

Beneficial Microbes

I n s p i r e d B y N a t u r e

Holistic pond management provides the basis for Inspired By Nature's all natural pond management. Holistic management is the process of determining the underlying causes of pond problems and developing best management practices to solve the problems. The combination of periphytic filtration (AquaMats), as well as bottom diffused aeration provide effective means of managing the pond's ecosystem. Another component, microbial application, proves to be effective in controlling water quality problems. At the same time, it holds the potential to increase fish production within the pond.

What exactly are "Beneficial Microbes"?

Microbes or bacteria are small, single-celled organisms that occur in practically all conditions imaginable. Many are aerobic, requiring oxygen to survive. However, a number of bacteria are capable of surviving in the absence of oxygen. Although variously shaped, they are typically round or rod shaped. These organisms are so small that they cannot be seen with the naked eye. In fact, approximately 8,700,000 round rod-shaped bacteria cells could be contained in the period at the end of this sentence. With few exceptions, microbes' primary role is that of decomposers, consuming organic muck and dead material and allowing it to be used within the system. In fact, without bacterial decomposition, your pond would fill with dead material very quickly.

Like all other living organisms, bacteria need to eat to survive. To feed, per say, bacteria absorb nutrients that are available within their surrounding area. To facilitate this decomposition, bacteria actually release enzymes that allow for the breakdown of tissue (animal or plant) externally. As the dead tissue breaks down, their components are absorbed and made available for the growth of the bacteria, which are then followed by assimilation of this material into the cell.

Another aspect of microbial growth is that of a boom and bust growth pattern. Somewhat similar to an algal bloom, microbe populations tend to grow and reproduce very rapidly, and are then subject to a crash in the popula-

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-tion as their food sources are depleted. Implications...following initial introductions of the microbes, microbe growth will be very rapid, producing an exponential growth of the population. Under these conditions, the microbial population can double from every 20 minutes to up to every 8 hours. The result, rapid growth and rapid consumption of both reactive nutrients and organic sludge. Microbes, like your fish, consume oxygen. Therefore, an aeration system may be necessary as a result of the rapid respiration that results from the initial microbial growth in older ponds.

Role of Beneficial Microbes in your Pond

Research has shown the importance of microbes within aquatic ecosystems. Referred to as "The Microbial Loop," this process emphasizes the role that bacteria play in transferring energy within aquatic systems. Traditional food chain theory emphasizes the role that primary producers(algae), primary consumers(zooplankton), and secondary consumers (small fish). In the background, however, are the decomposers. Although sometimes overlooked, these organisms play a critical role in any food web.

Typically, microbes are seen only for the role they play in decomposition, allowing for the recycling of nutrients, making them available for future plant and animal growth. However, they also play an important role in transferring energy to the primary consumers such as the zooplankton. The result, utilization of energy from the decomposition of organic decay in addition to that of photosynthesis by primary producers.

Within every pond there are billions upon billions of microbes. In fact, there are microbial populations established in nearly every aquatic environment. The key, however, lies in the diversity of the microbes that are present.

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Each microbe plays a slightly different role or niche, that allows for efficient decomposition of organic matter within the system. In addition to the microbes, enzymes are added to the mix. The enzymes enhance the natural role of bacteria, allowing for more rapid mobilization of the nutrients within organic matter (sludge).

Now, this may seem somewhat contradictory to our goal of managing excessive nutrients. Why would I want to mobilize nutrients that are tied up in the sludge at the bottom of my pond? Number one, efficient decomposition of this sludge will permit you to actually increase the depth of the pond. Number two, the decomposition of the material will allow those nutrients that are piling up in your pond bottom to become available for fish growth. In addition, fewer nutrients are available for algae growth in the water column.

As previously stated, algae are the base of the aquatic food chain. This large food source is consumable by small organisms such as daphnia and copepods, which are in turn consumed by small fish. However, bacteria can also play an important role in this food web. Many of the small filter-feeding organisms that consume algae are also able to consume bacteria. This can be especially important in situations where filamentous or other algae inedible to zooplankton are present. This has the potential of converting inedible food sources into fish biomass via microbial consumption. At the same time, a transformation of nuisance algae into more consumable bacteria shows improvements in water quality as well as holding the potential for increasing fish growth.

When used with Inspired By Nature's other holistic management approaches such as periphytic filtration and bottom diffused aeration, microbial enhancements can produce outstanding results in water clarity and reduction of organic sludge. At the same time, we can also enhance fisheries by providing an edible food source for many of the zooplankton and protozoans within the pond.

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