

# What is a Wastewater Lagoon?

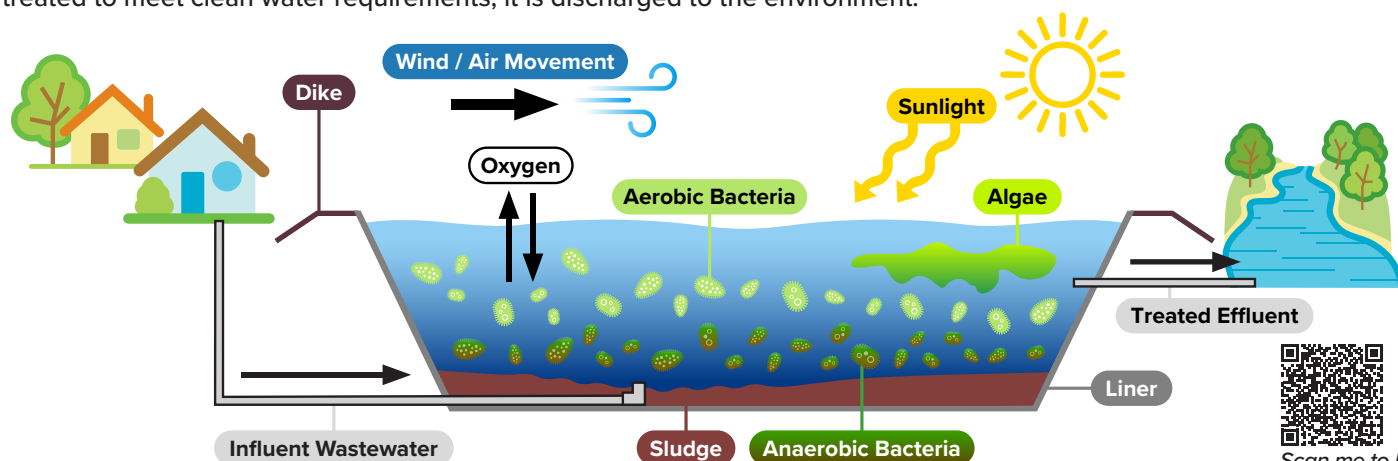
## Learn More About How Lagoons Treat Municipal Wastewater

Effective sanitation and wastewater treatment are crucial for protecting both public health and the environment. Various technologies are available for wastewater treatment, allowing communities to select solutions that best meet their specific needs. Wastewater lagoons are widely utilized and serve as an excellent option for rural and small communities, as they provide a sustainable and cost-effective approach to managing and treating wastewater efficiently.

**Wastewater lagoons**, sometimes called wastewater stabilization ponds, are earthen ponds that break down wastewater using natural biological processes. There are three main types of wastewater lagoons: aerated, facultative, and anaerobic.

## How Do Wastewater Lagoons Work?

Lagoons are designed to store and treat wastewater mainly through natural biological processes. Sunlight creates warm, bright conditions and wind provides the oxygen needed to support the growth of beneficial bacteria and algae in the lagoon. The algae and bacteria help break down organic pollutants in wastewater. After the water in the lagoon is treated to meet clean water requirements, it is discharged to the environment.



Scan me to learn more about how a lagoon system works!

## Which Communities are Served by Wastewater Lagoons?

Discharging wastewater lagoons account for approximately 25% of all municipal wastewater treatment facilities in the United States. In 2000, EPA estimated that there were around 8,000 wastewater lagoons nationwide, which includes both discharging and non-discharging lagoons. In 2021, the agency identified over 4,500 lagoons as discharging wastewater treatment facilities that hold National Pollutant Discharge Elimination System (NPDES) permits. These facilities are typically publicly or semi-publicly owned and do not rely on more advanced treatment technologies, which are common in large communities and urban areas that use intensive mechanical power. Lagoons generally serve communities with fewer than 3,000 people.

### Benefits of Lagoons:

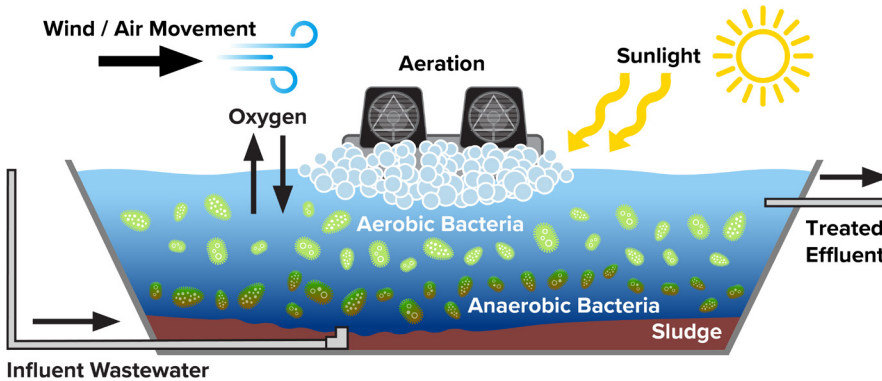
- Cost-effective.
- Low-maintenance.
- Energy-efficient.
- Reliable and effective treatment, when constructed and operated correctly.

### Challenges with Lagoons:

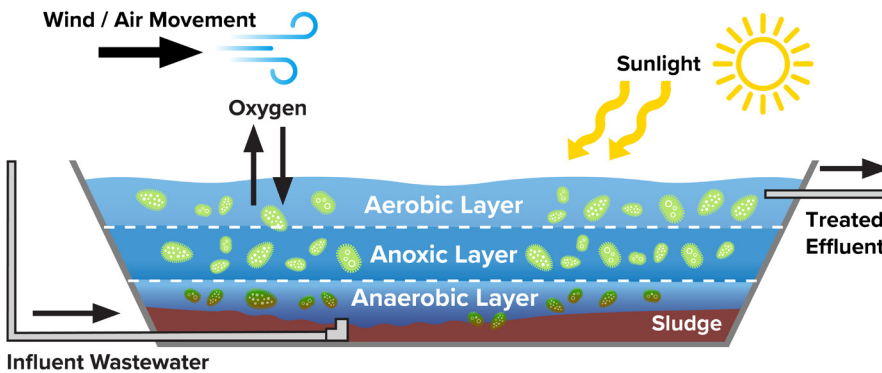
- Requires a substantial amount of land to construct.
- Must meet permit requirements regardless of seasonal impacts that may temporarily reduce a lagoon's ability to treat wastewater.
- May not be able to meet permitted limits for nutrients consistently.
- Communities must budget in advance for periodic upkeep like sludge removal as well as unexpected repairs.

# Types of Wastewater Lagoons

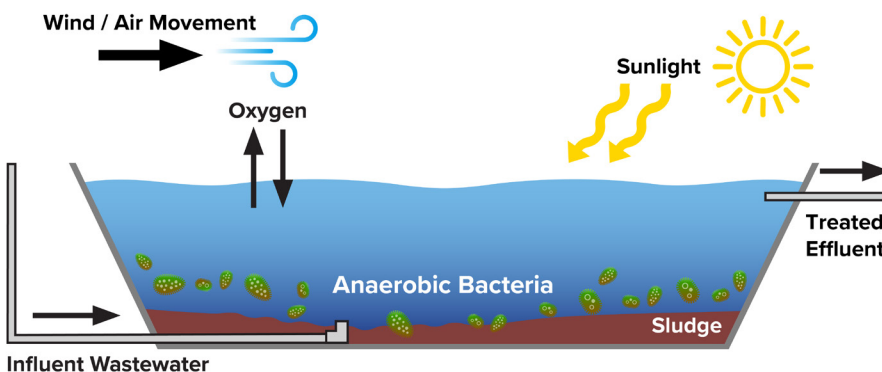
There are three main types of lagoons that can treat wastewater:



**Aerated:** In aerated lagoons (also called aerobic lagoons), oxygen is supplied to the system through surface aerators or a diffused aeration system, instead of by the photosynthesis of algae. As a result, these lagoons can require more energy than anaerobic or facultative lagoons. These systems are well-suited to treat both municipal and some types of industrial wastewater.



**Facultative:** These are the most common type of wastewater lagoon and have been in use in the United States for over 100 years. Facultative lagoons consist of three layers: a bottom layer of anaerobic sludge, an anoxic middle layer (no oxygen), and an aerobic top layer that is supported by microalgae. These lagoons are often used to treat raw municipal wastewater in small communities.



**Anaerobic:** Often used as the first stage in a wastewater treatment system, anaerobic lagoons are not aerated, heated, or mixed. Instead, the biochemical processes that help treat wastewater take place deep in the lagoon, without any oxygen. These lagoons have a deep basin which helps facilitate anaerobic conditions. Anaerobic lagoons are not typically used to treat municipal wastewater but are especially effective when used for some types of high-strength industrial wastewater.

## Additional Resources:

Lagoon Wastewater Treatment Systems EPA Website: <https://www.epa.gov/lagoons>

First Step Toolbox for Lagoon Systems: <https://www3.epa.gov/npdes/lagoontoolbox/index.html>

Troubleshooting Manual for Small, Facultative, Partial-Mix Aerated, and Complete-Mix Aerated Wastewater Lagoons: <https://www.epa.gov/system/files/documents/2024-02/lagoon-troubleshooting-manual.pdf>

Principles of Design and Operations of Wastewater Treatment Pond Systems for Plant Operators, Engineers, and Managers: <https://www.epa.gov/sites/default/files/2014-09/documents/lagoon-pond-treatment-2011.pdf>