Seagrasses: Vital Habitat in Texas Estuaries

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Why Care About Seagrass?

- Sustain coastal fisheries
- Stabilize sediments
- Improve water quality
- Absorb carbon dioxide

Roger Swirdesski
Texas Seagrass Species

Shoal grass

Turtle grass

Widgeon grass

Star grass

Manatee grass

M.K. Wieksten

UTMSI
Seagrass Requirements

Sunlight
Soft substrate
Low wave energy
Nutrients (C,N,P,K)
Moderate salinity (20-50 ppt)
Threats to Seagrasses

- Excess nutrients
- Sedimentation
- Dredging
- Storms
- Algal blooms
- Propeller scarring
Propeller Scar or “Prop” Scar
Seagrass Protection

- Redfish Bay State Scientific Area established in 2000
- Regulation prohibiting uprooting of seagrass effective in 2006
- “No prop scar” regulation expanded to entire coast, 2013
- Coastwide education and outreach campaign
Success of Prop Scar Regs
Seagrass Monitoring

2000 Water Quality Standards: seagrass propagation use added

Texas Seagrass Monitoring Workgroup formed (2003)

Texas Seagrass Monitoring Program Strategic Plan (Pulich and others 2003)
Tiered Monitoring
(Dunton, Pulich et al.)

Known seagrass beds in Texas

San Antonio Bay

Tiered Monitoring
(Dunton, Pulich et al.)

Known seagrass beds in Texas

San Antonio Bay

Tier 3

Tier 2

Tier 1
State Agency Seagrass Monitoring

Port Bay wastewater impact study (2009-2010) with Ken Dunton (UTMSI)

Seagrass monitoring protocol development with TCEQ
- Phase 1 – 14 coastwide stations
- Phase 2 – Probabilistic design
  - 53 coastwide stations
  - Two bays (50 stations each)
- Intensive monitoring

TCEQ logo
Phase 1
(2010-2012)
Shoal grass
(Halodule beaudettei / Halodule wrightii)

Colonizing species
Forage for redhead and other ducks
Flat leaves with square tips

Multiple roots
Flat leaves
Sheath
Ability to Detect Change

**Halodule Percent Coverage**

**Halodule Canopy Height**

- Percent Coverage: 0, 20, 40, 60, 80, 100, 120
- Canopy Height (cm): 0, 10, 20, 30, 40, 50

Coastwide Monitoring in 2012

53 coastwide sites distributed among the major bays. Matagorda Bay is divided into East and West Matagorda Bay, for a total of eight systems.
Coastwide percent coverage

Gulf of Mexico

Percent coverage

(53)

- Halodule wrightii
- Thalassia testudinum
- Syringodium filiforme
- Ruppia maritima
- Halophila engelmannii
- Bare

Sources: GEBCO, NOAA National Geographic, DVL-army, and ESRI
2012 Bay Sampling - Tier 2 and Tier 3

Redfish Bay
(spans Corpus Christi and Aransas Bays)

San Antonio Bay
Intensive Monitoring
Return to San Antonio Bay 2014
Accomplishments

Designed and implemented seagrass monitoring at coastwide and bay scales
Demonstrated ability to detect spatial and temporal differences in coverage and canopy height
Provided cost estimates and options for a state seagrass monitoring program

Next Steps

Facilitate a coastwide seagrass monitoring program
Monitor Galveston Bay in 2015 with TCEQ Houston East and West Matagorda Bay…?
Acknowledgements

EPA
TCEQ
TPWD
UTMSI - Kim Jackson and Ken Dunton
Texas State - Warren Pulich
LCRA Environmental Laboratory Services
For More Information

TPWD Water Quality webpage
http://www.tpwd.state.tx.us/landwater/water/environmentalconcerns/water_quality/

TPWD seagrass webpage
http://www.tpwd.state.tx.us/landwater/water/habitats/seagrass/

Project Manager
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Questions?
### Monitoring Costs

Set-up – one-time costs - sample design, reconnaissance, contracting, reporting, …

Operating – on-going costs – field work, training, data management, …

<table>
<thead>
<tr>
<th>Expense category</th>
<th>Description</th>
<th>Operating costs</th>
<th>Operating hours</th>
<th>Set-up costs</th>
<th>Set-up hours</th>
<th>Total costs</th>
<th>Total hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tier 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coastwide</td>
<td>50 widely-spaced sites and 14 fixed sites</td>
<td>$44,399</td>
<td>895</td>
<td>$59,502</td>
<td>1241</td>
<td>$103,901</td>
<td>2,136</td>
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<td>Bay-scale (per bay)</td>
<td>50 closely-spaced sites</td>
<td>$17,914</td>
<td>361</td>
<td>$24,007</td>
<td>501</td>
<td>$41,921</td>
<td>862</td>
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<tr>
<td><strong>Tier 3 (per bay)</strong></td>
<td>Three transects with associated samples</td>
<td>$23,362</td>
<td>471</td>
<td>$31,310</td>
<td>653</td>
<td>$54,672</td>
<td>1,124</td>
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<table>
<thead>
<tr>
<th>Expense type</th>
<th>Description</th>
<th>Set-up</th>
<th>Operating</th>
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<td>Personnel</td>
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<td>82%</td>
<td>79%</td>
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<td>Travel</td>
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<td>1%</td>
<td>12%</td>
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<td>Supply-equipment-maintenance</td>
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<tr>
<td>Contract lab</td>
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<td>5%</td>
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<td>Misc expenses</td>
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<tr>
<td>Total</td>
<td></td>
<td>100%</td>
<td>101%</td>
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Why Now?

• Monitoring plan developed by Dunton and Pulich (2007, 2011)
• Efforts by TCEQ/TPWD, Dunton and others to test protocols
• Is it time to start a statewide seagrass monitoring program in Texas?
Seagrass vs Algae

- Root structure
- Vascular tissue to transport food and water
- Seeds create new plants

- No root structure
- No vascular tissue
- Spores create new plants
Thalassia testudinum
Turtle Grass

- A climax species in deeper waters
- Slow growing and slow recovery from stress/disturbance
- Grazed on by sea turtles, fish and invertebrates
- Leaves are flat and linear (strap-like)
Syringodium filiforme / Cymodoceoa filiformis
Manatee Grass

- Climax seagrass, dense beds
- Deeper waters
- Grazed on by sea turtles
- Cylindrical leaves
Ruppia maritima
Widgeon Grass

- Grazed on by ducks
- Grows in low and high salinity
- Not a “true” seagrass
- Thread-like and alternate leaves with a pointed tip

Pointed tip

Rhizome

Root

very narrow leaves

yellow flowers

often, branched shoots at a nodes

pointed tip
Invader species found as understory for shoal grass (*Halodule*) and manatee grass (*Cymodocea/Syringodium*).

- Leaves are long and elliptical and have fine spikes on the leaves.
## State Monitoring Program Options

<table>
<thead>
<tr>
<th>Monitoring program components</th>
<th>Base</th>
<th>Fundamental</th>
<th>Optimal</th>
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<tbody>
<tr>
<td>Tier 2 coastwide</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Tier 2 bay-scale</td>
<td>No</td>
<td>2 bays</td>
<td>8 bays</td>
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<tr>
<td>Tier 3 bay-scale</td>
<td>No</td>
<td>2 bays</td>
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<td>Estimated annual operating cost</td>
<td>$45,000</td>
<td>$127,000</td>
<td>$375,000</td>
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Seagrass Conservation in Texas

1994 – Developed “Boating and Seagrasses” pamphlet
1996 – Seagrass Symposium
1999 – Seagrass Conservation Plan for Texas (SCPT)
2000 – Seagrass included as aquatic life use in WQS Redfish Bay State Scientific Area (RBSSA);
        Created voluntary no-prop zones
2003 – Seagrass Monitoring Program Strategic Plan
2003 – Seagrass Monitoring Work Group established
2005 – RBSSA designation renewed
2006 – RBSSA no-uprooting regulation
2009 – 2nd Seagrass Symposium, update SCPT
2013 – HB 3279 no-uprooting legislation
Phase 2

Task: Develop and implement a coastwide monitoring protocol

- In line with current scientific thinking (tiered structure, probabilistic, ...)
- Meets state QA requirements
- Can be implemented with existing resources

Protocol design

- Tier 2 – seagrass percent coverage and canopy height by species
  - Coastwide
  - Bay-scale
- Tier 3 – transect-based intensive sampling in bays
Final Seagrass Recommendations (9)

• Develop statewide seagrass protection regulation
  – Highest priority recommendation
  – Near unanimous agreement for a regulation
  – Resolution in support passed by a 7 - 4 vote
    • Concern over sentence regarding TPWD’s continued ability to create SSA’s
  – Would require legislative action