



## Biomats

A. R. Jarrett, Professor of Agricultural Engineering

A biomat is a black, slimy jelly-like, slowly permeable layer of partially decomposed organic waste containing microorganisms that seek to feed and grow in this anaerobic environment. Biomats are often found in either of two locations within an on-lot sewage disposal system; (1) on the bottom and sidewalls of the aggregate-soil interface of the absorption area’s trenches or beds, and (2) on the top surface of an aerobic pretreatment filter.

### How and why biomats form?

Biomats form because the infiltrating surfaces, designed to receive wastewater and be maintained in an oxygen rich (aerobic) condition, have become wet and oxygen starved; anaerobic. Biomats form due to; (a) overloading an area hydraulically, or (b) overloading an area organically.

**Hydraulic Overloading.** The development of a biomat on the bottom and sidewalls of the aggregate-soil interface within the absorption area is usually caused by hydraulic overloading. When septic tank effluent is distributed to the absorption bed or trenches by gravity, most of the water is applied to the initial few feet of the area. In other words, all of the effluent falls out of the first two or three holes in the distribution

pipe and lands on the bed or trench bottom right below these holes. Because the bed or trenches were designed to receive this effluent uniformly, the very small area receiving the excessive volume of effluent becomes wet and eventually saturated. In this overly wet environment the aerobic microorganisms (aerobes) can no longer live and give way to anaerobic microorganisms (anaerobes) that thrive in these wet conditions. So, what causes the biomat? When the anaerobes take over because of the wet conditions, two things happen; (i) the rate at which the organic matter (BOD) is broken down is greatly reduced (aerobes convert organic matter to carbon dioxide and water much faster than anaerobic microorganisms), and (ii) the waste products generated by the anaerobes create a slimy, jelly-like, slowly permeable layer we call a biomat.

After the small area under the first few distribution pipe holes has developed a biomat, which will no longer permit the wastewater to infiltrate into the soil it rests on, the excess wastewater will naturally flow over the biomat to adjacent unclogged soil, see Figure 1. In time this once permeable soil will also develop a biomat. This process will be repeated over and over again until the entire aggregate-soil interface has a biomat on it at which time, the wastewater will begin to pond and backup into the septic tank and then your home. **Note: pumping your septic tank will NOT correct this problem.**

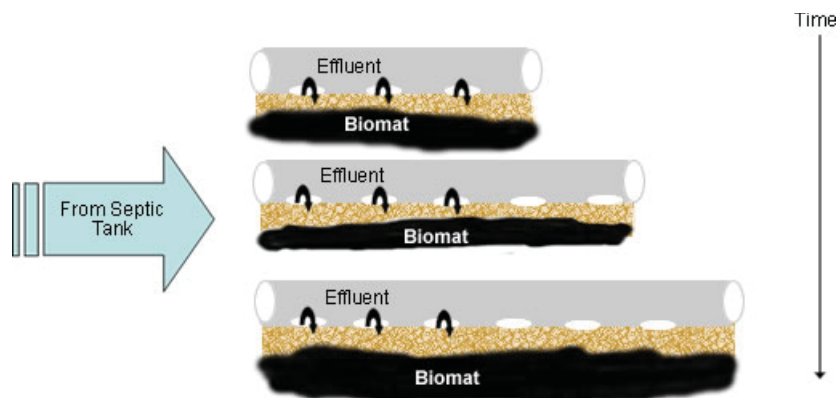


Figure 1 – Biomat formation schematic

**Organic Overload.** The development of a biomat on the top surface of a pretreatment filtration unit is usually the result of applying organic matter (BOD) to the filter at excessively high rates. As described above, when the filter media becomes wet/saturated to the point where the aerobes can no longer live, the anaerobes will take over and produce the slimy, jelly-like, slowly permeable layer we call a biomat.

### **Is a biomat helpful?**

Some have argued that a biomat is necessary and helpful to the processes that treat the wastewater coming from the septic tank. Not true. There is no treatment process that is enhanced by a biomat. Some have said that the biomat is needed to slow the intake of water into the soil or media so the water flow regime within the soil/media will be aerobic. Not true. The design loading rates prescribed to size an absorption area or a media filter ensure aerobic conditions. No special help is needed. Some have argued that effluent ponding in an absorption area is a normal, expected occurrence. Not true. If there is water ponded in your bed or trenches for more than a few minutes following a large water use in the home, your system has failed.

### **How can the biomat be removed?**

The key to removing a biomat is to change the environment at the biomat so oxygen can reach the biomat. With the oxygen restored, the aerobic microorganisms begin to reestablish themselves and will quickly break down the biomat returning the area to its original permeable condition. Suggestion: One

suggestion that has been shown to be effective in controlling or removing a biomat from an absorption area is to have your septic tank pumped just before you and your family leaves for a one- to two-week summer vacation. The period of non-use during your vacation restores an aerobic environment within the absorption area, thus resulting in the biodegradation of any biomats that may have formed. You will most likely return to a functioning system.

### **How to prevent the development of a biomat**

Make sure the biomat susceptible areas are kept aerobic. There are a growing number of wastewater treatment units available to homeowners that are designed to create and maintain aeration in the effluent leaving the septic tank. Some of these units are experimental, others are proven technologies. They can make a difference.

PSU 1st Edition 04/06

**Agricultural and Biological Engineering Department**  
**246 Agricultural Engineering Building**  
**University Park, PA 16802**  
**<http://www.abe.psu.edu/extension/factsheets.html>**  
**Telephone: 814-865-7685**  
**FAX: 814-863-1031**

**The Pennsylvania State University is committed to the policy that all persons shall have equal access to programs, facilities, admission, and employment without regard to personal characteristics not related to ability, performance, or qualifications as determined by University policy or by state or federal authorities. It is the policy of the University to maintain an academic and work environment free of discrimination, including harassment. The Pennsylvania State University prohibits discrimination and harassment against any person because of age, ancestry, color, disability or handicap, national origin, race, religious creed, sex, sexual orientation, or veteran status. Discrimination or harassment against faculty, staff, or students will not be tolerated at The Pennsylvania State University. Direct all inquiries regarding the nondiscrimination policy to the Affirmative Action Director, The Pennsylvania State University, 328 Boucke Building, University Park, PA 16802-5901, Tel 814-865-4700/V, 814-863-1150/TTY.**