ETI - Environmental Technology Initiative
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## What is an evapotranspiration system?

Evapotranspiration (ET) is a method of onsite wastewater treatment and disposal that offers an alternative to conventional soil absorption systems for sites where protection of the surface water and groundwater is essential. An ET system is unique in its ability to dispose of wastewater into the atmosphere through evaporation from the soil surface and/or transpiration by plants, without necessarily discharging it to the surface water or groundwater. However, in certain cases, the ET concept also offers flexibility by combining seepage with evaporation as an alternative option.

An ET system is a feasible option in semi-arid climates and locations where the annual evaporation rate exceeds the annual rate of precipitation and wastewater applied.

ET is the net water loss caused by the evaporation of moisture from the soil surface and transpiration by vegetation. There are three main types of ET systems. The first type, an ET system, is the most commonly used. The main components are a pretreatment unit (usually a septic tank or an aerobic unit) to remove settleable and floatable solids and an ET sand bed with wastewater distribution piping, a bed liner, fill material, monitoring wells, overflow protection, and a surface cover. Vegetation has to be planted on the surface of the bed to enhance the transpiration process. See Figure 1 on page 2 for a cross-sectional view of a typical ET bed.

The second type of ET system is known as an evapotranspiration/absorption system (ETA), which is an unsealed bed where evaporation and transpiration are the primary means of disposal, but percolation is also used. The design provides discharge to both the atmosphere and to the sub-surface.

The third type of ET system uses mechanical devices; however, these methods are still being developed.

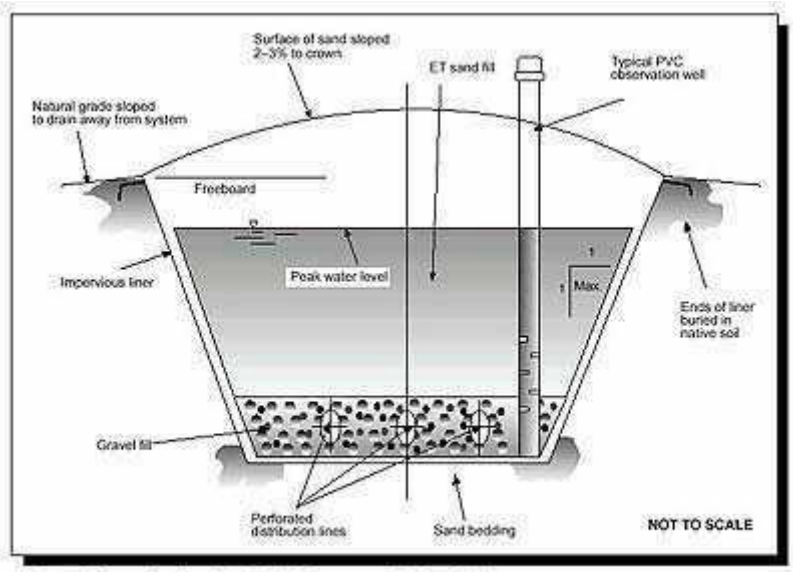


**Figure 1: Cross Section of a Typical Evapotranspiration Bed**

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## What are the advantages and disadvantages of using ET systems?

## *Advantages*

- ET systems may overcome site, soil, and geological limitations or physical constraints of land that prevent the use of subsurface wastewater disposal methods.
- The risk of groundwater contamination is reduced with ET systems that have impermeable liners.
- Costs are competitive with other alternative onsite systems. * ET systems can be used to supplement soil absorption for sites with slowly permeable, shallow soils with high water tables.
- These systems could be used for seasonal application, especially for summer homes or recreational parks in areas with high evaporation and transpiration rates, such as in the southwestern U.S.
- Landscaping enhances the aesthetics of an ET system.

## *Disadvantages*

- ET systems are governed by climatic conditions such as precipitation, wind speed, humidity, solar radiation, and temperature.
- These systems are not suitable in areas where the land is limited or where the surface is irregular.
- They have a limited storage capacity, and are thereby unable to store much winter wastewater for evaporation in the summer.
- There is a potential for overloading from infiltration of precipitation.
- The bed liner must be watertight to prevent groundwater contamination.
- ET systems are generally limited to sites where evaporation exceeds annual rainfall by at least 24 inches (i.e., arid zones).
- Transpiration and evaporation can be reduced when the vegetation is dormant (i.e., winter months).
- Salt accumulation and other elements may eventually eliminate vegetation, and thus transpiration.

### What determines the performance of ET systems?

By far the most important performance consideration of any ET system is the rate of evaporation. This is largely affected by climatic conditions such as precipitation, wind speed, humidity, solar radiation, and temperature. Since these factors continually change from time to time, evaporation rates will also vary significantly, which must be considered in the design.
In addition to the climate, other factors that determine the performance of an ET system include water usage, the potential for capillary rise action in the sand, and the ability of the cover soil and vegetation to withstand the fluctuating precipitation.

### Are ET systems easy to operate and maintain?

Regular operation and maintenance (O&M) of ET and ETA systems is usually minimal, mostly involving typical yard upkeep such as trimming the vegetation. If a septic tank is used for pretreatment, it should be checked for sludge and scum buildup and pumped as needed to avoid carryover of solids into the bed. If an ET or ETA system is properly installed on a suitable site, scheduled maintenance should rarely be needed except in cases of poor operating practices such as irregular septic tank pumping. ET systems also should have measures to prevent salt buildup.

### What is the cost of an ET system?

The cost of an ET system depends on the type of system, the site, and the characteristics of the wastewater. The construction cost of an ET bed is determined by its surface area, which is a function of the wastewater flow. Other cost considerations are the availability of suitable sand, the type and thickness of the liner that is used, a retaining wall (if needed), and the type of vegetation (usually native to the area).

### How do I stay informed about ET technology?

For more information on evapotranspirationsystems or a list of other fact sheets, contact the National Small Flows Clearinghouse (NSFC) at West Virginia University, P.O. Box 6064, Morgantown, WV 26506-6064. Phone: (800) 624-8301 or (304) 293-4191. Fax: (304) 293-3161. World Wide Web site: ***http://www.nsfc.wvu.edu***.
The NSFC provides free and low-cost informational services and products to help homeowners and small communities address their wastewater needs. Also, information about manufacturers, consultants, regulations, and facilities can be obtained from the NSFC's databases.

### References

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