

Ponds, Lakes, Canals or River Remediation with Bioaugmentation

Eutrophication:

The introduction of an excessive amount of contaminants and nutrients (notably nitrogen and phosphorus) into an aquatic ecosystem causes a proliferation of algae. Some algae grow on carbon sources, but many utilize excess N and P. Decomposing algae consumes a great deal of oxygen, endangering fish and other aquatic animals. Eutrophication occurs most often in ecosystems where water is renewed very slowly, such as deep lakes.

Untreated sewage and agricultural runoff flowing into a lake or stream may result in eutrophication. A eutrophic body of water is one rich in dissolved nutrients, such as phosphates (-PO₄-3) from detergents, fertilizers, and manure. Because of the high concentration of dissolved nutrients, algae will typically proliferate, die, and sink to the bottom. Here, their decomposition by bacteria requires a great deal of oxygen - i.e. the BOD goes up. If oxygen levels drop too low, the oxygen-requiring organisms, like fish, might be killed. In fact, some eutrophic lakes may become anaerobic (with all the aerobic life dying) if the BOD becomes too high.

Biological Oxygen Demand is the amount of oxygen needed to degrade the organic matter contained in effluent biologically. The BOD is determined by the level of organic matter in the discharge into a watercourse. If the nutrient level is too high, it results in the bacteria and other micro-organisms expanding rapidly. This depletes the available oxygen supply causing fish and other aquatic organisms to suffocate.

What is Chemical Oxygen Demand?

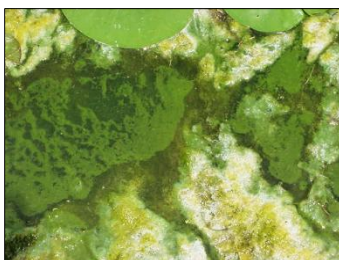
A COD test measures all organic carbon with the exception of certain aromatics (benzene, toluene, phenol, etc.) which are not completely oxidized in the reaction. COD is a chemically chelated/thermal oxidation reaction, and therefore, other reduced substances such as sulfides, sulfites, and ferrous iron will also be oxidized and reported as COD. NH₃-N (ammonia) will NOT be oxidized as COD.



Algae can cause serious problems in ponds if not controlled. They produce large quantities of oxygen during the day but the decay of dying algae demands oxygen in considerable quantities also, resulting in severe oxygen depletion overnight. In conditions of heavy algae infestation aquatic plants become vulnerable to pests and diseases and fish become distressed.

Algae can be found growing in ponds, lakes, in clarifiers, de-chlorination tanks, etc. More than 10,000 living diatom species are known, there are over 8,000 species of Algae, there are 1500 species of Blue Green algae or Cyanobacteria, there are 6000 species of red algae or Rhodophyta. the list goes on and on- ok, so identification is not as important as why is it growing, how it impacts my plant and how to get rid of it!

With Summer time here, and lots of plants, ornamental ponds, lakes and lagoons having difficulties with Algae control, we are going to put together a few pages on our website on plants and their issues. Then we will put together the types of algae that can be found as an FYI, because in reality, most of the algae that are growing in your plant, regardless of species, need to be controlled and removed!



Algae Controls:

There are various different controls depending upon the type of system, the cause and the location of the algae, maintenance, weir brushed, sprayers, manual scraping, control of nutrients, biological products, chlorination, etc.. See our troubleshooting guide for Algae problems.



Bioaugmentation in Ponds and Lakes for Nutrient Control

Many of you have purchased products for algae control in ponds. Here is a way to make your program more active.

Algae control in ponds is about a time and numbers game. How much nutrients are there; excess debris like leaves and decaying matter. The bacteria are added to remove excess nutrients that cause algae and duckweed to thrive. Rain, run-off, temperature, fallen dead trees and leaves, even wind can impact how sufficient the bacterial program is. You may need to change your dosing schedule after these events!

For smaller ponds, sometimes the cost of the biological product can be a bit prohibitive to keep up with heavy rains. One way to cheat is to grow up the product prior to adding to the lagoon. Some paper mills have 40-60 million gallon lagoons, and may use 2-3000 lbs of product a month in the winter time! That can get costly, so we use a "Biofeeder" to get more bang for the buck from the product.



Bacteria grow and multiply in 20 minutes to 2 hours! With the proper environment, you can grow up the product, and effectively get more product into the lagoons. We purposely package the products in one lb. water soluble bags so there is no mess or need to have to touch the product, but for cases where more is needed, and the cost is a little prohibitive, there are ways to cheat! Yes, I know I am telling you how to buy less of our products! Our goal is not to make the most money off of you, but to solve your problems! While you are not going to make a huge commercial biofeeder, the concept is the same. Take a 5-10 gallon container with warm water, go get a small fish pump and aerator stone at the local Wal-Mart, Home Depot, etc. and put one lb. of product into the container with the warm water. The pump will mix and aerate the bacteria. Do this for anywhere from 4-8 hours.

You will have doubled or tripled the number of bacteria you are going to add to the pond. Make sure, if possible, to put it in more than one point, or in a spot where there is quite a bit of algae located, near the fountains or aerators you have. Always clean out the container before using again! And no, more time is not better. There is only a limited amount of food and nutrients on the bran carrier that the product is supplied with. We have found that after 18 hours, the activity starts to drop off, so no real gains are made!!



Aeration and mixing are also critical. Without these, all the bacteria in the world are going to settle and not reach the edges of the pond where they were not distributed. pH is also critical in a large pond. If you have the ability to impact these variables, the program will be more successful!

Good luck and let me know if you have any questions. See additional available file on Biofeeders!

Typical System control parameters to test and monitor-

For small ponds-COD or TOC, N and P values to determine loading demand on your pond if large enough. Small "fish tank" test kits can be bought at your local hardware store and these will test N and P levels very quickly and cheaply. Since this is more a remediation for the visual purposes more than for regulatory controls and permit requirements, the results will be good enough to help guide you in your treatment and evaluation of results.

For Large rivers or lakes where other sources of runoff or discharges to the river are it is a good idea to know that the incoming flow contains. Typical tests required are flow, BOD or COD, TKN, pH and P. If there are oils and grease, these too should be determined. Bioaugmentation is not very hard or expensive, it is more an issue of controlling the Critical 5. See newsletter on Critical 5. Most Rivers or canals



if they have a high enough flow that they get pretty good D.O. Usually the program is based upon the number of carbons to be removed and the nutrient levels present. A remediation program can be based upon a closed system with current levels of contamination, or in some cases where rivers or canals have ongoing upstream contributions, a short term remediation program along with a long term maintenance program is required.



Mixing and Aeration: These are the two largest things that will speed up any treatment program. In small ponds that are not very deep and do not have a current like a lake or river, static water has less Oxygen as well as mixing. The bacteria need to be able to move around in order to get at the contaminants. They will settle to the bottom of the pond if not mixed or stirred.

Bioaugmentation products that are used: In most cases where low levels of carbon or excess nutrients are present due to runoff, leaves decaying or animal waste, MicroClear®™ 101 is sufficient to help clean up the contaminants.



MicroClear® 101

Water Clarity Nutrient Control Product Bulletin

MicroClear® 101 is a high potency, bacteria-laden, powdered formulation for removal of nutrients that may cause algae to thrive.

MicroClear® 101 contains a specially formulated, proprietary blend of microorganisms and surface tension suppressants/penetrants. Because of the diversity of the microorganism's enzyme systems, this product is excellent for *increasing water clarity*. The safe naturally occurring bacteria and enzyme systems are present in high numbers to handle difficult algae and odor related problems.

ADVANTAGES

- Reduces Odor
- Increases Settleability
- Safe to the Environment
- Restores Water Quality
- Environmental Friendly, Contains No Chemicals
- Removes Available Nutrients from Water
- Leaves Little Nutrients or BOD for Algae to Grow



MicroClear® 102

Nutrient Control in Saltwater Ponds, Rivers or Lakes PRODUCT BULLETIN

A ready to use pond treatment product formulated to reduce organic waste, turbidity, and algae in aquatic systems

ADVANTAGES

Environmental Leverage™ Inc. biologically active formula contains a proprietary blend of bacterial strains that were selected for the ability to breakdown excess waste material in ponds and reduce the amount of available phosphorous causing a reduction in the algal population.

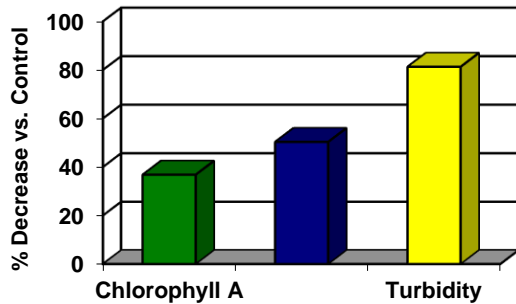
Environmental Leverage's™ naturally occurring cultures efficiently digest pond bottom materials and reduce the organic matter in the water column leading to cleaner water and higher oxygen levels.

The bacteria are stabilized and shipped in spore form, ensuring long term stability and extended shelf life.

Multilevel quality assurance processes extend far beyond our doors. Purity and microbial concentration is guaranteed for consistent and superior biological products in the hands of your customers.



Top before & bottom picture after Remediation



As demonstrated in the graph, the bioaugmentation application resulted in a significant reduction in Chlorophyll A, a measure of algal concentration, Phosphorous, and turbidity. These results were not generated in a laboratory, they were obtained under actual field conditions.



Top 2 pictures without product added



Bottom 2 pictures After Environmental Leverage's MicroClear products added

MicroClear® MicroBlock is a solid, bacterial laden, brick for use in degrading organics. The safe, naturally occurring bacteria are present in high numbers to handle difficult organic problems. The unique brick will gradually dissolve over a 35-120 day period which allows for continuous treatment and degradation of waste. The naturally occurring bacteria contained in the block will reduce odor, sludge, fats, oils and grease buildup. This product can also be placed in rivers, lakes and ponds to remediate.

Biological products offer a more efficient alternative to chemicals. They actually degrade the grease and organics at the source. The blocks are suspended below the water level and provide slow, continuous release of the bacteria.



ADVANTAGES

- * Allows for 24-hour continuous treatment of waste, not just periodic dosage
- * Greatly reduces labor time needed for dosage maintenance
- * Reduces hydrogen sulfide & sludge buildup
- * Easy to use
- * Significantly reduces malodors
- * Cost effective & reduces the need for pump-outs and dredging
- * Breaks down fat & grease buildup
- * Eliminates need for metering pump - no initial or maintenance cost
- * Eliminates need for personnel to dose other types of treatments daily or weekly
- * Automates septic and grease trap maintenance program

DOSAGE RATE GUIDELINES

2 Pound Brick	35-60 Days	flows less than 50,000 gpd
5 Pound Brick	45-75 Days	flows 50,000-100,000 gpd
10 Pound Brick	60-90 Days	flows >100,000 gpd



Extra Note- in some extreme cases Dredging may be required.

Sediment accumulation can build up in a lake over time and can impact water quality. Runoff from farms or land can build up in inlets of lakes and rivers.

Core samples or depth of the river bed where solids may have built up & slowly release nutrients or contamination should be examined prior to a bioaugmentation program. Use of a sludge judge if relative shallow depths can be used. Otherwise electronic LED indicators can be used or even Fish” depth finders to determine the solid/liquid interface.

