

# Koi Pond Start-up Guide

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The *most important thing* to know about the start-up of a new pond is that it usually takes **at least 4 weeks for a pond to cycle or achieve good water quality**. What this means is; over a period of time, the 'good or beneficial bacteria' will multiply in the filter media until it has reached its full capacity to break down ammonia in your pond and convert it to nitrites and then into nitrates, the latter being generally safe for your fish. This process is what creates a balance in your pond and protects your fish.

The pond **temperature** must be 60° F or above for the beneficial bacteria to multiply. Adding one small koi per 500 gallons, or 1 large koi per 1000 gallons, will feed the bacteria the ammonia they need to multiply.

Here are the questions you must be able to answer to have a healthy start-up pond for your fish.

## 1. What is the volume of my pond?

- a. Use a water meter attached to a hose when filling your pond. This is not always easy to measure accurately with your house meter because of water usage inside your home.
- b. Or use the formula: Length (average length) x Width (average width) x Average depth x 7.48 = Pond Volume. A volume calculator may be found on the Internet at [www.pondpetsusa.com/calculator.html](http://www.pondpetsusa.com/calculator.html)

## 2. What are ammonia, nitrites, pH, KH, GH and DO?

- a. **Ammonia** is a waste product of fish and also comes from the break down of organic waste. It can seriously burn the gills of fish and cause death.
- b. **Nitrites** come from the break down of ammonia by 'beneficial bacteria'. It can cause severe damage and/or death to your fish.
- c. **pH** is a measure of how acid or basic a substance is. Below 7 is acidic, higher is alkaline. Since everyone has a different water source, your goal should be to stabilize the pond pH near or equal to the source water pH.
- d. **KH** is a measure of carbonate ( $\text{CO}_3^{2-}$ ) and bicarbonate ( $\text{HCO}_3^-$ ) ions dissolved in the water and represent the main buffering or pH stabilizing capacity of pond water. It helps keep the pH from crashing (falling into the acidic range – see "pH Crash" section below).
- e. **GH**, or general hardness, is a measure of the calcium and magnesium ions dissolved in the water.
- f. **DO** is dissolved oxygen. Koi must have sufficient DO in the water to be able to breathe and the beneficial bacteria in the filter need it to multiply. The larger the koi the higher the total demand for oxygen.

## 3. How do I detect ammonia, nitrites, pH, KH, GH and DO?

Buy a test kit (or kits) with liquid reagents and test tubes and test the pond water daily. Make sure the ammonia test kit is a salicylate reagent test that is compatible with your ammonia-binding water conditioner. See shopping list.

#### 4. How do I control ammonia, nitrites, pH, KH and DO?

**a. Ammonia** should always be zero when tested with the average test kit. If it is not, add **AmQuel, ClorAm-X, Ultimate** or **Pond Prime** to bind the ammonia. Once the ammonia is bound, it is non-toxic for the fish but can still be utilized by the filter. It is crucial that the ammonia test kit you use be compatible with the chemical used to bind the ammonia.

**b. Nitrites** should always be zero when tested. If present, do a water change and add **Solar Salt (salt w/o additives)** to bring the salt reading up to between 0.1 to 0.3% or about 0.8 to 2.5 pounds of salt per 100 gallons of pond water. When nitrites reach zero, do water changes to reduce the salt reading to about the same as the tap water.

**c.** If there is a **pH crash**, before you attempt to raise the pH, change some water if possible and definitely add an ammonia binder. Only after binding the ammonia should you add **Baking Soda** (1/4 cup per thousand gallons). Retest after the pond has circulated through the filter once and keep adding baking soda until the pH has reached the same pH as your source water. If the pH falls below about 5.0 for very long, koi may die.

#### 5. How is a water change done and why should it be done at least weekly?

**a.** To do a proper water change, empty out 5-10% of the pond volume and replace with fresh water. Topping up a pond after evaporation is **NOT** a water change. Use a chlorine remover (Sodium Thiosulfate) or an ammonia binder (AmQuel or ClorAm-X or Pond Prime) if you have chloramines. Check with your City Water Department to see what additives they use and when, as it will tell you what to use: a dechlorinator, and/or an ammonia binder.

**b.** While “change” is usually a big threat to koi by causing stress, water changes are more beneficial than harmful. Doing small daily water changes is less stressful than doing larger water changes less often. Do weekly water changes at a minimum. Also consider that the smaller the pond, the bigger the percentage of change should be.

**c.** Water changes mimic nature, reduce mineral build-up, add buffers to the water and dilute pollutants such as ammonia, nitrites, nitrates, and acid rain.

**d. KH** or carbonate hardness is constantly being consumed by the fish, algae, other plants, the filter and must be replenished to avoid a pH crash. Baking soda may be used to immediately add carbonates (KH) and bring up the pH. In the long term, oyster shells, plaster of Paris pills or crushed coral can add carbonates gradually.

### The Relationship Between pH and Alkalinity, KH, GH

As mentioned above, **pH** is a range of acidity (<7.0) to alkalinity (>7.0), with 7 being neutral. Koi keepers need to keep their **pH** (depending on source water) in the alkaline range with 7.0 to 8.5 about average.

**KH**-carbonate/bicarbonate ions, act as a buffer or stabilizer for pH, keeping the pond water on the alkalinity side of the scale. The only way to know how much carbonate hardness there is in your pond is to use a KH test kit. It should measure between 50 and 200 ppm. Higher than 200 ppm is not particularly harmful but lower than 50 ppm is very dangerous because KH is always being depleted by every living thing in the pond. KH is also called *temporary hardness*.

**GH-** general hardness results from dissolved magnesium and calcium salts. GH plus KH is referred to as Total hardness. A favorable GH reading is 6-16 dH (degrees of German hardness).

## pH Crash

When KH is depleted, it causes pH to fall or crash into the acidic range. KH MUST be replaced so the pH will move back into the alkaline range. **WARNING:**

1. **NEVER** correct pH without testing ammonia which should be zero. If not, add AmQuel or ClorAm-X to bind the ammonia.
2. Now KH (carbonates) can be brought up by adding baking soda, 1/4 cup per 1000 gallons. Circulate through the filter and retest until pH reaches a safe range.

## Shopping List for Koi Pond Start-up

[www.dallaskoikichi.org](http://www.dallaskoikichi.org) has resources listed on the web site. Products can also be found at [froogle.google.com](http://froogle.google.com) to shop the Internet.

**Test Kit** for ammonia (salicylate type), nitrite, pH, kH, DO and salt. Master Liquid Test Kit for ponds or Tetra Koi Master are good choices. Do not use test strips as they are not as accurate.

**AmQuel or ClorAm-X** binds ammonia and chlorine.

**Sodium Thiosulfate**-is easy to use, inexpensive and a good choice for chlorine removal in municipal water.

**Ultimate or Pond Prime**- Detoxifies Chlorine, Detoxifies **Ammonia** and **Nitrites**, Destroys Chloramines, Detoxifies Copper and Heavy Metals, Boosts Alkalinity Adds Essential Electrolytes, Replaces slime coat where it is missing without coating the gills.

**Stress-X**- a must for the first year of a pond to reduce stress.

**Solar Salt**- blocks nitrites, reduces ammonia burns to the gills and reduces stress. Only use 99.9% pure. Do not use pellet salt. Sold in 40 pound bags at Home Depot or Lowes for under \$5.00.

**Baking soda**- Brings up alkalinity. Baking soda is sold in 12 pound bags at Costco and Sam's Club, for under \$5.00.

**Extra air pump with air stones**-an air pump can be a real life saver if you need it when medication is added to the pond or if the pond becomes too hot during the summer, or if an air pump goes out. These are just a few of the reasons to keep an extra on hand.

**Thermometer**-test your water temperature to know when to feed your koi. Do not feed below 55 degrees or over 85 degrees.

**Water hose**-Many hoses are made of polyvinyl chloride, which uses lead as a stabilizer. Some of the hoses that were labeled as unsafe for drinking had 10 to 100 times the level acceptable by the FDA. Since you fill your pond with a hose, make sure you buy a camping hose that is lead free. It is only \$30.00 for 50' and well worth keeping your pond lead free.

**Timer**- The biggest killer of koi is chlorine! While filling a pond, it is all too easy to walk away and get involved doing something else and the fish die of chlorinated water. A Polder Electronic Timer has a cord to hang around your neck so you will never forget to turn the water off. The Polder Timer (\$15.95) can be found at [www.cooking.com](http://www.cooking.com) .

### A few helpful formulas and conversions:

**Area:**

Rectangle or square = Length x Width

Circle =  $3.14 \times (\text{Radius squared})$

**Volume:**

x Depth

Cylinder = Area of the circle x Depth

**Conversions:**

1000 grams = 1 kilogram

264 US gallons (rounded) = 1 metric ton = 1000 liters

1 ounce = 28.35 grams

Rectangular box = Area of rectangle  
parts per million (ppm) = 1 gram per 1000 liters = 1 mg per 1 liter

**Salinity:**

1# of salt will raise 12 gallons of water to 1%

1# of salt will raise 100 gallons of water 0.12%