Nature-Based Dark Greywater Treatment for Onsite Reuse: A New Mexico Case Study

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Presentation Overview

Subjects Covered

- Freshwater challenges
  - Groundwater depletion
  - Groundwater contamination
- Nature-based treatment solutions
- Regulatory pathway for novel technologies
- New Mexico: probationary permit for dark greywater reuse
- Preliminary results
- Outcomes, next steps, & broader applications

Photo Credit: Newsweek

The Growing Water Crisis

We are depleting groundwater supply and contaminating what is left

- Southwest US faces extreme drought conditions
- Rate of water use is increasing with population growth and new water demands
- Septic system failure rates reach 50% in many states
- Untreated waste contaminating the remaining groundwater supply
- New Mexico: Unregulated tiny home and off-grid living
- Hawaii: 53 million gallons/day raw sewage from cesspools

Conventional Septic System Challenges

Technical Issues:

- Poor performance in rocky/volcanic soils
- Limited treatment effectiveness
- Susceptible to FOG clogging

Economic Impact

- Replacement costs: $25,000-$60,000
- Extensive excavation required
- Unafforadable for many

Household Wastewater Streams

01

Standard Greywater:

Non-Kitchen Sinks, Baths/Showers, and Laundry.

02

Dark Greywater:

Standard Greywater sources plus kitchen sinks and dishwashers

03

Toilet Waste:

Treatment solutions include, composting, incinerating, and water recycling toilets

04

Combined Blackwater:

Wastewater from the whole home, including toilet waste.

Nature-Based Approach

Advantages for Greywater Reuse

Working with Ecology

Harnesses wetland ecosystem processes and plant-microbe relationships for water purification

The Beauty of Nature

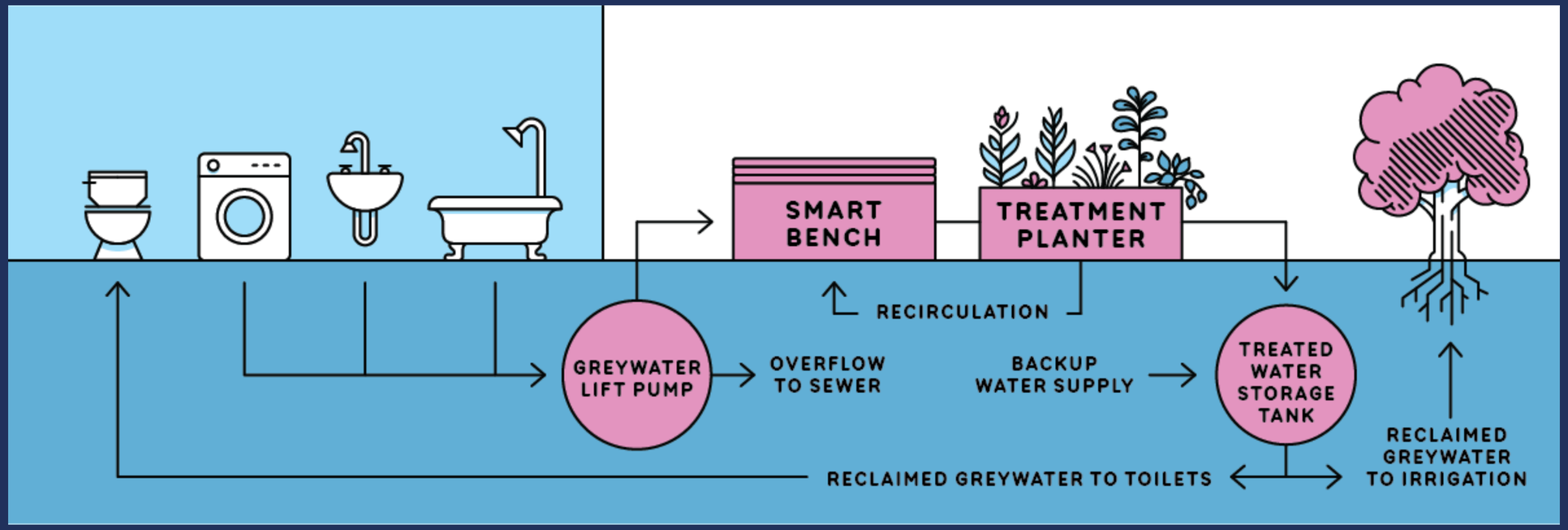
Effecient treatment with diverser biology provides aesthetic benefits

Packaged Water Treatment

Above-ground modular installation means minimal site disruption during installation

Onsite Water Reuse

Greywater Reuse Diagram



System Attributes:

- Max Loading Rate: 50 gpd (single planter)
- Power consumption: <175 kWh annually
- Noise level: <40 dB operation
- WiFi connected monitoring and controls

Oregon Greywater Permit

A Tiered System

“Type 1: Untreated graywater or graywater that has passed through a physical process to remove solids, fats, oils and grease.

Type 2: Graywater that has passed through some type of chemical or biological process, such as a wetland, to further reduce solids and organic matter.

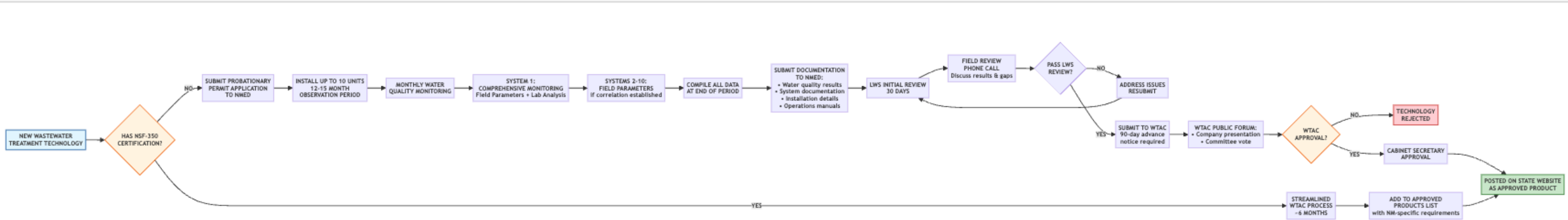
Type 3: Type 2 graywater that is also disinfected.”

Study Objectives

1. Document and demonstrate regulatory pathway for emerging technology in New Mexico

2. Validate dark greywater treatment performance for reuse

3. Show viability for use in sanitaion systems without septic leachfieds



New Mexico Probationary Permit

New Mexico Probationary Permit

1. Submit Permit application
2. 12-15 month observation period with monthly water quality monitoring
3. Compile data at the end of the observation period.
4. Submit Documentation
5. Administrative Review
6. Public Forum
7. Final Administrative Decision
    a. Approval - Listed as approved technology on the state website.
        i. Standard permitting applies.
    b. Non-approval - Not listed as approved technology.

Site One

- New 2,500 sq ft residence on sewer
- Part-time occupancy
- 100 gpd treatment capacity
- 2 planter modules
- Reused for drip irrigation

Site Two

- Existing home on septic
- Kitchen waste only
- 1 planter module
- 50 gpd treatment capacity
- Reused for irrigation

Observation Period Ongoing

Treatment Performance Data

Statistic	Average	Max
Loading Rate (GPD)	19.7	46.5

Statistic	Treatment Standard	Average
CBOD5 (mg/L)	<10	
TSS (mg/L)	<10	
Ecoli With UV	<14	

CUSTOMERS AND TECHNICIANS

Market Entry Metrics

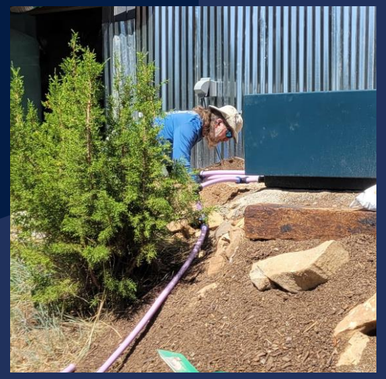
Sales Results

Three completed sales during probationary period, two additional sales pending

User Satisfaction

100% positive response

Cost including installation <$6000 av.



Local Training

One local technician workforce established

Outcomes

Objectives

1. Document and demonstrate regulatory pathway for emerging technology in New Mexico

- Complete

2. Validate dark greywater treatment performance for reuse

- In Progress

projected completion date: 08/31/2026

3. Show viability for use in sanitaion systems without septic leachfieds

- In Progress

projected completion date: 08/31/2026

Cost Analysis

Cost of dark greywater reuse: $6000

MSRP for an incinerating toilet: $3,500

Total Sanitaion Costs: $9,500

Outcomes

Next Steps and Broader Applications

1. Partner with an alternative toilet vendor to demonstrate viability of complete sanitiaotn system without septic.

2. Bring permitting precedents and state data reporting from Oregon and New Mexico to other states, i.e. Hawaii., Alabama.

Opportunity Geographies

- Water-scarce regions
- Challengin soil conditions
- Coastal Areas
- High water table

Opportunity Applications

- Off-grid/rural new construction
- Cesspool and leach field upgrade
- Tiny home

Key Take Aways

Seperating Waste Streams Can Reduce Santiation Treatment Costs

Performance based permitting creates opportunities for innovaiton

Nature-based treatment provides a viable, and desirable solution to onsite sanitation

Pairing novel technologies could create new opportunities for problem sites

Thank You

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