



Ecosystem Services in the Greater Houston Region

A case study analysis and recommendations for policy initiatives



Ecosystem Services

Ecosystems provide services through their natural processes that we all benefit from daily:



Fresh water quality control



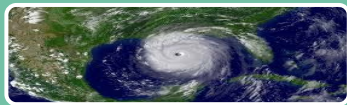
Flood protection



Recreation opportunities



Recharging of aquifers for water supply



Protection from damage by hurricanes and tropical storms

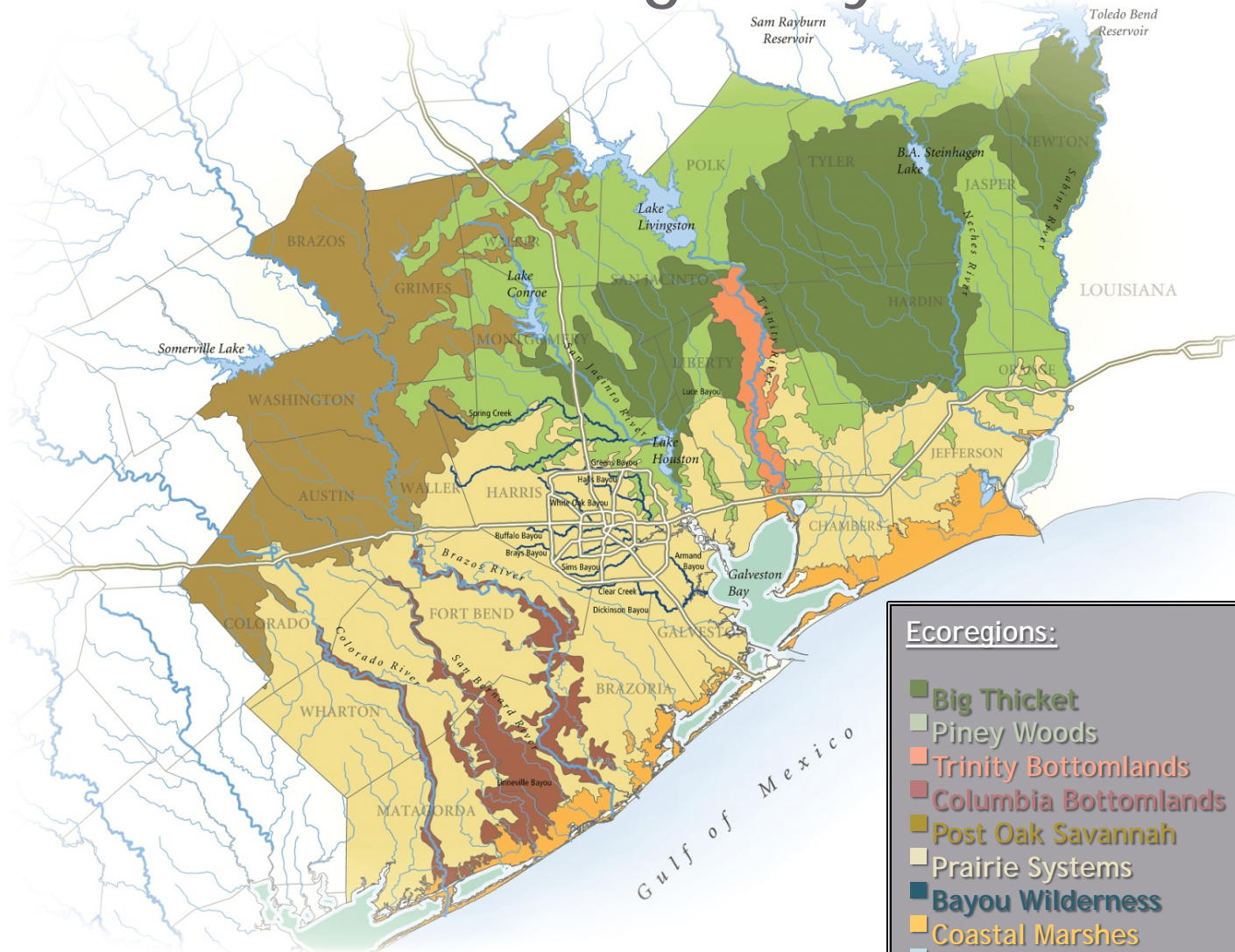


Pollution reduction from air and water



Carbon sequestration

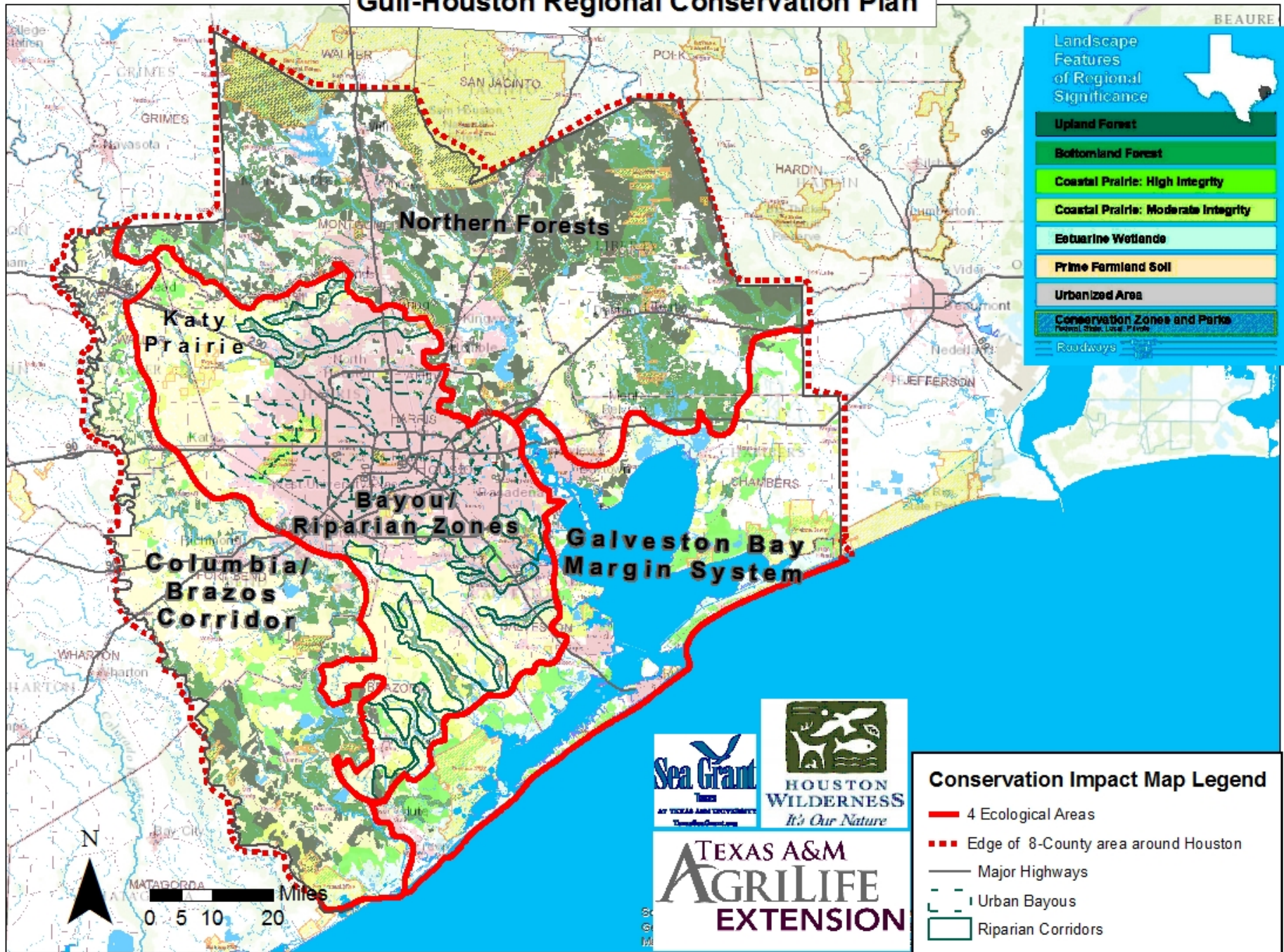
Houston is an Ecologically Diverse Region



Ecoregions:

- Big Thicket
- Piney Woods
- Trinity Bottomlands
- Columbia Bottomlands
- Post Oak Savannah
- Prairie Systems
- Bayou Wilderness
- Coastal Marshes
- Estuaries and Bays
- Gulf of Mexico

Gulf-Houston Regional Conservation Plan



Landscape Features of Regional Significance

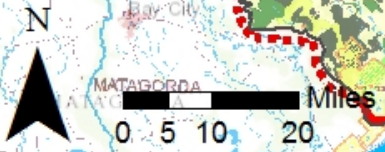
- Upland Forest
- Bottomland Forest
- Coastal Prairie: High Integrity
- Coastal Prairie: Moderate Integrity
- Estuarine Wetlands
- Prime Farmland Soil
- Urbanized Area
- Conservation Zones and Parks
- Roadways

Conservation Impact Map Legend

- 4 Ecological Areas
- - - Edge of 8-County area around Houston
- Major Highways
- - - Urban Bayous
- ▭ Riparian Corridors

Sea Grant
HOUSTON WILDERNESS
It's Our Nature

TEXAS A&M
AGRILIFE
EXTENSION



Local Ecosystem Service Benefits



Wetlands and Estuaries

- 1. Recreation
- 2. Recharge aquifers
- 3. Flood prevention
- 4. Freshwater inflows to estuaries
- 5. Wildlife viewing
- 6. Carbon sequestration
- 7. Erosion control
- 8. Water quality improved



Prairies

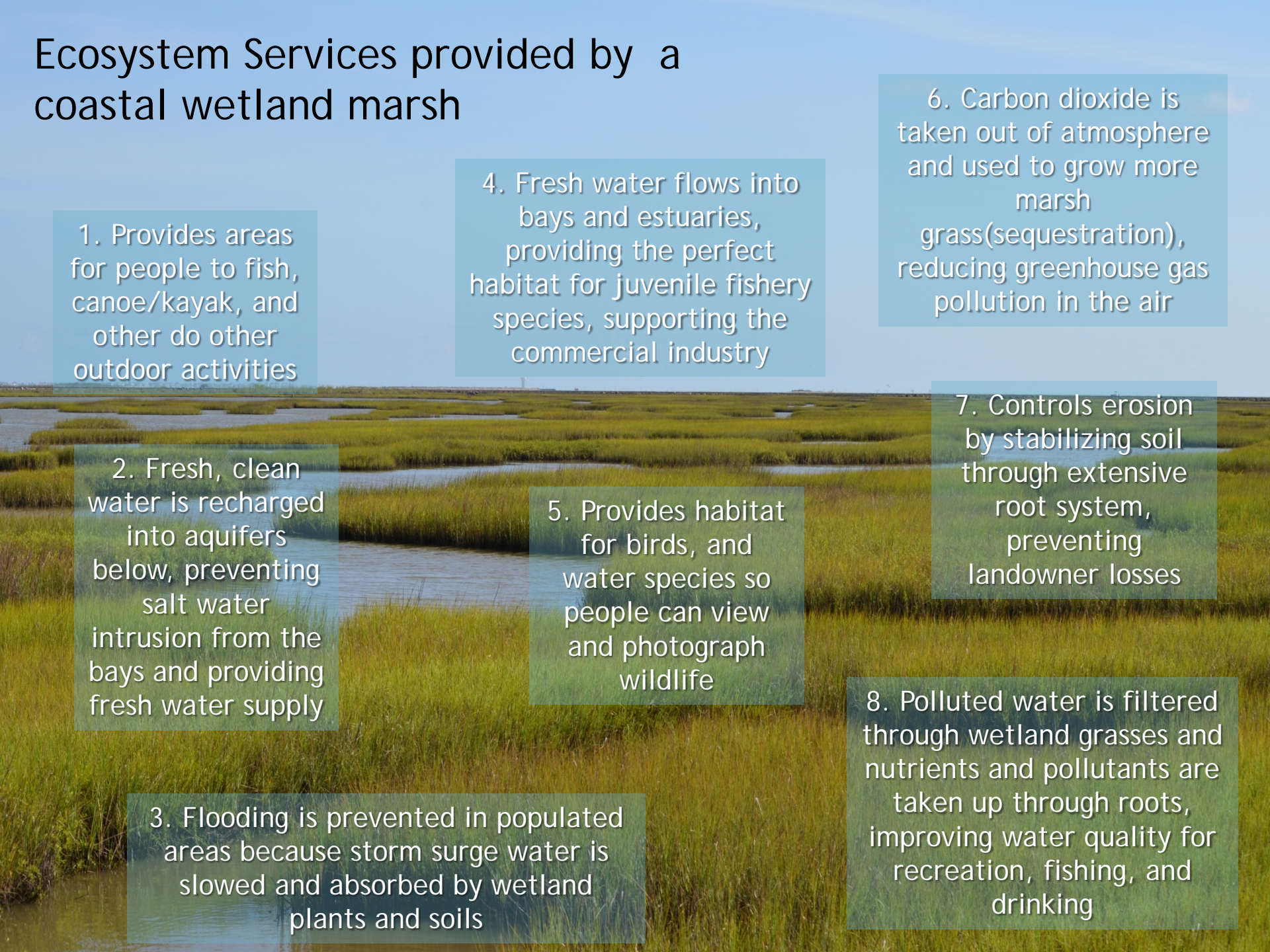
- 1. Aesthetic beauty
- 2. Eco-tourism
- 3. Water supply
- 4. Decrease flooding
- 5. Biodiversity
- 6. Control soil erosion
- 7. Carbon sequestration
- 8. Avoided engineered system costs
- 9. Water quality



Forests

- 1. Recharge aquifer
- 2. Retains storm water
- 3. Eco-tourism
- 4. Adds aesthetics to city
- 5. Outdoor activities
- 6. Noise control, property values
- 7. Reduced health costs
- 8. Carbon sequestration
- 9. Reduced energy use/costs

Ecosystem Services provided by a coastal wetland marsh



1. Provides areas for people to fish, canoe/kayak, and other do other outdoor activities

2. Fresh, clean water is recharged into aquifers below, preventing salt water intrusion from the bays and providing fresh water supply

3. Flooding is prevented in populated areas because storm surge water is slowed and absorbed by wetland plants and soils

4. Fresh water flows into bays and estuaries, providing the perfect habitat for juvenile fishery species, supporting the commercial industry

5. Provides habitat for birds, and water species so people can view and photograph wildlife

6. Carbon dioxide is taken out of atmosphere and used to grow more marsh grass(sequestration), reducing greenhouse gas pollution in the air

7. Controls erosion by stabilizing soil through extensive root system, preventing landowner losses

8. Polluted water is filtered through wetland grasses and nutrients and pollutants are taken up through roots, improving water quality for recreation, fishing, and drinking

Ecosystem Services Provided by a Prairie

1. Adds aesthetic beauty to communities, increasing property values

2. Provides wildlife viewing opportunities by adding habitat for insects, birds, and small mammals

3. Rain water is able to soak through soil and recharge the groundwater below, adding water supply

4. Rainfall is absorbed by the soil and plants, decreasing flooding in nearby communities

5. Diversity of flowers and grasses acts as seed bank for future agriculture and restoration projects

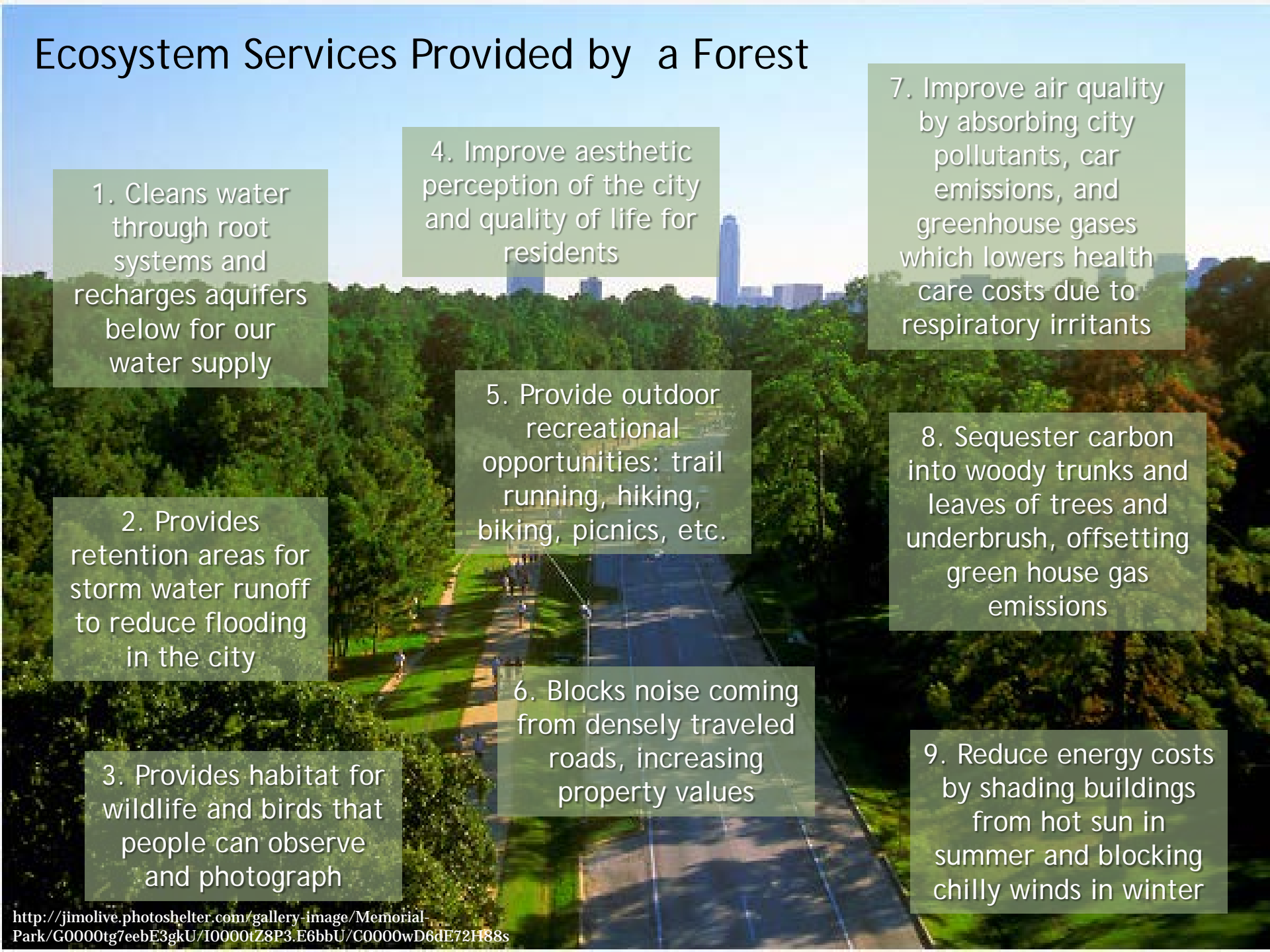
6. Roots penetrate deep into soil, preventing soil erosion and keeping our surface water bodies clearer

7. Vast plant community absorbs carbon dioxide and other air pollutants, protecting our health

8. We can avoid building large-scale and expensive drainage systems, retention ponds, and storm culverts by preserving areas of native prairie

9. Reduced runoff of pollution and nutrients from agriculture protects our water supply in lakes and reservoirs

Ecosystem Services Provided by a Forest



1. Cleans water through root systems and recharges aquifers below for our water supply

2. Provides retention areas for storm water runoff to reduce flooding in the city

3. Provides habitat for wildlife and birds that people can observe and photograph

4. Improve aesthetic perception of the city and quality of life for residents

5. Provide outdoor recreational opportunities: trail running, hiking, biking, picnics, etc.

6. Blocks noise coming from densely traveled roads, increasing property values

7. Improve air quality by absorbing city pollutants, car emissions, and greenhouse gases which lowers health care costs due to respiratory irritants

8. Sequester carbon into woody trunks and leaves of trees and underbrush, offsetting green house gas emissions

9. Reduce energy costs by shading buildings from hot sun in summer and blocking chilly winds in winter

Houston's Green Approach to Development

Understand ecosystems and the services they provide to the region



Realize the true value of ecosystem services and the potential economic burden on the region if those services are compromised



Implement growth and development while considering ecosystem services by protecting ecological diversity and utilizing green infrastructure



Continue to develop an economically and environmentally prosperous city

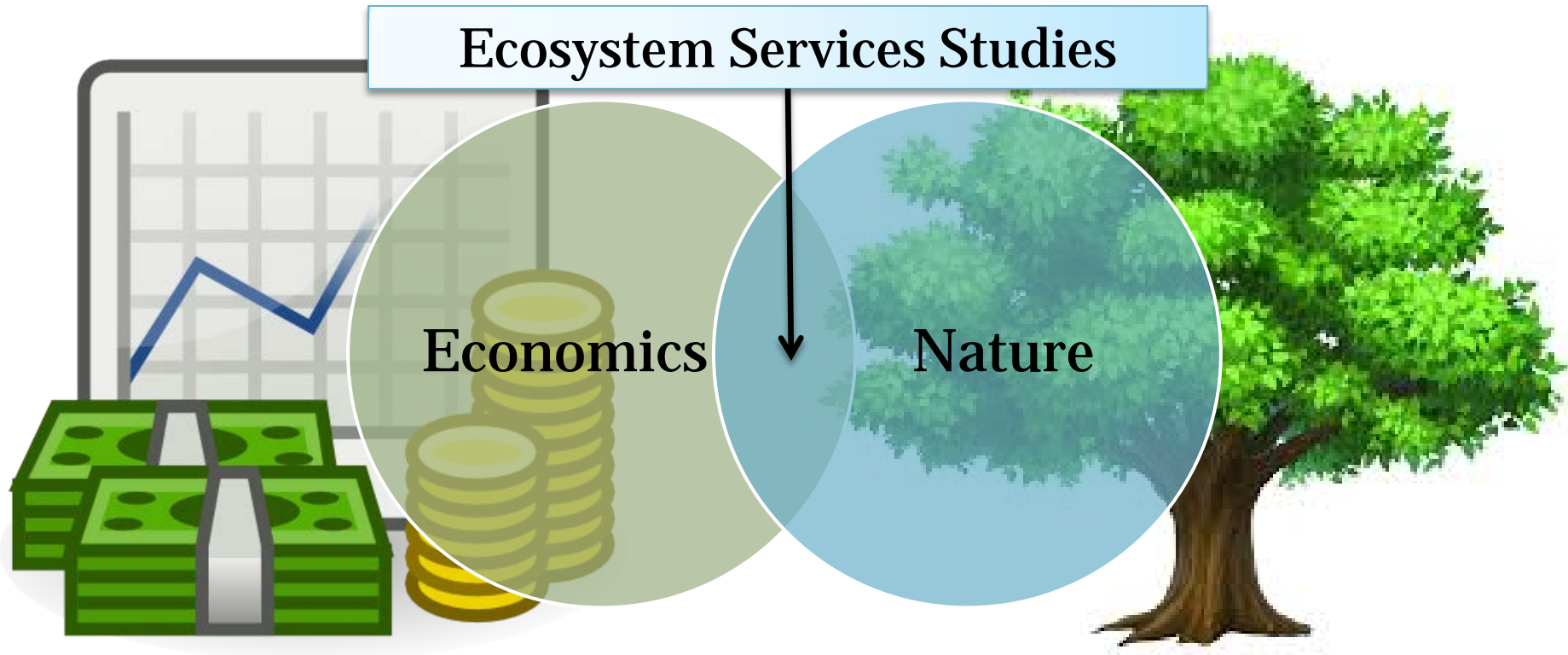
Services Provided by Local Ecosystems

	Water Supply	Water Quality	Erosion Control	Flood Protection	Air Quality	Energy Savings	Carbon Sequestration	Recreation/ Wildlife Habitat
Wetlands/ Estuaries	✓	✓		✓	✓		✓	✓
Prairies		✓	✓	✓	✓		✓	✓
Forests	✓	✓	✓	✓	✓	✓	✓	✓

Realizing the true value of ecosystem services and the potential economic burden on the region if those services are compromised depends on local ecosystem services studies

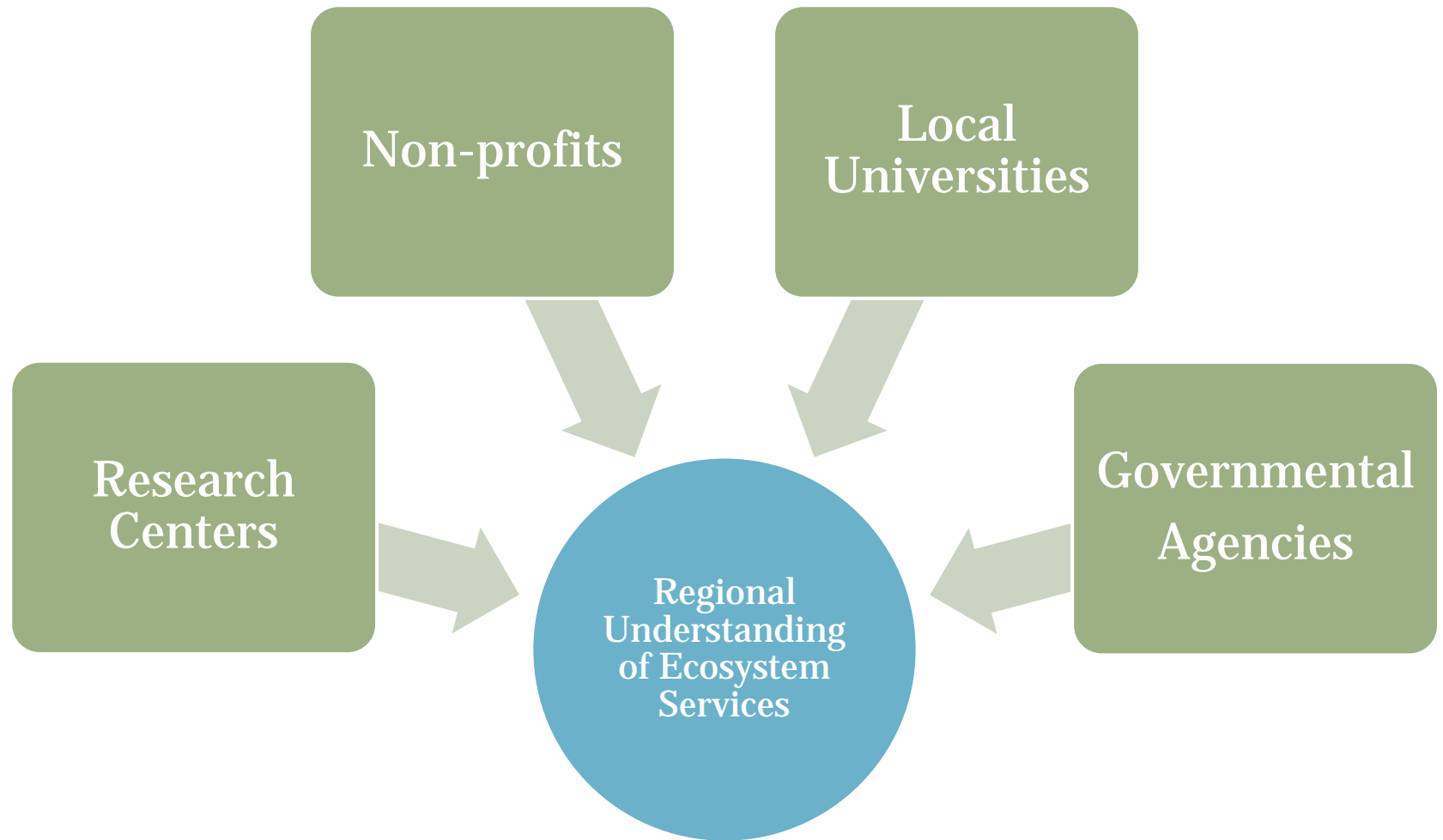
When the tangible value of services is understood, policy decisions can be made that take into consideration all economic factors, including ecosystem services.

Field of Ecosystem Services Studies



Understanding ecosystem services value allows for informed communication between scientists, industry, and policymakers regarding the benefits of ecosystems to human wellbeing.

Contributors to Ecosystem Services Studies



Proactive Policy in Houston

Implement growth and development while promoting policy decisions that consider ecosystem services

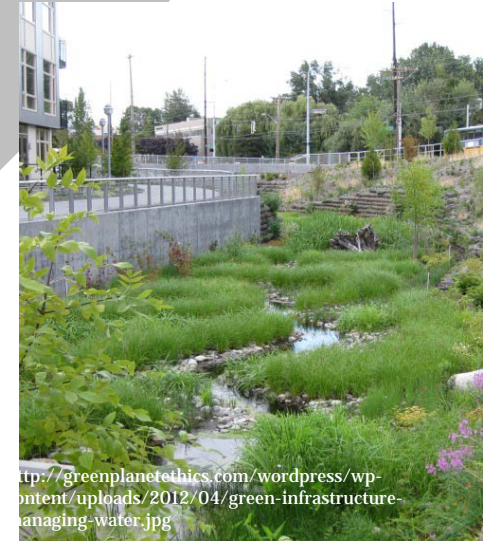
Protect existing ecological diversity and associated ecosystem services

Increase production and value of services by enhancing ecosystems

Solve local and regional resource issues using cost-effective ecosystem services solutions such as green infrastructure



http://www.mcatoolkit.org/images/1_3_Conservation_Oyster.jpg



<http://greenplanetethics.com/wordpress/wp-content/uploads/2012/04/green-infrastructure-managing-water.jpg>

Gray v. Green Infrastructure



Gray Infrastructure

- Mechanical processes
- Man-made
- Facilities, buildings
- Artificial
- Complete a function



Green Infrastructure

- Naturally occurring processes
- Existing or engineered/enhanced natural areas
- Ecosystem services
- Complete a function

Green infrastructure is the most direct way to include ecosystem services into development decisions

Green Infrastructure: New York City

Problem

- Water supply under threat from non-point sources of pollution
- Supply comes from large privately-owned, agricultural based watershed

Solution

- Created the Whole Farm Program:
 - Farmers create custom pollution control designs and implement themselves
 - Compensated for efforts, avoid regulatory enforcement

Results

- Protected pristine water supply
- Avoided building treatment facilities
- Saved Billions of dollars

Implications

- Demonstrated importance of stakeholder engagement in protecting ecosystem services
- Voluntary/incentivized cooperation is proven to be most effective strategy

Local Examples of Green Infrastructure

Project Brays

- Develop natural marshlands and green spaces along Brays Bayou
- Improve water quality and reduce the need for treatment
- Provide recreation and tourism opportunities for the community



In 2006, the Brays Bayou Marsh at Mason Park, near the mouth of the bayou was completed.

<http://www.projectbrays.org/about.html>

Dow Chemical- Seadrift, TX

- Engineered wetlands
- Reduce nutrient loads of effluent that caused the manufacturing facility to exceed discharge permit criteria
- Saved millions of dollars
- Improved habitat and aesthetics of the surrounding area
- Completely effective for over 15 years



Ecosystem Service Policy Integration in Houston



Prairies

- Prairie land conservation and restoration is a way to control flooding in the Houston area
- Katy Prairie currently conducting infiltration study to show effectiveness of prairie system flood control
- Katy Prairie Conservancy studying drought resistant native prairie turf for yards



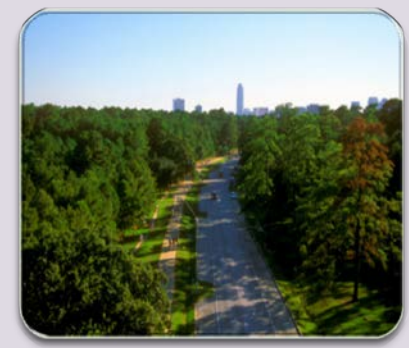
Bayous and Riparian Systems

- Harris County Flood Control District using bayous and associated green spaces as flood control measures
- Project Brays and Buffalo Bayou project both increasing flood water retention and green space
- Cypress Creek land use study currently being implemented: improve runoff quality affecting Lake Houston



Coastal Wetlands and Oyster Reefs

- Texas Coastal Exchange designed to give value to the hurricane protection services provided by coastal wetlands and natural areas
- Oyster reef restoration creates surge buffer as well as boosts commercial oyster industry



Urban Forests

- COH tree planting and protection ordinance, Chapter 33 COH Code of Ordinances
- Houston maintaining current Tree City USA designation
- Coastal woodlot conservation for migratory bird habitat attracts birders from around the world
- Tree planting initiatives increase property values

Through policy intervention and green infrastructure, the city of Houston and the Greater Houston Region can:

- Improve the aesthetic and natural capital of the city
- Improve the economy by saving taxpayer's money while solving important issues
- Retain more long-term businesses and residents in the region
- Attract more visitors and capital to the region through ecotourism
- Create jobs through restoration and green infrastructure projects
- Improve the health of residents by improving air quality and encouraging activity through outdoor recreation
- Reduce the risk of damage caused by flooding and natural disasters- lowering insurance rates, improving safety of residents and reducing damage costs to the city

Moving Forward

Recognition

- Provide more opportunities for regional recognition and support of the 10 unique ecoregions in the Greater Houston Region.

Studies

- Engage in more region-based studies and projects on ecosystem services to better understand natural benefits and the resulting understanding of cost-effective infrastructure solutions

Value

- Compare the economic value of *ecosystem services* to other alternative approaches when making public policy decisions regarding land-use and infrastructure.

Integration

- Incorporate ecosystem services into infrastructure decisions.

Contributors:

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- More information:
www.houstonwilderness.org



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