Management of Distributed Wastewater Systems in Tennessee

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Decentralized Systems?

- Since the 1980s, thousands of Tennessee Decentralized Systems collect, treat, and/or disperse or reclaim wastewater from
  - Individual dwellings
  - Individual businesses
  - Clustered properties
  - Small communities

Distributed Systems?

- Any single decentralized system serving more than one property owner is a Distributed System
  - Any decentralized system in a more sensitive environment
  - Mechanical, biological treatment followed by effluent drip dispersal
  - Managed by a Responsible Management Entity (RME)

- Some alternative collection systems discharging to municipal systems

Facilities Served

Overnight Rental Communities

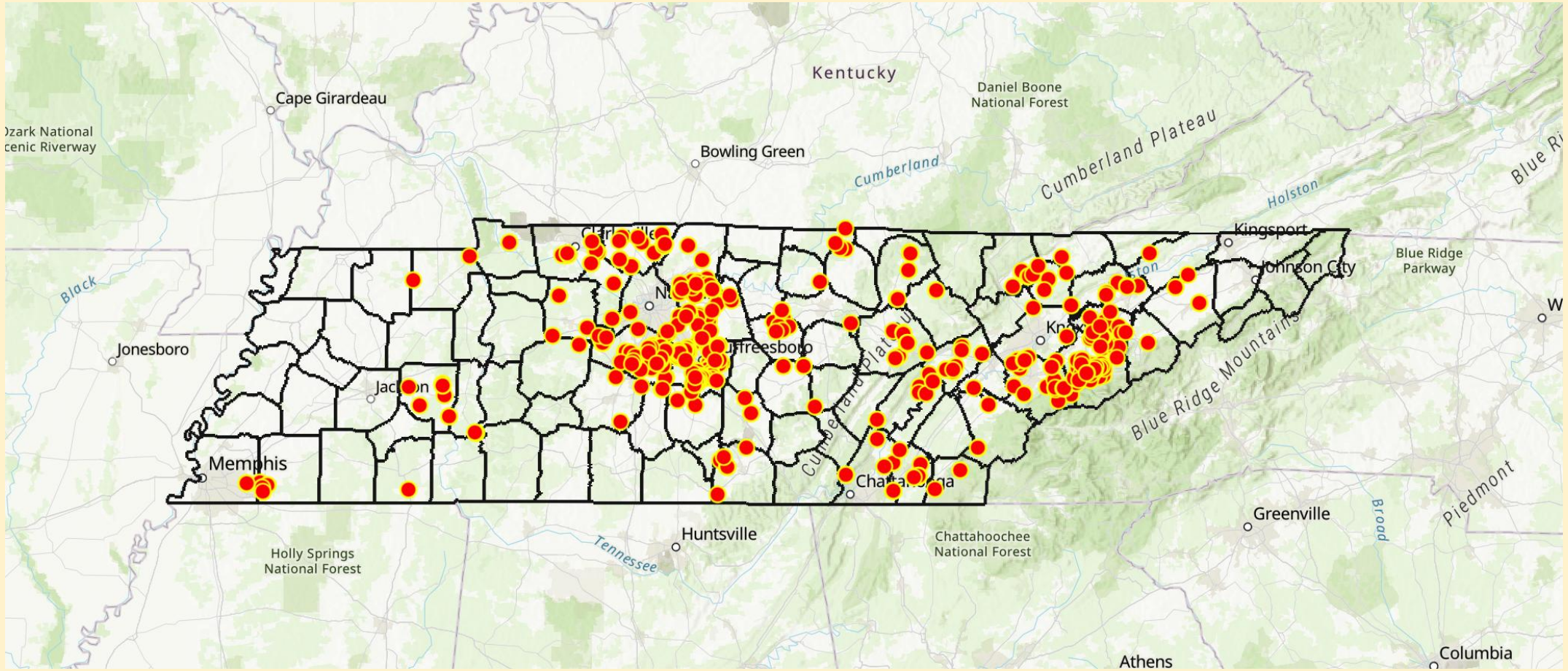
Subdivisions

Commercial Establishments

Tennessee Decentralized Wastewater Systems

- Tens of thousands of decentralized systems
- 374 distributed collection, treatment, dispersal systems
- Some advanced treatment/drip systems serving individual properties
- Several distributed collection systems

Distribution of Land Application Systems Utilizing Drip Dispersal in Tennessee (TDEC 2024)



Tennessee Drip Systems

- West Tennessee - Subdivisions, State Parks, Campgrounds
- Middle Tennessee - Subdivisions, Camps, Businesses
- East Tennessee – Overnight Cabin Rental Communities, Subdivisions
- All permitted as non-discharge State Operating Permits (SOPs)

Management of Wastewater Systems

- As important, if not more so, than design and construction
  - Poor management can kill performance of the best designed/built system
  - Excellent management can salvage systems with design/construction flaws
  - More complex systems demand higher levels of management

Tennessee Management Entities

- The emergence of the distributed system paradigm (1980s)
  - Development of advanced treatment systems followed by drip
  - Explosive growth of rural subdivisions utilizing these systems
  - Tennessee Public Utility Commission begins regulating non-municipal distributed systems as privately owned Public Utilities

Tennessee Governmental Utility Entities

- Many governmental entities adopt decentralized/distributed technology
  - Municipal utility departments
  - Water & Wastewater Authorities
  - County and multi-county utility districts
  - Sanitary Districts

- Organized
  - Funded, regulated, and managed similar to municipal systems

EPA Recommended Management Guidelines

- Released March 2003
  - Voluntary National Guidelines for Management of Onsite and Clustered (Decentralized) Wastewater Treatment Systems
  - Created five management models in ascending order based on threats to sensitive environments
  - From individual conventional septic systems serving single properties to complicated mechanical/biological systems in highly sensitive environments

Low to Medium Risk Systems

- Model I - Homeowner Awareness
  - Property owner has total liability for system performance
- Model II - Maintenance Contracts
  - Contractual risk and performance liability on property owner and contractor
- Model III – Operating Permits
  - Specific O&M and performance requirements
  - Increased regulatory attention

High Risk Systems

- Model IV - Responsible Management Entity (RME) O&M
  - Operating permit issued to contracted RME
  - Tight regulatory review and control of permit requirements
  - O&M manuals required of RME
  - Both RME and system owner liable for performance and O&M

High Risk Systems

- Model V – RME Ownership of System
  - RME has complete liability for system design, construction, and operation
  - System design and construction funding by developer
  - O&M funding by user fees
- In most states, a public utility is any entity that overs utility services to the public for a fee.
  - Model V entity is and MUST be a public utility

Evolvement of Management Requirements

- Prior to 1990s, septic tank permits and TNPDES permits
  - Limited O&M and regulatory enforcement
- Experiments with soaker hose to distribute treated effluent
  - TN septic regulators would not approve
  - Deputy Commissioner releases 7.5” depth policy
- TN Law required any entity providing sewer service for a fee be a public utility

Tennessee Drip System Performance Study

- TDEC (TN Dept of Env and Conservation) announces inspection survey in December 2023
  - 374 government and privately owned treatment/drip systems to be inspected in first week or two of January 2024.
  - The goal was to obtain insight on the hydraulic performance of the soil profile component of these systems.
    - (Presenter and others think goal was to prove to legislature need for rigid design regulations.)

Primary Product of Drip Inspections

- TDEC 2024 Drip Dispersal Performance Report
  - Available on TDEC website
    https://www.tn.gov/content/dam/tn/environment/water/land-based-systems-unit/wr_lbs_report-performance-of-wastewater-systems-utilizing-drip-dispersal-tn.pdf
  - Data set difference with spreadsheet
- Inspection Spreadsheet
  - Not publicly available
    - 510 inspections, many repeat or followup inspections
    - Data not consistent with report due to different structure

TDEC Report Findings

Description	Discrete Systems	Drip Zones
Not installed or non-operational	14 (3.7% of permitted systems)	14 (3.3% of permitted zones)
Discharge from treatment or infrastructure (not to drip)	41 (11.4% of operating systems only)	43 (10.6% of installed zones)
Total	**55 (41 operating treatment systems)**	**57 (0 operating drip zones)**
No Malfunction	177 (49.2% of operating systems only)	205 (56.5% of operating zones)
Zones with localized malfunctions	77 (21.4% of operating systems only	87 (24.0% of operating zones)
Zones with extensive ponding or overland flow	53 (14.7% of operating systems only)	57 (15.7% of operating zones)
Zones overgrown/not accessible	12 (3.3% of operating systems only)	14 (3.9% of operating zones)
Total	**319 operating treatment systems**	**363 operating drip zones**
Grand Total	**374 (360 operating treatment systems)**	**420 (363 operating drip zones)**

Modified from *Report on the Performance of Wastewater Systems Utilizing Drip Dispersal in Tennessee – June 7, 2024*

2024 TDEC Drip Survey Report

- 374 permitted facilities with 420 drip zones in sample
  - 14 systems with 14 drip zones not installed or were not in operation
  - 41 systems bypassing 43 drip zones from treatment or other infrastructure
- 360 discrete facilities surveyed utilizing 363 operating drip zones

Report Findings

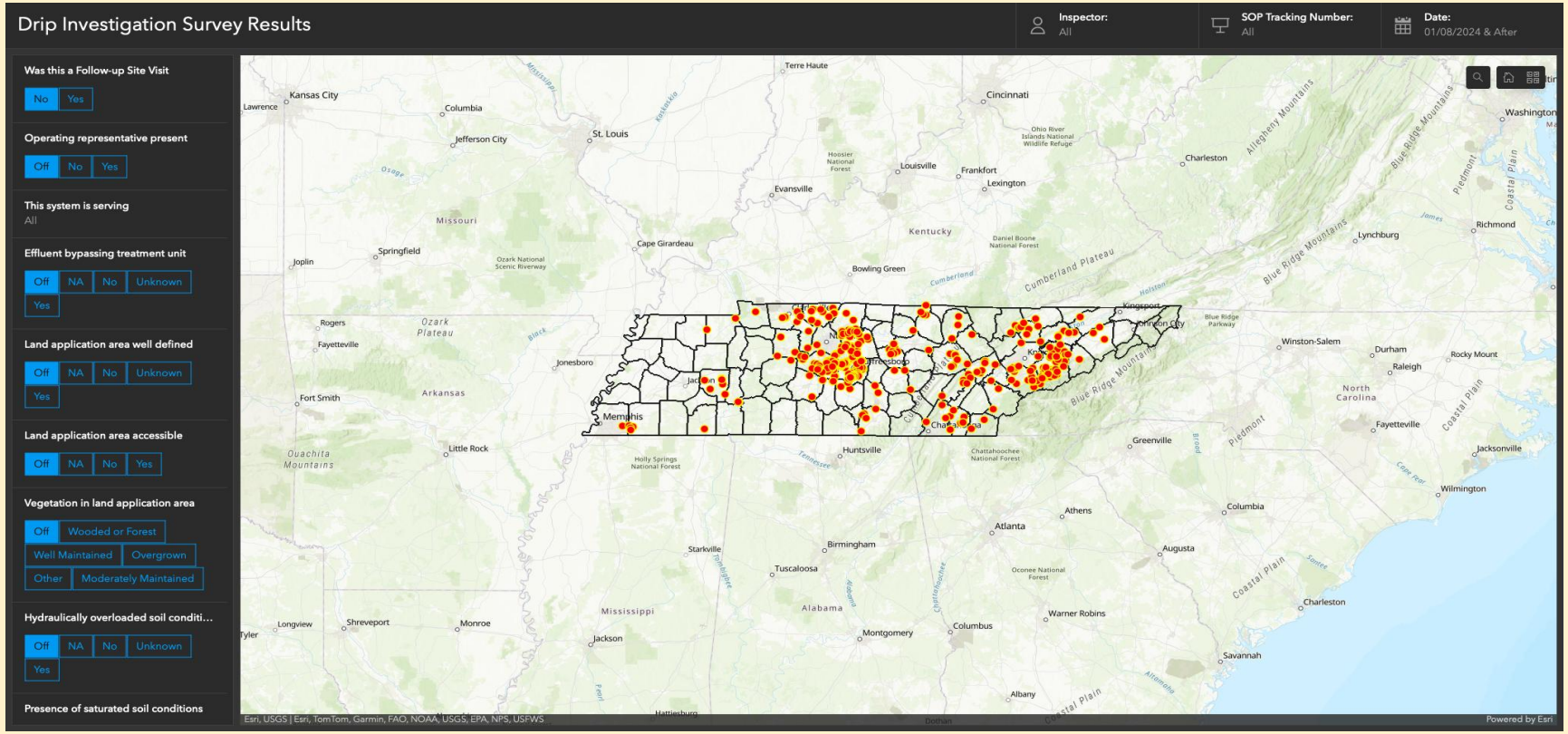
- No malfunctions at 49.2% of facilities and 56.5% of drip zones.
- Localized (minor?) malfunctions at 21.4% of facilities and 24% of drip zones.
- Extensive ponding at 14.7% of facilities and 15.7% of drip zones.
- Zones overgrown or not accessible at 3.3% of facilities and 3.9% of drip zones.
    - TDEC historically violates any drip zone with ponding not associated with rainfall.

Secondary Product of Drip Inspections

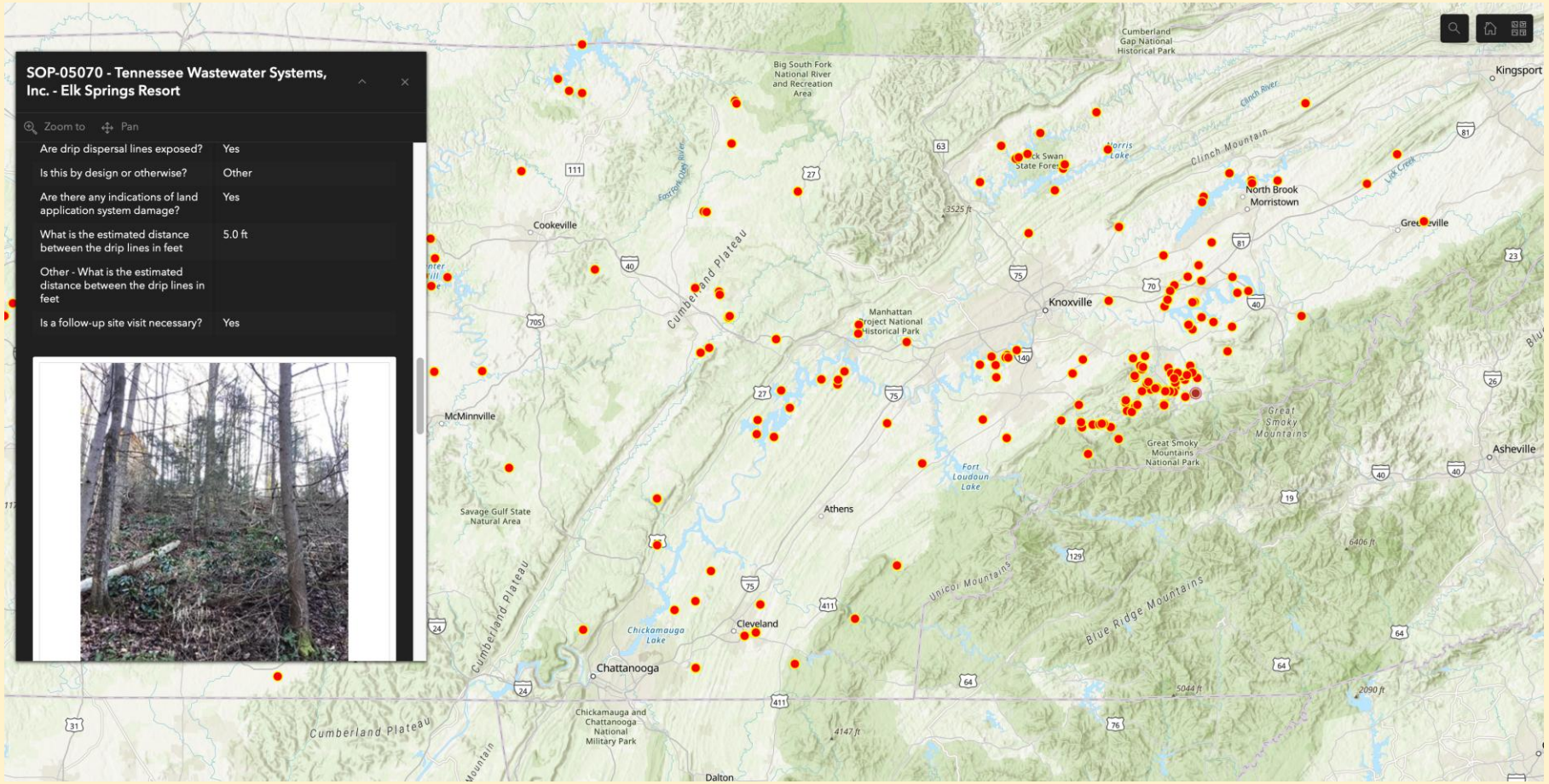
- Inspection Spreadsheet
  - Not publicly available
    - 510 inspections, many repeat or followup inspections
    - Data not consistent with report due to different structure

Product of Drip Inspections

- Drip Investigation survey results dashboard
  - https://www.arcgis.com/apps/dashboards/c83fa34306ce4283b6cdec1f8e35259a



Interactive ARCGIS Information



Summation of Inspection Spreadsheet Data

Owner	Hydraulic Overload	Soil Saturated	Ponding	Long Term Ponding	Large Area Ponded	Overland Flow	Effluent Left Site
Utility	188	172	165	104	98	89	57
Private	24	25	22	16	11	16	6
Totals	212	197	187	120	109	106	63
% of Inspected	41.6%	38.6%	36.7%	23.6%	21.4%	20.8%	12.4%

Data From TDEC Inspection Report Spreadsheet

Conclusions from TDEC Inspection Study

1. Influent flows and resulting arial loading rates were not measured but would be necessary to adequately evaluate performance of soil-based systems.

2. Most drip zones were operated without malfunction significant enough to result in treated effluent leaving the drip site.

3. Considerable improvement in both operation and maintenance would significantly lower the infrastructure malfunctions resulting in ponding on drip zones.

Conclusions from TDEC Inspection Study

1. Government and private utility owned systems experience significantly higher malfunctions than systems owned by individuals, schools, businesses, etc.

2. The study demonstrated no design flaws related to soil loading or operating characteristics nor was the study designed to do so.

3. Ponding and/or overland flow were not sufficient indicators that offsite pollution would occur, although it would be expected that diluted secondary quality effluent would leave the site during rainfall events sufficient to cause runoff.

2024 TDEC Drip Study Websites

- TDEC 2024 Drip Dispersal Performance Report
  - https://www.tn.gov/content/dam/tn/environment/water/land-based-systems-unit/wr_lbs_report-performance-of-wastewater-systems-utilizing-drip-dispersal-tn.pdf
- TDEC 2024 Drip Dispersal Inspection Spreadsheet
  - Not available on website
- TDEC 2024 Drip Investigation Survey Results Dashboard
  - https://www.arcgis.com/apps/dashboards/c83fa34306ce4283b6cdec1f8e35259a

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