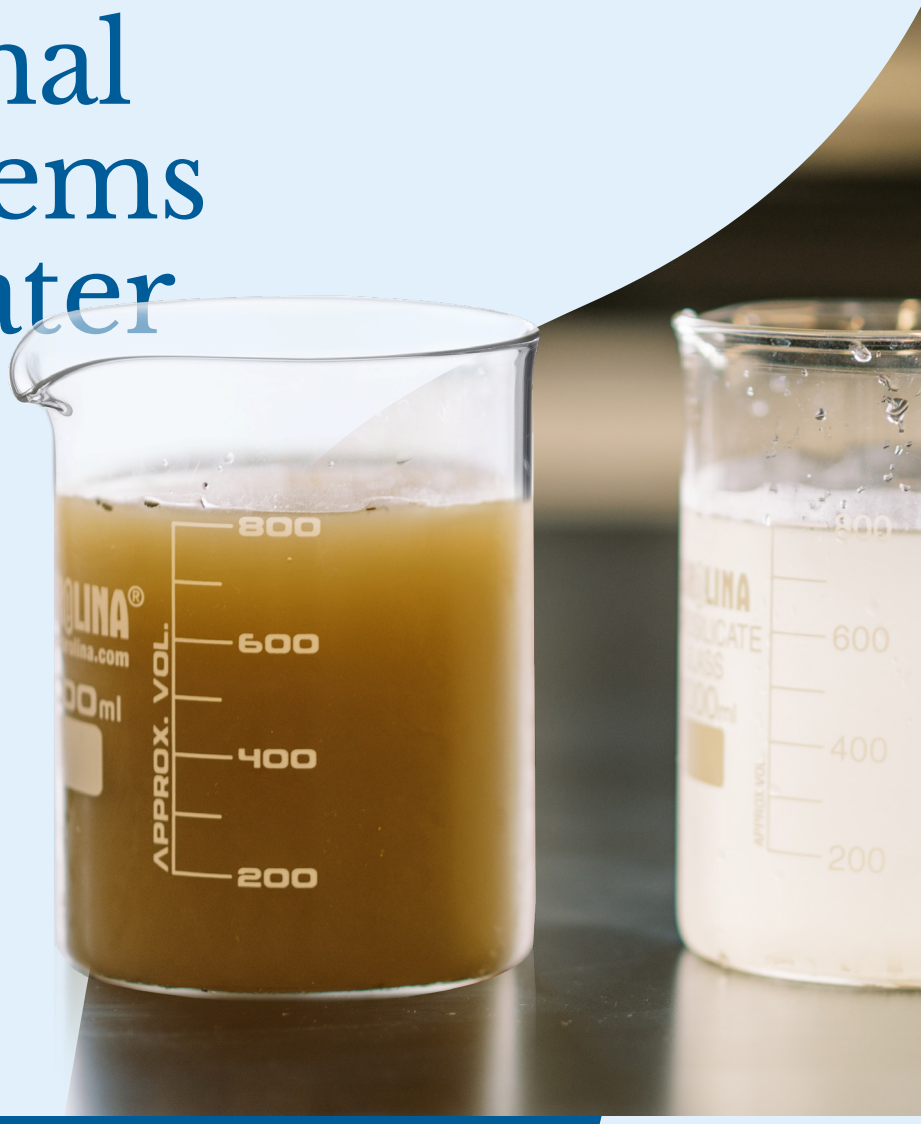
Blanchard River DEMONSTRATION FARMS NETWORK

Conventional Septic Systems *vs.* Wastewater Irrigation Systems



Nitrogen and phosphorus are essential nutrients all living things require. However, an overabundance of these nutrients in both ground and surface water can lead to dense plant and algae growth in lakes and other bodies of water.

In the rural landscape, poorly managed or outdated home septic systems - used to treat human waste and household wastewater - are one of many possible sources that **can result in an overabundance of nutrients such as nitrogen and phosphorus reaching surface water.** In addition, conventional home septic systems are typically not designed to remove phosphorus.

As an alternative, **rural property owners can reduce nutrient discharge through a wastewater irrigation system.** This option allows wastewater to be reused through lawn and landscaping sprayers after the wastewater has been treated and disinfected.

THE POTENTIAL NEGATIVE IMPACTS OF EXCESS N & P

- ✖ Toxins in drinking water
- ✖ Excessive nutrient richness in lakes
- ✖ Harmful algal blooms

RESIDENTIAL PHOSPHORUS SOURCES

- Tap water
- Kitchen sink disposal
- Human waste
- Lawn care fertilizer

Source: "Phosphorus Reduction from Septic Systems" - Mancl & Rowan, FABE, The Ohio State University

BENEFITS OF ONSITE WASTEWATER REUSE

- ✔ Turns wastewater into clear, odorless effluent for reuse as irrigation for lawn and landscape vegetative growth
- ✔ Reduces discharge of nitrogen and phosphorus to groundwater and streams
- ✔ Low cost and low energy

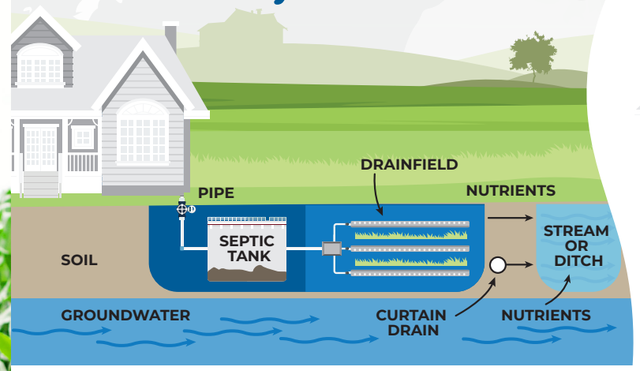
Home Septic System Replacement at *Stateler Family Farms*

Above: Research being done at the Stateler Family Farms demonstration site is helping other farmers and rural families learn about tools and practices they can implement to improve downstream water quality.

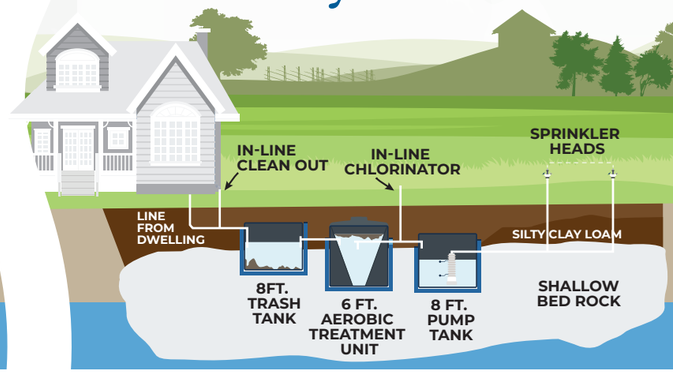
With a nearly 70-year-old septic system in need of replacement, the Statelers had two options: *replace their existing system with a new conventional septic system or install a wastewater irrigation system.*

As traditional systems age, there is the potential for environmental degradation. Even if the Statelers replaced their outdated traditional system with a "new" traditional system, the possibility for excessive phosphorus to escape and impact downstream water quality would still exist. Not to mention that existing site conditions were not conducive to a replacement due to poorly drained soils and lack of appropriate depth to treat the wastewater. As a result, fill dirt would have been needed.

Conventional Septic System



Wastewater Irrigation System



In comparison, a wastewater irrigation system would allow the Statelers to filter wastewater, disinfect pathogens and bacteria with ultraviolet light, and pump the treated wastewater through spray irrigation nozzles onto the landscape to be used by growing vegetation. This system reduces nutrient loss off-site that could potentially impact downstream water quality.

Wastewater irrigation system installation at Stateler Family Farms

From left to right: Filtration tank in which wastewater from the home gets filtered; Disinfection tank where pathogens and bacteria are treated with ultraviolet light; Electrical panel that controls the spray irrigation septic system; Treated wastewater being sprayed onto the landscape through above-ground irrigation heads.

With the installation of an irrigation system at the Statelers, wastewater biochemical oxygen demand (BOD), phosphorus and suspended solids were all reduced. The majority of the phosphorus removal from this system occurs through the spray irrigation system where phosphorus is absorbed by the soil and/or taken up by plants. The removal of BOD, nitrogen and suspended solids occurs prior to spray irrigating. **The total cost of the installation, including all components, excavation, and labor for electrical installation, was $28,000.**

Water Quality Comparison

WASTEWATER PARAMETER	Main Environmental Concern	Conventional Septic System	Wastewater Irrigation System	% REDUCTION
Biochemical Oxygen Demand (BOD)	Harmful to aquatic life	206 mg/l	Not detected	100%
Nitrogen, KJELDAHL	Surface and groundwater pollutant; lake eutrophication (algal blooms)	21.5 mg/l	Not detected	100%
Nitrogen, Ammonia (NH3, NH4+)	Toxic to aquatic life	3.26 mg/l	0.39 mg/l	88%
Nitrogen, Nitrate + Nitrite (NO2-, NO3-)	Surface and groundwater pollutant; algal blooms; Infant Methemoglobinemia (Blue Baby Syndrome)	Not detected	7.5 mg/l	NA
Phosphorus	Surface water pollutant; lake eutrophication (algal blooms)	2.06 mg/l	1.94 mg/l	6%
Suspended Solids	Increased BOD and phosphorus transport; harmful to streambed habitats	372 mg/l	7 mg/l	98%

Source: Jones & Henry Laboratories, Inc.

Water quality samples were collected at the Statelers prior to the new wastewater irrigation system installation and four months after installation. Upon completion, each wastewater parameter saw a reduction in nutrients with the exception of nitrogen. Within the irrigation system, organic nitrogen is converted to ammonia, which naturally converts to nitrite and nitrate. This explains the increase in nitrate and nitrite from not detected to 7.5 mg/l because the irrigation system provides for the complete cycling of nitrogen.

From left to right: Treated wastewater is irrigated onto the landscape through a series of three above-ground sprinkler heads; Close up view of the "Rain Bird" brand irrigation head.

Contact

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