Conservation and Restoration of Large Landscapes

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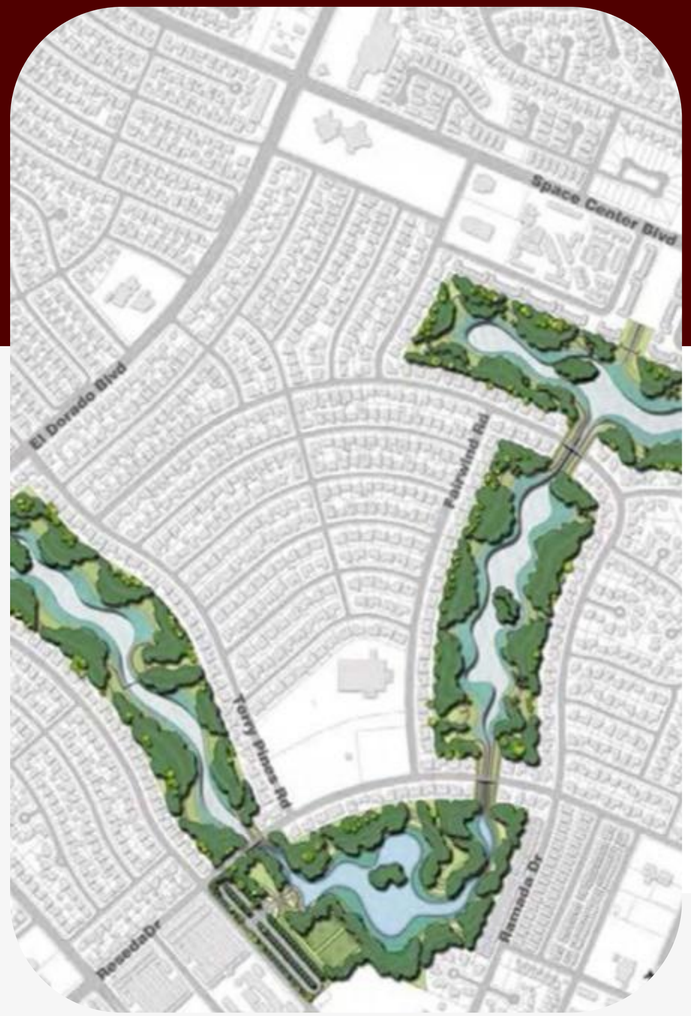
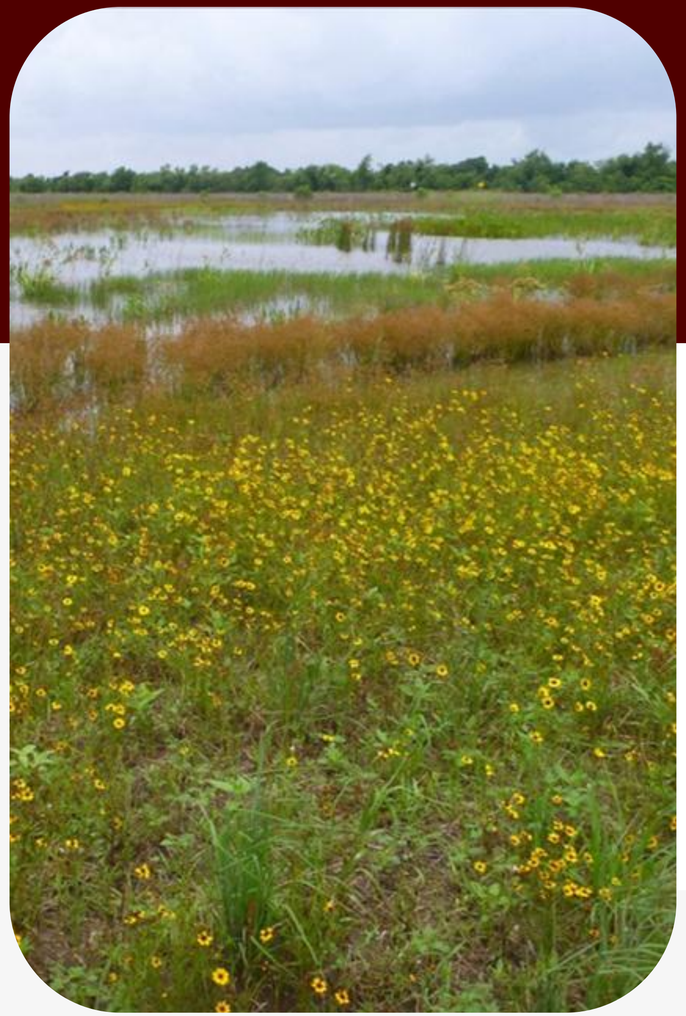
Green Infrastructure

Site Scale

Mid Scale



Large Scale



Overview

Ecosystem Services

Protecting Services at the Largest Scale

Case Studies

Proactive Preservation: Edwards Aquifer, TX

- Alternate Approach: NY

Restoring Native Wetlands: Houston, TX

Ecosystem Services

John Bunker Sands Wetland Center, Seagoville, TX

Exploration Green, Houston, TX

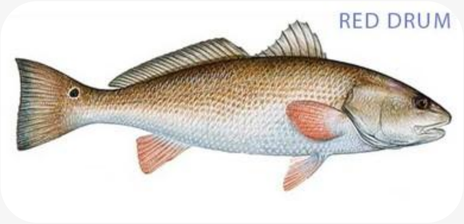
TEXAS A&M AGRILIFE EXTENSION

Wetland Ecosystem Services

Provisioning Services

Water

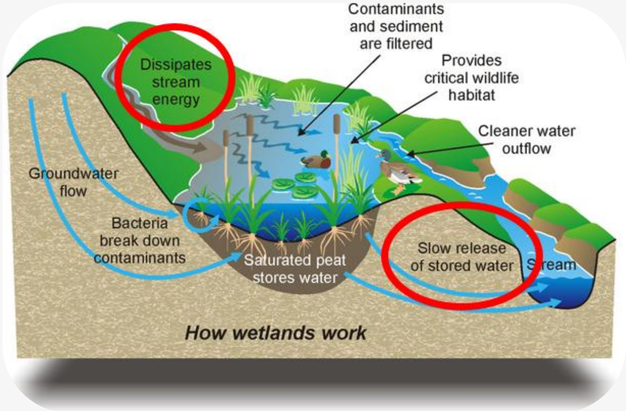
Food



Wetland Ecosystem Services

Regulating Services

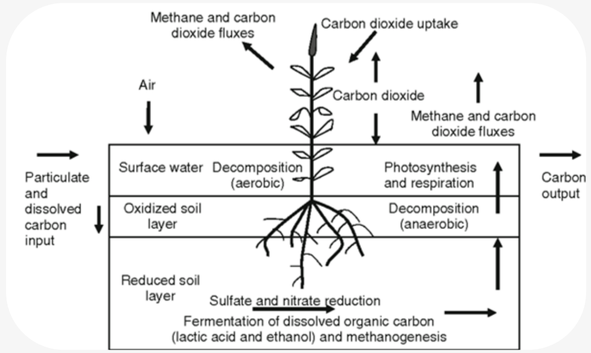
Flood Mitigation



Water Quality and Quantity

Erosion Control & Bank Stabilization

Biogeochemical Processes

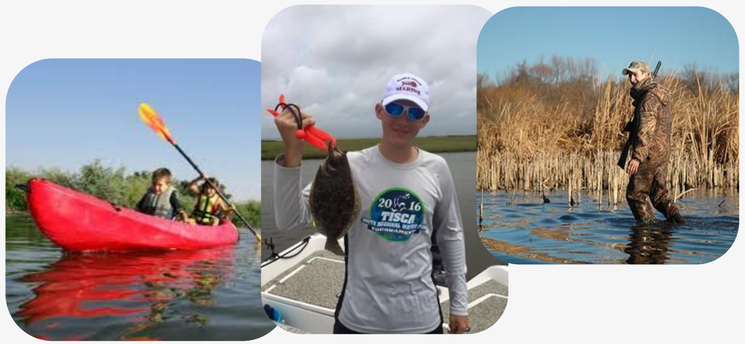


TEXAS A&M AGRILIFE EXTENSION

Wetland Ecosystem Services

Cultural Services

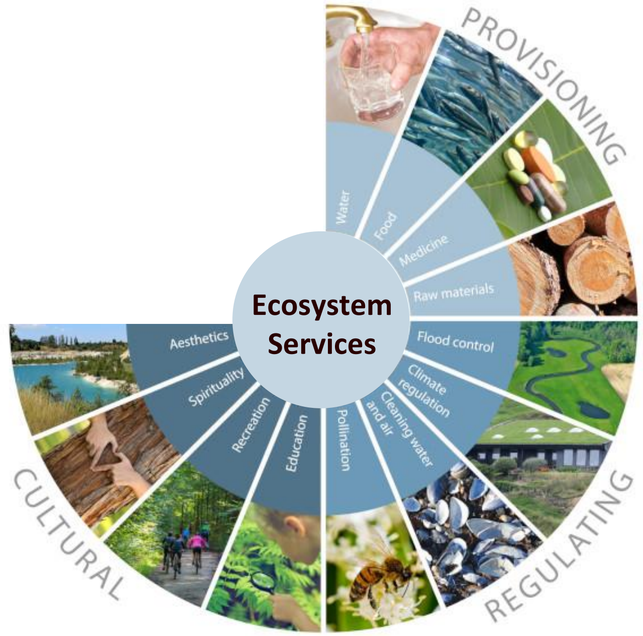
Recreation



Eco-Tourism

Enjoyment of Nature

Sheldon Lake State Park, Houston, TX



Wetland Ecosystem Services

Supporting Services

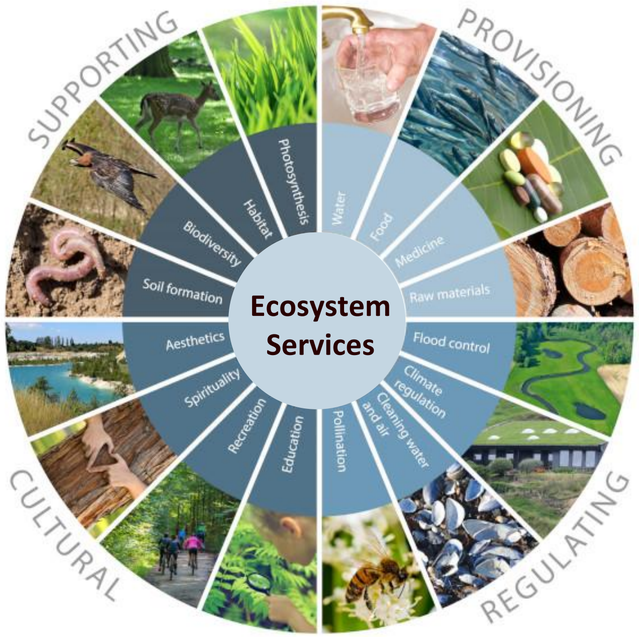
Habitat & Biodiversity

Santa Ana National Wildlife Refuge, Alamo, TX

Sheldon Lake State Park, Houston, TX

Nursery & Spawning

Threatened & Endangered



TEXAS A&M AGRILIFE EXTENSION

Wetland Ecosystem Services

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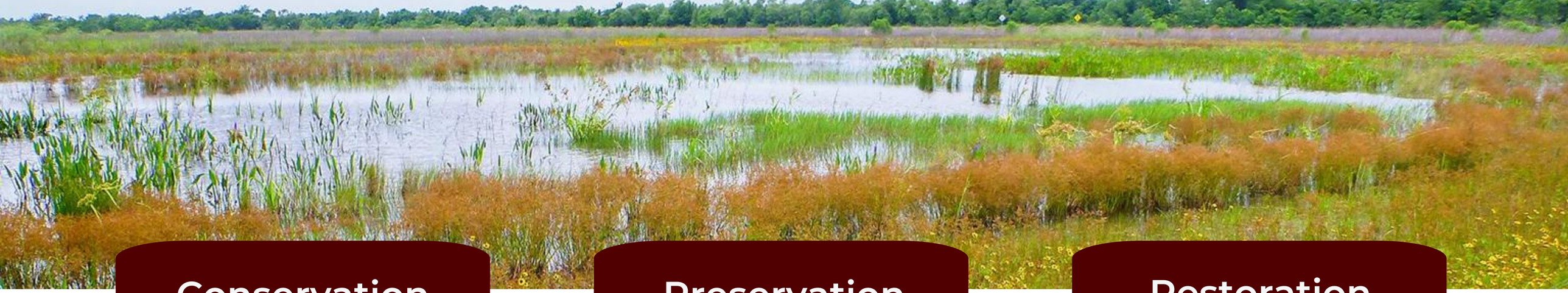
How can we protect these services at a landscape level?

Texas A&M AgriLife Extension



Conservation

Sustainable management of natural areas and allowing their proper use.

Managing or regulating use or access so it does not exceed the capacity of the species of or the system to renew itself

Preservation

Maintaining, protecting, or keeping a piece of land in its current state.

Ensure species or ecosystem continuity regardless of their potential utility

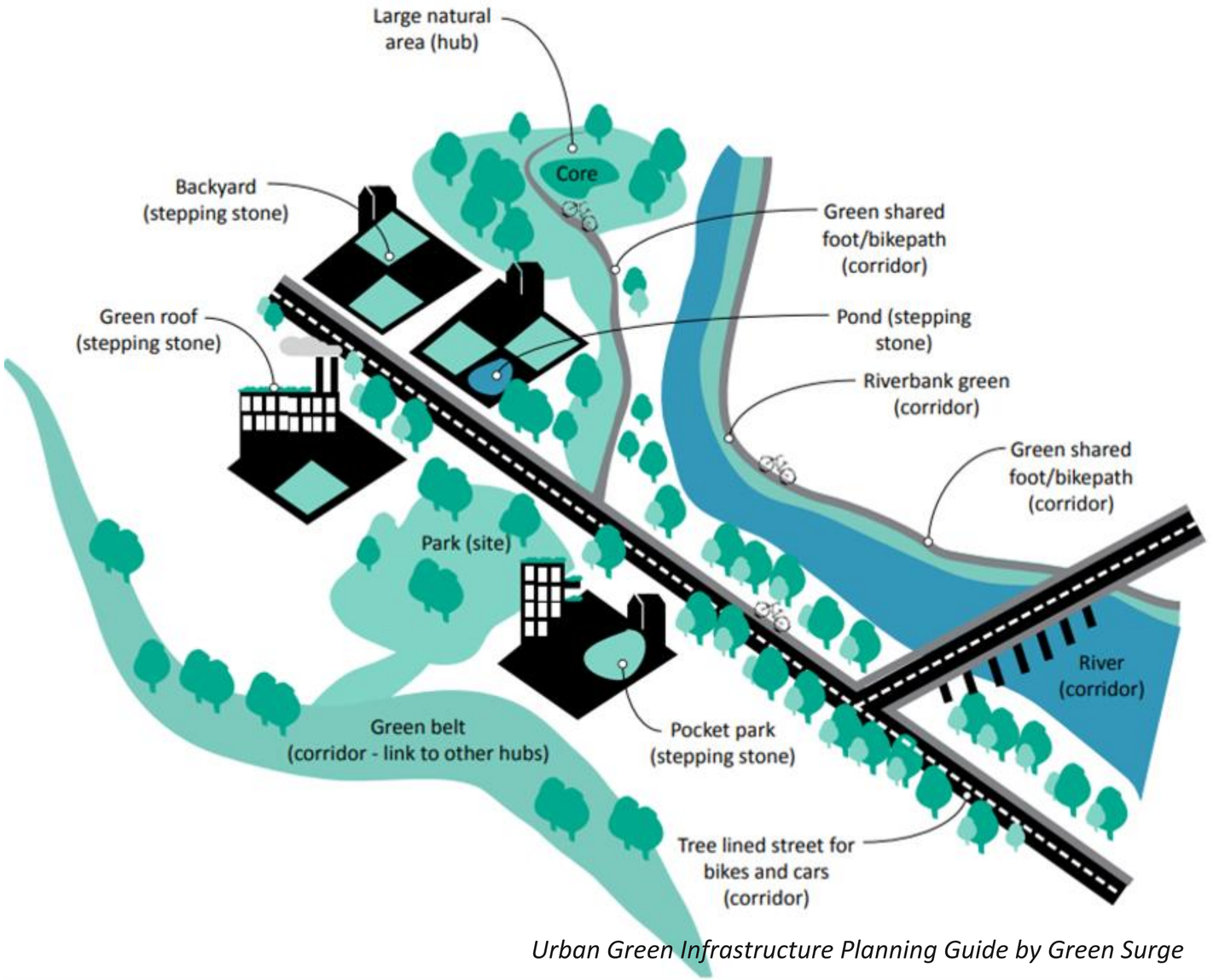
Restoration

Bringing a piece of land back to its previous condition.

To repair the damage so that normal ecosystem integrity, resilience and productivity returns

Texas A&M AgriLife Extension

Scale and Connectivity



Urban Green Infrastructure Planning Guide by Green Surge

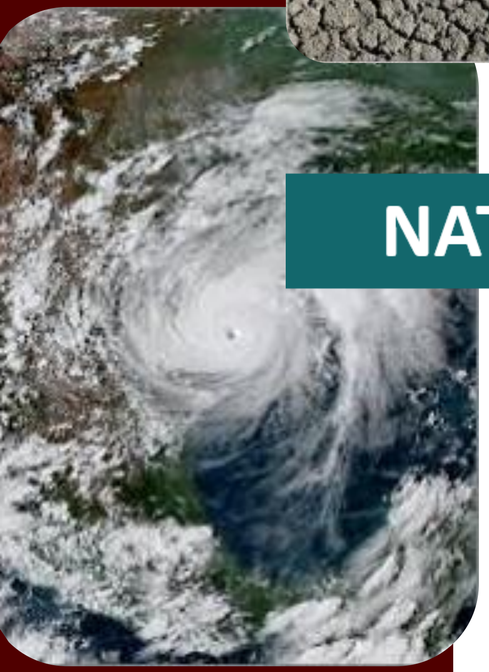
- Scales up benefit of services
- Facilitates movement
- Corridors can be integrated with utilities

TEXAS A&M AGRILIFE EXTENSION

Connecting **Site-Scale** to Create **Large-Scale** Benefits

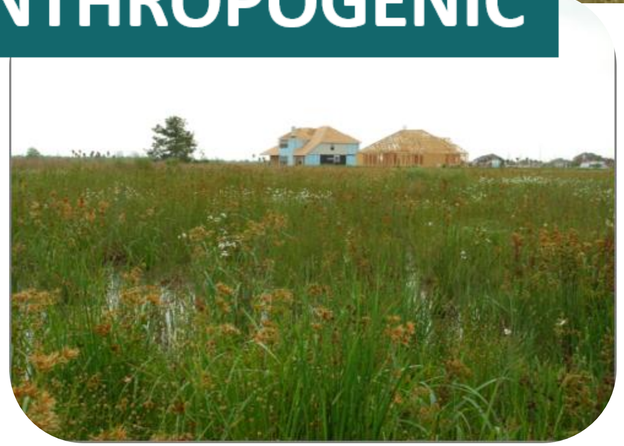
Resilience and Disturbance

the ability to maintain normal patterns – i.e. nutrient cycling and biomass production – after damage by an ecological disturbance



NATURAL

ANTHROPOGENIC



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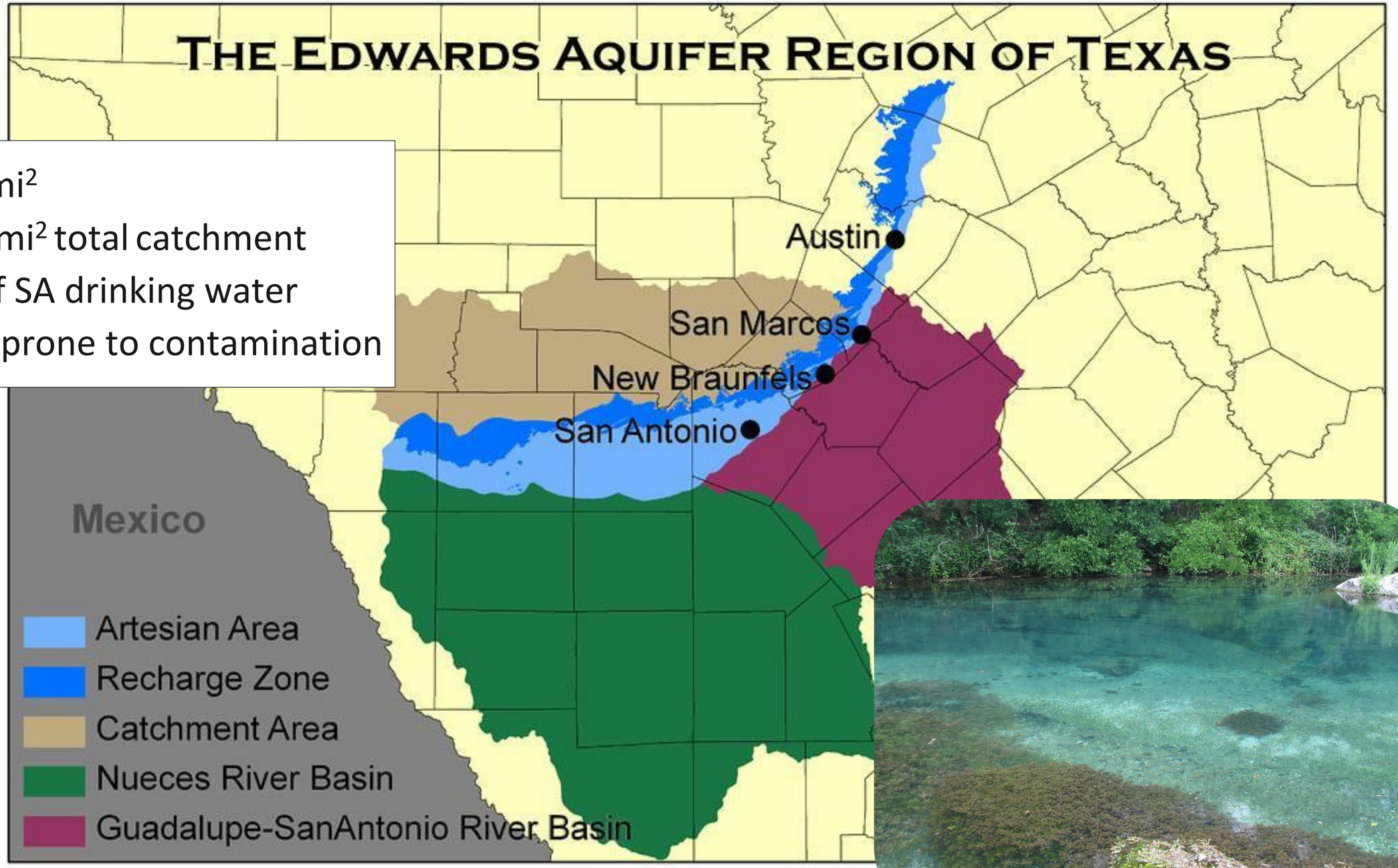
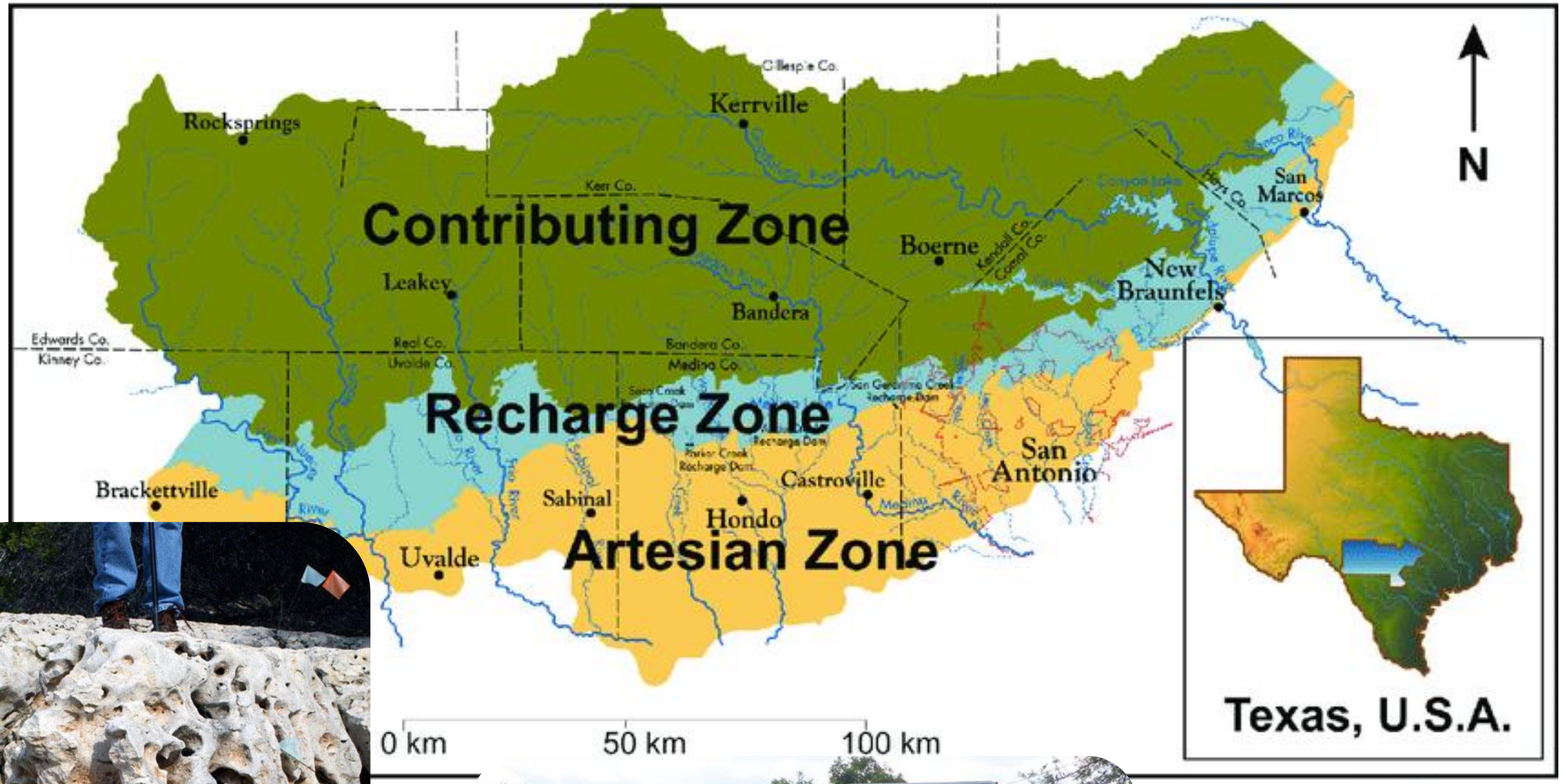


3600 mi^2

4,400 mi^2 total catchment

80% of SA drinking water

highly prone to contamination


Contributing Zone
Recharge Zone
Artesian Zone
Rocksprings
Kerrville
Leakey
Bandera
Boerne
New Braunfels
San Marcos
Brackettville
Uvalde
Sabinal
Hondo
Castroville
San Antonio
Edwards Co.
Kinney Co.
Real Co.
Uvalde Co.
Bandera Co.
Medina Co.
Kerr Co.
Gillespie Co.
Kendall Co.
Comal Co.
Hays Co.
Canyon Lake
0 km
50 km
100 km
N
Texas, U.S.A.


ENTERING
EDWARDS
AQUIFER
RECHARGE ZONE
ENVIRONMENTALLY SENSITIVE AREA

City of San Antonio – Funding Land Acquisition

2000	Prop 3 : 1/8 cent **increase** in sales tax collecting $45 mil for land acquisition (6,500 acres)
2005	Prop 1 : **additional** 1/8 cent increase for $90 mil acquiring most sensitive properties & easements
2010	Prop 1: **continuation** of tax (up to $90 mil)
2015	Prop 1: **again** approved continuation (up to $100 mil)
2019	Governor vetoes sale of EA water **outside** of EA Authority boundaries
2020	Proposition redirects current funding (through FY2022) for EAPP; approved alternative funding plan for $100 mil commitment for EAPP (FY2023 start)

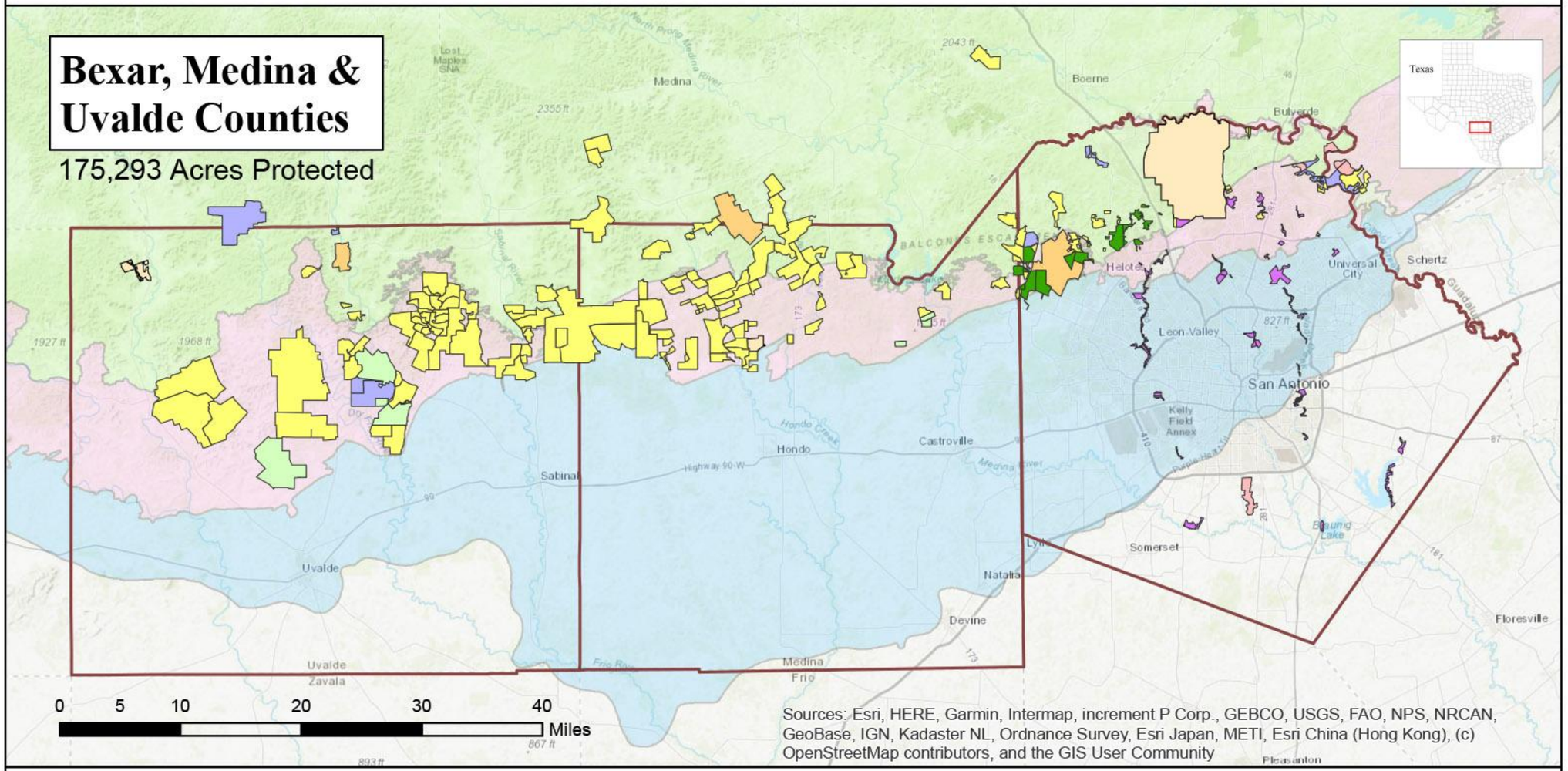
Edwards Aquifer Protection Program

https://www.sanantonio.gov/ParksAndRec/Parks-Facilities/All-Parks-Facilities/Gardens-Natural-Areas/Edwards-Aquifer

CITY OF SAN ANTONIO
EDWARDS AQUIFER
PROTECTION PROGRAM

City of San Antonio
Edwards Aquifer Protection Program

CITY OF SAN ANTONIO
PARKS & RECREATION



- Proposition 3 Properties
- Proposition 1 Properties
- City Parks
- Federal Managed Land
- San Antonio Water System
- Texas Parks and Wildlife
- The Nature Conservancy
- Conservation Land
- Edwards Aquifer Contributing Zone
- Edwards Aquifer Recharge Zone
- Edwards Aquifer Artesian Zone

N

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LOCAL

Edwards Aquifer Authority (EAA)

- *Groundwater Conservation Plan
- Abandoned Well Program
- Management of Regulated Substance Program

City of San Antonio, Parks and Recreation

- EA Protection Program
- EA Protection Venue Project

STATE

TX Commission on Environmental Quality

- *EA Protection Plan

TX Water Quality Board

Barton Springs/EA Conservation District

TX Parks and Wildlife Department

FEDERAL

USGS

- Texas Water Science Center

USFWS

- EA Recovery Implementation Program

NONPROFIT

Edwards Aquifer Conservancy

TX Alliance of Groundwater Districts

MULTI/COOPERATIVE

*Habitat Conservation Plan

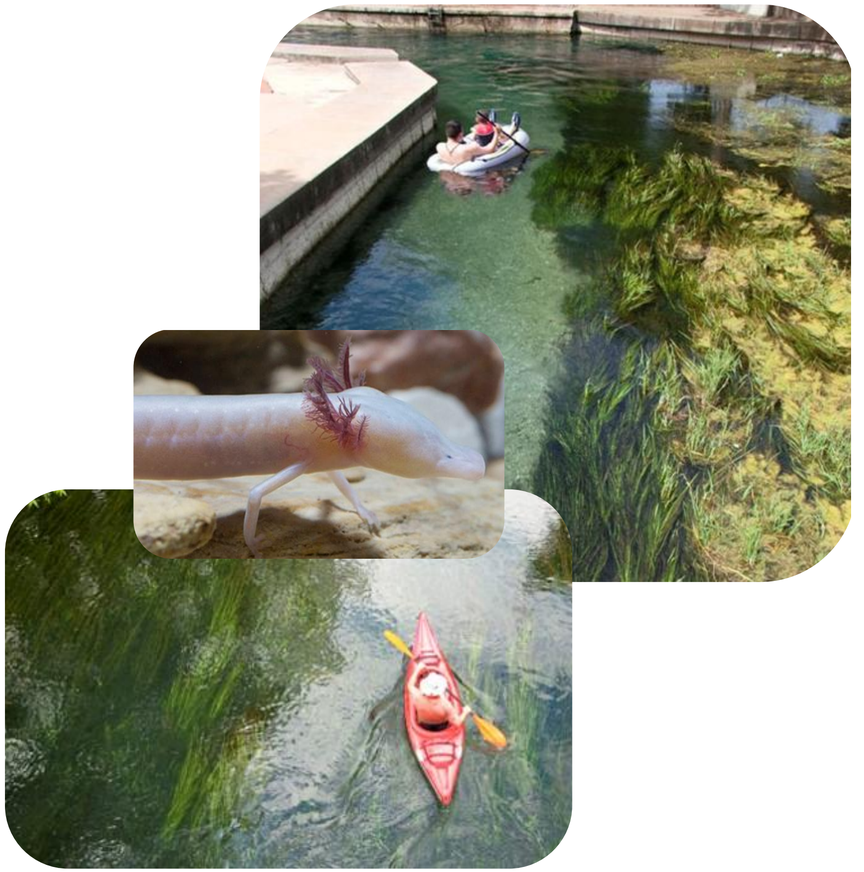
- San Antonio River Authority
- USFWS & TPWD San Antonio Water System
- City of San Marcos
- City of New Braunfels
- Guadalupe-Blanco River Authority
- Texas State University

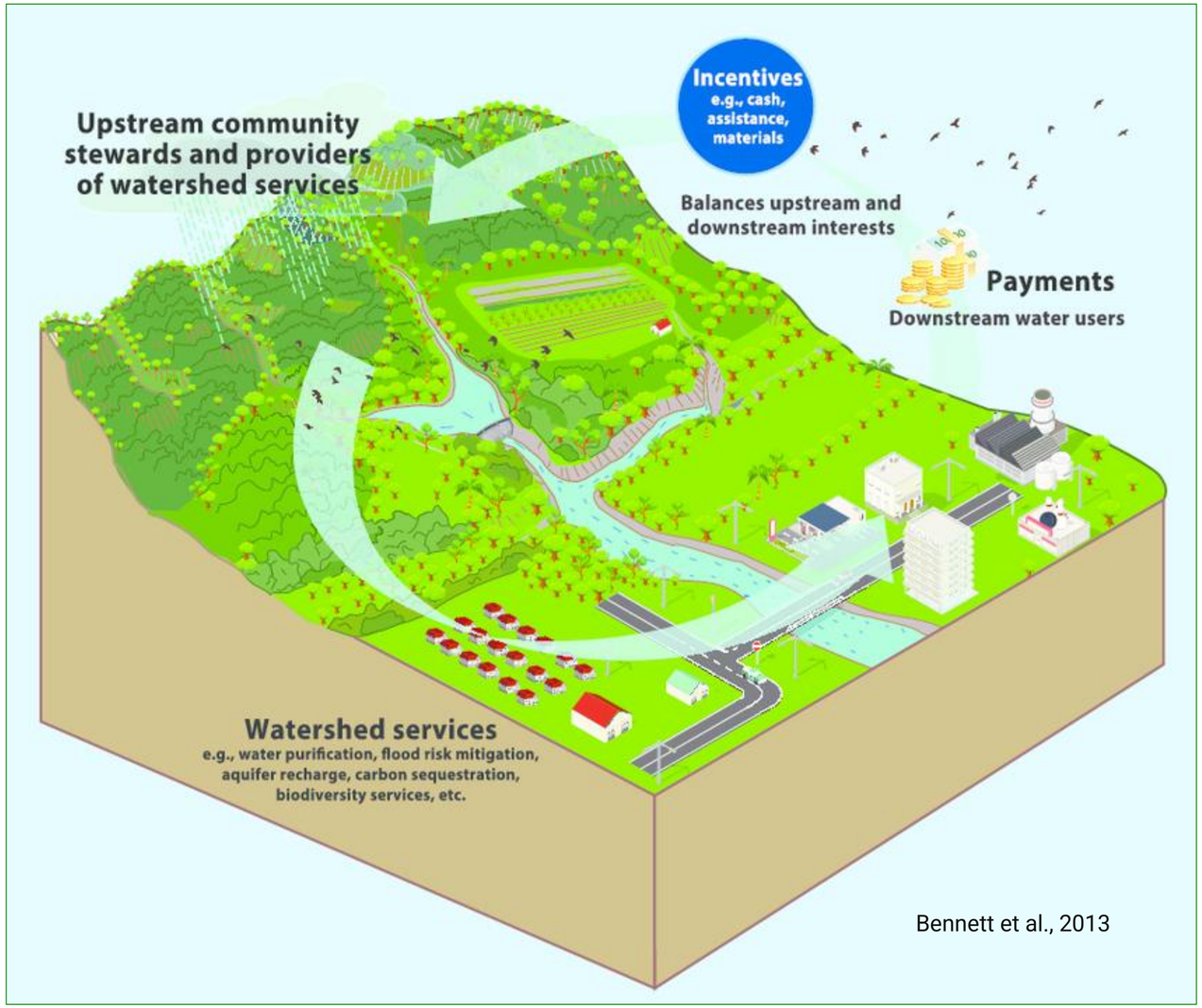
TEXAS A&M AGRILIFE EXTENSION

Partners and Plans

Takeaways

- Proactive protection
- Collaborate with technical experts
- Informing the public, engages them and increases support
- Land acquisition is highly effective … not always the most economical



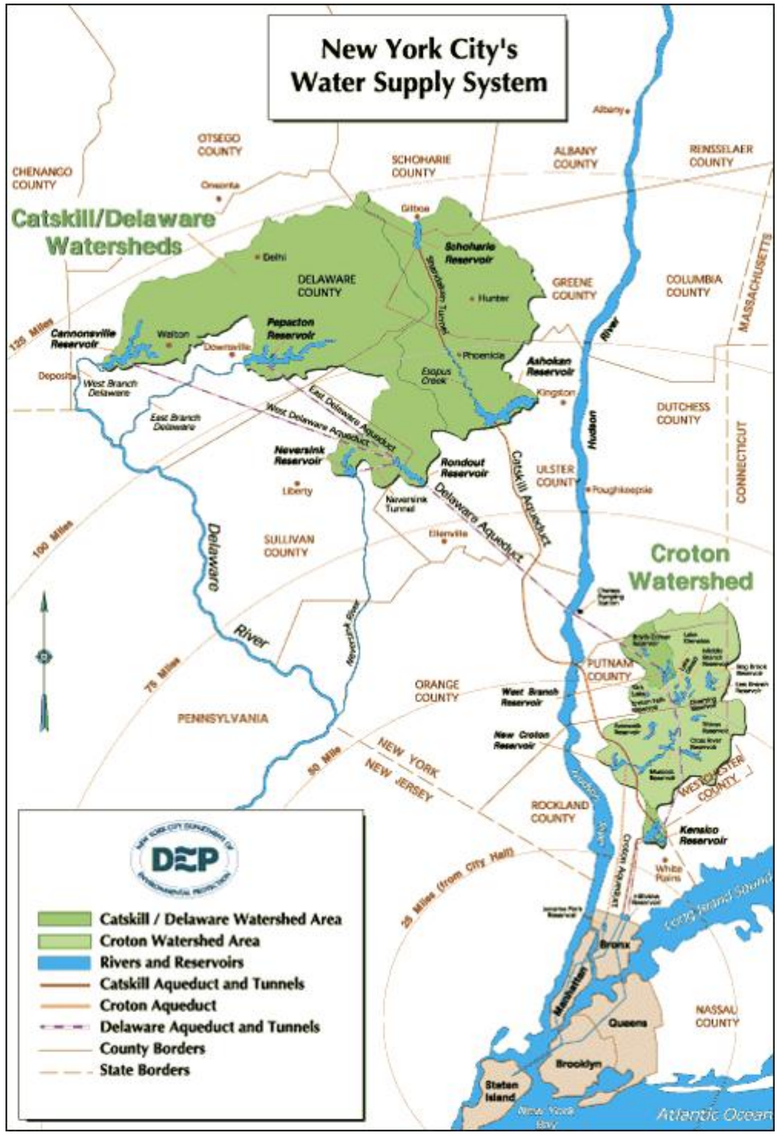


Payment for Ecosystem Services

Beneficiary pays provider to manage land to provide specific benefit

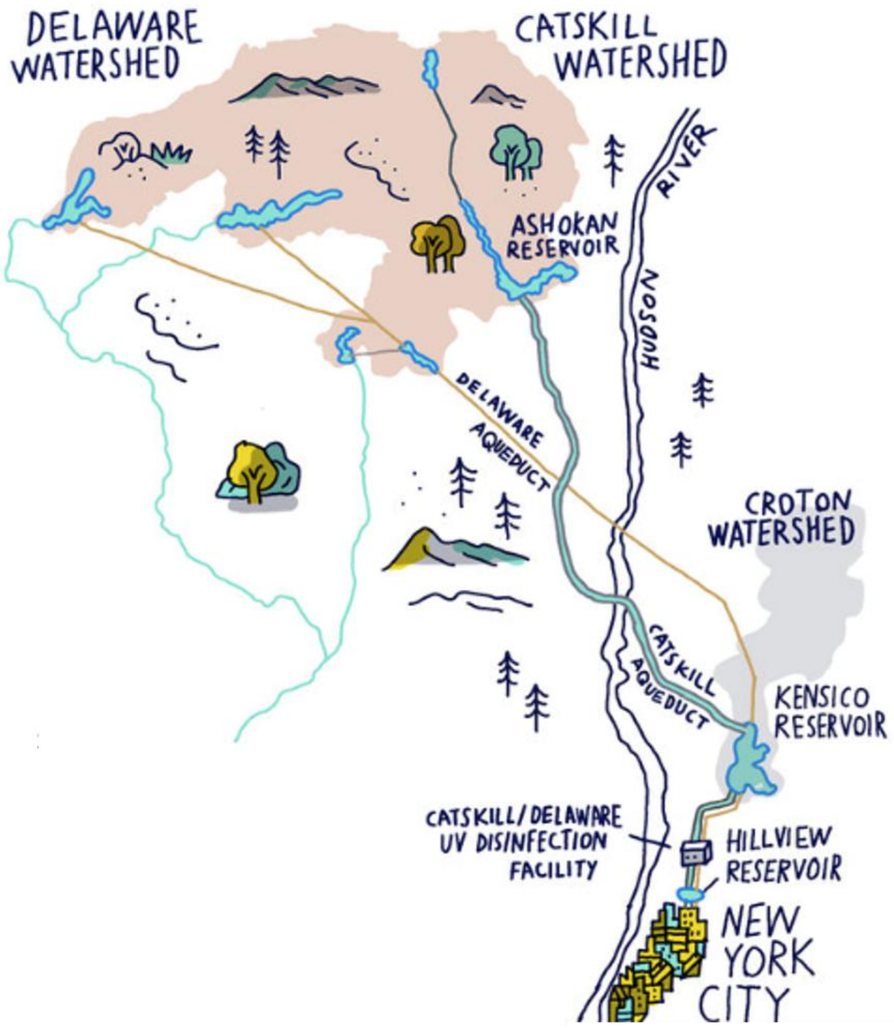
- Monetary or otherwise

Alternative Approach – Incentivize Landowners



Catskills-Delaware Watershed, NY

- Largest unfiltered surface water supply, yielding 1.2 billion gallons/day
- Lots of ag & livestock
- EPA mandates per Save Drinking Water Act
  - $8-10 billion filtration plant
  - Proof of protecting watershed
    - WWTP upgrades, SPPP on new development, setbacks, buffers
    - Land acquisition, conservation easements
    - **Payments for Ecosystem Services**

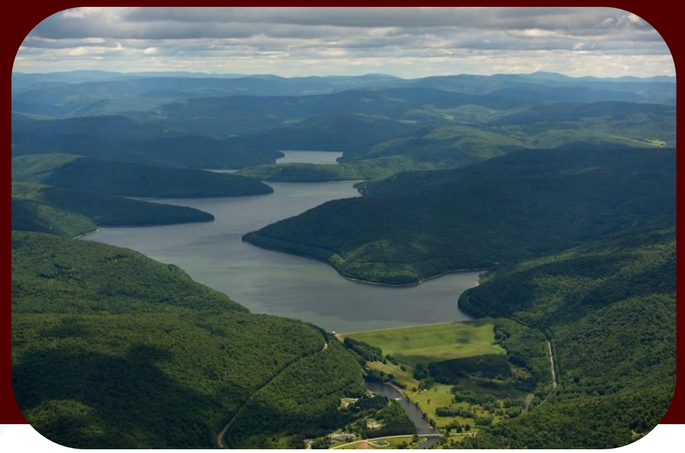


Landowners saw livelihood threatened

- Discussions lead to collaboration and involvement in the PES design
- Voluntary, no cost, improvers operation, provides ES
- Watershed Forest/Ag Management Program
  - City pays for technical assistance
  - City pays for infrastructure construction or upgrades
  - Follow prescribed management plan

NYC – Payment for Ecosystem Services (PES)

Success but Still a Work in Progress



- Ongoing protection from established program
- A single investment is rarely the final and only solution
- PES produces superior environmental & social results, at much cheaper cost than traditional strategies

Overview

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Restoring Native Wetlands: Houston, TX

- 2003 – 2019
- 5 Phases
- 410 acre prairie-wetland

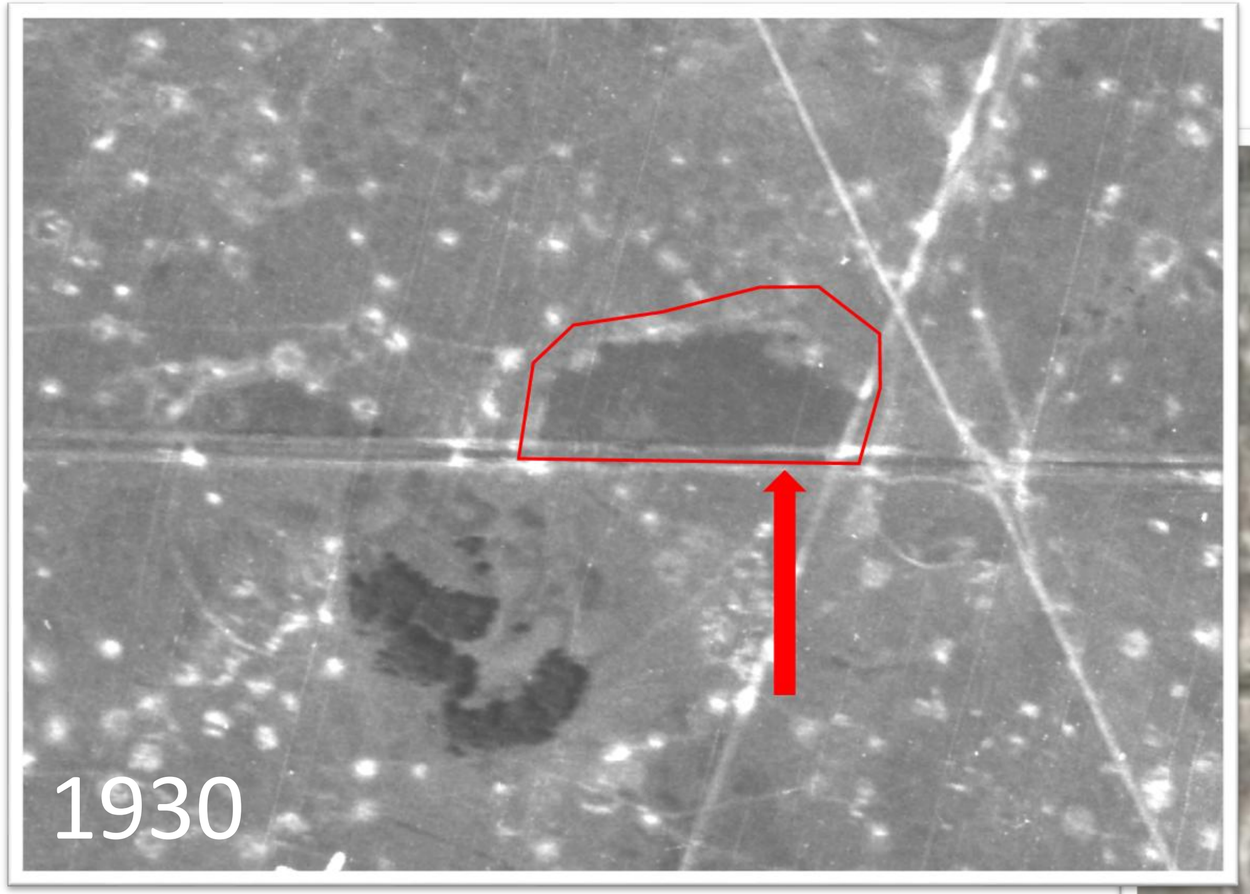
TEXAS A&M AGRILIFE EXTENSION

Google earth

Restore prairie-wetland complex impacted by damming and agriculture

1. Identify historic extent
2. Basin excavation
3. Active planting

Restoration Scope



- Ground-truthing with soil samples
- Excavate

Aerial Imagery Soil Signatures

Active Planting

- Propagation & collection
- Sourcing plant material
  - 45 species within 4 county region (50 mi radius)
  - Genetic diversity and local adaptation
- Timing of planting by species

Volunteers & stewardship

Restoration Methods

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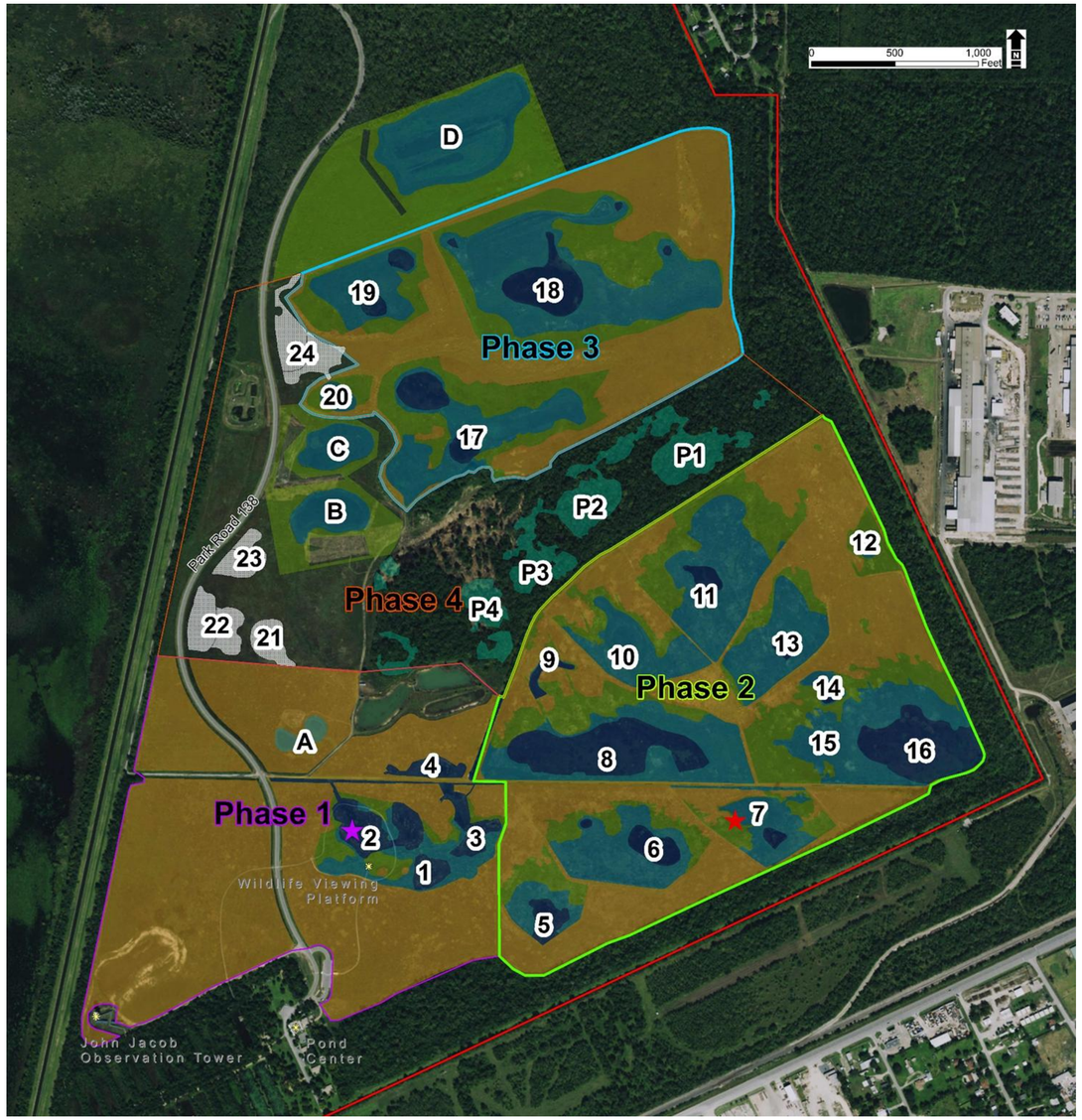


Restoration Phase

- Phase 1
- Phase 2
- Phase 3
- Phase 4

Completed Restoration Zone

- Deep Marsh
- Marsh
- Upland Prairie
- Wet Prairie
- Peninsula Ponds

Early 2000's :	**Method developed**
2003 – 2005 :	**Phase 1 (10 ac)** **Ponds 1 – 4**
2009 – 2011 :	**Phase 2 (78 ac)** **Ponds 5 – 16**
2011 :	**Drought!!**
2011 – 2013 :	**Phase 3 (48 ac)** **Ponds 17 – 20**
2014 – 2016 :	**Phase 4 (72 ac)** **Ponds 21 – 24**
2017- 2019 :	**Phase 5 (23 ac)** ***not pictured*** **Ponds 1 – 7**

TEXAS A&M AGRILIFE EXTENSION

Project Phasing

Texas A&M AgriLife Extension

Drought Tolerance

Takeaways

Restoration can combat habitat loss

- Historic imagery

Phasing

- Funding driven
- Chance to refine method
- Evolved into large-scale

Volunteers & Community Outreach

- Reduced planting costs thanks to volunteers
- Outreach encourages stewardship

Strong ecological principals

- Native species
- Locally adapted
- Put-it-back-where-it-was Methodology

It’s the core of what we do since we mitigate disturbances: floods

- Follow BMP’s
- Test, learn, and refine
- Include the experts & collaborate

Resilience, Resilience, Resilience…

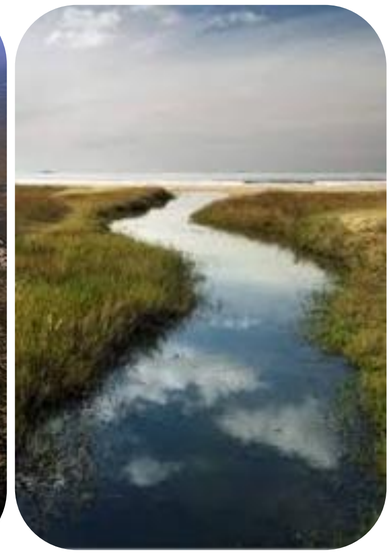
Strategies for Protecting Large-Scale Landscapes

<u>To Review</u>

Connecting small-scale GI
Preservation (acquisition & easements)
Payment for Ecosystem Services
Habitat restoration

<u>Other Options</u>

GI Integration with Planning
Transfer of Development Rights
Landowner incentives (cost-share, subsidies)



Texas A&M AgriLife Extension

No matter your scenario, GI can be integrated, connected or restored