player in catalyzing this work.

Why UH

- UH, an urban university, is a Tier 1 Research Institution with multidisciplinary strengths.
- The Institute for Ecological Resilience at UH will fill a largely overlooked niche and become an academic leader in nature-based solutions for the urban and suburban regions in the Houston–Galveston area.
- We will utilize our broad and diverse network to collaborate with stakeholders across sectors.
- IER's Coastal Center will lead research and workforce development, and act as a seed source for urban resiliency projects.

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MISSION & VISION

Vision

UH IER will be the leading testbed for validating nature-based solutions in urban areas, helping communities across the Houston–Galveston region and Texas Triangle adapt to climate and ecological change through research, innovation, and collaboration.

Mission

To advance multidisciplinary, collaborative research, education, and outreach that scale nature-based solutions for ecological resilience, public health, biodiversity, and community well-being.

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OUR FRAMEWORK

HEALTH**IER**
HAPP**IER**
LEAF**IER**
SPONG**IER**
HARD**IER**

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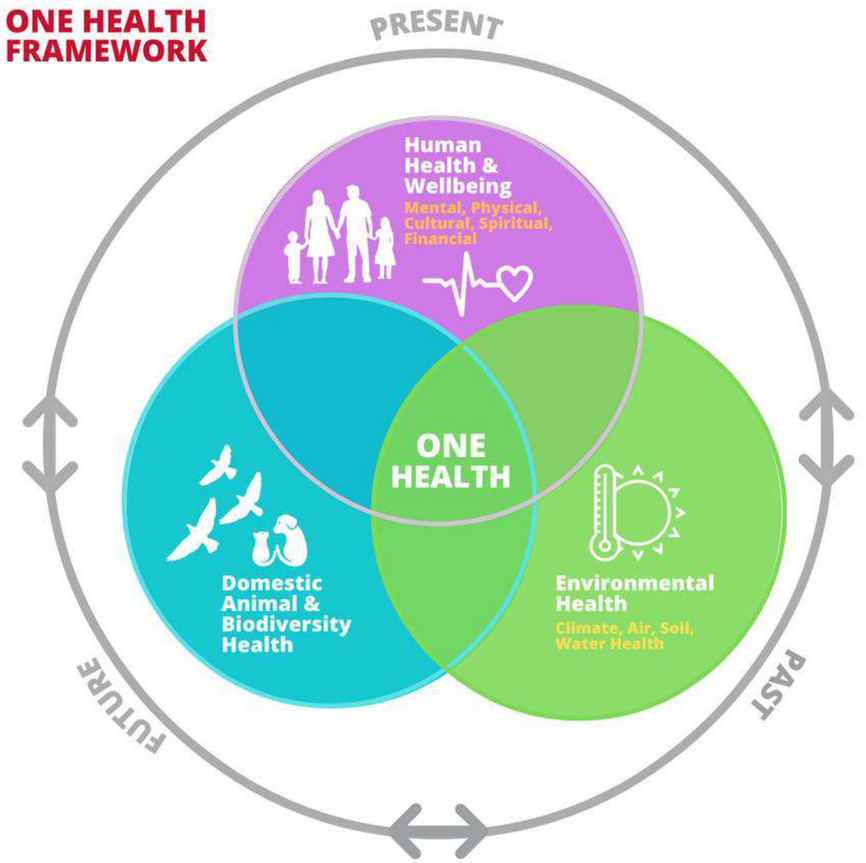
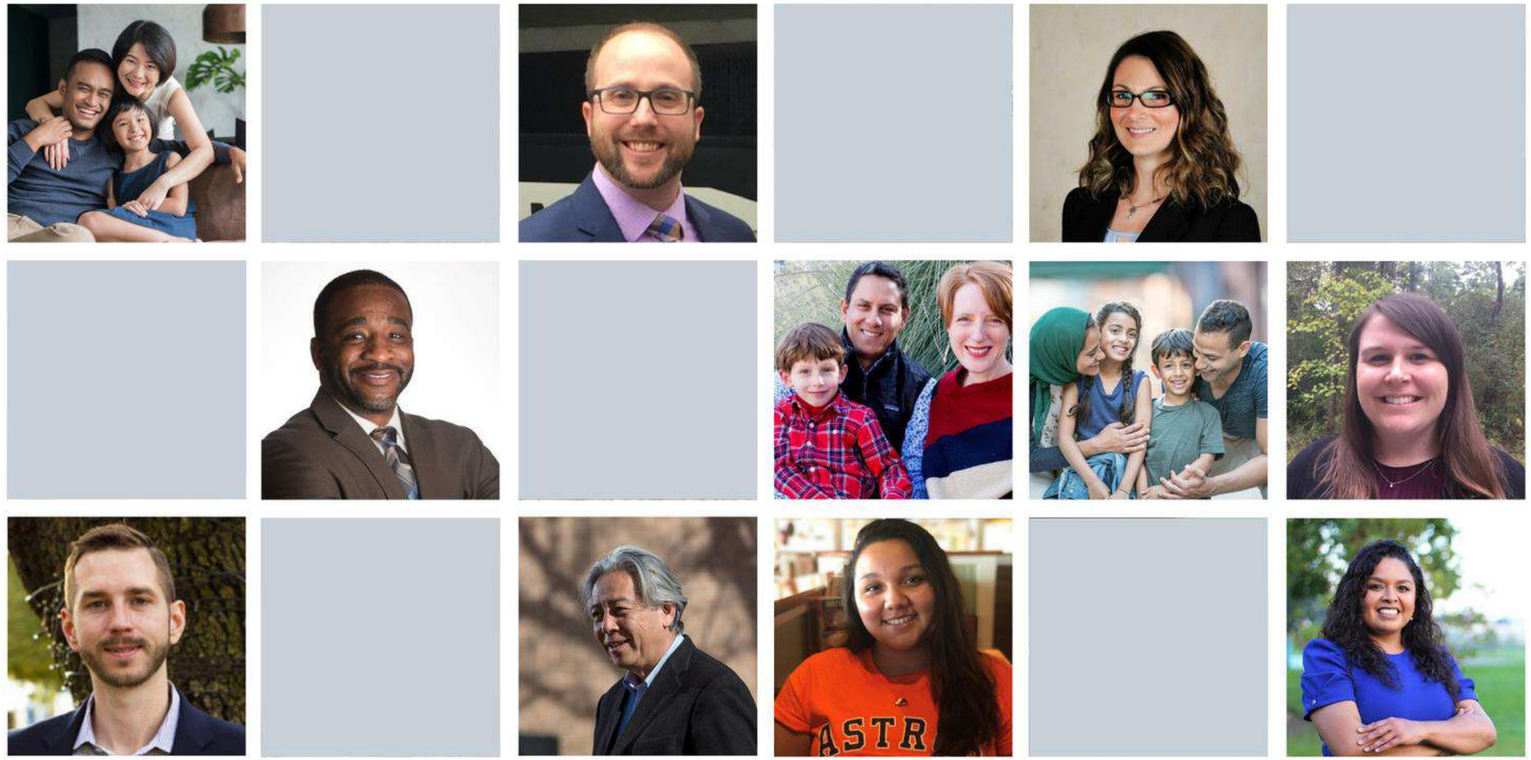


Rooted in One Health

Our projects, research, education, and outreach are guided by the inclusive One Health framework—**an interdisciplinary approach that connects human, environmental, and ecological well-being**. Through this lens, we seek to strengthen community health and resilience, improve air and water quality, and revitalize local ecosystems using bold, scalable nature-based solutions.

WHO IS OUR COMMUNITY?

HEALTH**IER**
HAPP**IER**
LEAF**IER**
SPONG**IER**
HARD**IER**



GREATER HOUSTON COMMUNITY MEMBERS

MADE IN Canva

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WHO IS OUR COMMUNITY?

HEALTH**IER**
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HARD**IER**

GREATER HOUSTON COMMUNITY MEMBERS

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ONE HEALTH INDEX

HUMAN HEALTH & WELLBEING

PERSON-RELATED

Person-related factors of human health and wellbeing includes information concerning an individual's health such as disease, life expectancy and social vulnerability.

✓ Cancer, Chronic Asthma, Coronary Heart Disease, Depression, Diabetes, Obesity, Poor Mental Heath, Poor Physical Health (CDC PLACES 2023 / 2021 BRFSS data)

✓ Life Expectancy (USALEEP 2010-2015 estimates)

✓ Social Vulnerability (CDC/ATSDR 2020)

ENVIRONMENT-RELATED

Environment factors of human health and wellbeing address levels of access and hazards in the community.

Access

✓ Food Access (USDA FARA 2019)

✓ Park Acreage Per 1,000 Residents (TPL ParkServe 2022)

Hazards

✓ Heat Vulnerability Index (HCPH 2021, 2011-2016 data)

✓ Air Quality Vulnerability Index (HCPH 202

✓ Population within 0.2%, 1% Flood Hazard Zones (TWDB RFPG 2021 Floodplain Quilt and Building Footprints)

✓ Population within 1 mile of facilities with Risk Management Plans (EPA via HIFLD 2022)

SYSTEMS-SCALE LANDSCAPE

Systems-scale landscape factors of environmental health look at the overall condition and land use character within a community.

Land Cover and Composition

✓ Acreage of Wetlands (NWI 2022)

✓ Acreage of Open Space (NLCD 2021)

✓ Percent Impervious Surface Coverage (NLCD 2021)

Quality

✓ Flora Ecological Index within Riparian Areas (TPWD 2015)

✓ Flora Ecological Index (TPWD 2015)

HABITAT QUALITY

This factor assesses the overall quality of habitat by acreage of important ecosystem and by water quality.

✓ Acreage of Important Ecosystems (TPWD 2015)

✓ Linear Feet of Streams Impaired for Aquatic Life (TCEQ 303(d) 2022)

SITE-SCALE GREENSPACE

At a more local scale, site-scale greenspace measures the type and amount of greenspace as well as the overall structure of the vegetation.

Spatial Configuration

✓ Diversity of Open Space Types (NLCD 2021)

✓ Acreage of Protected Areas (PAD-US v 3.0)

Vegetation Structure

✓ Tree Canopy Coverage (HARC with 2018 LiDAR)

✱ Vertical Structural Complexity (H3AT 2020)

CONNECTIVITY

Connectivity is an indicator of size and relative proximity to priority areas.

✓ Acreage of SECAS Blueprint Medium-Highest Priority Connections (2022)

✓ Distance to SECAS Blueprint Medium-Highest Priority Areas and Connections and Riparian Corridors (2022)

DIVERSITY

Diversity factors include unique species and ecological indices.

✓ Unique Species Reported on iNaturalist

✓ Fauna Ecological Index within Riparian Areas (TPWD 2015)

✓ Fauna Ecological Index (TPWD 2015)

ENVIRONMENTAL HEALTH

BIODIVERSITY & ANIMAL HEALTH

We collect and share seeds from the Aumann Prairie at the UH Coastal Center to help grow urban prairies that strengthen community resilience, improve human health, and restore biodiversity.

WHERE WE WILL WE HAVE IMPACT

COMMUNITY

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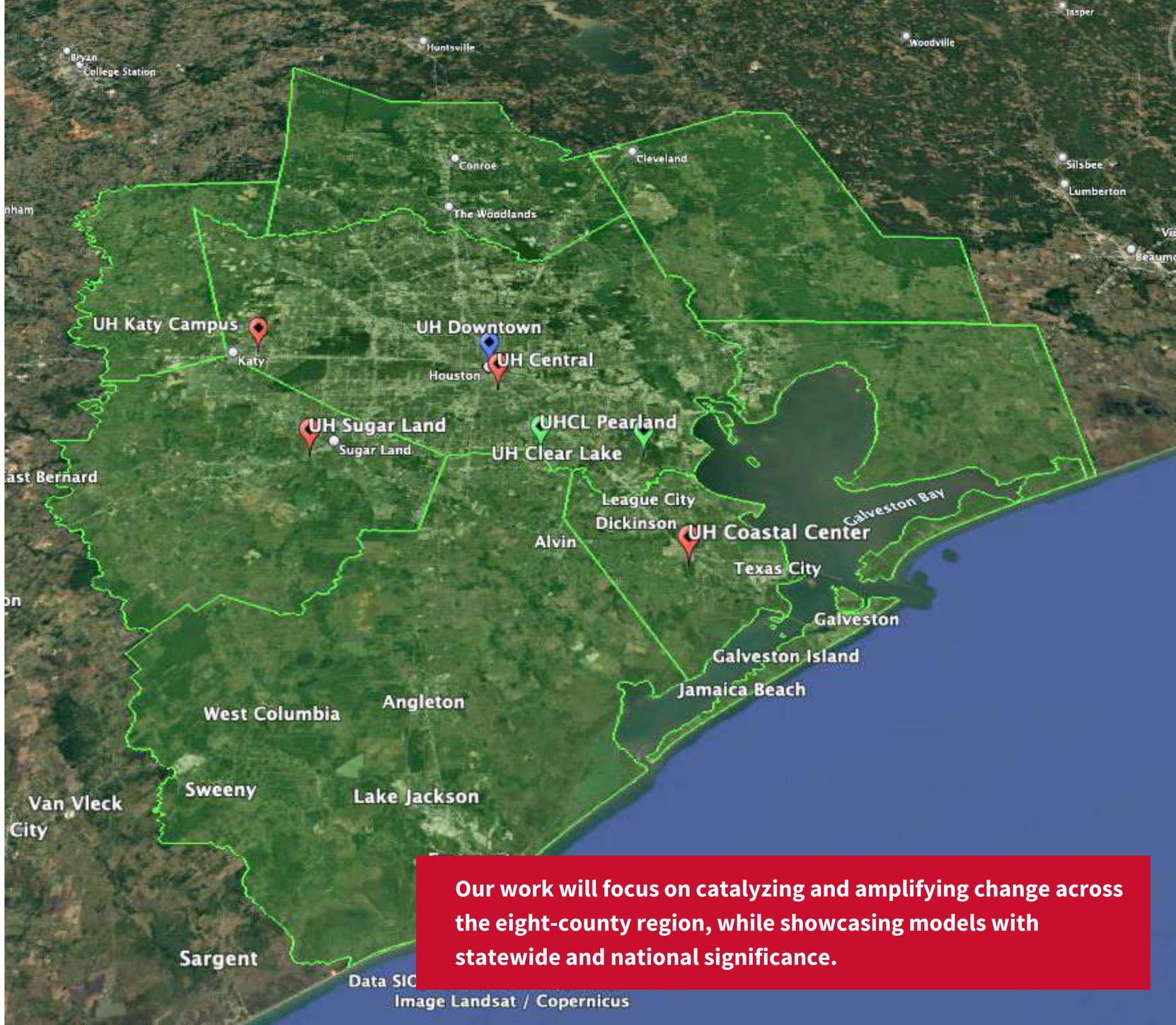

Our work will focus on catalyzing and amplifying change across the eight-county region, while showcasing models with statewide and national significance.

WHERE WILL WE HAVE IMPACT

COASTAL CENTER

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COASTAL CENTER

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Designated as an official Regional Biological Field Station, the Coastal Center facilitates research across disciplines including ecology, atmospheric sciences, and engineering.

WHERE WILL WE HAVE IMPACT

COASTAL CENTER

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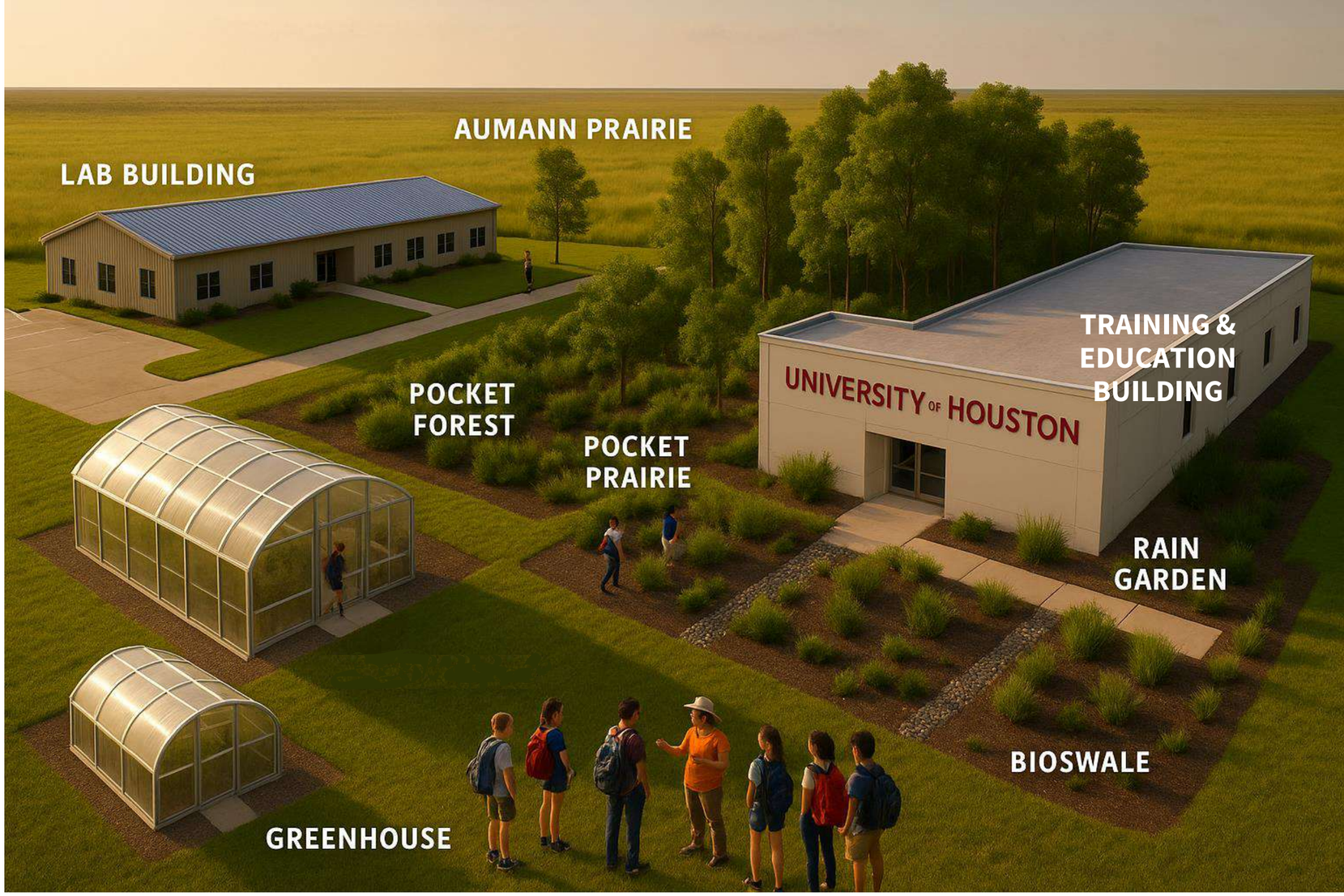
The Coastal Center welcomes UH and community audiences alike, hosting events that explore science, the arts, conservation, and opportunities for volunteer engagement.

WHERE WILL WE HAVE IMPACT

COASTAL CENTER



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Our vision is to transform the UH Coastal Center into Greater Houston's preeminent hub for nature-based solutions training, while continuing to advance frontier research and strengthen engagement with UH classes.

WHERE WILL WE HAVE IMPACT

CAMPUS

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Serving as an ecological resilience resource for the UH campus and surrounding community is a core part of UH IER's mission.

WHERE WILL WE HAVE IMPACT

CAMPUS

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WHERE WILL WE HAVE IMPACT

COMMUNITY

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UH is part of the larger Third Ward Community and is linked to the rest of Houston through the Bayou Greenways trail system.

WHERE WE WILL WE HAVE IMPACT

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We are participating in local projects like tree plantings in the Third Ward and the World Cup ’26 Sustainability efforts

WHERE WILL WE HAVE IMPACT

COMMUNITY

Gulfton Streetscape: Current Conditions

Gulfton Streetscape: After Natural Improvements

Current Conditions

Impervious surfaces, like sidewalks, reach 125°-132° F in summer. Conventional bus shelters are also very hot. This makes walking and transit riding uncomfortable and potentially dangerous.

Impervious surfaces, like sidewalks, parking lots, and hardened curbsides, force water to quickly drain into local drains, increasing likelihood of street flooding during heavy rain events.

Lack of trees, native grasses and wildflowers, and wetland plants make for very poor habitat for pollinators and birds. This limits opportunities for Gulfton residents to see charastmatic species like monarch butterflies

Research has shown that a environments that hosts hard, concretized surfaces and vistas can be harmful to residents - resulting in lower measures of self esteem and higher stress levels

RCurrently, bus stops servicing Gulfton's commuters provide wi-fi service but wi-fi service is not available at local bus stops.

After Natural Improvements

Shaded concrete sidewalks have been shown to decrease surface temperatures but as much as 15-20°+F

Replacing curbs with spongy bioswales, installing water absorbing green roofs on bus stops, and water intercepting shade structures can slow down and filter water.

IThe native wetland plants in bioswales, prairie wildflowers on bus green roofs, and native, pollinator-friendly vines on shade structures provide increased habitat for showy wildlife.

Adding nature into the viewscape of the built environment has been shown to reduce stress, decrease feelings of loneliness, and recharge focus. Even birdsong, increased by adding nature, has been shown to have positive health benefits.

The Greener Gulfton Team has been in communications with a telecommunications firm and bus stop wi-fi service could be effectively installed. These solar powered wi-fi routers have a rrange of 100 yards.

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WHERE WE WILL WE HAVE IMPACT

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IMPACT AREAS

RESEARCH
EDUCATION
OUTREACH

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- **Research & Innovation:** Advance interdisciplinary nature-based solutions through interdisciplinary research and actions at UHCC, UH campuses, and in regional communities.
- **Education & Training:** Build credentialed programs, internships, and workforce pathways that strengthen Houston's green economy.
- **Outreach & Advisement:** Convene decision-makers, community groups, and regional leaders to inform nature-based solutions policy and funding.
- **Corporate & Finance Partnerships:** Collaborate with corporations and investors to create new finance models for nature-based solutions at scale.
- **Demonstration Projects:** Deliver a suite of visible, collaborative, high-impact nature-based solutions projects linking campus, community, and UHCC assets.

WHERE WE ARE GOING NEXT

EARLY & UPCOMING WORK

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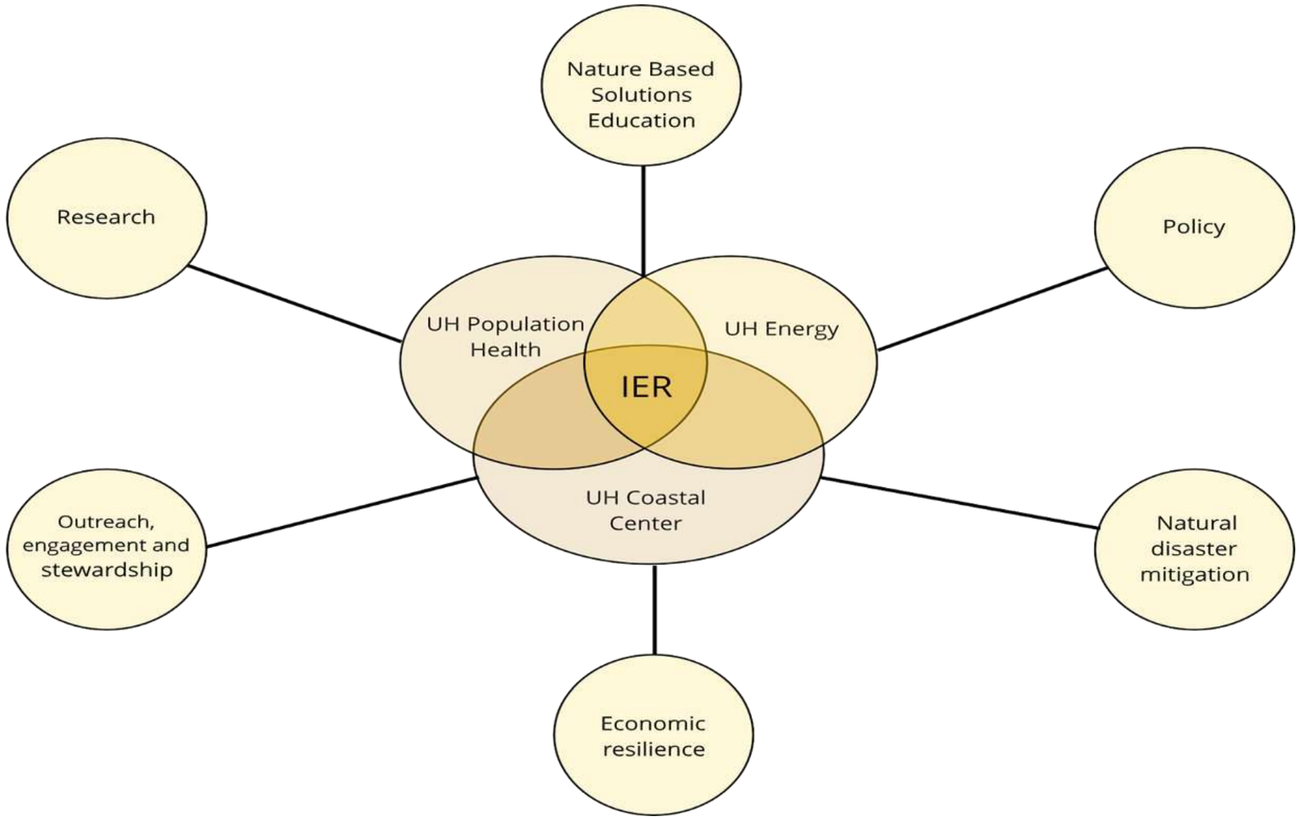
- **Research**
  - Harris County Flood Control Research
  - Greater support for researchers upcoming
  - Research opportunities for students upcoming
- **Outreach**
  - World Cup ’26 Green Corridor
  - Nature-based Solutions Mapping (relational)
  - Advisement to a broad suite of interested parties
  - Key ecological restoration projects are being scoped
- **Education**
  - Continued education at UHCC
  - UH IER events, in community and virtual
  - Scoping for credentialled programming
  - Upcoming planning for UHCC career training site
- **Planning & Funding**
  - Resilient Futures Studios Sprint

OUR STRUCTURE

LEVERAGING STRENGTHS, MOVING TOWARDS INDEPENDENCE



Division of Energy & Innovation

- Leader, Ramanan Krishnamoorti, PhD
- Energy staff with nature-based solutions expertise

Staff

- Executive Director
- Research Liaison Officer
- Programs Director
- Caretaker (Land Steward)

Attracting Talent

- UH IER Advisory Council
- Fellows
- Affiliated Faculty
- Internships
- Student Workers

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WHERE WE ARE GOING NEXT

EARLY & UPCOMING WORK

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Q&A

FOUNDING THE NEW INSTITUTE

Ramanan Krishnamoorti, PhD
Vice President for Energy and Innovation, Professor of Petroleum Engineering & Chemistry

Beth Robertson
Former UH Regent, Business Innovator, Civic Leader, and UH Supporter

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FOUNDING THE NEW INSTITUTE

Glenn Aumann, PhD, Director
1960 - 2010

Steve Pennings, PhD, Director
2010 - 2024

Evelyn Merz, Programs Director
2019 - Present

Tim Becker, Caretaker
1997 - Present

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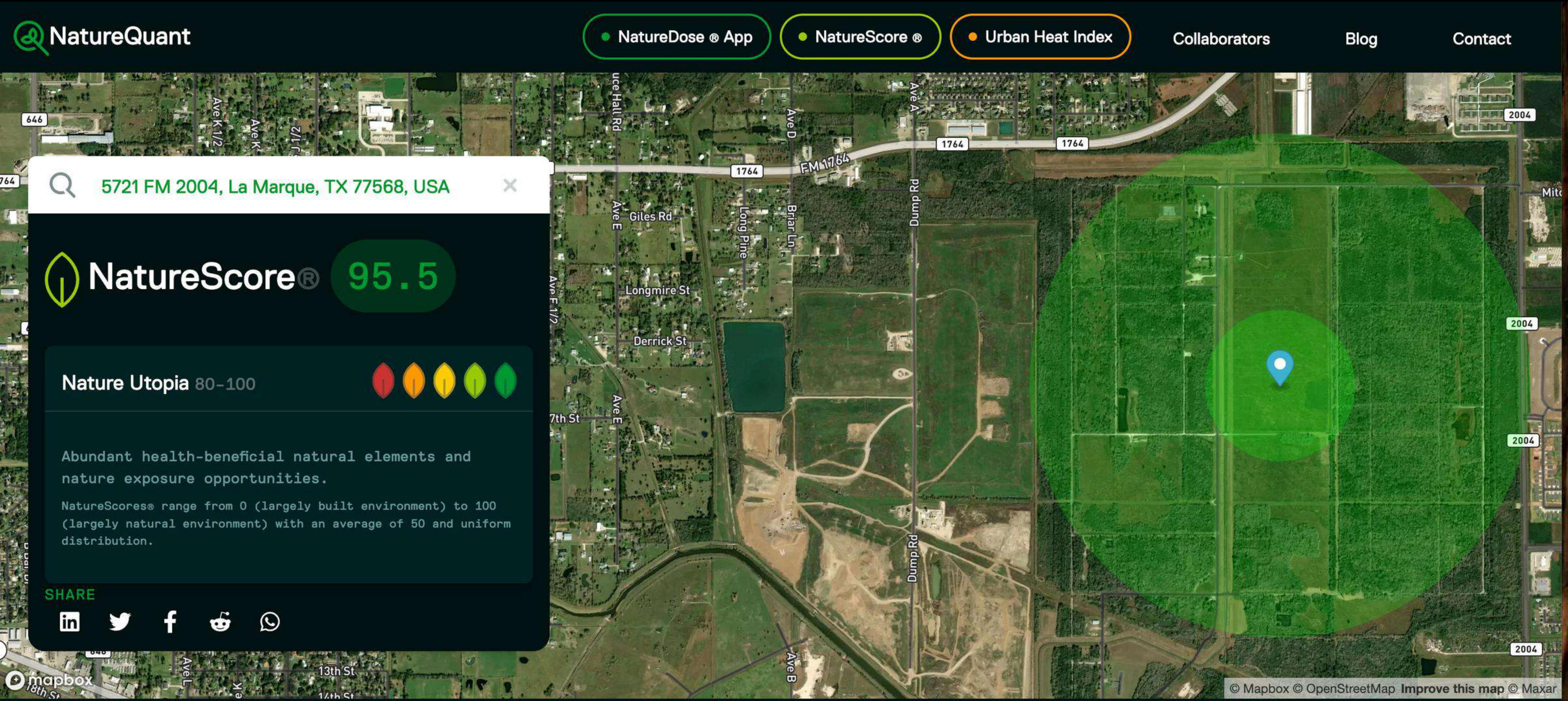
NatureQuant
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5721 FM 2004, La Marque, TX 77568, USA
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NatureScores® range from 0 (largely built environment) to 100 (largely natural environment) with an average of 50 and uniform distribution.
SHARE
FM 1764
1764
2004
646
Giles Rd
Longmire St
Derrick St
7th St
13th St
Dump Rd
Briar Ln
Long Pine
Ave D
Ave A
Ave E
Ave B
mapbox
© Mapbox © OpenStreetMap Improve this map © Maxar

WHERE WE WILL WE HAVE IMPACT

COMMUNITY

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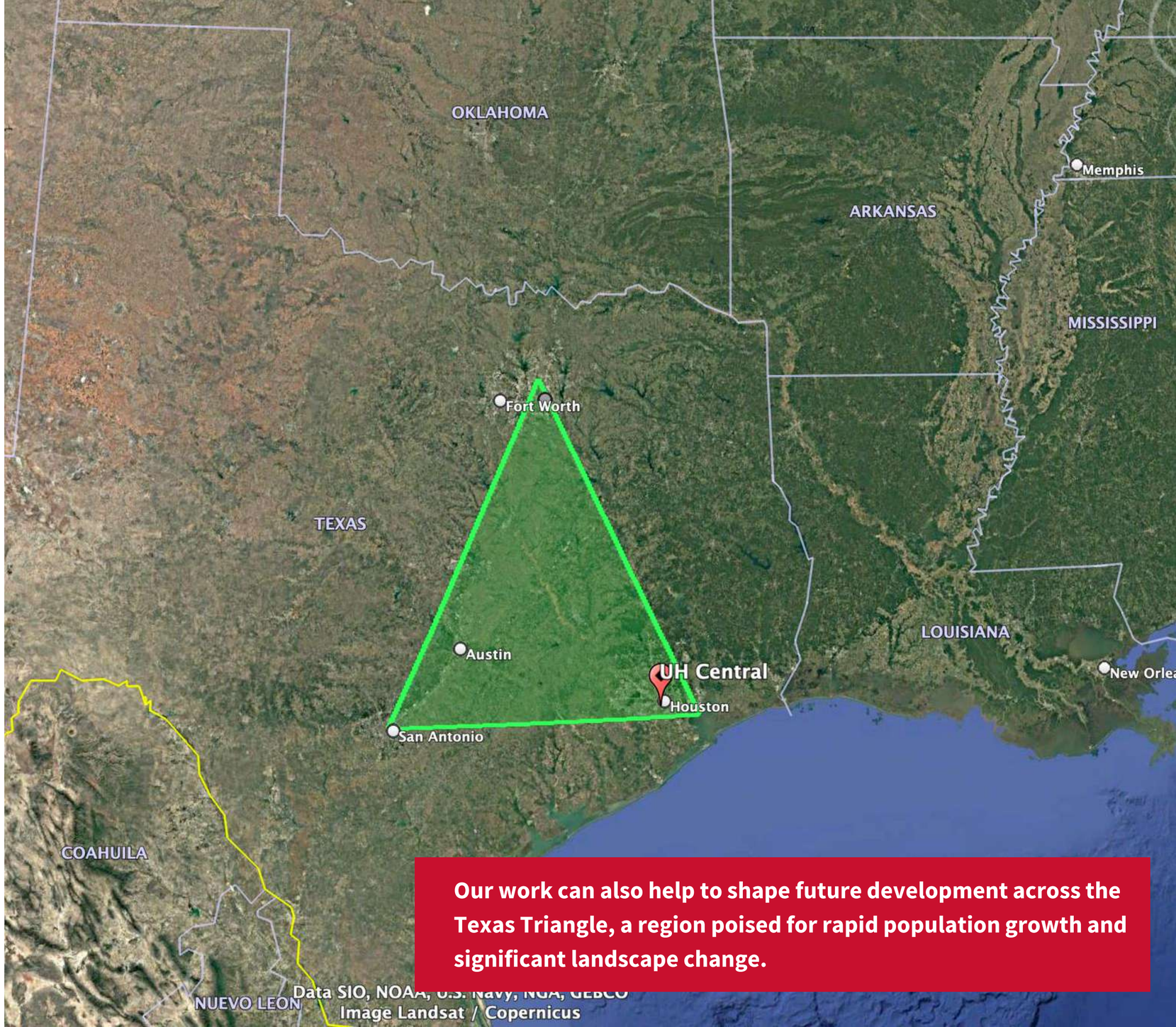

Our work can also help to shape future development across the Texas Triangle, a region poised for rapid population growth and significant landscape change.