

TEXAS A&M AGRILIFE

Conservation and Restoration of Large Landscapes



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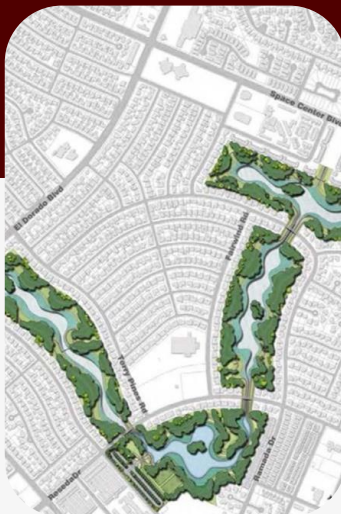
AgriLife.org/GIFT

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

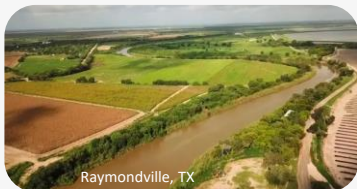
Ecosystem
Services



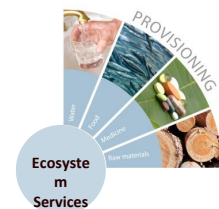
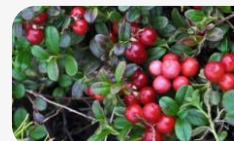
Wetland Ecosystem Services

Provisioning Services

Water



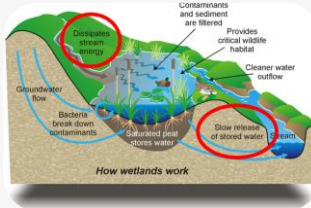
Food



Wetland Ecosystem Services

Regulating Services

Flood Mitigation



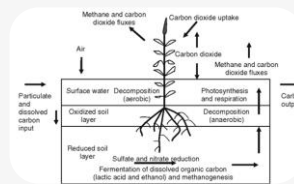
Water Quality and Quantity



Erosion Control & Bank Stabilization



Biogeochemical Processes



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

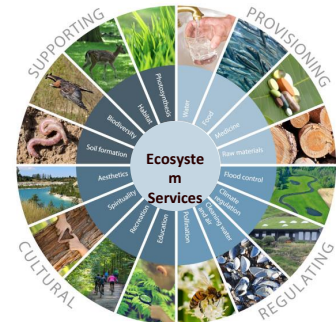


Sheldon Lake State Park, Houston, TX

Nursery & Spawning



Threatened & Endangered



Wetland Ecosystem Services



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How can we protect these services at a landscape level?



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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 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

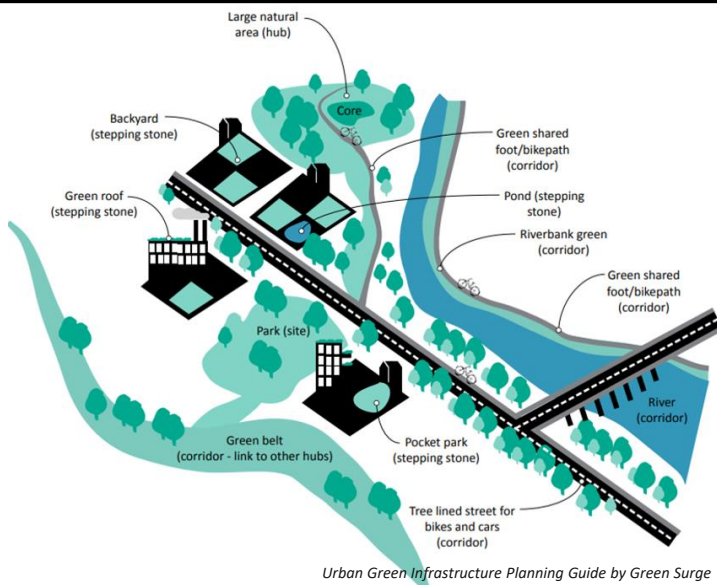
Restoration

Bringing a piece of land back to its previous condition.

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



Scale and Connectivity



Urban Green Infrastructure Planning Guide by Green Surge

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



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





Overview

Ecosystem Services

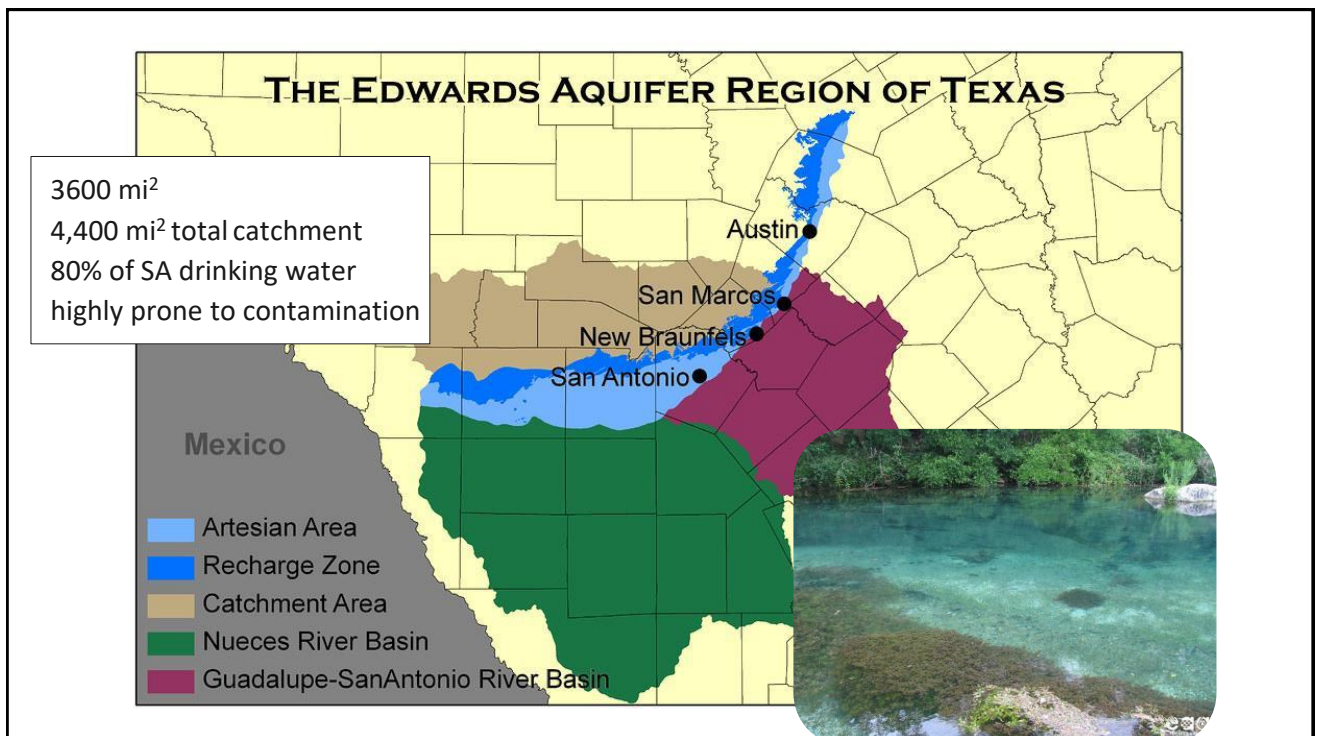
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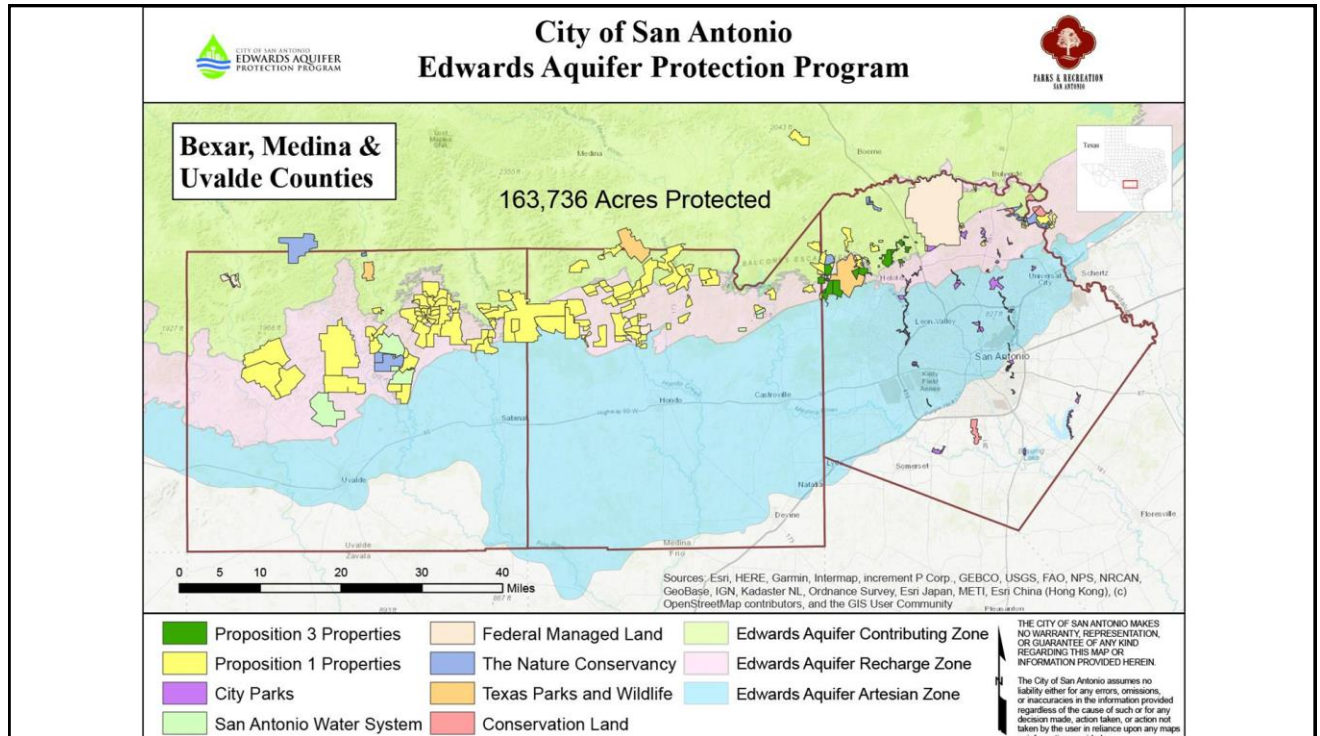




City of San Antonio – Funding Land Acquisition

- 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



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



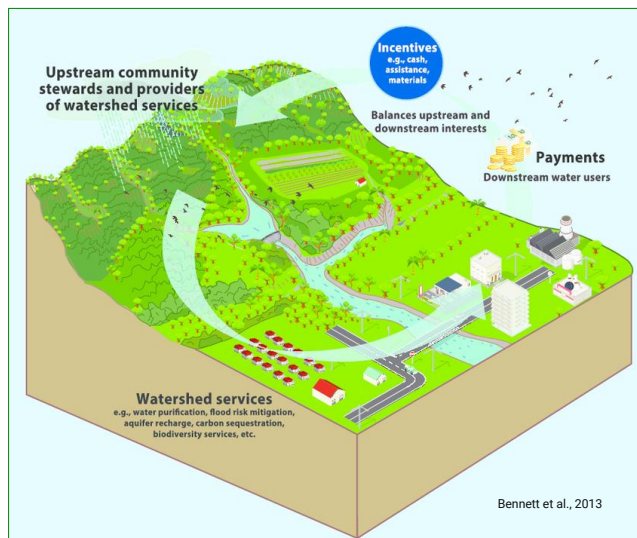
Partners and Plans

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



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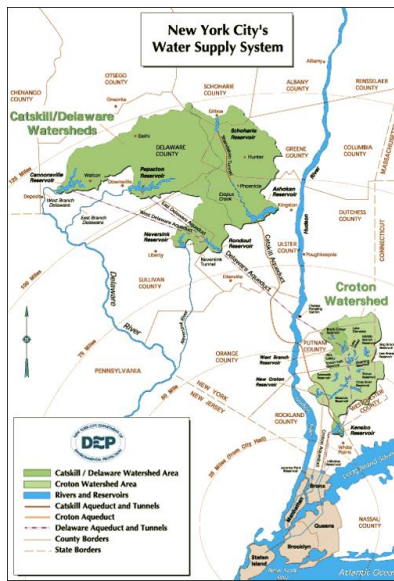
Payment for Ecosystem Services

Beneficiary pays provider to manage land to provide specific benefit

- Monetary or otherwise

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Alternative Approach – Incentivize Landowners

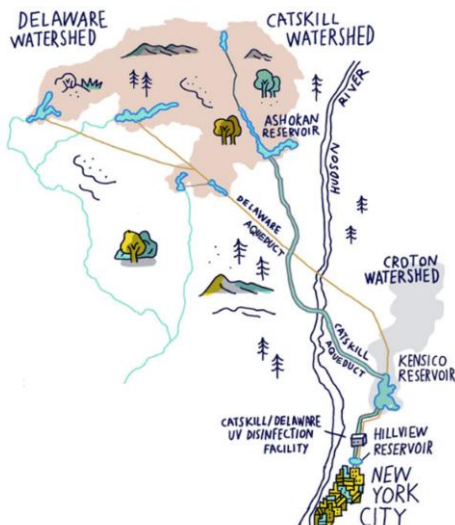


Catskills-Delaware Watershed, NY

- Largest unfiltered surface water supply, yielding 1.2 billion gallons/day
- Lots of ag & livestock
- EPA mandates per Safe 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



Watershed Protection and New York City's water supply system



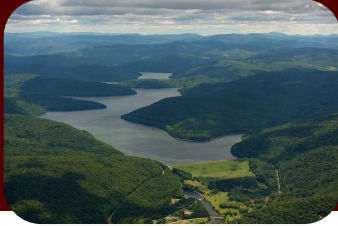
Landowners saw livelihood threatened

- Discussions lead to collaboration and involvement in the PES design
- Voluntary, no cost, improves 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



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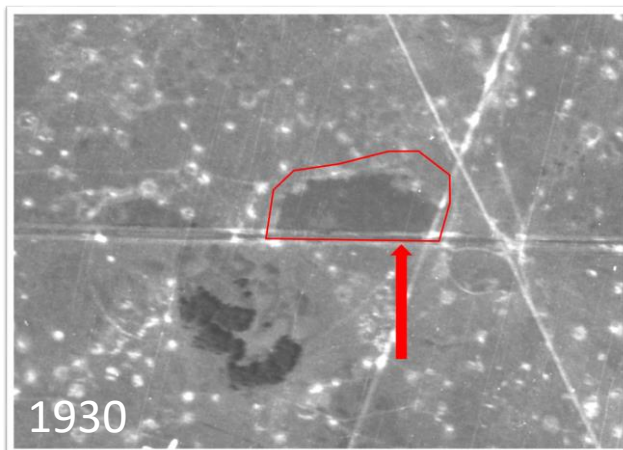
Restore prairie-wetland complex impacted by damming and agriculture

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



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Restoration Scope



- Ground-truthing with soil samples
- Excavate



Aerial Imagery Soil Signatures

Active Planting

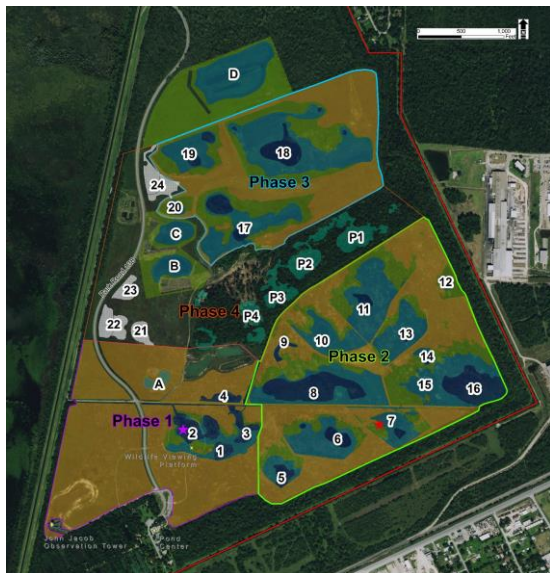
- Propagation & collection
- Sourcing plant material
 - 45 species within 4 county region (50 mi radius)
 - Genetic diversity and local adaptation
- Timing of planting by species

Volunteers & stewardship



Restoration Methods

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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

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Project Phasing



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

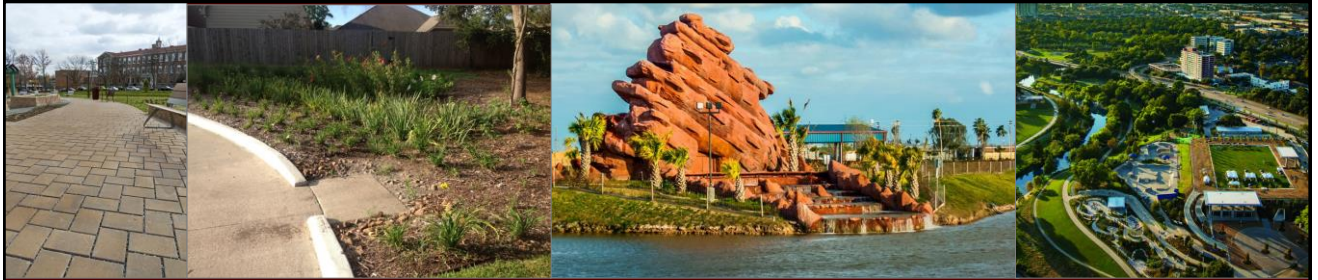
To Review

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

Other Options

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





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

