

# Water quality

## Units

L	Gallons (US)
1	0.264
3.785	1
6	~1.5
12	~3
20	~5
30	~8
40	~10

Total Ammonia Nitrogen ( $\text{NH}_3/\text{NH}_4^+$ ) to PPM

		Temperature													
pH	42.0 (°F)	46.4	50.0	53.6	57.2	60.8	64.4	68.0	71.6	75.2	78.8	82.4	86.0	89.6	
	6 (°C)	8	10	12	14	16	18	20	22	24	26	28	30	32	
7.0	.0013	.0016	.0018	.0022	.0025	.0029	.0034	.0039	.0046	.0052	.0060	.0069	.0080	.0093	
7.2	.0021	.0025	.0029	.0034	.0040	.0046	.0054	.0062	.0072	.0083	.0096	.0110	.0126	.0150	
7.4	.0034	.0040	.0046	.0054	.0063	.0073	.0085	.0098	.0114	.0131	.0150	.0173	.0198	.0236	
7.6	.0053	.0063	.0073	.0086	.0100	.0116	.0134	.0155	.0179	.0206	.0236	.0271	.0310	.0369	
7.8	.0084	.0099	.0116	.0135	.0157	.0182	.0211	.0244	.0281	.0322	.0370	.0423	.0482	.0572	
8.0	.0133	.0156	.0182	.0212	.0247	.0286	.0330	.0381	.0438	.0502	.0574	.0654	.0743	.0877	
8.2	.0210	.0245	.0286	.0332	.0385	.0445	.0514	.0590	.0676	.0772	.0880	.0998	.1129	.1322	
8.4	.0328	.0383	.0445	.0517	.0597	.0688	.0790	.0904	.1031	.1171	.1326	.1495	.1678	.1948	
8.6	.0510	.0593	.0688	.0795	.0914	.1048	.1197	.1361	.1541	.1737	.1950	.2178	.2422	.2768	
8.8	.0785	.0909	.1048	.1204	.1376	.1566	.1773	.1998	.2241	.2500	.2774	.3062	.3362	.3776	
9.0	.1190	.1368	.1565	.1782	.2018	.2273	.2546	.2836	.3140	.3456	.3783	.4116	.4453	.4902	
9.2	.1763	.2008	.2273	.2558	.2861	.3180	.3512	.3855	.4204	.4557	.4909	.5258	.5599	.6038	
9.4	.2533	.2847	.3180	.3526	.3884	.4249	.4618	.4985	.5348	.5702	.6045	.6373	.6685	.7072	
9.6	.3496	.3868	.4249	.4633	.5016	.5394	.5762	.6117	.6456	.6777	.7078	.7358	.7617	.7929	
9.8	.4600	.5000	.5394	.5778	.6147	.6499	.6831	.7140	.7428	.7692	.7933	.8153	.8351	.8585	
10.0	.5745	.6131	.6498	.6844	.7166	.7463	.7735	.7983	.8207	.8408	.8588	.8749	.8892	.9058	
10.2	.6815	.7152	.7463	.7746	.8003	.8234	.8441	.8625	.8788	.8933	.9060	.9173	.9271	.9389	

Drop test result \* 0.0131 @ 24C, 7.4PH = unionized ammonia.

Dangerous level for fish is 0.05.

# Nitrogen Cycle

- [Source](#)

1. **Ammonia (NH<sub>3</sub>):** Fish produce waste, and uneaten food decays. Both of these create toxic ammonia.
2. **Nitrite (NO<sub>2</sub>):** A first type of beneficial bacteria consumes this ammonia and converts it into nitrite. This is where your problem starts. While it's a necessary step, nitrite is *extremely* toxic to fish.
3. **Nitrate (NO<sub>3</sub>):** A second type of beneficial bacteria then consumes the nitrite and converts it into nitrate. Nitrate is far less harmful and is managed with regular water changes and live plants.

**Ammonia (NH<sub>3</sub>) and Nitrite (NO<sub>2</sub>) are toxic to fish!**

Nitrite poisoning is often called "Brown Blood Disease." It gets this name because nitrite enters a fish's bloodstream and interferes with hemoglobin, the part of the blood that carries

oxygen. It essentially turns their blood a brownish color and prevents it from transporting oxygen effectively.

Even if there's plenty of oxygen in the water, a fish suffering from nitrite poisoning is slowly suffocating from the inside. This is why you might see them gasping at the surface, breathing rapidly, or acting very weak. **Any level of nitrite above 0 ppm (parts per million) is stressful and potentially lethal.**

## Reducing Nitrite (NO<sub>2</sub>)

- Perform a 50% water change
- Add a detoxifier
- Increase aeration
- Stop feeding fish for 24-48 hours

Sustain low level:

- Regularly replace water
- Add aquarium salt with water changes - promote gill function
- Good filtration system - clear out all waste and pollutants from the tank; raising oxygen levels in the tank and providing living space for nitrifying bacteria to thrive.
- Add nitrification bacteria

## The Typical Cycling Pattern

- Source: <https://www.shrimpkeepers.com/parameters/nitrite/>

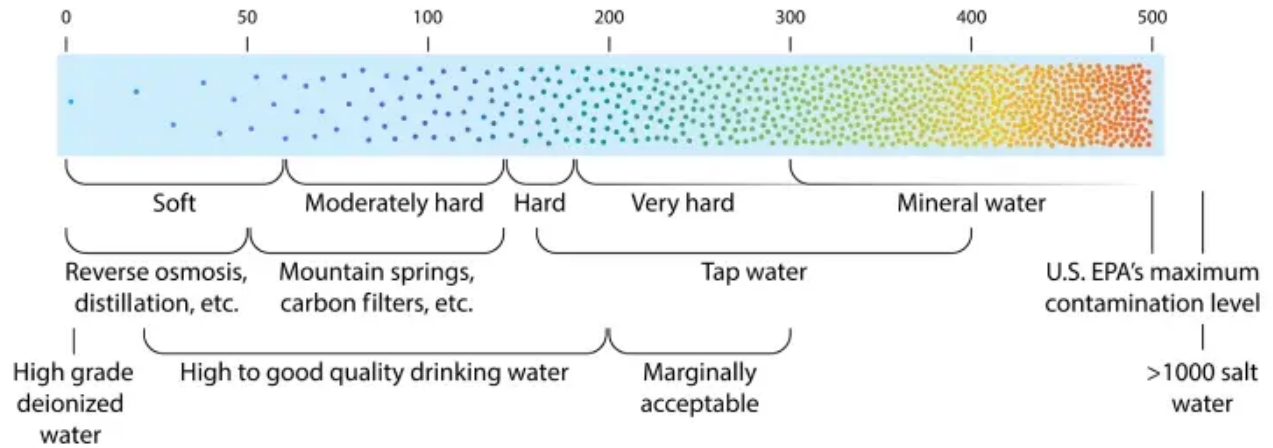
1. **Week 1-2:** Ammonia (NH<sub>3</sub>) rises, no nitrite (NO<sub>2</sub>)
2. **Week 2-4:** Ammonia-eating bacteria establish, ammonia drops, nitrite (NO<sub>2</sub>) SPIKES
3. **Week 4-6:** Nitrite-eating bacteria establish, nitrite (NO<sub>2</sub>) drops, nitrate (NO<sub>3</sub>) rises
4. **Week 6+:** Cycle complete - both ammonia (NH<sub>3</sub>) and nitrite (NO<sub>2</sub>) at 0

Adding ammonia and bacteria to aquarium without fish can speed up the process.

## General hardness

- <https://waternitylab.com/water-hardness-dh-to-ppm/>

## Total Dissolved Solids (TDS) in parts per million (ppm)



- **dH** or *degree of Hardness* (also referred to as the *degree of General Hardness (dGH)* or German degree) is a unit of water hardness equal to **10 mg/L of calcium oxide (CaO)**.
- **PPM** or *Part Per Million* is a unit of water hardness equal to **1 mg/L of calcium carbonate (CaCO<sub>3</sub>)**.

$$\text{PPM} = \text{dGH} \times 17.848$$

dH	PPM
1.0	18
3.0	54
5.0	90
7.0	125
9.0	160

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