Remnant Prairie Reclamation in an Urban Landscape, Houston, Texas
Society for Ecological Restoration
November 2nd, 2013

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Harris County Flood Control District
Stormwater Quality Department
Agenda

• Harris County Flood Control District Overview

• Willow Waterhole Overview and History

• Adaptive Management

• Management and Monitoring
  • Methods and Results
  • Endangered Species – Hymenoxys texana

• Challenges and Lessons Learned

• Future Plans
Harris County Flood Control District

...to provide flood damage reduction projects that work with appropriate regard for community and natural values.

The District is Created

1937
Area = 1756 square miles
1500 ± channels
2500 ± miles of channels
Population = 4.1 million (county)
2.1 million (Houston)
Willow Waterhole

Detention Basin Facts

- Overall Acreage: 250
- Open Meadow: 89.5 acres
- Forest Planting: 41 acres
- Wetland Planting: 21 acres
- Low Flow Volume: 1,849 acre-feet
- Detention Volume: 1,849 acre-feet

Legend:
- Proposed Future Regional Bike Trail System
- Trail System
- Nature Learning Stop
- Open Meadow Area
- Forest Planting Area
- Wetland Planting Area
- Top of Bank
- Basin Sloping Area
- Edge of Bank
- Shale Centerline
- Culvert
- Parking
- Per Control Structure
- Pedestrian Bridges/Boardwalk
- Neighborhood Access
- Compartments

PASSIVE SYSTEM:

- All connecting culverts designed to control "filling and emptying" timing in H&H modeling.

WATER "IN" FROM:
- WWH Bayou @ Inlet Weirs
- WWH Bayou @ 2-8ft x 8ft Culverts
- Chimney Rock Ditch thru new culverts
- Area street inlets and sheet flow
1956 – Coastal Prairie

[Map showing the Coastal Prairie Conservation Area and remnant areas in 1956]
The coastal prairie of Texas and Louisiana is one of the most imperiled ecosystems in the U.S.

It once stretched from the western edge of the Atchafalaya basin to the King Ranch.

Farming, ranching, fire suppression, and urbanization have eliminated over 98% of its historic extent.
Gulf Coastal Prairie Habitat

Bermuda Grass

Native Grasses
• Sustainable habitat.
• Supports infiltration, transpiration, evaporation.
• Reduces runoff – stormwater quantity
• Improves stormwater quality
• Requires less mowing, but still requires some level of maintenance.
• Increases plant and animal species diversity.
• Keeps undesirable species in check.
• Provides aesthetic appeal of seasonally changing wildflowers.
• Provides educational opportunities for local schools and the general public.
• Enhances community and natural values.
NEPA and Biological Assessment Compliance

- *Hymenoyxs texana* and coastal prairie remnants discovered during NEPA study.
- HCFCD obligated to conserve 15 acres of coastal prairie and prairie dawn colonies.
- Coastal Prairie Management Plan prepared with USFWS cooperation to address continued success of the Texas prairie dawn flower colonies.
- Revegetation of adjacent detention basin will include native prairie buffer.
- Annual monitoring and reporting to USFWS and USACE.
Adaptive Management

- Map coastal prairie remnants, fence Texas Prairie Dawn
- Phase I clearing with hydro-ax over about 7 acres - 2010
- Clear additional undesirable trees and rake mulch
- Set management units, mow, transplant, survey, monitor, etc.
- Phase II clearing with hydro-ax over about 7 additional acres - 2013

Hydro-Ax Clearing
Willow Waterhole Prairie Conservation Area

Coastal Prairie Remnant
Wet Coastal Prairie Remnant
2012 Trees Remaining
Prairie Conservation Area
Future Forest Barrier

Aerial Photo - 2010

Phase I (2010)
Phase II (2013)
Post-Phase I

Willow Waterhole Prairie Conservation Area

Coastal Prairie Remnant
Wet Coastal Prairie Remnant
2012 Trees Remaining
Prairie Conservation Area
Future Forest Barrier

Aerial Photo - 2012

Phases:
- Phase I (2010)
- Phase II (2013)
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  • Methods and Results
  • Endangered Species – *Hymenoxys texana*
• Challenges and Lessons Learned
• Future Plans
Management and Monitoring: Cyclical Mowing Schedule

<table>
<thead>
<tr>
<th>Management Unit 1</th>
<th>Management Unit 2</th>
<th>Management Unit 3</th>
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<tbody>
<tr>
<td>May</td>
<td>Mow</td>
<td>Mow</td>
</tr>
<tr>
<td>June</td>
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<td>July</td>
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<td>November</td>
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<td>Mow</td>
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<tr>
<td>December</td>
<td>Mow</td>
<td></td>
</tr>
<tr>
<td>January</td>
<td></td>
<td>Mow</td>
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</table>
Management and Monitoring: Transects
Transect Monitoring Results
Data shows a rapid recovery of coastal prairie habitat

Transect 4, for example:

<table>
<thead>
<tr>
<th>Date</th>
<th>Bare Ground (% cover)</th>
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<tbody>
<tr>
<td>10-Dec</td>
<td>62.75</td>
</tr>
<tr>
<td>11-Mar</td>
<td>48.25</td>
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<tr>
<td>11-Oct</td>
<td>56.50</td>
</tr>
<tr>
<td>12-Mar</td>
<td>12.35</td>
</tr>
<tr>
<td>13-Oct</td>
<td>&lt;10.00</td>
</tr>
</tbody>
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- Consistent Shannon-Wiener Diversity Index: 3.8 – 4.1 over three years
- Evenness values of +0.87

Pioneer and other prairie plant species emerging
- 244 native grasses and forbs
- Notable species
  - Sharp, Prairie, and Bracted blazing star, Rattlesnake Master, Houston Camphor daisy, Texas Prairie Dawn, Texas Coneflower, Indian Plantain, Giant Blue Sage, Green Antelopehorn
  - Little, Big, and Bushy Bluestem, Indian grass, Eastern Gamagrass, Gulf Cordgrass, Gulf Muhly
**Hymenoxys texana**

- Common name is Texas Prairiedawn
- Federally listed as endangered in 1986
- First discovered in 1890s and then thought to be extinct until rediscovery in 1981
  - Exists from February - May
  - Found in small open areas of sandy, saline soils
  - Often located on lower sloping portions of mimma mounds
  - Mounds of sandier soils form micro-topography that support a unique and diverse plant assemblage
**Hymenoxys texana**

1. Fence the two known colonies

2. Control invasive species encroachment

3. Annual quantitative monitoring
   - First year (2013) – 100 individuals
     - 82 seed heads

4. Soil analysis
   - Higher salinity than neighboring prairie soils (1.0-1.7 mmho/cm)
     - Highly sodic soils (ESP>25%)

5. Increase colony size and vigor
   - Teamed with Mercer Arboretum to explore seeding introduction
     - Seedling germination trial
       - In-situ vs ex-situ
     - Amend the soil to facilitate growing conditions
       - Increase soil salinity
       - Expand bare spaces for reintroduction
Selective Clearing and Transplanting

Volunteers from local public schools and organizations

• YES Prep public school
• Post Oak Middle School
• Houston Audubon Society
• Texas Gulf Coast Master Naturalists
Challenges

Proximity to an urban area

- Unauthorized public access
  - Nearby residents
  - Public infrastructure
- Higher incidence of invasive species
<table>
<thead>
<tr>
<th>Prairie Expansion</th>
<th>Basin Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Continue to Mow</td>
<td>• Test methods to establish native plants on slopes</td>
</tr>
<tr>
<td>• Continue to Monitor</td>
<td>• Install boundary to prevent unrestricted site access</td>
</tr>
<tr>
<td>• Burn Plots?</td>
<td>• Design access plan for public education, recreation, trails, etc.</td>
</tr>
<tr>
<td>• Increase <em>H. texana</em></td>
<td></td>
</tr>
<tr>
<td>populations</td>
<td></td>
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<tr>
<td>• Transplant and seeding</td>
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Lessons Learned

• Diverse and viable seed bank is crucial
• Minimize soil disturbance
• Consistent and thorough documentation
• Consistent volunteer coordination
• Adaptive Management Plan
• Outreach
  • Public
  • Internal
Questions?

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