

Take Stock of Your Pond

By Larry Lunsford

One of the first questions asked by someone starting a pond is "How many Koi can I keep in my pond?", followed closely by question number two "Do I really need a filter?" The novice is looking for simple answers like "843" and "no." Unfortunately, the answers to these seemingly simple questions aren't nearly so simple. Stocking density is the leading parameter that affects all other design decisions. Lets take a look at that first.

The stocking density of a pond can be measured several ways. To the novice, it is simply the number of fish in the pond. Since the size of individual Koi and the nature of individual ponds vary so drastically, I would propose that a more useful measure of stocking density is gallons of water per pound of Koi. Some other measures of stocking density to consider are: lbs. of Koi food / day, energy consumption, hours of maintenance / week, level of technology needed to sustain pond, and \$ needed to sustain pond. Listed below are (very rough) stocking densities for a range of situations.

1 gal : 1lb high density fish farm
10 gal : 1lb medium density fish farm, very high density Koi pond
100 gal : 1lb low density fish farm, medium density Koi pond
1000 gal : 1lb high density Japanese mud pond, very low density Koi pond
10000 gal : 1lb low density Japanese mud pond
100000 gal : 1lb well stocked fishing lake
1000000 gal : 1lb nature

Lets look at the characteristics of each of these situations.

Fish Farms: Require great quantities of labor, energy, and technology. Lots of filtration. Lots of automated monitoring. Heavy reliance on chemicals and medications. Frequent water changes. Good temperature control. Skilled staff on site or on call 7/24. Fish are only grown for a few months before being sold. Long term health of fish is not of concern - just long enough to sell at a profit. Brief failures of power, pumps, etc. can result in significant problems. Occasional total losses of fish are an accepted part of the business.

Japanese Mud Pond: Requires careful preparation in spring. Requires frequent maintenance by skilled technicians. Pond is only operated a few months during optimum weather periods before fish are removed and everything is restarted. Health of Koi is of highest importance.

Fishing Lake: Fish are stocked in spring. A large percentage of the fish are caught and removed over the course of the summer. Water is continuously replaced by stream/spring/river feeding lake. Good amount of biodiversity. Good amount of natural biological filtration. Long term health of fish is not of great concern. Occasional environmental anomalies (heavy rains, droughts, large temperature swings) can cause significant problems. Occasional large fish losses are expected.

Nature: No maintenance or technology required. Energy requirement is huge, but provided by sun. Everything is important to the health and survival of everything else. Old and weak become middlemen in the food chain. System does not attempt to maximize life span of individual animals. Some areas may have significantly higher stocking densities, but such areas are only possible because they are supported by the whole planet.

To determine your stocking level, you need to take inventory of your pond. Account for each fish and record its length as accurately as possible (measured from tip of nose to tip of tail). Also note whether the Koi is normal, skinny, or fat. A very skinny Koi may weigh as little as 1/2 as much as a normal Koi. A very fat Koi may weigh 1.5 times as much as a normal. Now, using the chart below along with the build of your fish, estimate the weight of each Koi. Next, total the weights of your Koi. Now calculate your stocking density by taking your pond volume (gallons) and divide by total weight of fish (pounds).

4	0.4		15	23		26	122
5	0.9		16	28		27	137
6	1.5		17	34		28	152
7	2.4		18	41		29	169
8	3.6		19	48		30	188
9	5.1		20	56		31	207
10	6.9		21	64		32	228
11	9.2		22	74		33	250
12	12		23	84		34	273
13	15		24	96		35	298
14	19		25	109		36	324

Koi Length (inches) - Weight (ounces)

So, now that you know your stocking density or the density you're targeting, you can compare it to other fish environments. Hopefully, these scenarios will put your Koi pond's requirements into perspective. You can't expect to stock your pond like a fish farm, ignore it for days or weeks, and still expect your Koi to remain healthy for years.

From these scenarios, it should be obvious that the answer to "Do I need a filter?" is absolutely YES. Even the lowest stocking that could pass for a Koi pond - the high density Japanese mud pond - is not capable of supporting Koi for more than a few months. Its also far less stocked than most of us want for our ponds.

To decide how densely you can stock your Koi pond, you should consider the following:

- How much time are you willing to devote to care and maintenance?
- How often are you willing to perform maintenance?
- How much money are you willing to spend on: water, filters, electricity, food, backup systems, etc.?
- How long must the pond survive situations like power outages or pump failures?
- How skilled are you at identifying and fixing health problems?

You also need to factor in the growth of your Koi. Lets suppose that you start with 6 Koi that are 6" long. Your initial fish weight is only 9 ounces. If they are well cared for, they could easily be 10" long in a year and 14" in just two years. At 14" each, you now have 114 ounces of fish, almost 13 times what you started with only two years earlier - and they're not done growing! You need to plan for this growth when designing your pond and filters and when deciding on whether your pond can handle "just one more Koi".

Lets see how our Koi ponds stack up against the scenarios to see how much care our pond may need. The first difference is fish life span. Most of us want our Koi to live long and healthy lives. Even if they become sick, we don't just let nature take its course, we try to nurse them back to health. Of all the scenarios listed, only the Japanese mud ponds put health and longevity of individual animals as the highest priority - even duplicating nature isn't enough. So if we want our Koi to remain healthy for many years, we should expect that we will have to provide the necessary level of care. In a commercial farm, if a fish gets sick, they just dispose of it. Unless you want to do the same, you can't stock your pond like it's a fish stick factory.

The fish farms and Japanese mud ponds are cared for by well trained staff that check on the fish very frequently. With similar stocking, you should plan to check on your pond just as frequently. The more heavily you stock your pond, the less time you have to react to problems. If you are regularly gone for long weekends or long vacations, you either need to have others who can care for your pond, or you need to keep stocking low to give your Koi the best chance of surviving a pond problem. Sometimes it seems that things are most likely to fail when you're not there to fix them.

By now, you're probably wondering when I'm going answer the question "how many Koi can I keep in my pond?" Well, I'm not. There isn't a concrete answer (and I would suggest that you not trust anyone who claims there is), but I hope I've given you the ability to better answer this question for yourself. In closing, I'll leave you with some typical examples of Koi pond stocking densities.

Ultimate Pond: 20,000 gal. 500 - 1000 lb. Koi 20 - 40 gal. / lb.

Multiple sets of filters/pumps. Filters more than capable of supporting fish load. Pond is deep to improve stability and promote good physical development of Koi. High pumping rate keeps water well filtered and creates a lot of water movement in the pond. Pond is heated to minimize or eliminate periods of temperatures in the 50° F - 59° F range. Sick fish are immediately moved to a hospital facility. New fish are quarantined. Lots of aeration. Sufficient shade and UV to control algae. Koi are well fed and given food several times a day. Backup systems keep pond livable if power fails. Pond is not left unattended for more than a day or two. Pond keeper is educated and able to provide best care possible. Fish death rare.

First Pond - First Year: 1,000 gal. 1 - 5 lb. Koi 200 - 1000 gal. / lb.

Wrong Way: Low stocking compensates for inexperience and neglect. Filter non-existent or very small and never cleaned. Water is never tested. Water conditions vary wildly. Infrequent water changes. Fish death common.

Right Way: Low stocking compensates for inexperience. Fish added slowly. Water checked frequently during startup period. Problems avoided or corrected early. Frequent water changes. Filter small, but maintained well. Water conditions good considering everything is new. Fish death infrequent.

Both: Pond design less than ideal - no bottom drain, no skimmers, undersized filter, filter difficult to maintain, pump flow rate low, should be deeper.

First Pond - Second Year: 1,000 gal. 5 - 20 lb. Koi 50 - 200 gal. / lb.

Wrong Way: Fish made it into second year due to toughness and in spite of poor water quality. Spring starts with typical new pond problems: green water, ammonia, nitrite. Problems become more frequent and more severe as stocking and feeding continue to increase, but care remains low.

Right Way: Fish off to good start due to good care. Less problems with algae and other water parameters since system is getting mature. Fish stocking and feeding continue to increase, but slowly. Pump and filter upgraded - bigger, easier to clean, able to keep up with current and future demand. Pond keepers knowledge and care continues to increase, keeping ahead of pond requirements. Fish health problems infrequent.

First Pond - Third Year: 1,000 gal. 20 - 100 lb. Koi 10 - 50 gal. / lb.

Wrong Way: System getting more mature despite neglect. Fish stocking and feeding continue to exceed safe levels. Low levels of maintenance allow debris, bacteria, and parasites to flourish. Koi health problems continue to grow.

Right Way: System getting well matured and more stable. Fish stocking, feeding, filtration, care, and pond keeper's skill all continue to grow. By end of third year: maintenance needs and practices have become well established; health problems rare and detected early; factors such as sun, shade, plants, and winterizing have been dealt with.

Second Pond: 5,000 gal. 50 - 150 lb. Koi 30 - 100 gal. / lb.

Bigger, deeper, more stable. Better design: bottom drains, skimmers, bigger pipes, bigger pumps, bigger filters, easier to maintain.

Good Hospital Tank: 500 gal. 5 - 20 lb. Koi 25 - 100 gal. / lb.

Bio-filter is kept functioning year round. Temperature maintained in 70's. Water cycled through filter 2 to 4 times per hour. Lots of aeration. Water changed frequently. Koi are easy to observe and catch for treatment.

Koi Show Tank: 300 gal. 15 - 20 lb. Koi 15 - 20 gal. / lb.

Koi are only kept in tank for 2 - 3 days. Water quality is maintained with a lot of chemical assistance.

Hopefully, this article has given you a better idea of what you can expect from your pond. In an effort to better understand how particular Koi keeping practices affect Koi health, MAKC is conducting a survey. Please take a few minutes to fill out and return the survey on the back protective cover of this magazine.