

Aquatics **in** Brief

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Surprise in the Grass

Bio-Dredging – Dredging with Bacteria?

By **Shannon Junior, Environmental Ecologist**

I want to start by saying that I really don't like the term "Bio-Dredging". I think it's a little confusing, and can mislead people into thinking they're getting something they're not. But the term, short for Biological Dredging, has become the industry standard to describe the process of reducing organic sediments with large amounts of beneficial bacteria.

Beneficial bacteria occur naturally in ponds and lakes, and are the microbes responsible for processing dead organic material (i.e., decaying plant and animal matter). There are many different types of these bacteria, which work in different ways to break down organic compounds. Some of the bacteria produce enzymes that allow them to break down organic compounds and take them into their cells as nutrients. Many bacteria also perform denitrification, transforming nitrate into nitrogen gas and removing it from the pond system. They can also convert soluble phosphorus from the water column into insoluble minerals that are not available to most types of algae.

Biochemists have found ways to culture beneficial bacteria so that they can be added to ponds and lakes to accelerate the decomposition process and to remove nutrients from the aquatic system. This process is referred to as Biological Dredging. Initially, a large inoculation dose is added to get the bacterial population established, and then maintenance doses are applied to ensure that the bacteria continue to thrive. Some of the bacteria go down to the sediments in the benthic and littoral zones where they break down excess organic matter. Some of the bacteria remain in the water column, where they process dead phytoplankton and soluble nutrients.

Biological dredging can be a non-invasive and less expensive alternative to conventional dredging for the removal of large amounts of organic sediment. However, it does not address the build-up of inorganic soil particles, which may be the primary cause of sediment loading and depth reduction in many ponds and lakes. If a pond has been impacted by sedimentation from construction or agricultural activities, then Bio-Dredging may not be a viable solution. These types of sediments can only be removed from the pond by utilizing mechanical dredging equipment. However, in older ponds with a thick layer of dark organic "muck", Bio-Dredging can be very effective in reducing the overall sediment depth.

It is also important to note that not all beneficial bacteria products are geared towards muck

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Beneficial pond bacteria



**A Full Service
Lake and Pond
Management Company**

The Food Chain

By **David Beasley, Fisheries Biologist**

Many times when people think about fish populations within ponds they don't understand the entire food chain. Often it is thought that Bluegill and Bass are all you need to have a healthy fishery. Although it is true that Bluegill play a big role in the success and health of most freshwater ponds, the reality is that the food chain has much more detail.

Plankton is the base of the food chain in ponds and lakes. Plankton is broken down into two categories, phytoplankton which are microscopic plants (green) and zooplankton which are microscopic animals (brown). Phytoplankton rely on four things to grow: sunlight, available nutrients, CO₂ and water temperature above the mid 50's. The primary predator to phytoplankton is zooplankton. Large phytoplankton populations will give the water a green color, whereas large zooplankton populations will give the water a brown color. Often times in ponds phytoplankton and zooplankton populations will fluctuate back and forth as populations increase and decrease, resulting in the water color changing between bright green, olive green, olive brown and brown. In ponds with aeration the plankton populations will be more stable due to good nutrient management and the additional oxygen source. In ponds where an abundant population of fish is desired, increasing plankton populations should be considered.

Next up the food chain are invertebrates. Invertebrates feed on plankton, plants, small fish and detritus (decaying organics). Invertebrates play an important role as food for larger invertebrates and fish, while they also further the decomposition of organics. A healthy, high quality invertebrate population hinges greatly on good healthy water. With a good population of invertebrates, small fish will prosper.

Small fish are very important to the food chain, as large fish depend on them for survival. Small fish feed heavily on both phytoplankton and zooplankton, while also consuming available invertebrates and other small fish when possible. It is important that small fish have abundant food available to give them the needed energy to face life's challenges. Survival for small fish is difficult, so having abundant food is needed.



Larger fish begin playing a role at this point, primarily feeding on invertebrates and smaller fish. Fish diets vary between the species, but most fish tend to feed on what is readily available. A few species that have a unique diet are Grass Carp and Shellcrackers. Grass Carp feed primarily on submerged vegetation, while Shellcrackers play a more unique role, targeting mollusks as their primary food source. The Shellcracker's unique diet will help break the life cycle of parasites within the pond that are hindering the health of the fish.

The life cycle of many aquatic parasites have three stages within three hosts. Their first hosts are mollusks, then fish, and then finally birds. To break this parasitic life cycle, Shellcrackers consume the mollusks, leaving a void in the parasites host requirement, keeping the parasite from being able to infect fish.

Predator fish are much more vulnerable to going hungry than those lower in the food chain since they are relying both on the smaller fish's success and competing with their own tendencies to over populate. Too many top end predators will put a large strain on the smaller fish, bringing instability to the food chain. It is very important to actively remove top end predators from ponds before they overpopulate.

Overall the food chain is relatively straight forward. The Food Chain ties directly into the much larger picture of the "Food Web". The Food Web takes into consideration the "Food Chain" along with all of the Aquatic and Environmental variables that influence the aquatic life such as vegetation, water quality, runoff, sunlight, etc. To maintain a prosperous aquatic environment, the food chain needs to be in check, and the Food Web needs to be understood. Many ponds often require assistance from aeration, fertilization, vegetation treatment, Grass Carp, additional forage fish, harvesting bass, along with many other management practices. There are dozens of variables that can be modified to bring stability to the ecosystem and each lake or pond is a little different than the next. The more that is known about your pond or lake, the more it can be positively influenced by using good management practices. ■

Bio-dredging *Continued from cover*

digestion. There are many different types and formulations of beneficial bacteria. We use bacteria products in our Annual Maintenance programs for algae control, organic waste degradation and general water quality improvement. Since the bacteria convert nutrients into unavailable forms, they can shift the nitrogen to phosphorus ratio in a pond so that the beneficial planktonic green algae that form the base of the food web will dominate over nuisance species of filamentous and blue-green algae (cyanobacteria). This type of bacterial water quality augmentation is not true Bio-Dredging. It is only when the

bacteria are supplemented with a formulation that contains enzymes specifically geared towards digesting the organic matter that builds up on the pond bottom that it qualifies as Bio-Dredging. The enzymes are targeted to break down specific compounds, such as the cellulose found in leaves and sticks that accumulate in the pond.

Although Bio-Dredging does not address the build-up of inorganic soil particles in a pond, it can greatly increase pond depths and decrease the amount of organic bottom sludge, while also improving the overall water quality and appearance of a pond or lake. ■

"Oxy Clean"

By **David Ellison, Aquatic Biologist**

Dissolved oxygen levels are a good indicator of the health of an aquatic environment. Maintaining adequate levels of dissolved oxygen will ensure a safe habitat for aquatic species within a lake or pond. Mechanical aeration, beneficial phytoplankton, and a healthy balance of aquatic vegetation are examples of ways in which a lake or pond receives oxygen.



Mechanical aeration, beneficial phytoplankton, and a healthy balance of aquatic vegetation are examples of ways in which a lake or pond receives oxygen.

Excessive plant and algae blooms will reduce the amount of dissolved oxygen by increasing the water temperature. As the plants cover the water's surface, the temperature increases and dissolved oxygen decreases due to warmer water holding less oxygen than cooler water. One manner we use to enhance dissolve oxygen is the addition of bio-oxidation products.

Oxidizers are non-copper, EPA approved organic compounds that can be effective in treating algae and enhancing dissolved oxygen in lakes and ponds. These products will keep dissolved oxygen levels at healthy levels as algae decays. Decaying processes utilize oxygen and the addition of oxidizers is important in maintaining a balanced pond.

The addition of oxidation products will also lead to an increase in beneficial microbes in the pond as water clarity and dissolved oxygen improves. Reduction of organic material is an important role that beneficial microbes play in lakes and ponds. Nutrient loads in the lake or pond will decrease as these microbes help in reducing organics. Lower nutrient loads provide the biological benefit of fewer nutrients available for algae growth.

Although oxidation products are often thought to be better suited for small ponds, there are many oxidizers that perform well in large lakes as well. Oxidizers are just one of the many products lake managers incorporate in a comprehensive management program to keep your lake or pond healthy and looking great. ■

Why You Need SonicSolutions

By **Lee Abernathy, Environmental Scientist**

As environmental stewards we are always looking for ways to minimize the use of algacides to control algae in our ponds. SonicSolutions has developed a way to do just that. SonicSolutions is a transducer that sits beneath the surface of a pond, and emits ultrasonic waves that inhibit the growth and spread of algae. SonicSolutions is completely harmless to fish, turtles, and frogs, but targets both filamentous and harmful blue-green algae. It also has no effect on beneficial aquatic plants.

Three to four weeks after installation and implementation of a Sonic Solutions System, a significant change in the amount of algae in your pond should be noticeable. While this may not seem to be an immediate result, the SonicSolutions device kills any remaining spores and is an excellent long term solution to keeping your pond algae free.

Now, you may notice that even with the device in your pond that algae may reappear after some period of time, as is the case with traditional algae treatments. This may be a result of excess nutrients being introduced into the pond, promoting algae growth. The SonicSolutions device will kill the new algae and continue to keep your pond clear providing that no new nutrients are introduced.

SonicSolutions works with "line of sight" technology. This means that wherever the transducer faces it will emit ultrasonic waves, but will not navigate around corners or islands on your pond. The ultrasonic sound waves will reflect off of rip rap or concrete. Depending on the size and shape of your pond an additional transducer may be necessary for optimal results.

SonicSolutions is typically powered by electricity and is economical. With an approximated running cost of between \$3 and \$7 a month, it is very cost effective. SonicSolutions has also made their product adaptable to solar power, eliminating any electricity costs. This is just another way that this product is helping lake management professionals become more environmentally friendly. ■



Reduce Costs with Annual Inspections

By Theodore Scott PE, CPESC, LEED AP
Stormwater Maintenance LLC, Hunt Valley, MD

In most cases, property owners are required by regulation to maintain pond embankments and outfall works as related to structural integrity and dam safety. Proper maintenance also lessens the liability of pond and lake ownership by reducing the likelihood of failures that can impact downstream property. Owners or property managers may believe that proper maintenance is occurring only to later learn that they need expensive repairs. This situation illustrates that many contractors providing routine maintenance, such as landscapers, are not trained to properly identify issues that can be problematic or lead to increased cost of ownership.

Annual structural pond inspections are an economical way to ensure proper maintenance is being performed, identify current and potential problems, document the condition of a pond, and plan ahead for anticipated expenses. Qualified inspectors often identify changes to routine maintenance that may be simple for the contractor to make, but can save money in the long run. Inspectors also identify repairs that may be needed. Knowing that repairs are — or will be — needed is the only reliable way to establish and follow a budget.

In many jurisdictions, County personnel perform inspections of stormwater facilities. These inspections are regulatory and are not performed on behalf of the owner. Accordingly, municipal inspections do little to make owners aware of future expenses or actions that may reduce long-term costs. If a municipal inspector discovers any needed repairs, a 30-day timeframe is commonly given for action. Thirty days leaves little time to search for qualified vendors, secure bids, and schedule and complete the repairs. This also does not factor in any weather delays or the time necessary to secure funding from elsewhere in the budget for the unexpected repairs. Annual structural inspections by private qualified inspectors — who act as Owner Representatives — can avoid reactive “damage control” from municipal inspections and allow the owner to plan ahead for repairs.



STORMWATER MAINTENANCE
INSPECTION | MAINTENANCE | REPAIR

The cost of pond ownership can be reduced or made more predictable in many ways with Annual Inspections.

Common examples of what inspections can identify:

- **Mowed Areas** — In many cases contractors do not mow all areas required. Missing a few areas for years can lead to expensive clearing operations.
- **Mowing Intervals** — Sometimes contractors mow ponds as often as front lawns. In some cases it is appropriate for aesthetics. But quarterly mowing is sufficient to meet most maintenance guidelines. Overly aggressive vegetation management can lead to problems maintaining reliable ground cover.
- **Dewatering** — Unusually high water levels may mean a clogged outflow device. Low flow oraphaces can easily clog, leading to high water levels with erosion, vegetation damage, silting, and reduced flow capacities.
- **Rill Erosion** — Easily missed, erosion along the pond slopes can lead to topsoil loss which then causes difficulty with maintaining ground cover. Importantly, the resulting sediment ends up in the pond bottom, reducing pond depths, compromising water quality, and requiring earlier dredging.
- **Inflow Erosion** — If repaired early,



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erosion at inflow channels or pipes can be a simple and inexpensive process. If left to continue, the damage may quickly worsen and costs escalate significantly. As in the case of rill erosion, the resulting sediment is then in your pond.

- **Trash/Debris/Sediment Removal** — Ponds (especially stormwater ponds) collect this material by design. Identification and routine removal can help avoid water quality challenges and reduce the intervals for major dredging or cleanouts.
- **Outlet works** — The “riser and barrel” structure that hydraulically controls water release from the pond can be the most expensive item to repair or replace. It is important to make minor repairs to extend the lifespan of the structures. Simple actions such as making sure the outfall area drains well can significantly extend the life of these systems. Early identification of problems can result in more cost effective resolutions, such as pipe lining. Ignoring these structures can lead to very expensive repairs that are mandatory to keep your pond functional. Routine inspections can identify the need for major repairs in the future, giving you time to plan ahead.

Annual structural inspections provide information needed to properly manage ponds and lakes for long-term success. Owners and property managers are informed about what their contractors should — and should not — be doing, what proactive actions are needed, and what to plan for in the future. Ultimately, this information facilitates predictability while minimizing the cost of managing the aquatic resources. ■

Theodore (Ted) Scott, PE, CPESC, LEED AP is the founder and Managing Member of Stormwater Maintenance, LLC., headquartered in Hunt Valley, MD. Ted has been involved in the design, maintenance, and repair of water resources infrastructure for over 20 years. A strategic partner with Virginia Lake Management, Stormwater Maintenance provides inspection, maintenance, and repairs to the physical components of all types of stormwater and water resources infrastructure throughout the Mid-Atlantic region. Mr. Scott may be reached at tes@mdswm.com or 410.785.0875. www.SWMaintenance.com



Product Spotlight:

Algae control without chemicals

Virginia Lake Management Company is continuing to search the world for new technologies and reliable **SonicSolutions™** products that we can provide our customers to improve their lake and pond management programs. After a year of testing this product in a lake with one of our customers, we are proud to announce the addition of SonicSolutions™ Ultrasonic Algae Control to our product offerings.

Controlling algae the environmentally safe way is easy and inexpensive with SonicSolutions™ Ultrasonic Algae Control. SonicSolutions™ is safe for fish, plants, and other aquatic life, and uses less than 10 watts of power. A single unit can provide coverage for up to 6 acres depending on conditions.

“With more than 3000 installations worldwide our technology has been proven effective in ponds, lakes, and reservoirs,” said Kirk Whatley, Sales Manager for SonicSolutions. “The system is safe and easy to use, and we are helping golf



SonicSolutions™ is safe for fish, plants, and other aquatic life, and uses less than 10 watts of power. A single unit can provide coverage for up to 6 acres depending on conditions.

courses, botanical gardens, wineries, irrigation systems, water and wastewater authorities control algae in an environmentally responsible way.”

“Sonic Solutions, is a major component of our pond management strategy,” said Mathew Ceplo, CGCS of the Rockland County Country Club, New York. “For the past several years, our irrigation pond has stayed algae free. SonicSolutions has helped us obtain certification status with the Audubon Cooperative Sanctuary Program.”

For additional information about the Sonic Solutions product contact Virginia Lake Management Company at 1-866-697-2584. ■

Buffer Species Wanted: Dead Or Alive

By **Brian Misener, Fisheries and Wildlife Biologist**

By now you have probably spoken to one of our employees about your pond's vegetative buffer, or lack thereof. If your pond doesn't already have a buffer, we have probably recommended that your landscape company leave a 3-5 ft. section above the water level unmowed so that it can grow and help the pond. If your pond already has a buffer, then the pond and those who enjoy it are already reaping the benefits it can provide. If you've been reading and have no idea what a buffer is, then this article is for you! We'll establish exactly what a buffer is, why they're beneficial, and we'll touch on how to manage them.

The area directly surrounding a water body where the two ecosystems meet is called the riparian zone and provides a protective buffer between the two environments. This area provides many benefits for both environments because it allows for a wide range of growing conditions for both plants and animals. The more diverse an area is with plant and animal species, the healthier the area and surrounding areas will be.

The area directly surrounding a water body where the two ecosystems meet is called the riparian zone and provides a protective buffer between the two environments.

The buffer also helps to maintain the structure of the bank surrounding the pond which helps water quality, reduces maintenance, and will prevent unexpected costs in repairing the banks which can really add up. It does so because the root system of the plants in the buffer stabilizes the bank and reduces the amount of soil lost into the pond due to erosion. A buffer should be managed for the species of plants that are growing in it to better accomplish the bank stabilization and erosion reduction.

For instance, trees should not be allowed to grow in the buffer because of the damage they can cause later on in their life. When trees age, their roots form a ball that can become very large and outcompete surrounding plants for resources. Since the tree is growing next to a pond and on a slope it will lean toward the pond and eventually topple into the water. It then leaves a large hole in the ground resulting in a lack of bank stabilization along with water quality issues.

Grasses are a preferred type of vegetation to have in the buffer, but the kind of grasses present can also make a huge



Little Bluestem



Indian Grass

difference. Turf grasses, or lawn grasses, are not a great selection for growing a buffer. These species are better to have than leaving bare soil, but are not as effective in stabilizing the bank, slowing nutrient runoff into the pond, or increasing the biodiversity of the environment. Additionally, these grasses are usually mowed regularly and the grass clippings end up in the pond causing nutrient build-up and algae problems.

A better solution to turf grasses would be a number of species of warm season grasses.

Warm season grasses are a great choice because of the many benefits they can offer to the buffer. From a bank stabilization point of view, they are the better choice because of their deep root system. These perennials will establish their roots and come back year after year, providing the best option for bank stabilization, and preventing soil erosion. Another benefit of warm season grasses is their ability to obtain and hold nitrogen from the soil. This will greatly reduce the amount of nitrogen that ends up in the pond from fertilizers, plant decay, and other sources. Excess nitrogen causes algae blooms, so its removal also helps in the health of your pond.

One species that should be welcomed into your buffer is *Schizachyrium scoparium*, a warm season grass also known as Little Bluestem. This plant is preferred because it provides all of the benefits of a warm season grass, but only grows to three feet tall so it rarely blocks the view of the pond. Another warm season grass that grows well with Little Bluestem is *Sorghastrum nutans*. Also known as Indian Grass, this plant does not grow very tall and has a deep and dense root system that does a great job stabilizing the soil. There are many other plants that are beneficial in a buffer. Contact your lake professional for the best plant species for your area.

A great benefit that can come from managing the species in your buffer is an increase in the aesthetic value of your pond. With warm season grasses and other beneficial plants throughout the buffer, it can be a very pleasing sight that will undoubtedly increase the value of your property. ■

Surprise in the Grass

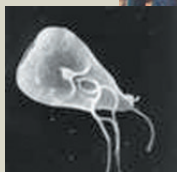
By **Ethan Chappell, Aquatic Specialist**

Two weeks ago my home and serenity was forever changed by the adoption of a new puppy. Our half boxer, half golden retriever, 'Martha,' is now the center of my universe. My spare time is now occupied with staying one step ahead of those puppy teeth. In addition to dealing with the constant threat of random object destruction, I am working to develop the near sixth sense that lets a puppy owner know when its potty time. Living in a townhouse (townhome association) and potty training a new puppy is not without its challenges.

Growing up in rural central Texas, the dogs of my childhood lived on the porch and in the dog house. They came in the house every 5 years or so when we got a bad winter storm or every couple of years when one would get bitten by a snake. Once the storm broke or the wound healed, it was back outside for the canine members of the family. Things are much different in the city. Martha will spend most of her days in the house waiting for us to come home. In fact, she will have to be leashed every time she leaves the house. After all, it is the law. Also, in keeping with the law and the rules of our Association, Martha's owners will have to pick up after her whenever nature calls or risk incurring a steep financial penalty. If only she understood what we do for her, perhaps she (and her teeth) would go easier on our sneakers.

As a country boy whose dogs always roamed free and took care to do their business far from the house, these legalities are admittedly a bit foreign to me. While at first I was upset by the notion of running around behind my pooch like so many of the stick figures in my neighborhood signs, I do not appreciate it when my shoe finds a surprise left behind by a less than responsible urban dog owner. This is not even, however distasteful, the biggest problem. The biggest or *smallest* problems, as the case may be, come in the form of the tiny microbes that can be present in the substance now attached to our favorite slippers - microbes that are 'free to move about the country.' Obviously, we are the transportation for these microbes as we unwittingly track up the carpet or the floor board of the truck. After a ground deposit from one of our precious pets, one good rain can make those little hitch hikers mobile. Carried by water they go where all water goes... down hill. In no time rain and irrigation water can carry fecal contaminants to our storm water ponds, creeks and streams, lakes and yes, even our drinking water reservoirs.

Last week my brand new beloved puppy was diagnosed with *Giardiasis*, "an infection of the intestines caused by the parasite *Giardia lamblia*. If you have spent any time in the back country or a foreign country you may know this often water born menace. According to the Division of Parasitic Disease at the Centers for Disease Control, *Giardia intestinalis* or *lamblia*, has become commonly recognized during the past 20 years as a cause of water born disease in the United States. It is found in every region of the country and throughout the world. Symptoms include upset stomach, cramps, nausea, diarrhea, and a host of additional com-



Giardia



Martha

plications that can last up to 6 weeks. *Giardia*, like *E. coli* and other fecal coliforms are most suited to the intestines of mammals, but can survive quite well in other environments for some time. This is, of course, how they are transmitted and how Martha was infected.

Known as 'beaver fever' in some circles, giardia can be present in both wild populations and domestic animals. In many cases giardia does not present symptoms. This makes it very difficult to control. The best prevention techniques for humans are water filtration with a filter specifically approved for giardia, like the Lifesaver products (featured on our website), or boiling water

While at first I was upset by the notion of running around behind my pooch like so many of the stick figures in my neighborhood signs, I do not appreciate it when my shoe finds a surprise left behind by a less than responsible urban dog owner.

before drinking it. Care must be taken to wash vegetables and good hand washing techniques can also prevent contamination. In addition to these practices, cleaning up pet waste at home and in public places is the best way to minimize our individual impacts.

With threats like giardia lurking in our neighborhoods, it is imperative that we do the right thing. Picking up after our pets is not just some pleasant way to share the spaces we all love. It is a civic responsibility. We must do all we can to protect our four legged and bipedal friends from the spread of parasitic organisms. While puppies may never stop chewing our sneakers we can stop the unwanted surprises stuck to the bottom of them. I am reminded of a poster from a recent water quality conference...

'If you don't like picking up dog poop... Try drinking it!' ■

"Pond"er These Thoughts

Virginia Lake Management wants you to be prepared for 2010. With this in mind, we recommend that you consider the following during the winter months:

- If you have not been maintaining the vegetative buffer along the shoreline and the sloped areas adjacent to your lake, schedule thinning of the vegetation in these areas
- Schedule annual maintenance for your fountains and aeration systems
- Implement an annual maintenance program for your lake or pond
- Schedule a physical inspection of your lake or pond
- Review your lake/pond budget and reserve funds to ensure that funds are provided for bathymetry to determine if and when you will have a need for dredging. If bathymetry or dredging is needed, schedule early!
- Consider installing a Sonic Solutions algae control device prior to spring to help prevent the onset of algae blooms as the weather warms.
- Evaluate your pond and determine if you need to add aeration to meet your management goals and objectives.
- Develop a plan for improvement of cultural practices in the watershed so that you can improve the quality of your pond into the future. ■

Check Us Out...

Virginia Lake Management will be participating in the following events over the next couple of months. We encourage you to come see us! If you need information on attending any of these events, please call our office.

January 11 Washington Metro Chapter of Community Associations Institute's Jump Start January, Falls Church, VA

January 24-29 Mid-Atlantic Horticulture Short Course, Kevin Tucker, Speaker, Virginia Beach, VA

February 11 Central Virginia Chapter of Community Associations Institute Annual CA Day and Trade Show, Shannon Junior, Speaker, Richmond, VA

March 7-9 Virginia Water Conference (Virginia Lakes and Watersheds Association), Richmond, VA

March 13 Washington Metro Chapter of Community Associations Institute's Annual Conference and Expo, Washington, DC

March 27 Southeastern Virginia Chapter of Community Associations Institute's Annual CA Day Trade Show and Education Expo, Kevin Tucker, Speaker, Virginia Beach, VA



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