

AQUAPONICS CHEAT SHEET

180-gallon system · 2' × 8' media bed (16 sq ft) · Tilapia + mixed greens & fruiting plants

From your neighbors at Wai Gardens. This is the same one-page reference we keep taped to the side of our home aquaponic systems. Save it, print it, share it. Have questions? Reach us at waigarden.com.

DAILY · WEEKLY · MONTHLY CHECKS

DAILY · 5 MIN	WEEKLY · 15-30 MIN	MONTHLY · 1 HOUR
- Fish behavior — gasping at surface? hiding? off feed? - Water level — top off if evap > 2" - Equipment — water pump + air pump running? - Visual — clarity, foam, smell - Plants — wilting? new growth? pests under leaves? - Feed — 2× day, only what they eat in 5 min	- Test — pH, NH₃, NO₂⁻, NO₃⁻ (in that order) - Biofilter — check for clogs; rinse if flow drops - Plumbing — scan for leaks, drips, biofilm buildup - Skim — surface debris, dead leaves - Harvest / trim — anything mature; replant gaps - Temp log — record high + low for the week	- Glass + tank walls — scrape algae - Biofilter — backflush media - Water change — 10-15% (more if NO₃⁻ > 100 ppm) - pH meter — calibrate against pH 7.0 standard - Roots — prune dead/woody; check for rot - Fish health — fin rot, white spots, lesions, weight

WATER PARAMETER TARGETS

Parameter	Target range	Action floor / ceiling	Notes
pH	6.5 – 7.0	<6.0 or >7.5	Compromise: tilapia 6.5–9; plants 5.5–6.5. Stay in middle.
Ammonia (NH ₃)	0 ppm	>0.5 = problem; >2 = crisis	Spike = overfeeding or biofilter crash. Stop feeding 24h.
Nitrite (NO ₂ ⁻)	0 ppm	>0.5 = problem	Most toxic phase of cycling. Patience, not panic.
Nitrate (NO ₃ ⁻)	20 – 80 ppm	<10 = plants starve; >100 = water change	Plants consume this. Low NO ₃ ⁻ = feed more / add fish.
Dissolved O ₂ (DO)	≥ 5 ppm (≥6 ideal)	<4 = aerate now	Tilapia gasp at surface = DO crisis. Add air immediately.
Temperature	75 – 82 °F	<68 stresses tilapia; >88 lethal	Heat in summer = bigger issue than cold in Mililani.
KH (alkalinity)	60 – 140 ppm	<40 = pH crash risk	Add coral chips or potassium bicarbonate.
GH (hardness)	60 – 150 ppm	<40 lacking calcium	Cal-Mag supplements help with low GH.
TDS / EC	<1000 ppm / <2.0 mS	>1500 stresses fish	High TDS = need more frequent water changes.

STOCKING & FEEDING MATH — YOUR SYSTEM

Your numbers: 180 gal water · 16 sq ft media bed · Mililani tilapia (Mozambique).

Metric	Conservative	Standard	Aggressive
Fish stocking density	1 lb / 7 gal	1 lb / 5 gal	1 lb / 3-4 gal
Total fish weight in 180 gal	≈ 25 lb	≈ 36 lb	≈ 45-60 lb
Fingerling start (¼ lb each)	12 fish (3 lb)	16 fish (4 lb)	20 fish (5 lb)
Mature stocking (1 lb harvest)	25 fish	36 fish	45-60 fish
Daily feed @ 1.5% body wt	≈ 170 g / day	≈ 245 g / day	≈ 305-410 g / day
Aeration required	1 air pump	1 air pump + airstone	2 air pumps + redundancy

Plant capacity (16 sq ft media bed): ≈ 30-50 leafy greens at 6-8" spacing · 12-16 fruiting plants at 12" spacing · or mix: 4-6 fruiting plants down the center column + 20-30 greens around them. (Tighter spacing works in NFT channels but invites root competition + shading in a media bed.)

Feed-to-plant rule: 60-100 g feed / day per m² of bed at full plant load (UVI/Rakocy). Your bed is 1.49 m² → target 90-150 g / day when fully planted. Back off feed if NO₃⁻ climbs > 100 ppm.

Feed schedule + rate: 2× per day, only what fish finish in 5 min. Skim uneaten pellets. 1.5% body wt is the adult-fish target — juveniles eat 3-5%; fish eat less when water is cold (<70°F) or stressed.

TROUBLESHOOTING — SYMPTOM → FIX

Symptom	Likely cause	Fix (in order)
NH ₃ > 0.5 ppm	Overfeeding, biofilter overloaded, dead fish	1. Stop feeding 24-48h. 2. Find + remove dead fish. 3. Check biofilter flow. 4. 25% water change if >2 ppm.
NO ₂ ⁻ > 0.5 ppm	Cycling incomplete or biofilter died (chlorine, antibiotics)	1. 25% water change. 2. Add nitrifying bacteria (API Quick Start / Fritz Zyme). 3. Reduce feed by half until 0.
pH < 6.0	Nitrification produces acid; KH too low	1. Add coral chips to sump (slow buffer). 2. Or potassium bicarbonate — NOT baking soda (Na harms plants).
pH > 7.5	Source water hard, limestone in system	Usually self-corrects. If persistent, blend in RO water.
DO < 4 ppm / fish gasping	Pump failure, overstocked, water too warm	1. Add air NOW (battery backup, manual stir). 2. 10% cool water change. 3. Reduce stocking next round.
Cloudy water (white)	Bacterial bloom — usually cycling	Wait 24-48h. Don't feed during bloom. Will clear.
Algae on bed/glass	Excess light + nutrients	Reduce light to 10-12h. Cover bare media. Check phosphate.
Plants yellowing (general)	Iron deficiency	Chelated iron (DTPA at pH<6.5; EDDHA at higher pH). 1-2 ppm.
Plants pale + slow growth	Low nitrate / not enough fish	Test NO ₃ ⁻ . If <20, increase feed or add fish.

Symptom	Likely cause	Fix (in order)
Fin rot / white spots	Ich, columnaris, stress	Raise temp to 86°F for 5–7 days (kills ich). Salt at 1 ppt only if you've removed sensitive plants — peppers, tomatoes, strawberries don't tolerate it; basil + most leafy greens are fine.
Mass die-off	Toxin, ammonia spike, oxygen crash	Test NH ₃ first. If high, 50% water change immediately. Aerate hard.

CYCLING A NEW SYSTEM (≈ 4–8 WEEKS)

Week	What's happening	What you do
1	Fresh water, no biology yet.	Fill, dechlorinate. Dose to 4 ppm NH ₃ (NH ₄ Cl or fish-food slurry). NO FISH.
2	Ammonia-eating bacteria seeding.	Add nitrifying bacteria (API Quick Start, Fritz Zyme 7, or Dr. Tim's One & Only) or media from a cycled system. Re-dose NH ₃ to 2–4 ppm daily. Plant a few greens.
3–4	Ammonia drops, nitrite rises (TOXIC).	Daily test. NH ₃ should fall in 24h. Continue light NH ₃ dosing. NO FISH.
4–5	Nitrite peaks 2–5 ppm. Hardest stretch.	Patience. Don't add fish. Don't water-change unless plants stressed.
5–6	NO ₂ ⁻ drops to 0; NO ₃ ⁻ climbs (40–80 ppm).	Add more plants. Bed should be visibly greening up.
6–8	Fully cycled: NH ₃ + NO ₂ ⁻ both clear within 24h of dose.	Add 25% target stocking (12 fingerlings). Wait 1 week, observe, then add another 25%.

APPLICANTS — EM-1, NEEM OIL, HYDROGEN PEROXIDE, BT

These four are the workhorses of a healthy aquaponic system. EM-1 keeps the biology humming, Neem oil handles pests on the plant side, hydrogen peroxide is your emergency-room tool, and BT is your biological control for caterpillars and fungus gnats. Used correctly, they cover 95% of the problems a home grower will see.

Applicant	Role	Best for	Watch-out
EM-1 (Effective Microorganisms)	Probiotic for the system	Biofilter boost, water clarity, root health, sludge reduction	Safe for fish at label rates
Neem Oil (cold-pressed)	Botanical pest + fungus knockdown	Aphids, whiteflies, spider mites, mildew on leaves	Toxic to fish — foliar only, cover the water
Hydrogen Peroxide (3%)	Oxidizer / oxygen emergency tool	Root rot, low O ₂ rescue, surface algae, fungal flare-ups	Kills biofilter bacteria — use sparingly
BT (Bacillus thuringiensis)	Biological larvicide	Caterpillars on leaves (Btk); fungus gnat larvae in media bed (Bti)	Safe for fish; foliar/drench only — not into water column

EM-1 — Detail	Notes & rates
What it is	Liquid culture of beneficial microbes (lactic acid bacteria, yeasts, phototrophic bacteria) that outcompete pathogens and accelerate nutrient cycling.
Why use it	Speeds up new-system cycling, keeps the biofilter resilient, breaks down fish waste/sludge, helps reduce algae over time, and supports stronger root zones.
Maintenance dose	1 fl oz per 50 gal of system water, once every 2 weeks (≈ 3.6 oz for the 180-gal system).
Cycling boost	2 fl oz per 50 gal weekly for the first 4–6 weeks of a new build.
Recovery dose	After a crash or 50%+ water change: 2 fl oz per 50 gal, then repeat in 7 days.
How to add	Pour into the sump or biofilter inflow where flow is highest. Pumps and aeration on — oxygen helps the culture establish.
Don't mix with	Hydrogen peroxide, chlorine, or any antibiotic — they kill EM-1 microbes. Space at least 48h apart.
Storage	Cool, dark, sealed. Activated EM (AEM) keeps ≈ 30 days; mother culture keeps ≈ 12 months. Smells sweet/sour — that's good. Smells putrid/rotten — discard.

Neem Oil — Detail	Notes & rates
What it is	Cold-pressed oil from the neem seed. Contains azadirachtin, which disrupts insect feeding, molting, and reproduction. Mild antifungal too.
Why use it	Knocks down aphids, whiteflies, spider mites, thrips, and powdery mildew on leaves without leaving a residue that hurts pollinators when applied at dusk.
Foliar spray recipe	1–2 tsp cold-pressed neem + ½ tsp mild liquid soap (emulsifier) per 1 qt warm water. Shake hard, use within 8 hours.
When to apply	Dusk or early morning only. Never in direct sun — it burns leaves. Repeat every 7–14 days while pests are active; stop once clean.
FISH SAFETY — critical	Neem is toxic to fish even at trace levels. Before spraying: cover the media bed/raft surface with plastic sheeting, turn off the pump for 30 min, and rinse drips off any plumbing that drains back to the tank. Never pour neem into the sump or fish tank.
Don't spray on	Open flowers (pollinator harm), wet/cool leaves below 60°F, or stressed seedlings under transplant shock. Test a couple of leaves first.
Storage	Tightly sealed, room temperature. Solidifies below 70°F — warm the bottle in a bowl of water before mixing.

Hydrogen Peroxide (3%) — Detail	Notes & rates
What it is	Common 3% household hydrogen peroxide — a strong oxidizer that breaks down into water and oxygen within hours.
Why use it	Spot-treats root rot, knocks back surface algae and fungal slimes, and adds emergency oxygen when DO crashes.
Emergency O₂ rescue	1 mL of 3% H ₂ O ₂ per gallon of system water (≈ 180 mL / 6 oz for 180 gal). Use only when fish are gasping and aeration has failed. Restart the air pump first — H ₂ O ₂ is a stopgap, not a fix.
Root rot dip (out of system)	Lift affected plant, trim rotten roots, dip remaining roots in a 1 : 10 H ₂ O ₂ : water solution for 30–60 seconds, rinse in clean water, then return to the bed.
Algae / fungal flare-up	Spot-spray a 1 : 5 H ₂ O ₂ : water solution on the media surface (not into the water column). Rinse residual off before plumbing kicks back on.
BIOFILTER WARNING	H ₂ O ₂ kills nitrifying bacteria — use sparingly. Any system-wide dose may trigger a mini-cycle. Re-test ammonia and nitrite for the next 7–10 days and consider a follow-up nitrifying bacteria booster.
Don't mix with	EM-1, beneficial microbes, or any organic acid additive within 48h. Never use 35% food-grade undiluted — it's caustic.
Storage	Original opaque bottle. Light degrades it; expect about 6 months once opened. If it stops fizzing on a cut potato, it's flat — replace it.

BT (Bacillus thuringiensis) — Detail	Notes & rates
What it is	Bacillus thuringiensis (BT) is a naturally occurring soil bacterium that produces crystal proteins (Cry toxins) lethal to specific insect larvae when ingested. Two strains matter here: Btk (kurstaki) targets leaf-chewing caterpillars; Bti (israelensis) targets fungus gnat larvae and mosquito larvae in the media bed.
Why use it	Controls cabbage loopers, hornworms, and fungus gnats without harming fish, beneficial insects, or humans. No withholding period. Breaks down within 24–72 h under UV — no residue accumulation in the system.
Btk — foliar spray	Mix per label (typically 1–2 tsp concentrate per quart of dechlorinated water). Spray upper and lower leaf surfaces until runoff. Apply at dusk or in low-light conditions for best efficacy. Repeat every 7 days while caterpillars are active.
Bti — media drench	For fungus gnat larvae in the media bed: dilute per label (≈ 1 tsp per gallon of clean water), pour evenly over the media surface. Repeat every 7–14 days while larvae are present. Do not pour into the fish tank — target the root zone only.
When to apply	At first sign of caterpillar eggs or feeding damage, or preventatively every 7–14 days during high-pest seasons. Always reapply after rain or heavy irrigation rinses the foliage.
Fish safety	Safe for fish at label rates. Bt crystal proteins are highly specific to susceptible insect larvae and degrade rapidly. No documented toxicity to fish, aquatic invertebrates, or plants.
Don't mix with	Copper-based fungicides (reduces Bt efficacy). Always use dechlorinated water for mixing — chlorine degrades Bt proteins.
Storage	Refrigerate liquid formulations for longest shelf life. Unopened: 1–3 years. Once opened, use within the growing season. Discard if the suspension won't re-mix or smells foul.

Applicant Compatibility — quick reference

Combination	Guidance
EM-1 + Neem (foliar)	OK if not mixed in the same spray and neem is kept out of the water.
EM-1 + H ₂ O ₂	NO. Peroxide kills the microbes. Space 48 hours apart at minimum.
Neem + H ₂ O ₂	AVOID. Oxidation breaks down neem and irritates leaves. Pick one tool for the day.
BT (foliar/drench) + EM-1	OK — BT is selective for insect larvae and compatible with EM-1 beneficial microbes.
BT + Neem (foliar)	OK if not mixed in the same spray. Complementary: BT targets larvae, neem targets adults and eggs.
BT + H ₂ O ₂	AVOID on the same day. Peroxide degrades Bt proteins. Space at least 24h apart.
Any applicant + medication	AVOID. Antibiotics, copper, formalin and similar treatments break the biofilter. Stop adding applicants when medicating fish.

Notes: Targets and cycling stages are from UVI/Rakocy and Texas A&M research; stocking + feed rates are industry rules of thumb — adjust to what your fish and water tests actually tell you. Hawai'i: verify current DLNR DAR aquaculture rules before stocking — some tilapia species require permits.

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