



# cycling your **AQUAPONIC SYSTEM**

## what is CYCLING?

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“Cycling” refers to the process of establishing nitrifying bacteria colonies that turn fish waste (ammonia) into a usable nitrogen (nitrate) for plants. The bacteria is established and lives in the biofilter of an aquaponics system. This biofilter should always contain a great deal of surface area, so there is plenty of space for the bacteria to colonize. In aquaponics we are growing fish, plants, *and* bacteria. Without bacteria the system will not work.

Nitrifying bacteria are the engine behind the Nitrogen Cycle, a natural cycle that takes place in fish tanks, lakes, aquaponic systems, and soil; basically anywhere there are sources of ammonia. There are two key groups of nitrifying bacteria involved in this process. The first is called *Ammonia-Oxidizing Bacteria* (AOB), and the second is called *Nitrite-Oxidizing Bacteria* (NOB). AOB is the bacteria in your system responsible for oxidizing (adding oxygen) to the ammonia in your system to turn it into nitrite, while NOB is the bacteria responsible for oxidizing the nitrite into nitrate.

The Nitrogen Cycle breaks down like this:

*Ammonia* ----> **(AOB)** ----> *Nitrite* ----> **(NOB)** ----> *Nitrate*

Since there are thousands of types of nitrifying bacteria in existence it is difficult to know exactly which kinds of bacteria are in your system without a microscope, so we refer to them as AOB and NOB for ease of learning. Different types of bacteria will colonize your system over time, creating a more mature and stable environment.

To start the Nitrogen Cycle, a source of ammonia is needed. The ammonia can come from fish or it can come from other sources like uneaten food. Cycling can be stressful for fish which is why we recommend fishless cycling for large systems (see our blog on fishless cycling [HERE](#)). For our 20 gallon ECO-Cycle Aquaponics Kit, starting with 2 - 3 fish is ideal because overstocking before you are cycled will lead to fish casualties.

# information on WATER QUALITY

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We recommend purchasing an [API Freshwater Test Kit](#) to evaluate water quality.

Ammonia and nitrite are toxic to fish and will kill them if exposed for too long. Nitrate is only fatally toxic at high levels - 160@ ppm and above. The key is to only stock a few fish at the start, and feed them an amount that they will eat within a few minutes once a day. When your system *cycles* then a healthy aquarium will read the levels below.

pH	6.5 - 8
Ammonia	0 ppm
Nitrite	0 ppm
Nitrate	5 - 80 ppm

## how to ADD FISH

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Remember to acclimate fish first by resting their bag in the water for 10-15 minutes. This will allow the water temperature to equalize and prevent temperature shock. A basic guide for how many fish to stock is one pound per ten gallons or one inch of fish per gallon.

## what to LOOK FOR

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After three days of adding fish, test your ammonia level. You are aiming for a level of 2-4 ppm. Do not get discouraged if this does not happen right away. Any change you make to the water quality in aquaponics should be done slowly to keep your fish, plants, and bacteria healthy. If your level is higher than 4 ppm, remove one-third of your water, replace with fresh water, and rinse your mechanical filter (not your biofilter).

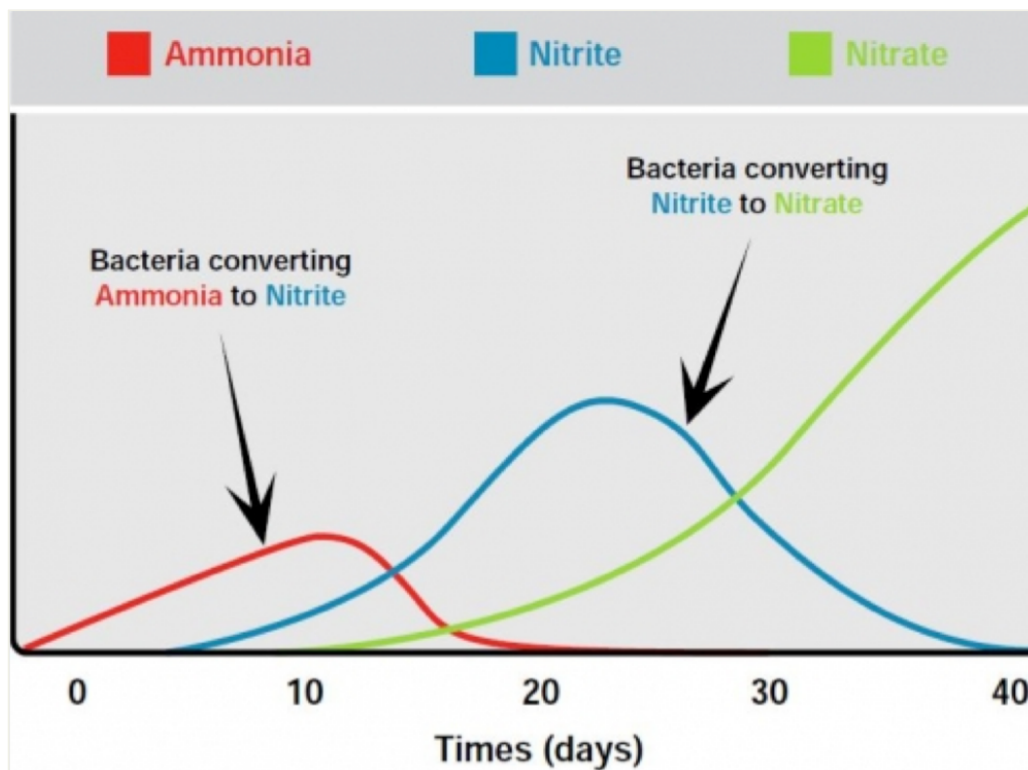
Keep an eye on your fish for signs of poor health including: gasping at the surface, swimming as if they are off balance, staying only on the bottom of the tank, light colored spots on their scales, scratching themselves against the bottom of the tank, or torn fins.

Four or five days after you have an ammonia level of 4 ppm, start testing water for nitrites. When you see a level of nitrites rise to .50 ppm, start to feed your fish every other day. It is crucial to make sure that your ammonia and nitrite levels are not too high. If your ammonia

level nears 8 ppm or your nitrite level nears 5 ppm do a one-third water change and rinse your mechanical filter. Remember that any food you put into the tank is going to create more ammonia, which will turn into more nitrite. Nitrite makes it difficult for fish to breathe which is why it is important to monitor your tank closely at this stage. Adding an air pump will increase the amount of dissolved oxygen in the water which will keep your fish, bacteria and plants healthy. Feed less if your rates of ammonia or nitrites are rising too quickly.

One week after you have nitrites in your system, start testing for nitrates as well. When you see signs of nitrates you can celebrate, as you have officially cycled! Now you will want to cut back on feeding for a day and let your bacteria process any ammonia and nitrite that is left in the water.

Continue testing for ammonia, nitrites and nitrates until the ammonia and the nitrite are close to zero and the nitrates are between 5-80 ppm. After your system has been cycled for a few weeks you will no longer need to test for ammonia and nitrite unless you suspect there is a health problem with your fish. You will want to keep an eye on your pH and your nitrates so that you can maintain a healthy environment for your plants. The chart below shows how a system cycles over time. The time it takes for bacteria to cycle will depend on many factors. For tips on how to speed up your cycling process and protect your fish review our [6 Ways to Speed Up your Cycle Blog](#).



## what's NEXT?

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Even though you are now cycled be careful when adding your new fish. You can still overwhelm your system with too much food, ammonia, or nitrite, so incrementally introducing fish into your system is important.

We hope this was helpful. Please visit [ecolifeconservation.org](http://ecolifeconservation.org) for more lessons and resources.

Visit our website for more helpful hints on how to grow!

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