Estimating Gallons

Volume for Rectangular Pond
Width x Length x Depth = Cubic Feet
Cubic Feet x 7.5 = Gallons

Volume for Circular Pond
Radius x Radius x 3.14 x Depth = Cubic Feet
Cubic Feet x 7.5 = Gallons

Example for a Rectangular Pond
10' x 15' x 3' = 450 Cu. Ft.
450 Cubic Feet x 7.5 gallons = 3375 gallons

Knowing gallons helps with the following: Sizing Pumps, Filters, Fish quantities and Water treatments.

Calculating Liner Size

To Calculate Liner Length
L=Max Length+Twice Depth+3'

To Calculate Liner Width
W=Max Width+Twice Depth +3'

EXAMPLE
Pond Size: 15' Long x 12' Wide x 3' Deep

Length = 15' + 3'(2) + 3' = 24'

Width = 12' + 3'(2) + 3' = 21'

Allow at least 1.5' of overlap around the pond's perimeter. 3' included in Length & Width.

Estimating Rock for Construction

Boulders in Pond
Pond Length x Pond Width / 65 = _____ Tons

Rocks in Pond
Tons of Boulders x 0.45 = _____ Tons

Boulders in Stream
Every 10' = 3/4 Ton

Rocks in Stream
Every 10' Section = 1/2 Ton

The above are estimates only as rocks vary in size.

Conversions & Formulas

Length	1in = 2.54 cm 1in = 25.4 mm 1ft = 30cm
Area	1 acre = 43,560 sq ft 1 acre foot = 325,851 gallons
Volume	1 Gallon = 3.8 L
Weight	1 lb = 0.45 kg
Power	1 HP = 746 Watts Watts = Amps x Volts Amps = Watts ÷ Volts

Pump Terms

TDH - Total Dynamic Head
This is the total lift in feet that a pump will produce combining vertical lift from the surface of a pond plus friction loss in tubing and fittings.

BEP - Best Efficiency Point
Point on a centrifugal pump performance curve at which the pump is designed to work and has the most efficient use of electricity.

Note: Pump Head is calculated by measuring how many feet the water will drop from the top of the waterfall to the water's surface. Also, add one foot of head for every 10' tubing.

Calculating Waterfall Flow Rate

Light Flow =	100 gph per inch of spillway
Average Flow =	150 gph per inch of spillway
High Flow=	200 gph per inch of spillway

Width of Spillway x Desired Flow Rate = Total GPH

Examples for waterfalls with a 24" wide spillway:

Light Flow	24" Spillway x 100 GPH = 2,400 gph
Average Flow	24" Spillway x 150 GPH = 3,600 gph
High Flow	24" Spillway x 200 GPH = 4,800 gph

Sizing a Waterfall Pump

1. Calculate Waterfall Flow Rate
2. Determine length of hose needed
3. Determine height of Waterfall
4. Determine number of elbow hose fittings

Add 1 ft of head for every 10 ft of hose
Add 1 ft of head for every elbow fitting

Example of a 24" wide waterfall that requires 3,600 gph and is 5ft above the pond and has 20 ft of hose and 2 elbow fittings:

Waterfall height + Hose+ Fittings = Total Pump Head
5 ft + 2 ft + 2 ft = 9 feet of head

You will need a pump that provides 3,600 gph at 9ft of head.

Pump Facts

HP:	1HP = 746 Watts
Amps:	Watts ÷ Volts
Watts:	Volts x Amps
Volts:	Watts ÷ Amps
1 PSI:	2.31' Head
PSI:	Head ÷ 2.31
Max Head:	Maximum lift that a pump can move water through tubing.

Sizing a Stream or Waterfall Reservoir

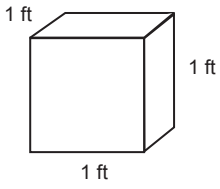
A good rule of thumb for waterfall reservoirs is to make the reservoir 2 to 3 times the volume of the total water in the stream or waterfall.

Example of a 3ft wide stream that is 30 ft long and has a average depth of 3".

3 x 30 x .25 x 7.5 = 168.75 gallons
Recommended reservoir size is 350 to 500 gallons.

Gallons of water per cubic foot

One Cubic Foot of Water = 7.48 Gallons
(7.5 is often used for easier calculations).



Benefits of the Pro Cube Water Reservoir

- Can replace up to 90% of gravel that is traditionally used in ponds without reservoirs
- Has up to three times more storage capacity than gravel.
- Allows for smaller reservoir.
- Easier to maintain water levels.
- Stackable.

Tubing Selection Chart

Only a certain amount of water can physically fit through any diameter of tubing. Despite the dimensions of the pumps discharge, tubing must be sized based on the amount of flow required.

Tubing Size (Inside Diam)	Max Flow (GPH)
1/2"	300
3/4"	720
1"	1,200
1 1/4"	2,000
1 1/2"	3,000
2"	4,800
2.5"	6,000
3"	9,000
4"	12,000

Estimating Operating Cost

To calculate the estimated annual operating cost of a pump, insert the operating watts of your pump into the formula below. The formula is based on an average kWh cost of $.10.

_____ x .876 = _____
Watts Annual Cost

Example of annual energy cost if you have a pump which is rated at 200 watts.

200 watts x .876 = $175 per year

Your annual energy cost is $175

Koi Growth General Guidelines

Months	Average Size (in)
1	0.3”
3	2.8”
6	5.1”
12	9.2”
18	12.6”
24	15.6”
36	20.1”
48	23.4”
96	29.4”

Fish Feeding Tips

Feeding Rate - Only feed as much food as your fish can consume in 5 minutes.

Food Quality - Higher quality (and most of the time more expensive) foods typically have less filler and higher nutritional values. Less filler means less fish waste and healthier fish.

Seasonal Foods - Fish have different nutritional needs at different times of the year. Buy foods that are specifically produced for feeding at different times of the year.

Winter - Stop feeding when the water temperature drops below 50° F / 10° C.

Auto-Fill Valves or Water Level Controllers

Auto-Fill valves or Water Level Controllers are a convenient way to control the water level in any pond or water feature. They ensure that there is always a sufficient amount of water in your pond or water feature to prevent the pump from running dry and burning out.

Importance of Water Temperature and Fish Feeding

- Feed only as much as fish can consume in 5 minutes.
- Above 65° - feed color enhancing and high protein food.
- 65° and below - feed wheat germ food (spring, fall and winter).

General Pond Tips

80°+ Increase pump circulation or add air pump.
75°+ Fertilize plants 2x per month.
70°+ Add tropical aquatic plants.
60°+ Begin fertilizing aquatic plants.
50°+ Begin using bacteria treatments re-pot aquatic plants (spring).
50°- Cut back aquatic plants.
45°+ Start pump and filters for season.
40°- Keep opening in ice using De-icers in cold climates, Airstones in mild climates.

Stocking Tips

1" Gold fish per sq. ft. of surface area
1/2" koi per sq ft of surface area

Plan for average mature fish - Goldfish = 10" Koi = 24"

**** Greater stocking loads are possible when using larger filtration.***

Algae in Ponds

Typically, Algae can be divided into two specific types: Single Cell & String Algae.

Single Cell: Single cell algae will appear when nutrients, water and sunlight are combined together. They are microscopic and therefore cannot be filtered out. They will cause the pond to turn a brilliant green.

To remove: Using a combination of UV clarifiers, beneficial bacteria and plants, will help to reduce the nutrients algae requires to survive. Other methods of removal include flocculents, Algaecide and reducing the food source.

String Algae: String Algae or Blanket weed attaches itself to rocks in streams and waterfalls. This type of Algae rises to the water surface during the day and sinks when the water temperature cools.

To Remove: Pond Vacuums, brushes and nets are common methods of control. Products that remove organic debris or Algaecide may also be used.