Inventory and Mapping of On-Site Sewage Facilities (OSSF) in the Coastal Areas of Texas: Methodologies and Challenges

Gabriele Bonaiti - Texas A&M AgriLife Extension
Outline

1) Why a Coastal Zone OSSF geodatabase
2) Coastal Zone OSSF Inventory (COSSI) method
3) Refinements for inventory continuous update
4) Applications in Texas
1) Goal: Protect Texas Rivers, Lakes, and Bays

Credit: TCEQ
Goal: Avoid Failing Systems
Coastal NPS Pollution Control Program

• Why?
  • Section 6217 of the Coastal Zone Act Reauthorization Amendments of the CZMA in 1990 requires states with federally approved Coastal Management Programs to develop and implement a Coastal NPS Pollution Control Program.

• Who approves?
  • NOAA and EPA

• What?
  • Develop & implement management measures/practices to control NPS

• When?
  • June 2019
Federal Mandate

• “To ascertain whether OSSFs in Coastal Zone are failing”
• Timeframe = 15 years
• Good News - Many inspections are already being done under existing practices of local Authorized Agents and the Real Estate Community
  • Projected inspections over the next 15 years have been calculated based on these existing practices
OSSF Inspections and Maintenance Tracking

- Texas AgriLife Extension is updating annually
- Much of this is already being done under existing practices of local Authorized Agents and the Real Estate Community

<table>
<thead>
<tr>
<th>Strategy to obtain inspections</th>
<th>15-year Projection</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authorized Agent Inspections</td>
<td>6,240</td>
<td>Based on totals for previous years</td>
</tr>
<tr>
<td>Required Maintenance Inspections Reported toAuthorized Agents</td>
<td>4,908</td>
<td>Based on totals for previous years</td>
</tr>
<tr>
<td>Watershed Based Plan (WBP) Inspections</td>
<td>17,288</td>
<td></td>
</tr>
<tr>
<td>Point-of-Sale Real Estate Inspections</td>
<td>20,805</td>
<td>Based on totals for previous years</td>
</tr>
<tr>
<td>Direct Contracting for Inspections</td>
<td>1,200</td>
<td></td>
</tr>
<tr>
<td>OSSF Education and Outreach</td>
<td>150</td>
<td></td>
</tr>
</tbody>
</table>

Credit: TCEQ
Completed OSSF Inventories
2) Coastal Zone OSSF Inventory (COSSI)

- Challenging local conditions
- Other similar projects in Texas:
  - Houston-Galveston Area Council (H-GAC)
  - Buck Creek watershed (Gregory et al., 2013): “A combination approach is recommended”
  - Other counties and watersheds
Amendment No.2 to Contract No. 582-13-30051, Coastal Zone Act Reauthorization Amendments (CZARA) On-Site Sewage Facility (OSSF) Training, Reconnaissance, and Replacement Project: (FY16) Develop and implement a method to produce an inventory of OSSF systems in selected counties of the Coastal Zone of TX

“Information is not easily available”

Contracts (FY17-19): “…Implement and maintain Inventory for the entire Coastal Zone…”
- Highlighted: Phase I (Amendment)
- Other counties: Phases II, II, IV
Coastal Zone Management Act (1972) Boundary

- Defined by the **individual states and territories**
- Direct and significant **impact** on coastal waters
- **Texas** Coastal Management Program (CMP):
  - “Coastal facility designation line”: Oil Spill Prevention and Response Act of 1991
    + Wetlands landward (one mile)
  - Roughly follows roads that are parallel to coastal waters and wetlands generally within one mile of tidal rivers
Steps

1) Gather information and **geolocate OSSF permits** (Authorized Agents, 911 address, legal description)

2) Determine **Sewer Service Areas** (Authorized Agents, service providers information, CCN, city limits)

3) Estimate **non-permitted OSSF** outside Service Areas (911 address, appraisal parcels, satellite) – **NOTE**: Could include OSSF permits (not received from AAs, not identified address/parcel)

4) Estimate systems **categories and attributes**:
   - With/without permit
   - System Type: Aerobic/Conventional (permit, parcel built date)
   - Year installed (permit, parcel built date)
Challenges

- **Permits**: missing/incomplete location, format, date, type
- **Sewer service area**: many providers, boundary/line/list, format
- **911 address points**: location, missing points, type
- **Appraisal district parcel**: incomplete, format
- **Aerial imagery**: varies (3D, street view, year)
Step 1) OSSF permits overview

- **Historic steps:**
  - **<1989** no statewide guidance for installing OSSFs;
  - **1997 rules** for site evaluation and wastewater treatment;
  - **2008 maintenance** of advanced treatment units

- **Locally regulated:** Authorized Agents collect data, and can set more stringent rules

- **TCEQ On-site Activity Reporting System (OARS):**
  - Monthly reports (count, type)
  - Aerobic systems: >40% (1999), >55% (2016)
Trend in System Types…

54,694 (1999)

This information was compiled from OARS data from TCEQ.
Number of OSSFs in TX then and now...

This information was compiled from 1990 Census data and OARS data from TCEQ.
Visits: key step (example: Jackson County)
Step 2) Sewer service area challenges

Sewer line as PDF

Estimated boundary
In sewer service area?
Geolocate one by one
(example: Bolivar peninsula, Galveston)
Number of providers (Galveston County)
Step 3) Non-permitted OSSF (parcels, 911 address points, satellite)

Verify and in case delete point (one/parcel)
Excluded?
Step 4) Categories/Attributes

- **Estimated OSSF**
  - *Without permit* outside SA
  - *With Permit*
    - Outside SA
    - Inside SA
      - Service is “Available”
      - Service is “Mandatory”
      - In approximate location
## Attributes (method)

Table 1. Description of classes used to identify or infer system age and type

<table>
<thead>
<tr>
<th>Flag</th>
<th>Category Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>there is one or more permits and permit date is available; use permit year (note: if there are overlapping permits, use most recent one among all sources [e.g. DR and/or TCEQ Region]);</td>
</tr>
<tr>
<td>2</td>
<td>there is one or more permits and no permit date is available but built year is available; use built year (note: if there are overlapping parcels, use oldest one)</td>
</tr>
<tr>
<td>3</td>
<td>there is no permit and built year is available; use built year</td>
</tr>
<tr>
<td>4</td>
<td>there is one or more permits but nor permit date nor built date is available; enter 0</td>
</tr>
<tr>
<td>5</td>
<td>there is no permits and no built year is available; enter 0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>System Type</th>
<th>System Year</th>
<th>Category Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>there is one or more permits, and type for permit is available (“most recent permit”, in case of overlapping permits; if a permit has same year and different type, investigate source in detail to decide); enter permit type</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>there is one or more permits, and type for permit is not available (“most recent permit”, in case of overlapping permits), but permit date for the permit is available; if permit year (most recent) is &lt;=1989, then enter conventional, if permit year is &gt;=1990, then enter N/A</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>there is one or more permits, and type for permit is not available nor permit date (“most recent permit”, in case of overlapping permits), but building date is available; if built year (oldest) is &lt;=1989, then enter conventional, if built year is &gt;=1990, then enter N/A. <strong>NOTE</strong>: in case maintenance contract details are available for all records, enter aerobic if there is a maintenance contract date OR an installer brand name, and conventional in all other cases</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>there is one or more permits, and type for permit is not available, nor permit or building date; enter N/A</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>there is no permit, but building date is available; if built year (oldest) is &lt;=1989, then enter conventional, if built year is &gt;=1990, enter N/A</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>there is no permit nor building date; enter N/A</td>
</tr>
</tbody>
</table>
Estimated OSSF as of 8/2017: 63,374
Additional tasks - Information

- Domestic waste data collected by the Texas Department of State Health Services
- Census population and housing 2010
- TCEQ On-Site Activity Reporting System (OARS) data
- 100 year floodplain data
- USDA NRCS SSURGO soil data
- HUC-12 watershed boundaries
- Stream segments, assessment units, and impairment status
- WPPs and TMDLs/I-Plans boundaries
- MS4 jurisdictions
Additional tasks - Analysis

확히 (must include all):
1) Single family
2) Density \( \leq \) one OSSF/20 acres
3) \( \geq 1,250 \) feet from a surface water

“Risk of system failure may be high” map

<table>
<thead>
<tr>
<th>risk</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>high seasonal wt and class IV soil</td>
</tr>
<tr>
<td>2</td>
<td>high seasonal wt only</td>
</tr>
<tr>
<td>3</td>
<td>class IV soil only</td>
</tr>
</tbody>
</table>
3) Refinements to update COSSI

A. Update
B. Develop/maintain an OSSF History Tracking Table
   - Update count of inspections needed
(A) Update inventory annually

- Sewer areas
- OSSF systems validation
- OSSF permits automated data entry
- Deliver geodatabase and maps:
  - Master OSSF layer with **One point/records for an OSSF** (ID) + Filter/export maps
  - Related permit tables with **multiple points/records for an OSSF**
Semi-automated OSSF permit data entry

**AA shares permit data with AgriLife:**
- Consistent format (e.g. agreed Excel format or database export)
- Periodical sharing (permit number, location, type, inspections; daily/quarterly)
- Consider XY coordinates (measure/validate)

**AgriLife supports AA:**
- Conversion of archived data into electronic format
- Updated interactive online maps (including mobile web applications)
- Education
  - Guidance material to data management/sharing
  - Training sessions with Authorized Agents and Maintenance Providers (CEUs)
- Materials (GPS hand held devices, software license)
Updated interactive online maps

OSSF permit location for the Galveston County (6/2018-1/2019):
Red = automatic location before correction; Green = corrected position.
Mobile application for field work

Find Map

Open Map

Zoom to area

Turn on/off layers
Select feature

Edit attributes/location

Add new feature

Add attachments
Guide

“...

- Working with GPS handheld receiver
  - Set up GPS …
  - Use GPS …”
Local Authorized Agent OSSF Database/Software
(B) OSSF History Tracking Table

- **Inspections** (existing practices Authorized Agents and Real Estate Community)

- **Update OSSF History Tracking Table:**
  1. Contractor inspection
  2. Maintenance (contractor, owner)
  3. New or revised permit for existing OSSF
  4. Site Visit (AA or TCEQ)
  5. Decommissioned (sewer extensions, connected to existing sewer service)
  6. Removed error

- **Identify** “Inspected/Removed since 2017” (NOTE: inspections >=2015 only)

- **Update inspections needed count:** 63,374 (FY2017) – Inspected/Removed since 2017
4) Applications in Texas

- The Texas Water Resources Institute (TWRI) and The University of Texas Rio Grande Valley (UTRGV) are expanding the inventory beyond the coastal zone for the Arroyo Colorado and Brownsville Ship Channel watersheds.

- The inventory will serve as a supporting tool in the development of the Brownsville Ship Channel Watershed Protection Plan (WPP) and the implementation of the Arroyo Colorado WPP.
OSSF Inventory in Lampasas Watershed

- Based on the methodology created for the Texas Coastal Zone
- Help implement the Lampasas River Watershed Protection Plan, a stakeholder developed plan to address bacteria in the Lampasas River and its tributaries
Seven counties
- Estimated OSSFs: 11,255
- Geolocated permits (average): 93%
- Type (aerobic or conventional): 69% of points
- Year of installation: 57% of points
Questions?! 

- Gabriele Bonaiti 
- BAEN Department 
- Extension Program Specialist 
- Office (979) 862-2593 
- Cell. (979) 922-4991 
- email: g.bonaiti@tamu.edu