

HYDROPONICS CHEAT SHEET

NFT rail systems + Media grow beds · Greens + Fruiting plants · Home + School setups

From your neighbors at Wai Gardens. Hydroponics done well is mostly about catching small drifts before they become big problems. This one-pager is the reference we keep next to every NFT rail we install. Save it, print it, share it. Questions? waigarden.com.

DAILY · WEEKLY · MONTHLY CHECKS

DAILY · 5 MIN	WEEKLY · 20-30 MIN	MONTHLY · 1 HOUR
- Pump + flow — every channel running, no dry sections - Reservoir level — above the pump intake; top off if needed - Plant visual — wilting, yellowing, tip burn? - Roots — white = healthy; brown/slimy = trouble - Pests — scan under leaves, on net cup rims - Temps — reservoir cool, air not roasting plants	- Test — pH and EC; adjust to crop targets - Top-off — add nutrient mix at ½ strength to refill - Channel scan — lift caps; check for biofilm, salt rim - Harvest + trim — anything mature; remove yellow leaves - Airstone + emitters — still bubbling? still dripping evenly? - Notes — log EC, pH, temps. Patterns matter.	- Reservoir change — full dump, scrub, refill fresh - Sanitize channels — 3% H₂O₂ rinse between crop cycles - Meter calibration — pH 4.0/7.0 + EC 1.41 mS standards - Pump teardown — rinse impeller; clear intake screen - Slope + level check — 1" per 30" run; no sag in channels - Light check — LED hours, height, lens dust

NUTRIENT TARGETS — GREENS vs FRUITING

Parameter	Greens / herbs	Fruiting / strawberries	Action floor / ceiling	Notes
pH (reservoir)	5.8 – 6.2	5.8 – 6.3	<5.5 = lock-out; >6.5 = micro-lockout	Adjust slowly. 1-2 mL pH Down per 5 gal is plenty.
EC (mS/cm)	1.0 – 1.6	2.0 – 3.0	<0.8 = starving; >3.5 = burn risk	Tomatoes ramp 2.0→3.0 from veg to fruiting.
PPM (TDS, 500 scale)	500 – 800	1000 – 1500	—	PPM = EC × 500 (US convention).
Reservoir water temp	65 – 72 °F	65 – 72 °F	>75 = pythium risk	Insulate or chill. Hawai'i air heats reservoirs fast.
Air temp (day)	65 – 78 °F	70 – 82 °F	>88 stalls fruit set	Shade cloth midday in summer.
Humidity (RH)	55 – 70%	55 – 75%	<40% = tip burn; >85% = mildew	Ventilation matters as much as misting.
Dissolved O ₂ (DO)	≥ 5 ppm	≥ 6 ppm	<4 = root rot starts	Airstone in reservoir; cooler water holds more O ₂ .
Light (PPFD)	150 – 300 μmol	400 – 700 μmol	—	Sun: 6-8h direct. LED: 14h greens / 12h fruiting.
Channel flow per rail	1 – 2 L/min	1.5 – 2.5 L/min	<0.5 = root oxygen drop	Slim film, not a river. Adjust ball valve.

YOUR NUMBERS — 4-CHANNEL NFT REFERENCE SYSTEM

Worked example — Wai Gardens 4-channel NFT rail. If your system is different, scale the math by gallons of reservoir and plant sites.

Reference dimension	Value / rule of thumb
Footprint	4 channels × 8 ft · ≈ 32 sq ft footprint
Plant sites	32 sites @ 6" spacing (greens) · 16 sites @ 12" (fruiting) · or mix: 24 greens + 4 fruiting
Reservoir	20 gal opaque (light-blocking) tote with lid
Pump	≈ 400 GPH submersible, on 24/7 for NFT; never run dry
Aeration	One airstone + small air pump in reservoir (root oxygen + reservoir mixing)
Flow per channel	1 – 2 L/min target · set with inline ball valve, measure with a cup + stopwatch
Slope	1" drop per 30" run · verify with a 4-ft level after install and again monthly
Daily water use (mature, hot week)	Greens ≈ ¼ – ½ gal / plant / day · 4–8 gal/day at full load
Top-off cadence	Every 2–4 days, replace lost water with ½-strength nutrient mix
Full reservoir change	Every 2–3 weeks for greens, every 10–14 days for fruiting
Crop turnover (lettuce / herbs)	Seed → harvest in 5–7 weeks · transplant at 2–3 true leaves

STARTUP — WEEK BY WEEK

Stage	What it is	What you do
Week 0	Build + leak test	Run plain water for 24h. Check slope, flow per channel, leaks at unions. Tweak until even film across each channel.
Week 1	Mix + balance nutrient	Fill reservoir with dechlorinated water (let chlorine off-gas 24h or use Vitamin C). Add base nutrient to seedling EC (0.5–0.8). Adjust pH to 5.8–6.0. Run pump 24h to mix.
Week 1	Transplant seedlings	Transplant at 2–3 true leaves into net cups with 1" hydroton collar over rockwool/peat plug. Roots should touch the film within 24h.
Week 2	Acclimation	Don't feed at full EC yet. Hold seedling strength (EC 0.5–0.8) until visible new growth. Daily pH check — fresh transplants drift fast.
Week 3	Ramp EC	Step up by 0.3 EC per week toward crop target. Watch leaf color before adding more — over-feed shows up faster than under-feed.
Ongoing	Steady state	Top off with ½-strength mix between full changes. Full reservoir change every 2–3 weeks (greens) to clear salt buildup.

TROUBLESHOOTING — SYMPTOM → FIX

Symptom	Likely cause	Fix (in order)
pH drifts up (>6.5) daily	Plants pulling nitrate; alkaline source water; new system establishing	1. Adjust with pH Down (phosphoric acid), 1 mL per 5 gal at a time. 2. Recheck in 30 min before adding more. 3. Persistent? Switch to RO or blend in distilled.
pH drifts down (<5.5)	Hot reservoir, organic additive overdose, EM-1 too heavy	1. pH Up (potassium hydroxide). 2. Reduce organic inputs. 3. Cool the reservoir.
EC climbs without adding nutrient	Plants drinking water faster than nutrient; salt concentration	Top off with PLAIN water until EC drops back to target. Then resume ½-strength top-offs.
EC drops fast	Plants in fast growth, taking up nutrient hard	Good sign. Top off with full-strength mix or step up base EC by 0.2.
Tip burn on new leaves	Calcium deficiency or low humidity; sometimes high EC	1. Add Cal-Mag (1–2 mL/gal). 2. Increase RH. 3. Check EC — over 2.0 for greens burns tips.
Yellow lower leaves	Nitrogen deficiency or end-of-life on bottom leaves	Bump base nutrient by 0.2 EC. If only lower leaves and plant is mature, it's natural senescence.
Yellow top leaves (interveinal)	Iron or magnesium deficiency, often at high pH	Drop pH to 5.8. Add chelated iron (DTPA <6.5; EDDHA >6.5). Cal-Mag covers Mg.
Roots brown + slimy (root rot)	Pythium — warm reservoir, low DO, organic debris	1. Drop reservoir to <72 °F. 2. Add airstone or second pump. 3. Beneficial inoculant (Hydroguard) OR sterilize with H ₂ O ₂ (3 mL of 3% per gal). 4. Trim worst roots.
Algae in reservoir / channels	Light leaking onto nutrient solution	Block all light. Cover with opaque lid, wrap channel ends. H ₂ O ₂ flush between crops.
White crystals on channel rims	Salt accumulation — EC too high or reservoir not changed enough	Full reservoir change + scrub channels. Drop top-off concentration.
Wilting with full reservoir	Pump or flow failure; root rot; heat stress	Check flow first. Then check root color. Cool the room. Shade midday.
Aphids / whiteflies / thrips	Pest pressure, often arriving on new transplants	Foliar neem at dusk (1–2 tsp neem + ½ tsp soap per qt). Repeat every 7 days. Quarantine new plants 5 days before transplant.
Powdery mildew on leaves	Too much humidity + still air	Increase airflow. Spot-spray potassium bicarbonate. Don't mist late in day.
Slow growth, no obvious cause	Reservoir too warm OR root oxygen low OR EC under target	Check reservoir temp first, then DO, then EC. Cool water + air bubbles solve most stalls.

APPLICANTS — THE SEVEN-BOTTLE TOOLKIT

Seven bottles cover almost every home hydroponic problem. Three are everyday tools (Cal-Mag, pH Up/Down, Silica). Four are problem-solvers (EM-1, Neem, H₂O₂, BT). Use the everyday three on schedule; reach for the problem-solvers when something goes wrong.

Applicant	When to use	Best for	Watch-out
Cal-Mag supplement	Daily / weekly	Tip burn, weak stems, RO/distilled water use	Add separately — never mix concentrate with silica.

Applicant	When to use	Best for	Watch-out
pH Up / pH Down	Daily as needed	Bringing reservoir into target range	Always measure before dosing. Tiny amounts.
Silica (potassium silicate)	Weekly	Stronger stems, heat + pest resistance	Add FIRST to fresh reservoir; raises pH.
EM-1 (probiotic)	Bi-weekly maintenance	Root health, biofilm control, recovery after crash	Never mix with H ₂ O ₂ — kills the microbes.
Neem Oil	As needed (pests)	Aphids, whiteflies, mites, mildew on leaves	Foliar only at dusk; don't spray flowers.
Hydrogen Peroxide (3%)	As needed	Root rot, algae, sterilizing between crops	Kills EM-1 and beneficials — space 48h apart.
BT (Bacillus thuringiensis)	As needed (pests)	Caterpillars, cabbage loopers, hornworms (Btk); fungus gnat larvae (Bti)	UV degrades quickly — reapply every 7 days; use dechlorinated spray water.

Cal-Mag — Detail	Notes & rates
What it is	Calcium nitrate + magnesium nitrate blend (some brands add iron). The missing micronutrients in most base hydroponic mixes.
Why use it	Prevents tip burn, blossom-end rot in tomatoes/peppers, and weak stems. Essential when running RO or low-mineral water.
Maintenance dose	1 mL per gal in fresh reservoir for greens; 2 mL per gal for fruiting/strawberries. Re-dose every reservoir change.
Deficiency rescue	Bump to 3 mL per gal for one week. Recheck EC — Cal-Mag adds 0.2–0.4 EC. Watch tip burn reverse within 7–10 days.
How to add	After base nutrient. Stir well between additions. Cal-Mag goes in the reservoir, not as a foliar.
Don't mix with	Silica concentrate (precipitates as calcium silicate scale). Add silica first, mix, then add Cal-Mag.

pH Up / pH Down — Detail	Notes & rates
What they are	pH Down = phosphoric acid (food grade). pH Up = potassium hydroxide. Both are concentrated — wear gloves.
When to dose	After base nutrient and Cal-Mag are in, when reservoir reads outside crop target (greens 5.8–6.2; fruiting 5.8–6.3).
Starting amount	1 mL pH Down per 5 gal will typically drop pH ≈ 0.3. Less for soft water, more for hard. Always start small.
How to add	Pump running, add slowly, wait 30 minutes before re-testing. Most overshoots come from impatience, not bad chemistry.
When pH won't hold	Source water hardness or alkalinity is fighting you. Blend in RO water 25–50% to soften the buffer.
Storage + safety	Tightly sealed, out of reach of keiki. Don't store next to bleach. Calibrate your pH meter monthly with 4.0 + 7.0 standards.

Silica (potassium silicate) — Detail	Notes & rates
What it is	Potassium silicate solution. Soluble silicon plants take up and deposit in cell walls and leaf cuticles.
Why use it	Sturdier stems, thicker leaf cuticle (fights pests + mildew), better heat tolerance in Hawai'i summers. Inexpensive insurance.
Maintenance dose	1 mL per gal in fresh reservoir; 0.5 mL per gal at top-off. Weekly is plenty.
ADD FIRST — critical	Silica is high-pH (≈ 11) and will precipitate calcium if mixed with Cal-Mag concentrate. Add silica to plain water, stir, then add base nutrient, then Cal-Mag.
pH side-effect	Silica raises reservoir pH. Always pH-test AFTER silica is in, then bring back to target with pH Down.
Storage	Sealed bottle; gels if it freezes. Crystallizes when old — discard if you see solid chunks at the bottom.

EM-1 — Detail	Notes & rates
What it is	Liquid culture of beneficial microbes (lactic acid bacteria, yeasts, phototrophic bacteria) that outcompete root pathogens.
Why use it	Healthier root biofilm, better resilience to small temperature spikes, faster recovery after a crash or full reservoir change.
Maintenance dose	1 fl oz per 25 gal of system water, every 2 weeks ($\approx \frac{3}{4}$ oz per 20-gal reference reservoir).
Recovery dose	After a reservoir change or crash: 2 fl oz per 25 gal, then repeat in 7 days.
How to add	Directly to the reservoir with the pump running. Aeration on. Don't pre-dilute in chlorinated water.
Don't mix with	Hydrogen peroxide, chlorine, or root sterilizers — they kill EM-1. Space at least 48h apart.

Neem Oil — Detail	Notes & rates
What it is	Cold-pressed neem seed oil. Contains azadirachtin, which disrupts insect feeding and reproduction. Mild antifungal too.
Why use it	Knocks down aphids, whiteflies, spider mites, thrips, and powdery mildew on leaves without leaving a residue at harvest.
Foliar spray recipe	1–2 tsp cold-pressed neem + $\frac{1}{2}$ tsp mild liquid soap (emulsifier) per 1 qt warm water. Shake hard, use within 8 hours.
When to apply	Dusk or early morning. Never in direct sun (burns leaves). Repeat every 7–14 days while pests are active; stop once clean.
Don't spray on	Open flowers (pollinator harm), wet leaves below 60 °F, or stressed seedlings under transplant shock. Test a couple of leaves first.
Reservoir safety	Hydroponic only — keep drift off the nutrient solution. (If you ever combine this rail with an aquaponic system, cover the water before spraying.)

Hydrogen Peroxide (3%) — Detail	Notes & rates
What it is	Common 3% household hydrogen peroxide — a strong oxidizer that breaks down to water and oxygen within hours.
Why use it	Treats root rot (Pythium), kills algae, sterilizes channels between crops, and adds emergency oxygen during heat waves.
Preventative dose	1 mL of 3% per gal of reservoir water, weekly ($\approx$ 20 mL for the 20-gal reference reservoir). Keep dissolved O ₂ up without nuking the biology.
Root rot treatment	3 mL of 3% per gal, once. If roots stay brown after 5 days, repeat once more. Expect a temporary stall — biology resets.
Between-crop sanitize	Drain channels. Rinse with 1 part 3% H ₂ O ₂ : 5 parts water. Let sit 10 min. Rinse with plain water before replanting.
Don't mix with	EM-1 or beneficial microbes within 48h. Never use 35% food-grade undiluted — it's caustic. Store in original opaque bottle; light degrades 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: Btk (kurstaki) targets leaf-chewing caterpillars; Bti (israelensis) targets fungus gnat larvae in growing media.
Why use it	Effective biological control for caterpillars and fungus gnats that doesn't harm pollinators, beneficials, or the nutrient solution. No harvest residue; zero withholding period. Breaks down within 24–72 h under UV — no buildup in the system.
Btk — foliar spray	1–2 tsp concentrate per quart of dechlorinated water. Spray upper and lower leaf surfaces at dusk or in low light. Repeat every 7 days while caterpillar pressure persists.
Bti — media drench	For fungus gnat larvae in growing media: dilute per label ($\approx$ 1 tsp per gallon of water), pour over media surface. Reapply every 7–14 days while larvae are present.
When to apply	At first sign of caterpillar feeding damage or gnat infestation, or preventatively during high-pest seasons. Reapply after heavy rain or overhead irrigation washes foliage.
Reservoir safety	Keep Bt spray out of the nutrient reservoir — UV and the aqueous environment degrade it rapidly. Target leaves and media only; don't spray into the tank.
Don't mix with	Copper-based fungicides (degrades Bt). Always use dechlorinated water — chlorine degrades Bt proteins. Do not pre-dilute in chlorinated tap water.
Storage	Refrigerate liquid formulations for longest shelf life. Unopened: 1–3 years. Use within the growing season once opened. Discard if separation won't re-mix or smells foul.

Applicant Compatibility — quick reference

Combination	Guidance
Silica → base nutrient → Cal-Mag	ALWAYS in this order. Silica first into plain water; then base; then Cal-Mag. Mix between each.
EM-1 + H ₂ O ₂	NO. Peroxide kills the microbes. Space 48 hours apart at minimum.
Cal-Mag concentrate + Silica concentrate	NEVER mix directly — forms calcium silicate scale. Dilute one in the reservoir before adding the other.
Neem + H ₂ O ₂	AVOID. Oxidation breaks down neem and irritates leaves. Pick one tool for the day.
EM-1 + foliar neem	OK if not mixed in the same spray and they're applied on different days.
BT (foliar/media) + EM-1	OK — BT targets insect larvae only and is 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 during seedling acclimation (week 1-2)	AVOID adding anything new. Let seedlings settle into the reservoir before stacking inputs.

Notes: Crop EC and pH ranges are from Resh's Hydroponic Food Production and UVI extension references; rates are home-system rules of thumb — adjust to what your meter and your plants actually tell you. Hawai'i: if you're selling produce, check current HDOA Good Agricultural Practices (GAP) requirements before scaling.

READY TO BUILD ONE?

Wai Gardens designs, installs, and maintains NFT and DWC systems for homes and schools across Central O'ahu. Free 20-minute consultation — we'll size a system to your space, water, and what your family actually wants to eat.

Book at waigarden.com · Email Tyler@waigarden.com