DECENTRALIZED AND ONSITE WASTEWATER MANAGEMENT ISSUES OF SMALL COMMUNITIES IN THE JOURDAN RIVER WATERSHED, MISSISSIPPI

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OVERVIEW

- Area of Interest – Jourdan River Watershed
- Nutrient issues in Mississippi’s coastal waters and their implications
- What is causing these issues?
- Septic systems – conventional and alternative
- Identify decentralized communities in the Jourdan River watershed
JOURDAN RIVER WATERSHED

- Discharges into Bay St. Louis
- Falls within Hancock County, MS
- Classified as Recreational Waters
- Part of the Citronelle Aquifer

Bay St. Louis
COASTAL RECREATIONAL WATERS

MDEQ *State of Mississippi Water Quality Criteria for Intrastate, Interstate, and Coastal Waters*

- **EPA Standards**
  - TDS = 1500 mg/L (freshwater streams)
  - Iron = 1 mg/L
  - pH = 6.5 – 9.0
  - Nitrate = 10 mg/L
Total Dissolved Solids

- Standard = 1500 mg/L
- Range = 12 mg/L to 1690 mg/L
- Median value = 50 mg/L
NUTRIENT ISSUES IN THE COASTAL WATERS

Iron

- Standard = 1 mg/L
- Range = <0.010 mg/L to 2.5 mg/L
- Median value = 0.020 mg/L
- **Determine source**
NUTRIENT ISSUES IN THE COASTAL WATERS

**pH**

- Standard = 6.5 – 9.0
- The pH levels in the Citronelle Aquifer rarely exceed 5.5.
- Range = 4.1 to 10.3
- Median value = 5.4
- **Determine source/reprocussions**
Nitrate

- Standard = 10 mg/L
- Range = 0.01 mg/L to 37 mg/L
- Median value = 1.5 mg/L
- Mostly coming from failing onsite systems
- Could contribute to hypoxia in the Gulf
## On-Site Treatment Units Within the Gulf Region

<table>
<thead>
<tr>
<th>County</th>
<th>No. of Housing Units</th>
<th>No. of On-Site Treatment Units</th>
<th>Estimated Failing Units</th>
<th>Percentage of Total Failing Units</th>
<th>Estimated Flow from Failing Units (MGD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>George</td>
<td>7649</td>
<td>6597</td>
<td>990</td>
<td>2.67%</td>
<td>0.196</td>
</tr>
<tr>
<td>Hancock</td>
<td>22363</td>
<td>12020</td>
<td>7212</td>
<td>19.45%</td>
<td>1.428</td>
</tr>
<tr>
<td>Harrison</td>
<td>83631</td>
<td>24019</td>
<td>9608</td>
<td>25.91%</td>
<td>1.902</td>
</tr>
<tr>
<td>Jackson</td>
<td>54035</td>
<td>22664</td>
<td>11332</td>
<td>30.56%</td>
<td>2.244</td>
</tr>
<tr>
<td>Pearl River</td>
<td>21457</td>
<td>15953</td>
<td>6381</td>
<td>17.21%</td>
<td>1.263</td>
</tr>
<tr>
<td>Stone</td>
<td>5445</td>
<td>3899</td>
<td>1560</td>
<td>4.21%</td>
<td>0.309</td>
</tr>
</tbody>
</table>
WHY ARE THEY FAILING?

- Improper maintenance
- Unsuitable soil
  - “Approximately two-thirds of all land area in the U.S. is estimated to be unsuitable for the installation of septic systems.”
WHAT DOES THIS MEAN?

- Untreated, or improperly treated, sewage is being discharged into groundwater and streams.
  - Water quality issues
  - Health issues
ON-SITE TREATMENT SYSTEMS

- Conventional Septic System
  - Gravity System
  - Pressure Distribution System
- Alternative Septic Systems
  - Aerobic Treatment Systems
    - Intermittent Sand Filter Systems
    - Recirculating Sand Filter Systems
CONVENTIONAL SEPTIC SYSTEM with Absorption Field

- Typical treatment levels
  - BOD5 = 10 mg/L
  - TSS = 10 mg/L
  - Fecal coliforms = usually less than 200 per 100mL
  - Doesn’t allow for nitrogen removal without additional treatment

- Cost
  - System and installation: $1,500 - $4,000
  - Operation and maintenance: $250 - $550 per year
AEROBIC TREATMENT SYSTEMS

- Mirror many of the steps and activities performed by municipal sewage plants
- Similar to a conventional septic treatment system, but aerobic systems inject oxygen into the tank
- Oxygen increases bacterial growth and consumption of waste
- Most systems include a pretreatment tank and a final treatment tank where chlorine is used instead of sending the effluent to a drainfield for the soil to filter.
- After the final treatment tank, the effluent can acceptably be directly discharged via sprinklers over the drainfield.
  - Good option for landowners who don’t want to clear trees
  - Good alternative for homeowners on lots close to a body of water that might be polluted through the use of a conventional septic system with a drainfield
SAND FILTER SYSTEMS

Intermittent Sand Filters

- Typical treatment levels
  - \( \text{BOD}_5 = 95\% \) removal
  - TSS = 85\% removal
  - Nitrification of 80\%+ of the applied ammonia

Recirculating Sand Filters

- Typical treatment levels
  - \( \text{BOD}_5 = 95\% \) removal
  - TSS = 95\% removal
  - Almost complete nitrification is achieved
  - Denitrification has also been shown to occur
    - “Depending on modifications in design and operation, 50% or more of the applied nitrogen can be removed.”
### SAND FILTER SYSTEMS

#### Intermittent Sand Filters

- After initial costs, yearly cost = $150 + Power

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Costs</td>
<td></td>
</tr>
<tr>
<td>Construction costs, 1,500-gallon single compartment septic/pump tank @ 57 cents/gallon</td>
<td>850</td>
</tr>
<tr>
<td>ISF complete equipment package (includes duel simplex panel, pump pkg., tank risers, lids, liner, lateral kit, orifice shields, etc.)</td>
<td>3,200</td>
</tr>
<tr>
<td>Non-component costs</td>
<td>750</td>
</tr>
<tr>
<td>Engineering (includes soils evaluation, siting, design submittal, and construction inspections)</td>
<td>2,000</td>
</tr>
<tr>
<td>Contingencies (includes permit fees)</td>
<td>1,000</td>
</tr>
<tr>
<td>Land</td>
<td>May vary</td>
</tr>
<tr>
<td>Total Capital Costs</td>
<td>10,800</td>
</tr>
</tbody>
</table>

#### Recirculating Sand Filters

- After initial costs, yearly cost = $300 + Power

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost ($)</th>
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</thead>
<tbody>
<tr>
<td>Capital Costs</td>
<td></td>
</tr>
<tr>
<td>Construction costs</td>
<td></td>
</tr>
<tr>
<td>Pretreatment</td>
<td>May vary</td>
</tr>
<tr>
<td>Recirculation tank and pumping system</td>
<td>10,000</td>
</tr>
<tr>
<td>Sand filter</td>
<td>10,000</td>
</tr>
<tr>
<td>Non-component costs</td>
<td>May vary</td>
</tr>
<tr>
<td>Engineering</td>
<td>3,000</td>
</tr>
<tr>
<td>Contingencies</td>
<td>3,000</td>
</tr>
<tr>
<td>Land</td>
<td>May vary</td>
</tr>
<tr>
<td>Total Capital Costs</td>
<td>26,000</td>
</tr>
</tbody>
</table>

#### Annual O&M Costs

<table>
<thead>
<tr>
<th>Item</th>
<th>Sand¹</th>
<th>Black Beauty Sand²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor</td>
<td>20/hr</td>
<td>20/hr</td>
</tr>
<tr>
<td>Power</td>
<td>May vary</td>
<td>May vary</td>
</tr>
<tr>
<td>Sludge disposal</td>
<td>50/yr²</td>
<td>50/yr²</td>
</tr>
</tbody>
</table>
CONTINUING THE STUDY

- What is causing the failures of these on-site systems?
- We are looking more into this.
- Find specific small communities with failing systems contributing to the issues in the Jourdan River Watershed
- Help them come up with unique solutions
- Find data specific to the Jourdan River Watershed
- Can you help us?