

# In Situ Lake/Pond Bioremediation



*By joining forces today, we can craft a sustainable future for generations to come*

# About Team One Biotech

- Individuals with vast amount of experience and knowledge to bring out the most powerful, robust, economical and proven microbial products and technologies for individual and institutions who manage industrial wastewater treatment, sewage treatment, decomposition of human fecal sludge, odor control, sanitation, lake and pond bioremediation, open drain bioremediation, solid waste composting, agriculture, aquaculture, oil spills, soil improvement and use of eco-friendly cleaning products.
- All our products are formulated keeping in mind the ground realities and challenges faced for each of the above area
- In house Manufacturing and R&D facility
- Proud to be a 100% “Make in India” company



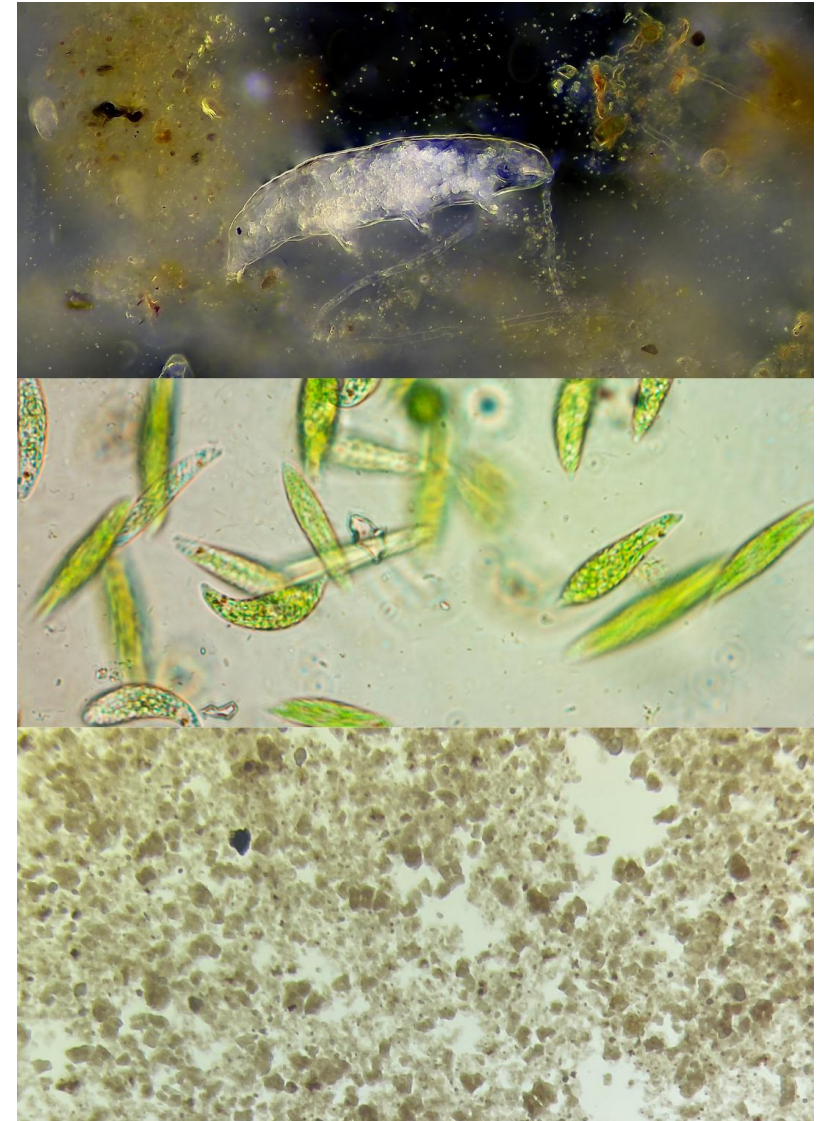
# Manufacturing and R&D



*By joining forces today, we can craft a sustainable future for generations to come*

# magnEfficient Microbes

- Many microbes are uniquely adapted to specific environmental niches. Unfortunately in the last 5 decades the human race have destroyed and altered the natural microbial fauna in the environment which has a direct negative impact on the soil, water and air thus affecting our agriculture, aquaculture and environment spaces across the globe.
- Microbes like good bacteria play utmost important roles in the global ecosystem. The ecosystem, both on land and in the water, depends heavily upon the activity of the good bacteria.
- To set the matter right we have come up with various path breaking formulations and solutions to address each of these issues and get back our **“missing magnEfficient microbes”** to where they belong.



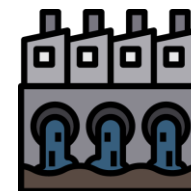
# Major Environmental problems in lakes

- Contamination of water bodies due to industrial waste, untreated and partially treated human sewage, agriculture run offs, human & religious activities, and various other ingresses.
- Ingress of large quantum of nitrogen and/or phosphorous and organic compounds discharged from the above means lead to eutrophication of water bodies resulting in heavy blooms of phytoplankton, deterioration of water quality, decrease of biodiversity, increase in sludge levels, odor generation and eventually resulting in a complete collapse of the aquatic ecosystem in the water body.

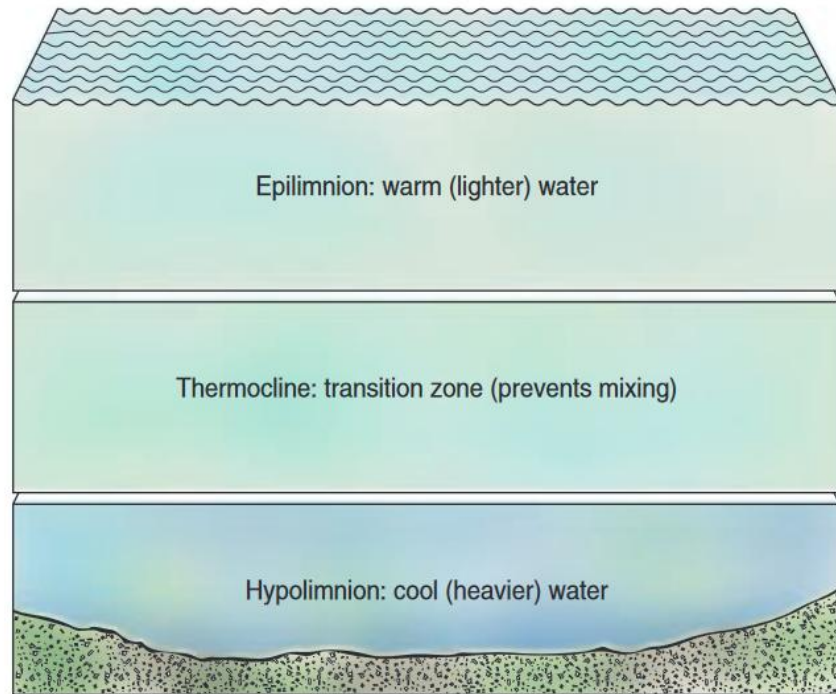


# Understanding impact of pollutants

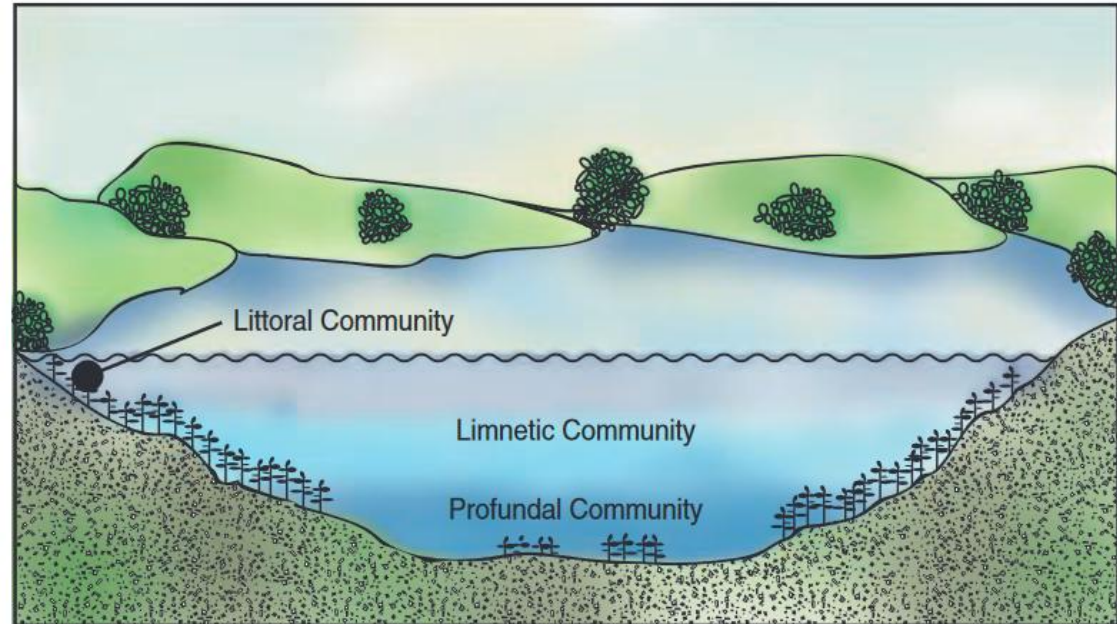
- **Organic pollutants**, they easily decompose in water and consume dissolved oxygen, leading ultimately to eutrophication
- **Nutrients**, these include mainly phosphate and nitrate and their increased concentration can lead to eutrophication
- **Heavy metals**, such pollution tends to be localized around industrial and mining centers
- **Microbial contamination** from bacteria such as E.coli, protists and fecal coliform that comes from untreated or partially treated sewage as well as animal husbandry
- **Traces of chemicals** and pharmaceutical drugs are hazardous substances that are not necessarily removed by conventional ETP's. Chemicals also enter the system due to usage of various chemical based cleaning products in our routine life.
- **Suspended particles**, these can be either inorganic or organic matter and originate mainly from agricultural practices and land use change



# Understanding lake/pond



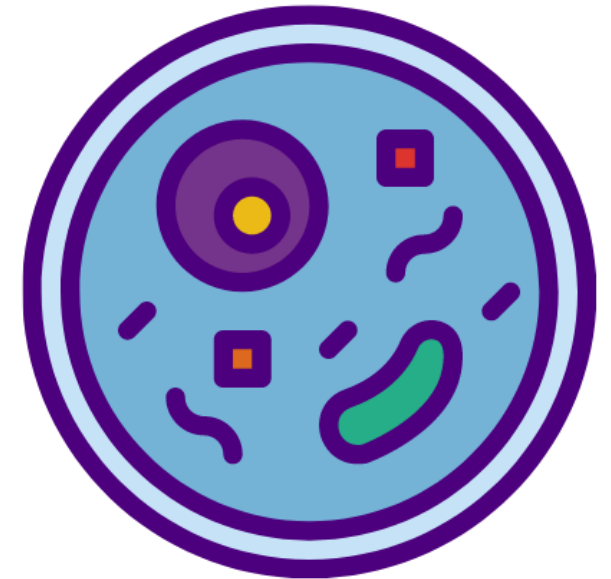
- The epilimnion is roughly equivalent to the zone of light penetration where the bulk of productivity, or growth, occurs.
- The thermocline is a narrow band of transition which helps to prevent mixing between the layers.
- The hypolimnion is the zone of decomposition, where plant material either decays or sinks to the bottom and accumulates



- Extending from the shoreline is the littoral community, where aquatic plants are dominant.
- The area of open water is the limnetic community, the habitat of algae, microscopic animals and fish.
- The profundal community, where light does not penetrate, is the habitat of bacteria and fungi.

# What is SF&R Pond & Lake Cleaner

- Pond & Lake Cleaner is a safe and natural microbial product used to improve the quality of pond and lake water along with sludge degradation.  
Pond & Lake Cleaner is made of concentrated blends of more than 98 selected biological species, essential vitamins, bio stimulants and biocatalysts blended in a perfect harmony for lake and pond treatment. One gram of product may contain more than 5 billion cfu.
- These natural bacteria are in a dormant state due to the use of micro encapsulation technology. Pond & Lake Cleaner uses these bacteria for removing excess nutrients from a eutrophied pond or lake in a process called bioaugmentation.
- The bacterial cultures within this probiotic are GRAS recognized and completely safe. All our products are completely non toxic.



# Why SF&R Pond & Lake Cleaner

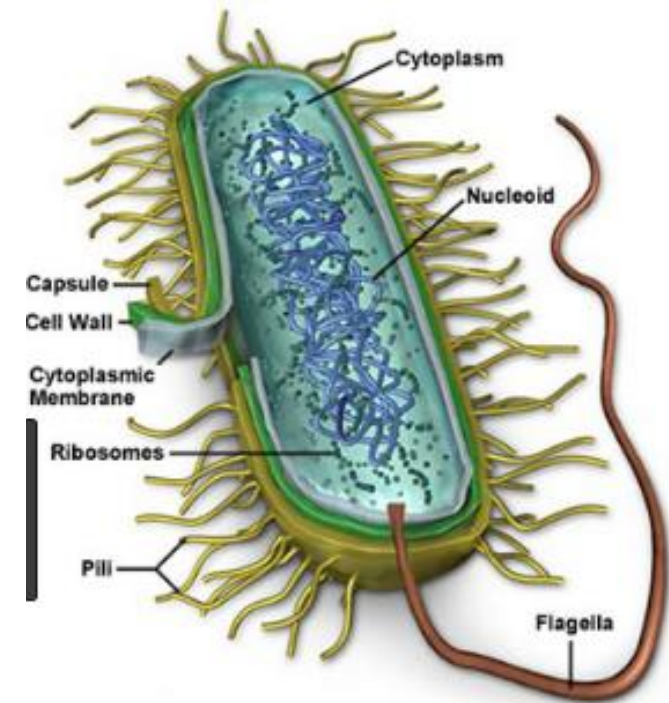
- **Lake Sludge:** When compared to the cost of dredging, the Pond & Lake Cleaner naturally reduces bottom accumulated muck at a very low cost. Organic muck from the lake bottom may be readily reduced by 15 to 40%.
- **Organic pollutants:** The potent facultative heterotrophic bacteria, used in Pond & Lake Cleaner have specific talents to generate enzymes, lignin, lipid and cellulose degraders which are responsible for the accelerated reduction of BOD and COD.
- **Excess Nutrient Control:** Bacteria in Pond & Lake Cleaner use ammonia, phosphate, and other nutrients to build their cells at higher rates in anaerobic and facultative environments, thus ensuring product effectiveness at all times.
- **Algal Control:** Nutrient removal from the water results in the elimination of algae growth, known as algal blooms.
- **Clarity:** Many bacteria in Pond & Lake Cleaner secrete bio poly saccharides, which acts as a natural coagulants and helps in reduction of suspended particulate matter. Thus ensuring more water clarity.

# Nitrogen-Phosphorus-Sulphur Removal

- Nitrification is the microbial conversion of ammonium to nitrate. Two types of bacteria are involved in this process. Nitrification, or the conversion of ammonia to nitrite, is carried out by ammonia-oxidizing bacteria (AOB). Nitrite-oxidizing bacteria are responsible for the conversion of nitrite to nitrate (NOB). Denitrification is the microbiological process of converting nitrate and nitrite to gaseous nitrogen forms, primarily nitrous oxide ( $N_2O$ ) and nitrogen ( $N_2$ )
- Several microorganisms known as poly P bacteria or PAOs can collect phosphorus in excess of the usual cell needs. Phosphorus is stored intracellularly as polyphosphate granules, also known as volutin granules or metachromatic granules.
- Organic sulphur compounds are mineralized by a variety of bacteria via aerobic and anaerobic routes. Sulfatase enzymes are involved in the breakdown of sulphate under aerobic conditions. Heterotrophs such as Bacillus, Pseudomonas, and others are responsible for sulphur oxidation, which eliminates the production of  $H_2S$  gas.

# COD & BOD

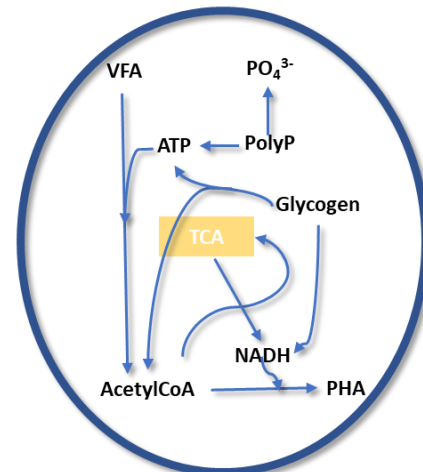
- Insoluble BOD accumulates on the bottom for anaerobic decomposition of solids while the soluble BOD stays in the water column.
- Pond & Lake Cleaner consist of a vast array of microbes i.e. aerobic, anaerobic and facultative, each performing specific functions in their respective parts of the eco system.
- Microbes present in Pond & Lake Cleaner are robust enough to handle a vast range of pH, temperature, dissolved oxygen levels, nutrient levels and toxicity. This ability helps us bring the eco balance of a eutrophic lake back to its normal state.



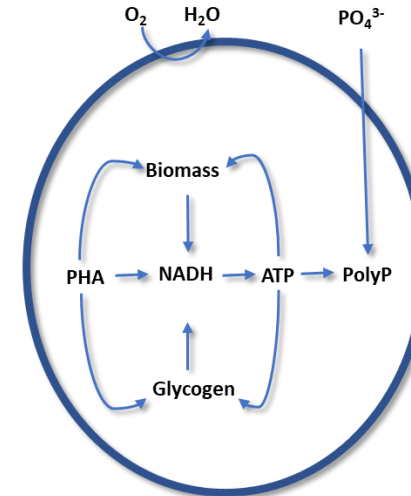
**prokaryotic cell  
(bacteria)**

# Phosphorus

In anaerobic soluble cBOD is fermented in the absence of free molecular oxygen and nitrate. The fatty acids are rapidly absorbed by poly-P bacteria and stored as insoluble starch granules (PHB). In order to absorb the fatty acids and convert the fatty acids to PHB, energy in the form of orthophosphate is lost in the process



Anaerobic conditions



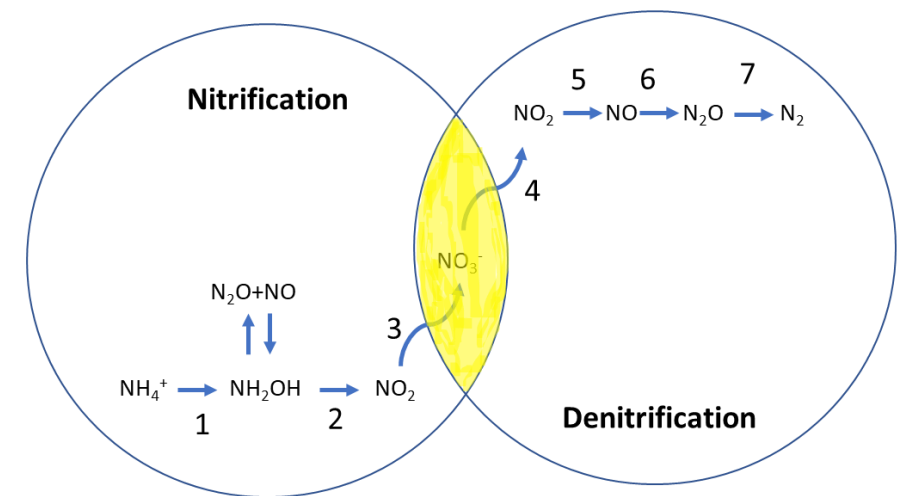
Aerobic conditions

In the aerobic conditions, PHB is solubilized and degraded in the presence of free molecular oxygen. The degradation of PHB results in the production of carbon dioxide, water, and new cellular material. Phosphate released in the system are absorbed by the poly-P bacteria and stored as volutin

- Phosphorus (P) releases due to anthropogenic activity promote eutrophication in aquatic ecosystems.
- Biological P removal (BPR) is a cost effective and environmentally sustainable alternative to chemical treatment. P-uptake relies upon Poly-P bacteria known also as phosphorus accumulating organisms (PAO)
- Ortho-phosphate, a primary nutrient, is reduced by the conversion to ATP (Adenosine triphosphate) within these microbes. This kind of phosphate will precipitate out of the water column and cease to be bio-available. Thus ensuring reduction in P

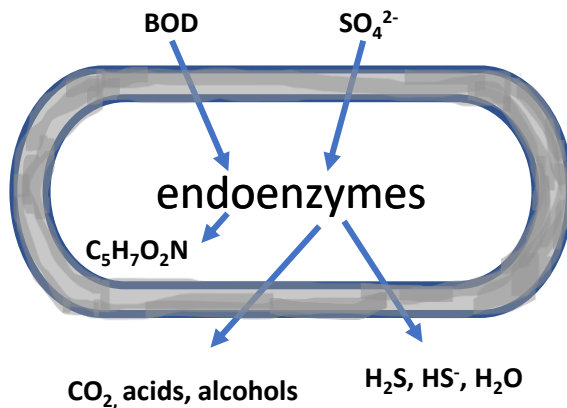
# Ammonia

- Nitrification is the biological or biochemical process in which ammonia is oxidized to nitrite, and nitrite oxidized to nitrate and nitrate to nitrogen gas.
- The major routes of entry of nitrogen into bodies of water are municipal and industrial wastewater, sewage works, septic tanks, farming activities, animal wastes (from birds, waterfowl and fish) and discharges from car exhausts.
- Pond & Lake Cleaner provides the essential nitrifying bacteria specifically selected to bring about nitrification of ammonia nitrogen. Strains of Nitrobacter and Nitrosomonas are mainly responsible for this. Under anaerobic conditions in the soil at the bottom of the lake or pond the Nitrosomonas will carry out denitrification, helping to complete the nitrogen cycle.



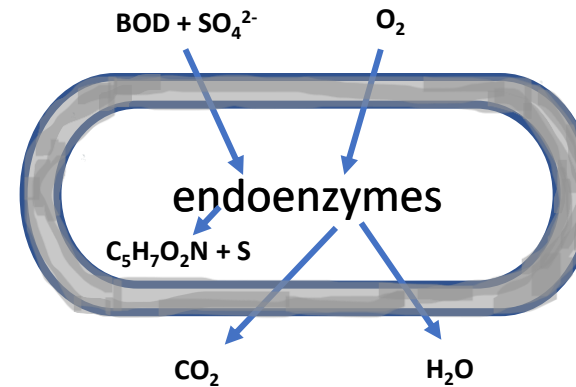
# Odor Control

- Lake muck encourages a lot of anaerobic bacteria. These anaerobes are capable of producing harmful gas known as hydrogen sulfide. This is the main reason why polluted lakes/ponds smell of rotten eggs. Hydrogen sulfide gas is a highly toxic gas to the natural flora and fauna of the lake, even in a very low amount.



Odor Generation

During dissimilatory sulfate reduction, SRB's remove sulfate from the solution in order to degrade soluble cBOD. Sulfate removes from the cell the electrons that are released from the degraded cBOD. Here, the sulfur in the sulfate is not incorporated into new cellular material but is released from the cell in the form of hydrogen sulfide gas.



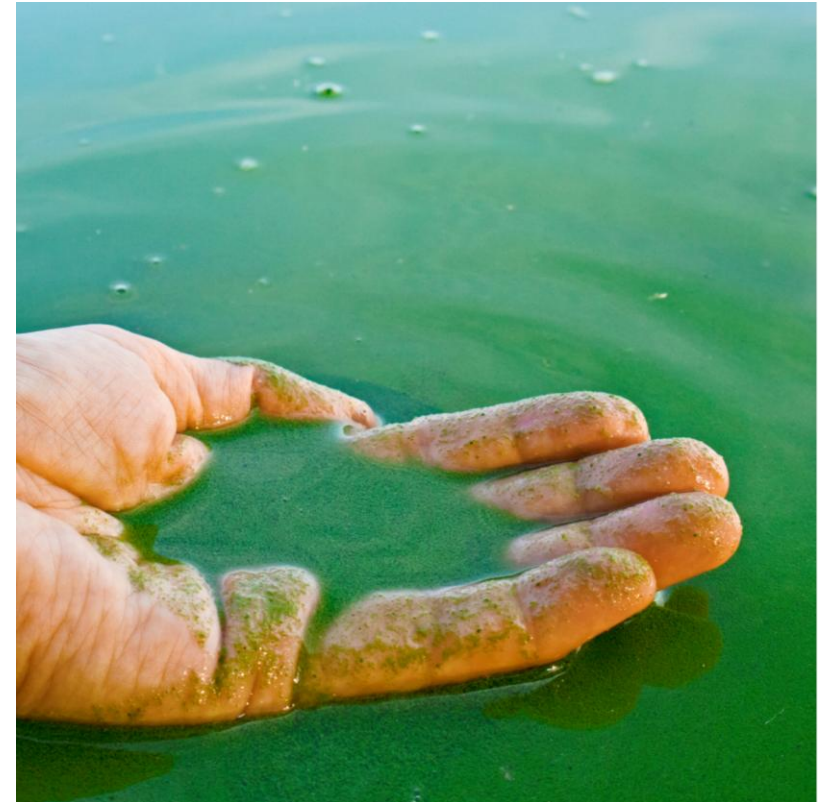
Odor Control

During assimilatory sulfate reduction bacteria remove sulfate from the solution and use sulfate as the sulfur nutrient. Here, sulfate is reduced intracellularly to sulfide (-SH), and the sulfide is incorporated into new cellular material.

- Sulfite and thiosulfate contribute to malodors associated with these pond or lake bottom.
- Hydrogen sulfide is biologically oxidized to sulfate by sulfur-oxidizing bacteria found in T1B Pond & Lake Cleaner

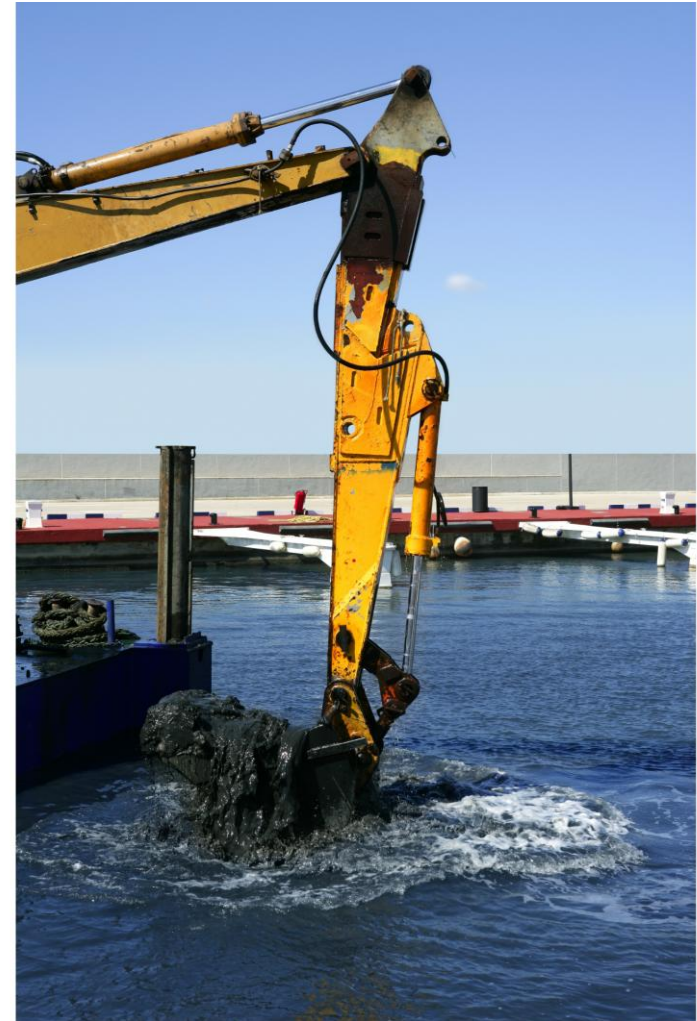
# Algae

- In most cases, the element present in the algal habitat is either nitrogen (N) or phosphorous (P).
- Nutrient dynamics can influence algal development or bloom. This can be accomplished by bioaugmentation using SF&R Pond & Lake Cleaner in a technique known as BNR (biological nutrient removal)
- SF&R Pond & Lake Cleaner bacteria are chosen precisely for their capacity to digest organic material and nutrients in the water and sludge column.
- The bacteria use carbon, nitrogen, and phosphorus in the following proportions: 100:10:4. This decreases the quantity of bio-available nutrients available to the algae. Thus, algal growth may be controlled. Also, if ammonia levels are lowered, the nutritional ratio in the water is altered. This change in the nitrogen-to-phosphorous ratio halts algal formation. .



# Understanding Lake/Pond sludge

- Lake/Pond sludge is a pile of organic and inorganic elements that accumulates in the bottom of your lake over time. Sand, clay, or silt are examples of inorganic materials, whereas organic elements include animal waste, uneaten fish food, leaves and grass, dead algae, fertilizer, grease and oil from runoff, and so on. A large amount of dissolved oxygen is drawn from the water as a result of this organic material breakdown process.
- Dredging is the most commonly used solution. However, in most circumstances, lake dredging is damaging to the aquatic life in the lake. It introduces phosphorus, nitrogen, and other contaminants from the muck into the water column, so exacerbating the situation.

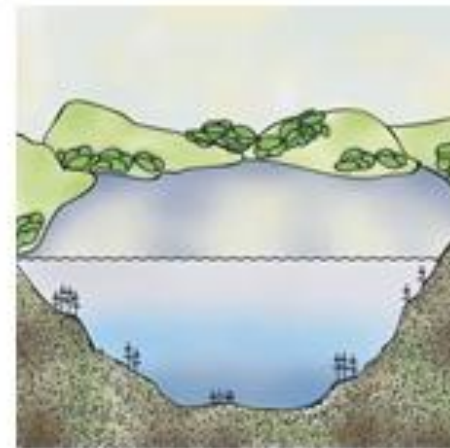


# Bio Dredging

- Bio dredging is the technique of digesting and reducing organic waste in a lake or pond by introducing naturally existing beneficial microorganisms.
- To ensure that the bacteria continue to proliferate, a high inoculation dose of Pond & Lake Cleaner is added first, followed by maintenance doses to ensure that the bacteria continue to thrive. Some bacteria settle in the benthic and littoral zones' bottom sediments, where they degrade excess organic materials, while others live in the water column, digesting dead phytoplankton and soluble nutrients.
- The addition of Pond & Lake Cleaner to the bottom muck causes an extensive degradation of the muck's monosaccharides and polysaccharides.



Before Bio Dredging



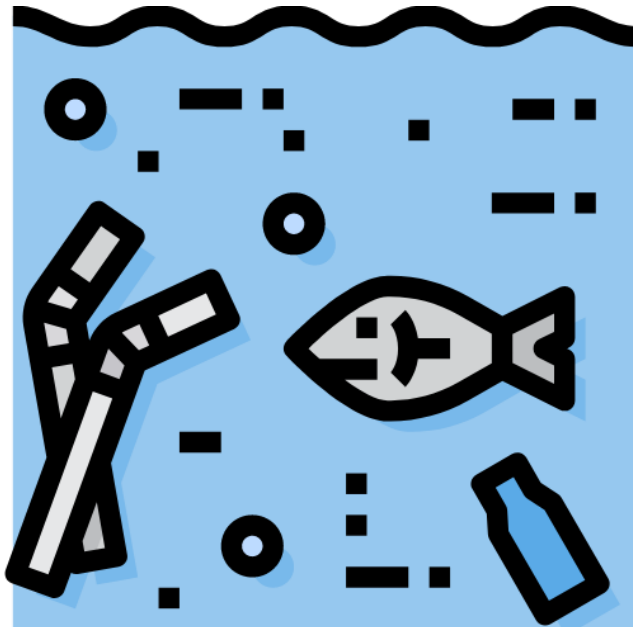
After Bio Dredging

# Benefits of SF&R Pond & Lake Cleaner

- Maximum reduction in pond sludge and pond water odor
- Helps in nitrite, ammonia, and hydrogen sulfide reduction
- Reduction in foul odor from pond bottom and water column
- Improvement in water clarity and lowering of suspended solids
- Reduction in algal blooms
- Reduction and control of weeds and water hyacinth
- Improves Dissolved Oxygen content
- Brings back the water body to its natural eco balance within a short span
- Control mosquitoes and fly infestation around the periphery of the water body
- Effective under wide environmental conditions
- Economical & safe to use

Let's Change From .....

This

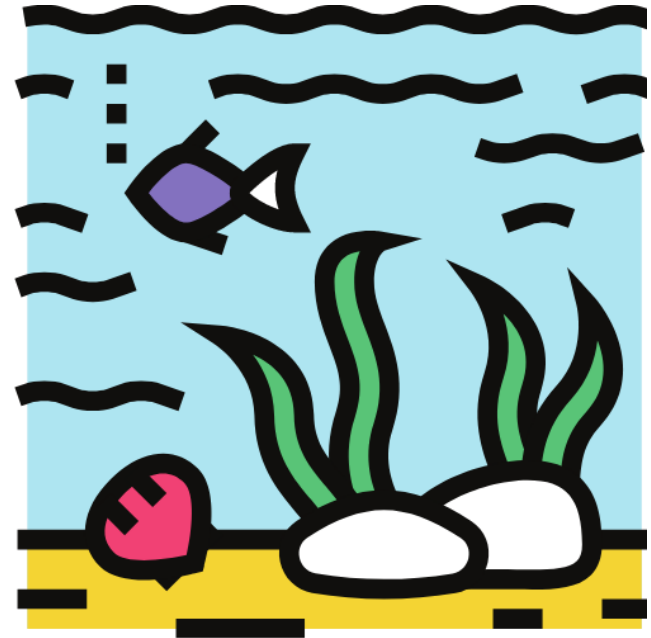


TO



SF&R Pond &  
Lake Cleaner

This



Thank  
you