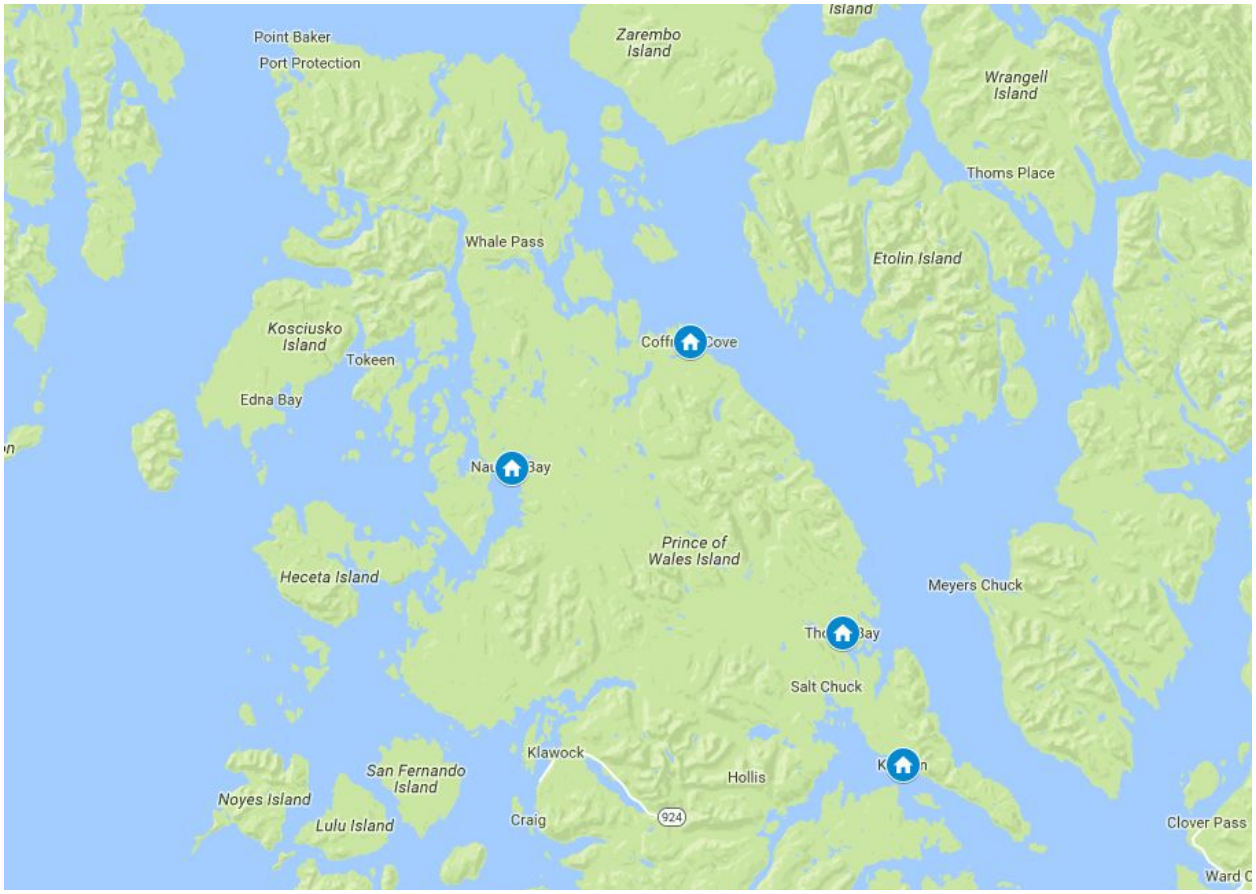
Southeast Island School District

Greenhouse Manual



Updated September 2016

Table of Contents

Greenhouse Supply Inventory

Below is a general list of items that were purchased for each greenhouse.

(1) Watering Can	(1) Chlorine Neutralizer - pint
(1) API Freshwater Testing Kit	(1) pH Up/Down - quart
(1) Dissolved Oxygen Testing Kit	(1) Liquid Seaweed - gallon
(1) Tote - 5 gallon (for fish feed)	(1) Chelated Iron - 1 lb
(1) Fish Feed - 40 lb	(1) Digital Scale
(1) Mortar & Pestle	(1) Clear Plastic Bags - box of 500
(1) Sprayer - 2 gallon	(1) Island Fresh Labels - roll of 500
(1) Insecticide - quart (powdered or liquid)	(1) Media Bed (Hydroton filled)
(1) Fish Net (small, green)	(1) Wicking Bed (Coco Coir filled)
(3) Seed Starting Trays w/Drains	(1) DWC Bed (raft)
(1) Seed Starting Station w/Lights	(20) Styrofoam Rafts
(1) Heat Mat (below seedling trays)	(1) Air pump w-12 Outlet Manifold
(1) Seed Container	(12) Sections of Airline
(1) Case of Rockwool (30 sheets w-200/each)	(12) Air Stones
(1) Seedling Pump	(1) Digital Thermometer
(1) Sump Pump	(1) Python Cleaning System
(2) Garbage Cans (for rainwater collection)	(1) Greenhouse Manual

If you see something on this list that you don't have, let the greenhouse manager know and it will get ordered. If you want something that's not on this list, go ahead and submit the order/requisition yourself using your site greenhouse account.

Daily Tasks

1. Sump

Pump

Make sure the pump is running. You should both hear and see water flowing out of the pump and into the fish tank. If water is not flowing, this is serious. The fish may die due to lack of oxygen, dirty, and/or hot water. Troubleshoot why the pump is not running: Is the power cord plugged in? Did the breaker flip? Is it making noise (humming) but not pumping water? If so, it's either clogged with debris (Hydroton or roots most likely) or burnt out. To remove debris, pop the gravel guard (screen) off of the pump intake. Remove the 3 screws on the impeller and take it off. Discard any foreign objects (debris) inside and rinse with clean water. If nothing obvious is wrong, the pump may have died and will need to be replaced as quickly as possible. Please notify the greenhouse manager ASAP (IMMEDIATELY).

Water Level

Make sure the sump is half-full or fuller. If the sump is low, fill with rainwater (preferably) or chlorine-neutralized water (either naturally or artificially "dechlorinated"). You can remove the chlorine naturally by letting water sit in containers for at least 24 hours (filling buckets, totes, garbage cans, tanks, etc.). While this does not remove chlorine, this will suffice for our needs. Otherwise, use the provided dechlorinating solution (see instructions on bottle for proper mixing ratios). If the water level is too high, make sure there isn't an input in the system (hose on, rainwater diverted in, etc.). Once you've assessed that everything's fine, leave it be; the level will drop over the next couple days of normal system use.

2. Fish

The fish need to be fed at least 3 times per day (before school, at lunch, and after school). We feed 3% of the total mass of the body weight of the fish every day, so each feeding represents about 1% of the total mass. Each greenhouse has a calculated weight of feed based on their fish stocking density and health/size of their fish. For example, the ideal overall fish mass for our systems is 30 lbs. This would mean that every day the fish could consume 3% of 30 lbs, or 0.9 lbs (14 oz) of feed. With 3 feedings per day, this would mean about 4-5 ounces of feed at each feeding. Generally speaking, the feeding should be roughly as much as they can eat in 5 minutes. If there's nothing left at the end of 5 minutes, then they could have eaten more. If there is some left, there was too much food. If you overfeed too often you run the risk of throwing the system out of balance or wasting an expensive input/product. For small fish (< 3"), the larger

pellets must be ground using the provided mortar & pestle. Otherwise, the small fish will not be able to eat and/or digest the larger feed resulting in restricted growth/health.

3. Temperatures

Water (°F) — Goal: **75°F ± 5°F**

Check and record the water temperature via fish tank probe/controls/display. These controls/thermometer do not need to be reset/touched. Below 70°F, both fish and bacterial metabolism begin to slow down exponentially. The fish will eat less and produce less nutrients; and the bacteria will digest those nutrients more slowly. Above 80°F, you risk stressing the fish and killing the bacteria. If the water temperature is over 90°F, you should perform an emergency ¼ volume water change and contact the greenhouse manager immediately.

Air Maximum / Minimum (°F) — Goal Min: **60°F** Goal Max: **80°F**

Check and document your 24 hour max and 24 hour min temperature using the provided digital thermometer. When you are done documenting the temperatures make sure to reset the thermometer, otherwise the next day's readings will not be accurate. To reset the air temperature thermometer, press and hold the reset button on the front until the numbers flash. If you notice that your highs and lows are consistently the same, it is possible that the thermometer is not getting reset correctly.

The ideal temperature for the greenhouse is around 80°F during the day and around 60°F at night. Plants exhibit hibernation characteristics below 45°F, and may sustain damage if frost develops or the temperature drops below freezing. Plants become stressed with higher temperatures in the 95°F or above range. Certain plants, especially lettuce, kale, and spinach, will "bolt" with higher temperatures, and/or become bitter and need to be replaced (inadvertently wasting precious resources, time & money).

Humidity (%) — Goal Range: **60 - 80%**

Use the provided digital thermometer/hygrometer to measure and record relative humidity in the greenhouse. If the humidity is below 30%, a door may be open or your exhaust fan may be continually running. If your humidity is over 90% (you should notice lots of moisture build up in the greenhouse), your circulation, exhaust, and/or intake fans may need turned on. Check your controls to make sure your maximum humidity setting is at 90%.

4. Plants

Seedlings

The seedlings are planted in rockwool which retains water very well. Check seeds/seedlings to make sure rockwool is moist so they can successfully germinate and grow. The seedlings are automatically watered daily by a small pump which is on a timer. If your seedlings are dry, the pump or timer is not working. If both are plugged in, one or the other may need to be serviced.

Media Beds

New/young seedlings planted into these beds will need to be manually watered daily until their roots reach the water line. The wicking bed holds moisture very well (compared to the Hydroton), but until the seedlings have adjusted to their new medium they run the danger of not getting the nutrients they need and/or drying out. Unlike the seed trays, there is no automatic watering of the media beds since the adult plants do not need to be manually watered. A couple of cans/gallons of water daily will suffice.

Pests

The primary pests in the greenhouse are aphids. Checking the DWC beds daily is crucial as aphid populations can double every 12 hours under ideal conditions. Look for aphids on the undersides of leaves and new growth giving special attention to over mature lettuce (get it out of the system!), as it is the perfect environment for starting an aphid infestation. If you see aphids, kill them and remove the infected plant from the building. Once aphids are detected, let other greenhouse personnel know and take appropriate control measures (i.e. spray with provided insecticide) as soon as possible. Along with spraying, try beneficial insects, companion planting, or your crazy uncle's voodoo. This is a great jumping off place for innovation and experimentation - if you find something that works, share!

5. Notes

The attached checklists are a starting point for recording quantitative information about the health of the greenhouse. However, growing plants, bacteria, and fish is also a subjective experience. If you notice anything out of the usual or especially interesting, or want to track/follow something else (not on the list) for educational purposes, use the "Notes" section. It's amazing the neat things you can find in this complex ecosystem if you pay attention.

Daily Checklist

School: _____ Week of: _____

		Date						
1. Sump	Pump							
	Water Level							
2. Fish	Breakfast							
	Lunch							
	Dinner							
3. Temperatures	Water (°F)							
	Air Maximum (°F)							
	Air Minimum (°F)							
	Humidity (%)							
4. Plants	Seedlings							
	Media Beds							
	Pests							
5. Notes								

Weekly Tasks

1. Water Test

Follow the instructions in your API Freshwater Testing Kit to test for pH, Ammonia, Nitrites, Nitrates, and the directions on the Dissolved Oxygen Kit to test dissolved oxygen levels.

API Freshwater Master Test Kit

pH Level — Goal: **6.8 ± 0.4**

pH affects all parts of the system. The goal of around 6.8 ± 0.4 is a compromise between the individual ideal ranges for the fish, plants, and bacteria. If the pH level is outside the goal range, you do not want to make huge adjustments in pH or you risk shocking the system. A ± 0.2 change per week is the maximum allowable difference. If you need to raise or lower the pH, follow the directions on the provided aquaponic friendly "pH Up" or "pH Down" solutions.

Ammonia — Goal: **0.25 - 0.50 ppm**

Ammonia is a natural byproduct of fish excretions and is the starting point for the nitrogen cycle, which will eventually feed the plants. A rise in ammonia means that the fish are producing more nutrients (i.e. poop) than the bacterial filter can effectively convert. While this will not affect the plants, eventually it will kill the fish. Contact the greenhouse personnel if you notice levels at or above 1.0 ppm, and perform an emergency ¼ volume water change at 3.0 ppm or higher.

Nitrites — Goal: **0.00 - 0.25 ppm**

Nitrites kill fish faster than ammonia does. If you notice levels higher than 1.0 ppm, the bacterial filters may have collapsed for some reason and the levels are likely to continue to rise. Contact the greenhouse manager if you notice levels at or above 1.0 ppm, and perform an emergency ¼ volume water change at 2.0 ppm or higher.

Nitrates — Goal: **5 - 150 ppm**

Nitrates are what the plants eat. If levels are at 0 ppm then there are more plants than the system can support and they are all starving. Some plants should be removed until the system can scale up its nutrients. If levels are greater than 150 ppm then there are not enough plants in the system to sustainably run the system and more plants should be added. Contact the greenhouse manager if you notice levels above 250 ppm and perform an emergency ¼ volume water change at 400 ppm or higher.

Dissolved Oxygen — Goal: **> 5 mg/L**

All parts of the system — fish, plants, and bacteria — need oxygen in order to live and thrive. Dissolved oxygen measures how much oxygen is available in the water to these living organisms. If the fish do not have enough oxygen they will swim to the surface of the water and gasp for air. If the bacteria do not have enough air, anaerobic strains will thrive creating all sorts of other problems with pH and chemicals. If the plant roots do not have enough oxygen, they will stop taking up nutrients. There is no dissolved oxygen level too high. However, if you see a number less than 5 mg/L, there may be a number of causes: overstocking, overfeeding, or decaying matter in the water (i.e., a dead fish or excessive algae) which is consuming the available oxygen. Check the fish tank to determine what the problem might be. Contact the greenhouse manager if you notice levels below 5 mg/L, and perform an emergency ¼ volume water change at 2 mg/L or less.

2. Harvesting

How to harvest

Harvesting should be done in the cool morning hours when plants are fresh, crisp, and hydrated — before the plants begin wilting from the afternoon sun. Some plants are harvested by clipping leaves, while others are harvesting by removing the whole plant. See the following pages for examples of when and how to harvest specific crops. **Every time you harvest ANYTHING, fill out a harvest form.**

Fill a tub with cold water so that all produce can immediately be washed and rehydrated. After rinsing the plants in a cold bath, gently shake off excess water, place in plastic bags and weigh each one to ensure consistency (see price list page). Immediately chill in a refrigerator until it is delivered or consumed.

Over-mature plants

If you notice a plant flowering or developing a bitter taste, it is likely that the plant is bolting (has gone to seed). This is a natural part of a plant's life cycle, but means that it is no longer harvestable/edible. Pull the whole plant, and start over with a seedling. This is a good jumping off point for experimenting with collecting our own seeds.

3. Transplanting

In order to provide continuous succession harvesting of crops, it is important to transplant seedlings into all beds for each of the plants that you removed during harvest.

When to transplant

It is important that you do not transplant anything until its roots are coming through the rockwool and able to firmly touch the water's surface. Otherwise the seedlings will not be able to reach the water channel and will not be able to get the nutrients they need to grow. The seedlings generally need to be 3-5 weeks old, depending on conditions.

How to transplant

Carefully cut the rockwool into individual squares. Sort the strong seedlings from the weak, and plant the strongest seedlings in the rafts or media bed (paying attention to spacing - see chart below). Use caution not to cut through roots or leaves, and avoid squishing the rockwool while transplanting, as it will compress and restrict proper growth.

4. Planting

DWC/Raft bed

In order to provide continuous succession harvesting of crops it is important to start seeds for each of the seedlings that you transplanted. Seeds are started in rockwool to provide a moist environment for germination and initial growth. Rockwool has a baseline pH of 8.0, which is too high for plants. The pH of the rockwool needs to be adjusted before planting seeds by soaking in “pH Down”. To do this, plug the drain in your seed starting tray, fill it with water, and add the appropriate amount of pH Down solution. Then completely submerge the rockwool for at least 15 minutes, and no more than an hour. When the time is up, drain the pH adjusted water outside of the system and plant seeds immediately.

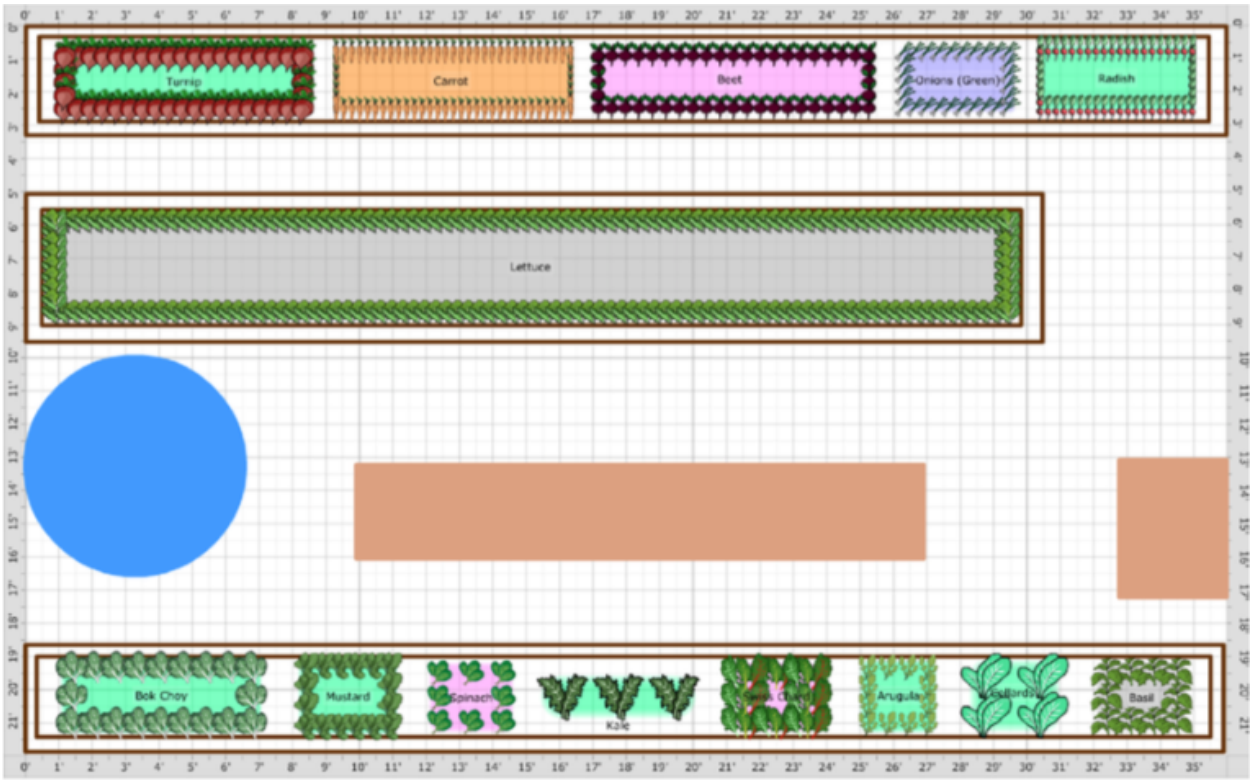
Media bed

Plant seeds for the media bed the same way as the DWC/raft bed (in rockwool).

Wicking bed

Plant seeds directly into the coco coir media by drawing shallow lines in the “dirt” and dropping seeds into the troughs, paying close attention to the proper depth and spacing (see tables below). Carefully cover the seeds with a thin layer of media and water gently, but thoroughly. After the seeds germinate, observe closely. If any of the seedlings are growing too close together, thin the weaker seedling(s) by removing it so that the other seedling can prosper.

Example Greenhouse Plan



Crop Planting (Greens)

CROP	BOK CHOI	MUSTARD	SPINACH	KALE	CHARD	ARUGULA	COLLARDS	BASIL
days to maturity	35	56	42	63	56	35	56	70
spacing	12”	12”	9”	12”	9”	9”	13”	9”
per row	3	3	4	3	4	4	3	4
# of rows	7	4	4	5	4	4	3	4
row spacing	12”	12”	10”	14”	10”	9”	16”	12”
length of bed used	72”	36”	30”	56”	30”	27”	32”	36”
total plants	21	12	16	15	16	16	9	16
spacing between	4” from end	12”	12”	12”	12”	12”	12”	12” & 4” from end
harvest per week	3	bunches	bunches	bunches	bunches	bunches	bunches	bunches

Crop Planting (Roots)

CROP	TURNIP	CARROT	BEET	GREEN ONIONS	RADISH	LETTUCE
days to maturity	56	70	63	77	35	35
spacing	6”	3”	5”	2”	3”	8”
per row	5	10	6	16	10	6
# of rows	16	30	18	22	20	45
row spacing	6”	3”	6”	2”	3”	8”
length of bed used	90”	87”	102”	42”	57”	ALL
total plants	80	300	108	352	200	270
spacing between	4” from end	6”	6”	5”	3” & 2” from end	n/a
harvest per week	10	30	12	32	20	54

5. Pests

If you see aphids or other pests, mix 1⁄4 to 1 tsp. of BotaniGard 22WP with 1 gallon of water in the sprayer. Spray beds and plants directly and thoroughly.

- Early scouting and detection followed by application of BotaniGard when insect numbers are low result in most effective control. Apply at first appearance of insect pests.
- Use a program of BotaniGard applied at 7-day intervals to keep your crop clean and prevent insect population explosions. If applied late or insects get out of hand, reduce the interval to 3-5 days, making at least 3 applications, and use a quick knockdown insecticide to help you regain control.
- Shake the container vigorously and thoroughly to suspend spores.

6. Nutrients

See the attached Nutrient Deficiency Key to diagnose possible nutrient issues. Coordinate with your site greenhouse personnel and/or the Greenhouse Manager for figuring out how many nutrients to add over what timescale.

7. Invoices

We typically have three types of customers to whom we sell produce from our greenhouses.

Community

These customers include private persons, farm stands, special events, etc. These are cash-only transactions which do not require any invoices but are paid in full at the point of sale. For these types of sales:

1. Fill out a Harvest Form with how much of which types of produce will be harvested & follow the directions for harvesting
2. At the end of the sale or event, fill out the Cash Count sheet (attached) detailing how much cash and checks were received, as well as which account to credit.
3. Send the Cash Count sheet to the SISD Accounts Receivable department

Commercial

These customers include stores, restaurants, businesses, etc. These are invoiced transactions which are not paid on delivery, but instead customers will send payment to SISD Accounts Receivable after the fact. For these types of sales:

1. Fill out a Harvest Form with how much of which types of produce will be harvested and follow the directions for harvesting
2. Fill out two copies of the Invoice Form with the items, quantities, subtotals, and total price
3. Deliver the produce to the customer
4. Get the customer's signature on one of the invoices which you keep with you
5. Give the customer the non-signed invoice for their records
6. Scan and email the signed invoice to Accounts Receivable with one invoice per email with the Subject Line following the format below:
    a. School Name_Invoice #_
7. Put the signed invoice in the section of the binder labeled "Unpaid Invoices"
8. Accounts Receivable will reply to the respective email when the invoice is paid
9. Move the signed invoice to the "Paid Invoices" section of the binder

Food Service

These customers include our own schools since we pay ourselves for using our produce in our school lunches. We still need to create an invoice so our accounting team can keep track.

1. Fill out a Harvest Form with how much of which types of produce will be harvested & follow the directions for harvesting
2. Fill out one copy of the Invoice Form with the items, quantities, subtotals, and total price
3. Scan and email the unsigned invoice to SISD's Accounts Payable AND Accounts Receivable with one invoice per email with the Subject Line following the format below:
    a. School Name_Invoice #_
4. Put the signed invoice in the section of the binder labeled "Unpaid Invoices"
5. Accounts Receivable will reply to the respective email when the invoice is paid
6. Move the signed invoice to the "Paid Invoices" section of the binder

8. Notes

The attached checklists are a starting point for recording quantitative information about the health of the greenhouse. However, growing plants, bacteria, and fish is a subjective experience. If you notice anything out of the usual or especially interesting, or want to track/follow something else (not on the list) for educational purposes, use the "Notes" section. It's amazing the neat things you can find in this complex ecosystem if you pay attention.

Weekly Checklist						
School: _____			Month: _____			
Date/Week of						
1. Water Test	pH Level					
	Ammonia (ppm)					
	Nitrites (ppm)					
	Nitrates (ppm)					
	Dissolved Oxygen (mg/L)					
2. Harvest						
3. Transplant						
4. Plant						
5. Pests						
6. Nutrients						
7. Invoices						
8. Notes						

Monthly Tasks

Monthly tasks are very important in keeping the greenhouse system effective. Please date and initial the following form when an item is completed.

1. Inventory

Tracking current supplies helps us to keep the greenhouse stocked in a timely manner.

Rockwool

Count full sheets.

Seeds

Identify low varieties.

Fish Food

One month supply (minimum) needs to be maintained at all times. If less, contact greenhouse manager.

Liquid seaweed

Notify greenhouse manager when less than a quart remains.

Chelated Iron

Notify greenhouse manager when you run out.

2. Cleaning

A clean greenhouse is a healthy greenhouse.

Fish Tanks

Make sure water is clear of algae. Use Python Cleaning System to remove debris from bottom of tank. If there is excess food collecting at the bottom, reassess feeding ratios accordingly.

Composters

Remove any waste products (ie yellow leaves, rockwool, overgrown plants) left in the greenhouse. Put in compost bins or feed to chickens.

Floors

Keep floors clear of obstacles and free from slippery buildup.

Wall/Roof Panels

Keep clean and clear.

Seedling Trays

Clean algae from trays and make sure drains are clear. Check for damage.

Rafts

When rafts are clear of plants make sure they are cleaned thoroughly and undamaged.

Stand Pipes

Need to be cleared of all buildup and debris, so water flows in or out freely.

Weeds

Make sure outside and inside the greenhouse is clear of weeds.

Monthly Checklist

School: _____

	Month						
1. Inventory	Rockwool						
	Seeds						
	Fish Food						
	Liquid Seaweed						
	Chelated Iron						
2. Cleaning	Fish Tanks						
	Composters						
	Floors						
	Wall/Roof Panels						
	Seedling Trays						
	Rafts (empty)						
	Stand Pipes						
	Outdoor Weeds (keep out!)						

NUTRIENT

DEFICIENCY KEY

BRIGHT
AGROTECH

www.zipgrow.com

DIAGNOSING COMMON NUTRIENT DEFICIENCIES

Welcome to Bright Agrotech's Nutrient Deficiency Key simple key for diagnosing deficiencies in aquaponic systems. Please keep in mind that this key is very general and not crop specific.

(Symptoms can vary quite a bit from crop to crop and from situation to situation.)

A plant's failure to thrive in aquaponic systems may be due to pests, diseases, lack of sunlight, improper care and environment, or nutrient deficiencies. Excluding all of these other possibilities, nutrient deficiencies in aquaponic systems are not too difficult to diagnose (most of the time!).

1

Is your plant chlorotic?

(Is there yellowing of the leaves?)

If yes, see 1a, if no, go to 2 (next page)

a

- Is the yellowing only between the veins, with the veins remaining green?
- Is the young growth most affected?

If yes, then you most likely have an iron deficiency. If no, go to 1b.

b

- Is the yellowing across the entire leaf (veins included)?
- Does the old growth appear to be more affected than the young?

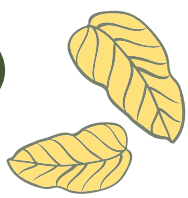
If yes, then you most likely have a nitrogen deficiency. If no, go to 1c.

c

- Is the yellowing primarily between the leaf veins, but the old growth is most affected?
- Are leaves cupping, developing brown spots, or dry with dead edges?
- Are the roots not developing? (Are there signs of stunted root growth?)
- Is there some chlorosis or dead fringes around the edges of the older leaves?

If yes, then you most likely have a potassium deficiency. If no, go to 1d.

d



- Is the yellowing primarily between leaf veins, but the chlorosis is concentrated in older leaves, with the most affected leaves falling off (old chlorotic leaves falling off)?

If there are dead fringes along the leaf edges or dead, brown spots on the leaves and the old, chlorotic leaves fall off, then you likely have a magnesium deficiency.

2

Are there necrotic spots (dead, brown spots) **on the leaves or stems of the young, rapidly growing parts of the plant? Are there brown dead spots on the fruit** (especially on the blossom end).

If so, you likely have a calcium deficiency. If no, then you may have another nutrient deficiency, but it is not as likely as other variables, including problems with temperature, pests, or cultural methods.

HOW TO TREAT THESE DEFICIENCIES

Iron

Add chelated iron to your system- there are many types out there, but FeEDDHA and FeDTPA are the best types of chelated iron. (FeEDDHA will turn your water red though.) There is quite a bit of math involved in determining how much to add, because different chelated iron types have different purities. Use the Able.ag Iron Calculator to easily calculate and schedule your iron additions.
Read more about iron in aquaponics

Nitrogen

Aquaponics

You should know that this is a possibility if you haven't been feeding much, have too much vegetation to fish, or have been measuring low nitrate levels in your system. Switch to a higher protein feed and feed more often to correct. If this doesn't correct, remove some plants and look for straw, wood or another high carbon substance in your system that could be consuming nitrogen in decomposition. Remove all wood, straw, etc. Low temperatures can also depress feeding and lead to nitrogen deficiency.
Read more about nitrogen in aquaponics

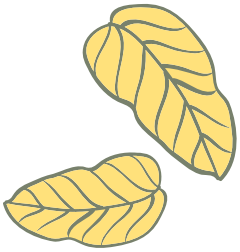
Hydroponics

Nitrogen deficiencies commonly occur in hydroponics when the ratio of calcium nitrate to NPK mix is too low. To treat a nitrogen deficiency, increase the amount of calcium nitrate when mixing nutrients.

Potassium

In systems with low pH, add potassium hydroxide (caustic lye) to raise pH and supplement potassium. In systems with neutral or high pH, add kelp meal concentrate (0-0-10) or potassium sulfate (0-0-50) in very low quantities. In hydroponics potassium deficiences are very rare.

Read more about potassium in aquaponics



Magnesium

In systems with low pH, adding dolomitic lime can help, as well as hydrated lime. In both hydroponic and aquaponic systems, Epsom salts (magnesium sulfate) can be added in small quantities to supplement magnesium. In hydroponics magnesium deficiences are very rare.

Read more about magnesium

Calcium

Most systems have plenty of calcium because it's common in the water. However, if there's too much potassium in the system, your plants might show a calcium deficiency. To correct in low pH systems, reduce the amount of potassium you are supplementing and add hydrated lime to the system in small quantities. In neutral or high pH systems, the best way to supplement calcium is with small amounts of calcium chloride applied foliage. In hydroponics calcium deficiences are very rare.

Read more about calcium in aquaponics

Remember that correcting deficiencies takes time — often 2-4 weeks, so add small amounts and measure the results over time. Adding too much of any of these substances can sometimes cause bigger problems than a nutrient deficiency! The amounts of these supplements that you add will vary based on system volume and the severity of the deficiency.

These nutrients can be supplemented through foliar applications as well - especially with calcium or potassium chloride.

Check out these resources for more info on how to correct deficiencies in your system:

Bright Agrotech Blog

Bright Agrotech YouTube Channel

Able Farm Planning Software

Have questions? Give us a call at (307)288-1188 and one of our team members will help you out.

Arugula

Harvesting

Harvest individual leaves from the bottom of the plant towards the top once the leaves reach at least 2” - 3” in length. Cut individual leaves off at the base of the stem where it meets the stalk of the plant using a knife, scissors, clippers or by hand (carefully twist the stem making sure to not tear the stalk). Dunk all produce into the cold bath to wash.

**** Remember to taste the arugula before harvesting to ensure good flavor! ****

Storing

Shake off excess water and bundle/place in plastic bags (refer to price list for specific weights). Store in refrigerator.

Immature

Over-Mature

Basil

Harvesting

When your basil plant has 3 to 5 sets of leaves, cut the top off just above the second set of leaves from the ground. The single stalk will now end here, and two new branches will now bud and grow from the set of leaves you left behind. Every couple of weeks, repeat the process, cutting just above the first or second set of leaves on your newest branches. Dunk all produce into the cold bath to wash.

Storing

Shake off excess water and bundle/place in plastic bags (refer to price list for specific weights). Store in refrigerator.

Beets

Harvesting

Beets should be at least 3 inches in diameter to harvest. Pull beets straight up keeping the greens intact, trim roots using a knife, scissors, clippers or by hand and dunk all produce into the cold bath to wash.

****Remember to taste the beet greens before harvesting to ensure good flavor!****

Storing

Shake off excess water and bundle/place in plastic bags (refer to price list for specific weights). Store in refrigerator.

Immature

Over Mature

Bok Choy

Harvesting

Harvest the whole head of bok choy with the roots intact by slowly and carefully pulling the entire head free. Cut off the roots just above the rockwool using a knife, scissors, or clippers. Dunk all produce into the cold bath to wash.

****Remember to taste the bok choy before harvesting to ensure good flavor!****

Storing

Shake off excess water and bundle/place in plastic bags. Store in refrigerator.

Immature

Over Mature

Carrots

Harvesting

Most carrots are ready to harvest when the shoulders are 1/2 to 3/4 inch in diameter. Pull the carrots straight up into the air, keeping the greens intact, and trim off the roots; do not pull carrots at an angle or you risk breaking the carrot. Dunk all produce into the cold bath to wash.

****Remember to taste the carrots during harvest to ensure good flavor!****

Storing

Shake off excess water and bundle/place in plastic bags (refer to price list for specific weights). Store in refrigerator.

Immature

Over Mature

Harvesting

Removing Greens

Chard

Harvesting

Harvest individual leaves once the leaves reach at least 6” in length; always harvest the largest leaves first to promote future growth. Cut individual leaves off at the base of the stem where it meets the stalk of the plant using a knife, scissors, clippers or by hand (carefully twist the stem making sure to not tear the stalk). Dunk all produce into the cold bath to wash.

****Remember to taste the chard before harvesting to ensure good flavor!****

Storing

Shake off excess water and bundle/place in plastic bags (refer to price list for specific weights). Store in refrigerator.

Immature

Over-Mature

Collard Greens

Harvesting

Harvest individual leaves from the outside of the plant towards the inside of the plant once the leaves reach at least 6” in length. Cut individual leaves off at the base of the stem where it meets the stalk of the plant using a knife, scissors, clippers or by hand (carefully twist the stem making sure to not tear the stalk). Dunk all produce into the cold bath to wash.

****Remember to taste the greens before harvesting to ensure good flavor!****

Storing

Shake off excess water and bundle/place in plastic bags (refer to price list for specific weights). Store in refrigerator.

Immature

Over-Mature

Green Onions

Harvesting

These alliums are best picked when they are young and tender. Dig or pull the green onions when the tops reach between 6”-8″ tall and the bulbs have begun to swell. Pull the entire plant out, keeping the roots intact to promote freshness. Dunk all produce into the cold water bath.

Storing

Shake off excess water and bundle/place in plastic bags (refer to price list for specific weights). Store in refrigerator.

Immature

Over-Mature

Kale

Harvesting

Harvest individual kale leaves from the bottom of the plant towards the top once the leaves reach at least 6” in length. Cut individual leaves off at the base of the stem where it meets the stalk of the plant using a knife, scissors, clippers or by hand (carefully twist the stem making sure to not tear the stalk). Dunk all produce into the cold bath to wash.

****Remember to taste the kale before harvesting to ensure good flavor!****

Storing

Shake off excess water and bundle/place in plastic bags (refer to price list for specific weights). Store in refrigerator.

Immature

Over-Mature

Lettuce

Harvesting

Harvest the whole head of lettuce with the roots intact by slowly and carefully pulling the entire head free of the growing raft. Carefully rinse the lettuce roots free of any debris. Dunk all produce into the cold bath to wash.

****Remember to taste the lettuce before harvesting to ensure good flavor!****

Storing

Shake off excess water and bundle/place in plastic bags (refer to price list for specific weights). Store in refrigerator.

Immature

Over-Mature

Mustard Greens

Harvesting

Harvest individual leaves once the leaves reach at least 3-4” in length cutting the largest leaves first. Cut individual leaves off at the base of the stem where it meets the stalk of the plant using a knife, scissors, clippers or by hand (carefully twist the stem making sure to not tear the stalk). Dunk all produce into the cold bath to wash.

****Remember to taste the greens before harvesting to ensure good flavor!****

Storing

Shake off excess water and bundle/place in plastic bags (refer to price list for specific weights). Store in refrigerator.

Immature

Over-Mature

Radishes

Harvesting

Harvest radishes when the root is greater than 1” in diameter; the larger the radish, the hotter it will become. Pull radishes straight up, keeping the greens and bulb attached, trim off the roots using a knife, scissors, clippers or by hand and dunk all produce into the cold bath to wash.

Storing

Shake off excess water and bundle/place in plastic bags (refer to price list for specific weights). Store in refrigerator.

Immature

Over-Mature

Spinach

Harvesting

Harvest individual leaves from the outside of the plant towards the inside once the leaves reach at least 2” - 3” in length. Cut individual leaves off at the base of the stem where it meets the stalk of the plant using a knife, scissors, clippers or by hand (carefully twist the stem making sure to not tear the stalk). Dunk all produce into the cold bath to wash.

****Remember to taste the spinach before harvesting to ensure good flavor!****

Storing

Shake off excess water and bundle/place in plastic bags (refer to price list for specific weights). Store in refrigerator.

Immature

Over-Mature

Turnips

Harvesting

Turnips should be at least 3” in diameter to harvest; they will continue to grow and can be harvested at any size larger than 3”. Pull turnips straight up, keeping the greens intact, trim the roots using a knife, scissors, clippers or by hand and dunk all produce into the cold bath to wash.

Storing

Shake off excess water and bundle/place in plastic bags (refer to price list for specific weights). Store in refrigerator.

Immature

Over-Mature

Harvest Form

School: _____ Harvested By: _____

Customer(s): _____ Date: _____

		Quantity
Greens	Arugula	oz
	Bok Choi	heads
	Chard	oz
	Collards	oz
	Kale	oz
	Lettuce	heads
	Mustard	oz
	Spinach	oz
	Spring Mix	oz
Herbs	Basil	oz
	Cilantro	oz
	Dill	oz
	Oregano	oz
	Parsley	oz
	Thyme	oz
Roots	Beet	oz
	Carrot	oz
	Green Onions	oz
	Radish	oz
	Turnip	oz

Island Fresh Student Enterprises - Price List			
		Weight	**Price**
Greens	Arugula	4 oz	$1.50
	Bok Choy	Head	$2.00
	Chard	4 oz	$1.50
	Collards	4 oz	$1.00
	Kale	4 oz	$1.50
	Lettuce	Head	$2.00
	Mustard	4 oz	$1.25
	Spinach	5 oz	$1.50
	Spring Mix	5 oz	$2.00
Herbs	Basil	0.75 oz	$1.50
	Cilantro	0.75 oz	$1.50
	Dill	0.75 oz	$1.50
	Oregano	0.75 oz	$1.50
	Parsley	0.75 oz	$1.50
	Thyme	0.75 oz	$1.50
Roots	Beet	16 oz	$1.50
	Carrot	16 oz	$1.50
	Green Onions	4 oz	$1.00
	Radish	8 oz	$1.00
	Turnip	16 oz	$1.50

ISLAND FRESH

STUDENT ENTERPRISES

INVOICE # _____

SCHOOL: _____

DATE: _____

CUSTOMER: _____

PRODUCE ITEM	QUANTITY	UNIT PRICE	SUB TOTAL
		GRAND TOTAL	

PAYMENT TERMS

To be made payable to Southeast Island School District within 30 days

ADDRESS

P.O. Box 19569 • Thorne Bay, AK • 99919

CUSTOMER SIGNATURE

_____

ISLAND FRESH STUDENT ENTERPRISES • SOUTHEAST ISLAND SCHOOL DISTRICT • (907) 828-8254

Southeast Island School District
Cash Count Worksheet

Today's Date: _____ Event: _____
Event Date: _____ Fund(s) to Credit: _____
Your Name: _____

CASH

$0.01	X		=	
$0.05	X		=	
$0.10	X		=	
$0.25	X		=	
$0.50	X		=	
$1.00	X		=	
$2.00	X		=	
$5.00	X		=	
$10.00	X		=	
$20.00	X		=	
$50.00	X		=	
$100.00	X		=	

TOTAL CASH _____

CHECKS

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

TOTAL CHECKS _____

Summation

Total Cash:
Total Checks:
Total Deposit:

Total Fund Deposit:

Deposit Slip	
Recorded:	

Contacts

Greenhouse Manager

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