Pump Selection

Before you can pick the best pump for your pond, you need to determine two things:

(1) What flow rate you want?
(2) What total dynamic head (TDH) does your system require to deliver that flow rate?

Since the head affects the pump's flow rate, you must know both parameters to properly select a pump.

Flow
The exact flow rate you will need depends on many factors including the size of your pond, the amount of flow required by your filtration system, and the flow required to operate accessory items (TPRs, GPRs, waterfalls, fountains, etc). In order to specify the correct pump, you must have the head required by your system for that flow rate!

Head
Head is a measure of resistance to flow. If a pump has a maximum output of 20 head feet, it means it can pump water 20' straight up in the air. If a pump is rated at 50 gallons per minute at 10 feet it means it can pump water up 10 feet and still deliver 50 GPM. As you increase the head, (above the full flow head) you will decrease the flow rate. Therefore, to maximize your flow you must minimize your head. For pond applications the three main sources of head are:
1. Static Head - This is the vertical distance you raise the water. To determine your static head, measure from the *surface* of the pond (vertically), to the highest point in the discharge line where the water is discharged to the atmosphere. This is usually the top of your biological filter, stream, or waterfall.
2. Friction Head - As water flows through pipe and fittings there is resistance. The higher the flow rate, and/or the smaller the pipe, the higher the resistance. Determine your overall pipe length and consult the *Friction Loss Chart* below. Find where the column for your pipe diameter intersects the row for your flow rate and read your friction loss per 100' pipe. Use large enough pipe to minimize this friction loss.
3. Pressure Head - Any additional pressure required by filters, UV lights, foam fractionators, spray nozzles, etc. must be calculated. Determine the pressure drop across each device. The conversion is 1 psi = 2.31 head feet (ie. a 5 psi drop across a filter = 11.55 feet).

To determine your TDH (as represented on pump curves and tables), add your static head, friction head and pressure head. Now that you know your flow and head, you can select a pump that provides this performance, and does so efficiently.

Friction Loss Chart

Friction loss per 100 feet of plastic pipe (schedule 40 pipe is white and schedule 80 pipe is gray).

Pipe Size	1 inch		1 1/2 inch		2 inch		2 1/2 inch		3 inch		4 inch	
US GPH	SCH 40	SCH 80	SCH 40	SCH 80	SCH 40	SCH 80	SCH 40	SCH 80	SCH 40	SCH 80	SCH 40	SCH 80
120	0.55	0.88	0.07	0.1	-	-	-	-	-	-	-	-
300	1.72	2.75	0.22	0.3	0.066	0.1	0.038	0.05	0.015	0.02	-	-
420	3.17	5.04	0.38	0.55	0.11	0.15	0.051	0.07	0.021	0.028	-	-
600	6.02	9.61	0.72	1.04	0.21	0.29	0.09	0.12	0.03	0.04	-	-
900	12.77	20.36	1.53	2.2	0.45	0.62	0.19	0.26	0.07	0.09	-	-
1200	21.75	34.68	2.61	3.75	0.76	1.06	0.32	0.44	0.11	0.15	0.03	0.04
1500	32.88	52.43	3.95	5.67	1.15	1.6	0.49	0.67	0.17	0.22	0.04	0.06
1800	46.08	73.48	5.53	7.95	1.62	2.25	0.68	0.94	0.23	0.31	0.06	0.08
2100	-	-	7.36	10.58	2.15	2.99	0.91	1.25	0.31	0.42	0.08	0.11
2400	-	-	9.43	13.55	2.75	3.83	1.16	1.6	0.4	0.54	0.11	0.14
2700	-	-	11.73	16.85	3.43	4.76	1.44	1.99	0.5	0.67	0.13	0.17
3000	-	-	14.25	20.48	4.16	5.79	1.75	2.42	0.6	0.81	0.16	0.21
3600	-	-	19.98	28.7	5.84	8.12	2.46	3.39	0.85	1.14	0.22	0.3
4200	-	-	-	-	7.76	10.8	3.27	4.51	1.13	1.51	0.3	0.39
4500	-	-	-	-	8.82	12.27	3.71	5.12	1.28	1.72	0.34	0.45
4800	-	-	-	-	9.94	13.83	4.19	5.77	1.44	1.94	0.38	0.5
5400	-	-	-	-	12.37	17.2	5.21	7.18	1.8	2.41	0.47	0.63
6000	-	-	-	-	15.03	20.9	6.33	8.72	2.18	2.93	0.58	0.76
7500	-	-	-	-	-	-	9.58	13.21	3.31	4.43	0.88	1.16
9000	-	-	-	-	-	-	13.41	18.48	4.63	6.2	1.22	1.61
10500	-	-	-	-	-	-	-	-	6.16	8.26	1.63	2.15
12000	-	-	-	-	-	-	-	-	7.88	10.57	2.08	2.75
15000	-	-	-	-	-	-	-	-	11.93	16	3.15	4.16
18000	-	-	-	-	-	-	-	-	-	-	4.41	5.83
21000	-	-	-	-	-	-	-	-	-	-	5.87	7.76
24000	-	-	-	-	-	-	-	-	-	-	7.52	9.93