

CENTRAL
Garden & Pet

RETAILER PLAYBOOK AQUATICS

ADDENDUM 1



This addendum covers Corals, Beneficial Organisms, Habitats, and Plants

CORALS

What is a Coral	6
Types of Coral	
Small Polyp Stony Coral or SPS Coral	6
Large Polyp Stony Coral or LPS Coral	6
Soft Corals	7
Mushroom Corals	7
Polyps	7
Gorgonians	7
Setting up a Reef Tank	
Tank Size	7
Lighting	8
Filtration	9
Water Flow	11
Water	12
Water Chemistry	
Salinity	12
ph.....	12
Temperature.....	12
Calcium	13
Alkalinity.....	13
Magnesium.....	13
Phosphate.....	13
Beneficial Organisms	14
Helping Customers with Corals	
Beginner	17
Intermediate.....	17
Advanced.....	18

HABITAT SETUP

Planning It Out	
Substrate	22
Rocks	24
Decor	27

PLANTED AQUARIUMS

Plants	
Understanding Plant Care Levels	32
Spectrum	36
Planted Tank Substrate	37
Source Water	39
Introduction to CO ₂	41
Putting It All Together	47

CARE GUIDES 49



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CORALS

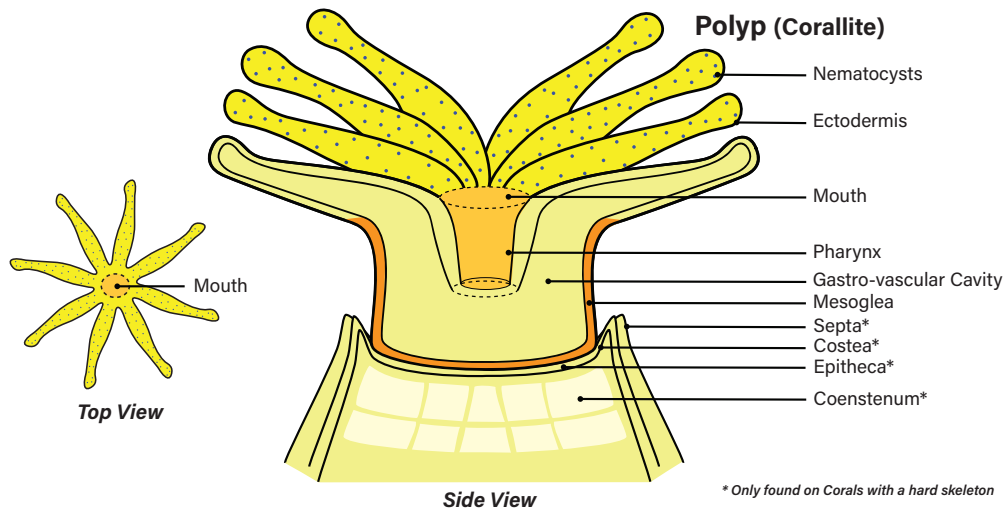
What is a Coral	6
Types of Coral	
Small Polyp Stony Coral or SPS Coral	6
Large Polyp Stony Coral or LPS Coral	6
Soft Corals	7
Mushroom Corals	7
Polyps	7
Gorgonians	7
Setting up a Reef Tank	
Tank Size	7
Lighting.....	8
Filtration	9
Water Flow	11
Water	12
Water Chemistry	
Salinity	12
ph.....	12
Temperature.....	12
Calcium	13
Alkalinity.....	13
Magnesium.....	13
Phosphate.....	13
Beneficial Organisms	14
Helping Customers with Corals	
Beginner	17
Intermediate.....	17
Advanced.....	18

CORALS



WHAT IS A CORAL:

One of the most fascinating groups of animals to care for in saltwater aquaria are corals. Simply put, corals are marine invertebrates from the class anthozoa. The polyps of corals have photosynthetic algae, called zooxanthellae that live in the tissue of the coral. This algae provides nutrition to the coral through photosynthesis. Corals often form colonies, which are what hobbyists have come to know and recognized. Corals can be as small as a single polyp or as large as hundreds of thousands of polyps forming a colony the size of a bus! Corals go on to be the foundation of coral reefs forming some of the largest living ecosystems on earth.



TYPES OF CORAL:

Corals exist in a variety of different shapes, colors, and forms. Understanding the different types of corals can help increase the success rate in aquaria. The marine aquarium hobby has done well to come up with ways to group common corals together based off of structure. Those groups are:

Small Polyp Stony Coral or SPS Coral

SPS corals are corals that build a skeleton out of calcium carbonate. Small polyps of these corals will produce calcium carbonate that forms a hard skeleton. These corals are typically more involved needing consistently stable water parameters and the addition of supplements such as calcium and magnesium.

Large Polyp Stony Coral or LPS Coral

LPS corals are similar to SPS corals with the most obvious exception that the polyps on LPS corals are significantly larger than those of SPS. When fully extended, the polyps of LPS corals can be substantially larger than the actual skeleton. LPS corals are typically more involved, but can be more forgiving in changing water parameters.

Soft Corals

Soft corals are one of the gray areas of coral categories. Technically, soft coral would define all corals that are a stony coral, however, for the hobby purposes soft coral refers to corals such as leather corals or carnation corals. These corals can have structure to their form, often standing upright like a tree, but do not have a calcareous external skeleton. They do have calcareous spicules in their tissues that supply the structure. These corals are typically easy to care for and often make some of the best beginner corals.

Mushroom Corals

Mushroom corals are a type of soft coral. The entire coral is soft. Mushroom corals can spread over rocks forming a group of mushroom corals which is a fascinating look in any home aquarium. These are typically easy to care for, they can be a bit aggressive so care is needed when placing them.

Polyps

Perhaps a category that is too general given that corals are polyps themselves, but when speaking in the hobby, polyps refer to zoanthids and palythoa. These polyps can exist singly or grow in massive colonies. These colonies are often referred to as “zoa gardens” by the hobby which can be simply magnificent. Zoanthids and playthoa are some of the easiest and most forgiving corals to care for.

Gorgonians

Gorgonians are perhaps the least common variety of coral, but some of the most appealing. They are a type of soft coral, but often have a defined structure. Some have structures so rigid that they appear more like an SPS coral, but unlike sps corals, these corals do not have an external stony skeleton. Gorgonians can be anywhere from simple to challenging to care for depending on how the animal gets nutrition and the water parameters it requires. Be sure to work on a species by species basis for gorgonian care and selection.

SETTING UP A REEF TANK:

Reef tanks are a world of imagination and wild adventure. No two reef tanks will ever be the same, just like no two coral reefs are the same. However, there are a few steps that can be taken to ensure that a hobbyist will be as successful as possible:

- **Tank Size:**

One of the beauties of reef tanks is that many corals really don't have tank size requirements. Zoanthids can grow wild in a five hundred gallon tank or be finely propagated in pico tank. As long as there is physical space for the coral and the tank

can be outfitted with the proper equipment then corals can be successfully kept.

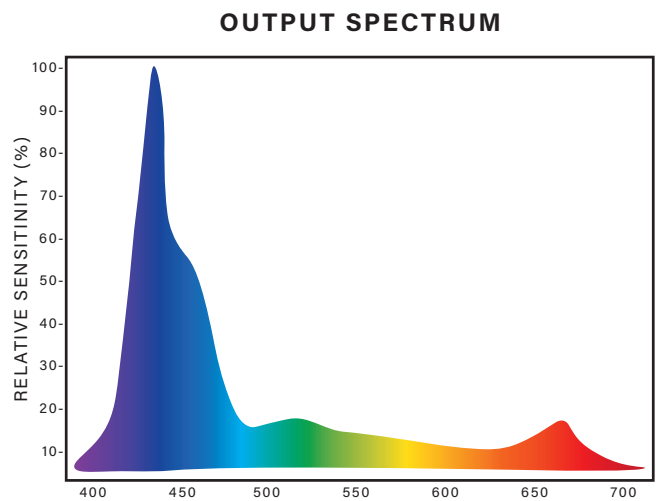
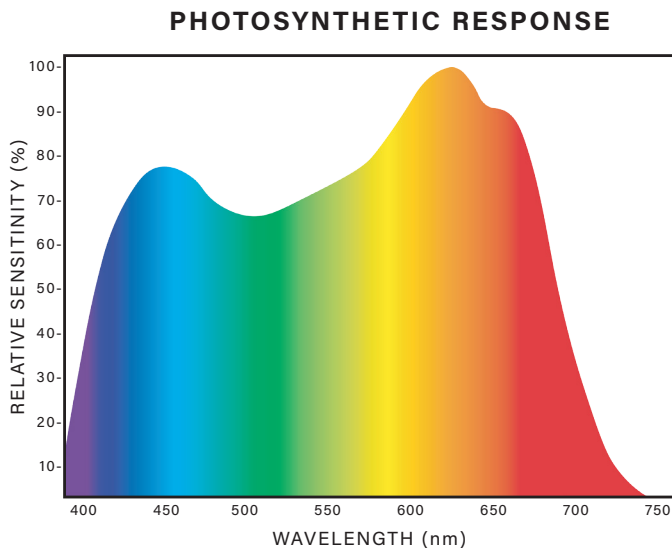
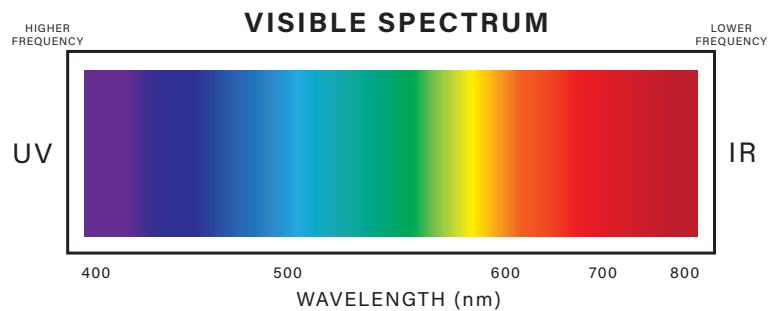
- **Lighting:**

When it comes to reef tanks, lighting may be the most complex topic outside of water chemistry. It's important to focus on the basics of lighting so that any hobbyist can have the foundations needed for success. Let's start with the two most readily available types of lights:

- ◆ LED lighting is quickly becoming the most regularly used type of lighting. LEDs are energy efficient, have low maintenance costs, and can be customizable or programmable. LEDs are readily available within the hobby and can come in a wide array of spectrums and strength. It's important to make sure that the light is suitable for the hobbyist's needs.

- ◆ T5 lighting is one of the most reliable types of lighting and the initial cost is generally lower than LEDs. T5 bulbs are long, thin bulbs that often come in fixtures with two, four, or eight bulbs. The spectrum of T5 bulbs isn't quite as customizable, but there is still a variety of different spectrum bulbs readily available on the market.

Now that we've looked at the types of bulbs, it's important to understand the two biggest components of lighting and how they impact corals. Those components are spectrum and strength.



◆ Lighting spectrum in this case refers to the visible color spectrum the light emits. For most reef tanks, a mix of white and blue bulbs achieve the best aesthetic look and are most appropriate for the care of corals. It's important not to use lights that incorporate too much yellows and reds like those meant for freshwater planted tanks.

◆ In terms of reef tanks, lighting strength refers to PAR, or Photosynthetically Active Radiation. Simply put, this is the amount of light that penetrates through the water column and that is usable for photosynthesis by the symbiotic algae within corals. When selecting a light for a tank, understand that different corals have different requirements for PAR, stony corals generally have higher requirements, soft corals, generally have lower requirements. It's important to check the lighting requirements for each coral going into the aquarium to make sure the selected light has enough strength to provide for the corals.

• Filtration

Filtration can be one of the more exciting aspects of setting up a reef tank. It's always important to understand that as with any sort of aquarium, the filtration on a reef tank should include mechanical, biological, and chemical filtration components. Ensuring that the hobbyist sets up a tank with all three will help set them up for more overall success with their aquarium.

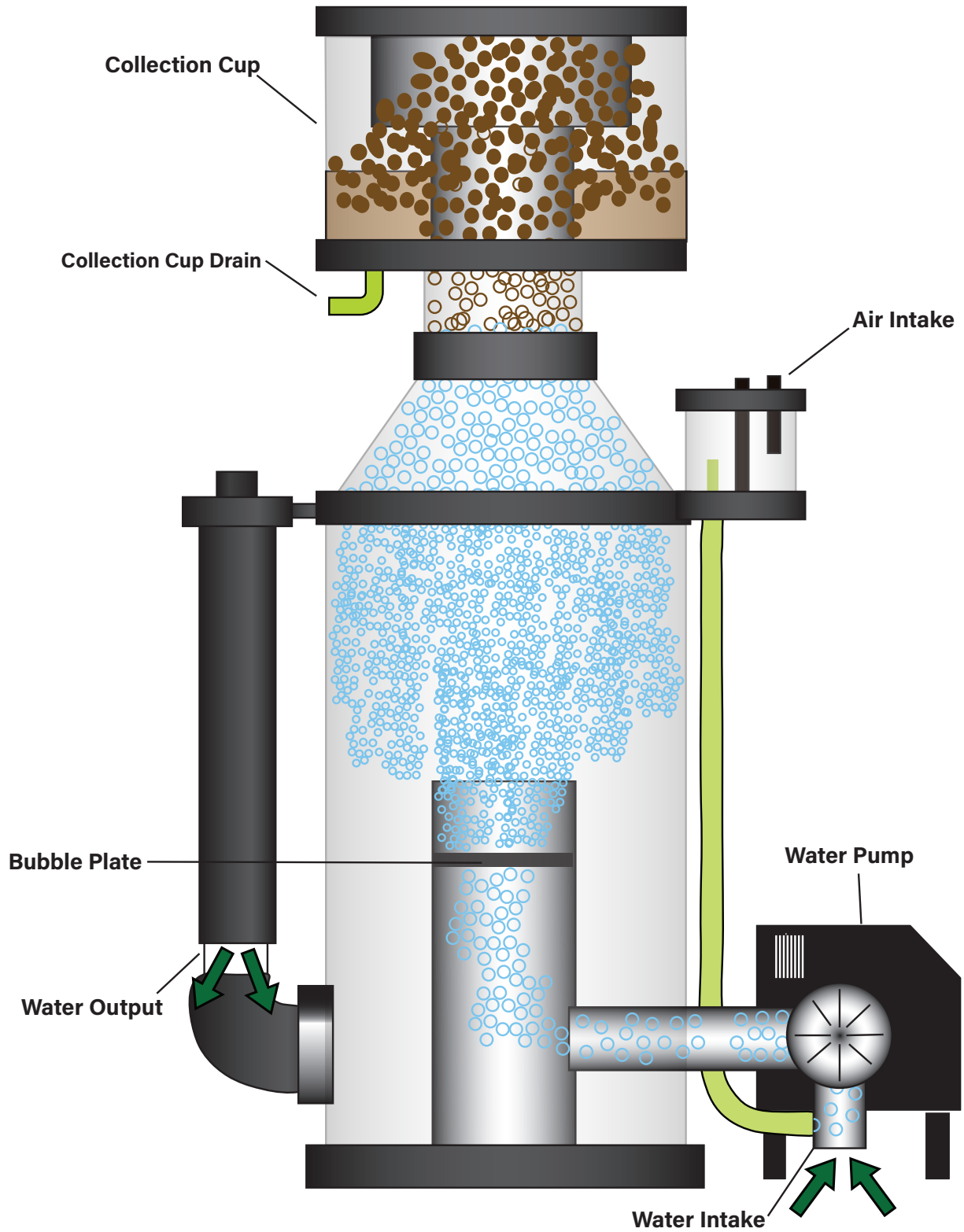
Most reef tanks use either an under the tank sump filtration or are an “all in one” tank where the filtration is included in the back of the tank. Both can either come as a “plug and play” style filter where the hobbyist purchases the filtration as is and can simply set it up and go, or the hobbyist can purchase the filtration with just the basic components where the hobbyist can add any number of individual components. Here are some of the major components to make sure are included in the filtration:

◆ A protein skimmer is generally required to help remove excess nutrients from the water column. It operates by creating a substantial amount of bubbles in a small chamber that elevates excess nutrients to a cup where they can be physically removed. Adding a sufficient protein skimmer for the size of the aquarium can be a crucial step in ensuring the success of the reef tank. *See graphic on following page.*

◆ A mechanical filtration component can be as simple as filter fabric. Something to physically remove detritus can help cut down on maintenance and increase the overall health of the aquarium so long as it is regularly cleaned.

◆ Chemical filtration can come a variety of different ways, but perhaps most commonly are fine mesh bags with some sort of chemical media inside them. There are a variety of different medias, all serving different purposes, so be sure to help select the most appropriate media for the individual aquarium.

Protein Skimmer

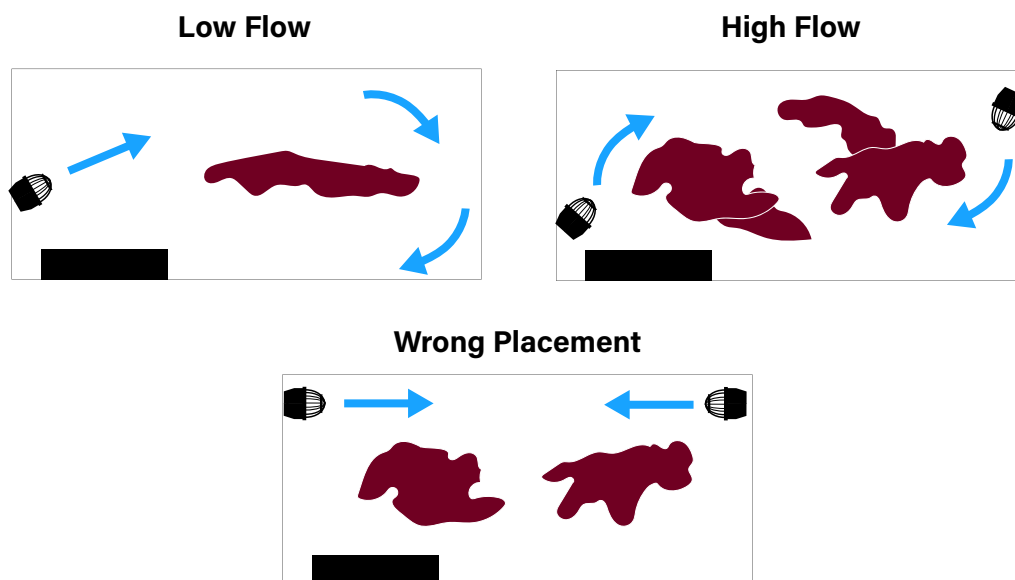


◆ Biological filtration can come in a few different ways, plastic bio-balls, ceramic bio-pellets, or as simple as live rock. All types of biological filtration are there simply to provide increased surface area for beneficial bacteria within the filtration. This is one of the most important, if not the most important, component of a successful reef aquarium.

◆ A refugium is that last piece, and it's debatable whether or not it is really required, or simply just an added benefit. A refugium is a separate tank or chamber that is dedicated to a more complex biological filtration. Typically refugiums have a deep sand or mud substrate, a layer of rubble rock, and macroalgae throughout. All three provide benefits beyond just typical biological filtration. The sand bed harbors filter feeders and other benthic organisms to help break down detritus. Additional rubble rock adds more surface area for bacteria, but also can allow for additional beneficial organisms in the filtration. It will also play a role in the buffering capacity of the aquarium, helping to keep calcium and alkalinity more stable. Macroalgae helps pull nutrients out of the water through photosynthesis and can help stabilize the pH of the aquarium if given the opportunity to perform photosynthesis at night while the rest of the tank is dark.

• **Water Flow**

Water flow requirements vary greatly tank by tank and species by species. Some corals like stronger flow, some like little to no flow. Understanding each species' requirements is important when determining how much flow is needed for the aquarium. Flow from the filtration is generally suitable for tanks with little rock and low flow requirements, but adding more rock work or corals that demand a higher flow will require additional flow through the addition of water circulators or wave makers. When placing water circulators and wave makers, always be sure to not face them directly at each other



or directly at rock work that would immediately impede the flow. Always ensure that there is enough water flow throughout the tank so that there are no completely stagnant areas.

- **Water**

Believe it or not, the actual water for reef tanks can be different than what is used for other types of aquariums and it's not just because of salinity. Typically source water has a variety of different elements and compounds in it that may or may not be beneficial for a reef tank. Using reverse osmosis/de-ionized water, or RO/DI water, is the most beneficial type of water to use for reef tanks as it can be as much as 99% pure water which means the hobbyist has far more control of whatever elements and compounds present in their tank.

With each reef tank being different, each set up will surely be different. However, it's important to cover the basic foundations of a reef tank with any hobbyist. Once the foundations of a reef tank are established, the sky is truly the limit for what is possible with both the equipment and with the animals going into the aquarium.

WATER CHEMISTRY

One of the most critical aspects of reef keeping is understanding the water chemistry associated with keeping corals. Corals require certain parameters to be at a certain level in order to be healthy and grow. Understanding these parameters and being able to communicate them with customers, is a great way to help set them up for success. Let's take a look at the essential reef tank parameters and how they impact reef tanks:

- **Salinity**

It may sound simple, given that it's a saltwater aquarium, but keeping a stable salinity within a 32 – 35 ppt range is one of the most important aspects of reef keeping. Stability, as we'll see, is the recurring theme of reef tank water parameters. Salinity swings can cause stress in corals, which can result in the coral not being able to carry out basic physiological functions thus leading to further issues or even the loss of the coral. Salinity outside of 32 – 35 ppt, may be too high or too low for the coral to survive and thrive, so keeping it stable and within range is extremely important.

- **pH**

pH matters more to corals than perhaps any other animal we intentionally keep in our reef tanks. Maintaining a pH between 8.1 and 8.4 is vital for the success of a reef tank. For corals, pH helps precipitate calcium and carbonate which are used for structure in the corals skeleton. With too low or too high of a pH, the coral is no longer able to add calcium or carbonate to its skeleton which inevitably leads to a loss of the coral. Rapid swings in pH can also be detrimental as the coral may not be able to

accommodate for a large change in a short period of time which could result in bleaching or loss.

- **Temperature**

Similarly to pH, temperature may seem like a simple concept, but it is often overlooked in reef tanks. Keeping a temperature between 76 – 82° F is important in reef tanks. Too high or too low and the coral will become stressed which can result in bleaching or loss of the coral. Just like in fishes, it's important to make sure the animal is temperature acclimated before placing it into a new aquarium to avoid any potential rapid changes that will stress the animal.

- **Calcium**

Perhaps the most well-known reef parameter, calcium is vital for the success of corals. Calcium is the building block of the coral skeleton. Stony corals, both small polyp stony and large polyp stony, use calcium to build a protective and structural skeleton that holds the individual polyps. However, even in soft corals, calcium is present. Calcium rods, called spicules, make up the soft tissue and help provide structure to many of our favorite soft corals. Maintaining a level between 380 – 450 ppm is crucial for corals to be able to have enough calcium present to maintain and grow their skeletons.

- **Alkalinity**

Along with calcium, alkalinity is one of the more well-known reef tank parameters, although alkalinity is often poorly understood as it's a bit more abstract. Essentially alkalinity measures the buffering capacity of the water which in very basic terms means how much of an acid is required to turn bicarbonates into carbonic acid. As reef keepers, we want the most stable water possible, so we want the alkalinity to be high so that small changes do not result in make chemical shifts in our tanks. We want alkalinity in a range of 2.86 – 4.29 meq/L, or 8 – 12 dKH, because this means there is stability in the water and that it would take an increased amount of acid to create a major change. As with any parameter, major changes are likely to stress corals and cause any number of adverse effects, so keeping the alkalinity within range and avoiding sudden changes, is vital to reef keeping.

- **Magnesium**

Magnesium is the unsung hero of reef keeping, without it, biological processes that allow our corals to survive and thrive, would not be possible. In short, magnesium is used by corals in addition to, or in place of calcium in building their coral skeletons. The reason why magnesium is lesser known than calcium is because magnesium is more plentiful in marine aquaria. The suggested level of magnesium is 1200 – 1400 ppm, significantly higher than that of calcium, and with a broader range. It's still important to test and maintain magnesium levels, as without it, corals would not be able to maintain and grow their coral skeletons.

- **Phosphate**

Perhaps the most controversial of the reef tank parameters, phosphate is both crucial for corals survival and can lead to incredibly challenging issues if not maintained properly. Corals, which have a symbiotic relationship with zooxanthellae algae, use phosphate as a source of energy. However, high levels of phosphate can result in increased uptake of phosphate resulting in the browning out of colorful corals, or an increase in nuisance algae. Fortunately, in most cases adequate filtration and routine maintenance on reef tanks keep the phosphate levels low enough, under 0.05 ppm, that the corals are able to utilize what they need and there is little remaining for nuisance algae to be present.

There are multiple test kits that are available to hobbyists that will test the aforementioned parameters, as well as some that will test even more specific reef parameters. Also readily available are dosing options to ensure that parameters such as calcium, alkalinity, and magnesium are all maintained at the appropriate levels. It's important that any reef keeper is able to regularly test their parameters so that they have a full understanding of the chemistry of their seawater. Make sure that before working with customers on what corals are right for their tank, that you, and the customer, have a basic understanding of the water chemistry within their aquarium.

SUGGESTED REEF AQUARIA LEVELS

PARAMETERS	SUGGESTED LEVELS
Salinity	32- 35 ppt
pH	8.1 - 8.4
Temperature	76 - 82°F
Calcium	380 - 450 ppm
Alkalinity	2.86 - 4.29 meq/L or 8 - 12 dKH
Magnesium	1200 - 1400 ppm
Phosphate	<0.05 ppm

Beneficial Organisms

Copepods



Copepods are a diverse group of crustaceans that generally are just a couple of millimeters in size. They will often come on any live rock or substrate added to the tank. Colonies of copepods can be added separately as well. Some species of copepods will reproduce in aquaria enough to have a sustainable population.

Benefits: Copepods are outstanding algae grazers. Although they are extremely small compared to typical algae grazers, the large populations within aquaria and the ability to graze on microalgae make them a niche organism essential to any marine aquarium. Copepods are also an excellent food source for many fish. They provide a much needed, and natural, live food option for marine aquariums

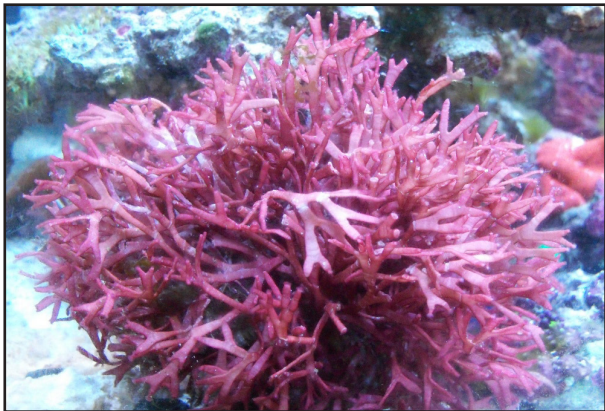
Chitons



Chitons are a rather common mollusk that are rarely notice, but generally present in marine aquariums. They are a flat mollusk that has a shell that is made up of overlapping valves giving them the appearance of being segmented. They're generally common on live rock, but similar to stomatellas, will rarely reproduce in such numbers that they become noticeable in marine aquariums.

Benefits: Chitons are a slow moving algae grazer that rarely will cause any problems in marine aquariums. Their populations within marine aquariums generally never reach a point that they become overwhelming to the ecosystem. Chitons are rarely subject to predation except for some of the largest mollusk predators that happen upon a a chiton in the open. Typically chitons will be tucked away in live rock, but are constantly grazing on algae in hard to reach places.

Macroalgae



Macroalgae is a broad term used in the marine aquarium industry to describe most algae that grow over a few centimeters in size. In marine aquariums the most common varieties of macroalgae are those of red, green, and brown algae. Macroalgae is the most common beneficial organism as almost every usable substrate added to an aquarium is a potential home for macroalgae.

Benefits: There is a fine line between beneficial organism and pest organism when it comes to macroalgae. It's no secret that macroalgae can, and often does, grow rapidly to the point where it can overgrow a tank. However, macroalgae is an incredibly important food source for most omnivorous and herbivorous species in marine aquariums. Macroalgae also plays a vital role in removing excess nutrients that can otherwise cause havoc in a marine aquarium. If controlled, macroalgae are some of the most beneficial organisms for marine aquariums.

Mysid Shrimp



Mysid shrimp small, typically clear crustaceans that resemble shrimp, however they are not true shrimp. Generally mysid shrimp are between one and two centimeters in length. Mysid shrimp are less common than amphipods and copepods, however still do appear on live rock. A population with no predation, such as a population within a refugium, can produce a sustainable population or they can be cultured in a separate system

Benefits: The primary benefit to mysid shrimp is a food option. They are a larger food option than copepods or amphipods which provide larger species with a live food option. In a tank with multiple predator species they typically cannot sustain populations, however they do make great refugium organisms. Not only will this allow them to reproduce for a food source, but they will also help scavenge within a refugium.

Asterina Starfish



Asterina starfish are small white starfish that typically do not get larger than one centimeter. There are some species of Asterina starfish that can be predatory towards certain coral species, but the majority of these starfish are reef safe and beneficial for marine aquariums. Most Asterina starfish will come in on live rock that is introduced to the aquarium.

Benefits: Often viewed as a pest because of their ability to reproduce in such great numbers, Asterina starfish are a generally underrated beneficial organism in marine aquariums. There are a few obligate predators that will benefit from having a population of Asterina starfish, mainly *Hymenocera* sp., but most species will leave these starfish alone. The greatest benefit of Asterina starfish is their ability to graze on algae, particularly on aquarium glass. Although the jury is still out on whether they're truly friend or foe, in almost every scenario within marine aquariums, Asterina starfish are a beneficial organism.

Feather Dusters



Feather dusters are a common term for several species of worms that all have a similar appearance in which most of the worm is within a calcareous tube with a crown, or feather, being exposed. They can come in just about any color and vary in size from a few millimeters to more than thirty centimeters. Many of the more colorful varieties are available individually in the industry, however smaller feather dusters are very common on live rock.

Benefits: Feather dusters provide little to no downside. Perhaps one of the most under-appreciated organisms in marine aquariums, feather dusters play a crucial, but unseen role. Feather dusters are some of the best filter feeders there are, particularly in marine aquariums. They filter microscopic organic matter out of the water column which not only helps keep the water clear, but also helps greatly help keep nitrogen related water chemistry balanced.

Stomatella



Stomatellas are a relatively small species of marine snail. Typically they don't get much larger than three centimeters within marine aquariums. They appear as slugs with a small shell on their back. Stomatellas are common on live rock, but will generally not reproduce in great numbers in marine aquariums.

Benefits: Much like other marine snails, stomatellas are a simple algae grazer. Where many marine snails are subject to predation by larger species, stomatellas are generally left alone by most species. Stomatellas are generally in cracks and crevices within live rock, but from time to time it's not uncommon to see one or two grazing on algae growing on the glass.

Amphipods



Amphipods are typically larger than copepods, but still generally smaller than one centimeter in marine aquariums. Similarly to copepods, amphipods will usually come on any live rock or substrate added to a tank. While less common than copepods, there are cultures of amphipods available within the hobby. Without high predation, amphipods will typically reproduce enough to have a sustainable population.

Benefits: Amphipods provide an important ecological niche within marine aquariums as they are one of the best and most proficient scavengers. Due to their still relatively small size, amphipods are able to scavenge areas that are not easily accessible to large scavengers. Amphipods will also scavenge within the sand bed therefore helping eliminate potential anoxic zones in the sand. Predators that prefer larger live foods will also greatly benefit from having amphipods in a tank as they provide an important trophic link within marine aquaria.

HELPING CUSTOMERS WITH CORALS

When helping a customer select corals for their reef tank, it's important to keep in mind that just like in fish, there are corals suited for all levels of expertise. Ensuring that a customer gets the best corals for their set up will help them be successful and will likely gain you a long term customer in the process. Let's take a look at options for the three levels of reef hobbyists:

• Beginner

These are hobbyists who are just getting into the reefing hobby. This is most likely their first reef tank and this could very well be their first coral purchase. They likely have little to no knowledge on coral nutrition or reef tank parameters. This could also reference a hobbyist who has very basic equipment that is just enough to support a reef tank. It's important to know what kind of system they are working with before giving any suggestions, but for most beginner hobbyists these corals are the best options:

- ◆ Zoanthid Polyps
- ◆ Palythoa Polyps
- ◆ Green Star Polyps
- ◆ Mushrooms
- ◆ Toadstool Leather Corals

• Intermediate

Intermediate hobbyists are those who generally have a decent understanding of reef tanks and have likely kept one or multiple tanks before. They have a basic understanding of reef tank parameters and likely supplement their tank with coral foods and other additives. Their systems are usually up to control the basic parameters, but it's still important to ask to make sure their system can handle more advanced corals. For

more intermediate hobbyists, these corals are the best options:

- ◆ Frogspawn Corals
- ◆ Duncan Corals
- ◆ Lobophyllia Corals
- ◆ Micromussa Corals
- ◆ Hammer Corals

- **Advanced**

Advanced hobbyists have a strong understanding of reef tanks and undoubtedly have had, or currently have multiple reef tanks. They understand reef tank parameters and likely have equipment in place that helps maintain the appropriate levels. Their system is likely set up to keep their water quality consistent and healthy, as well as it allows them to focus their efforts on some of the finer details of reef keeping. They almost always use corals foods and additives. As always though, it's important to talk with them about their systems to make sure they are ready for the most advanced corals.

For advanced hobbyists, these corals are the best options:

- ◆ Acropora Corals
- ◆ Hydnohpora Corals
- ◆ Favia Brain Corals
- ◆ Dendrophyllia Corals
- ◆ Elegance Corals

There are of course plenty of other options that fall into all three categories. Always be sure to work with your customer to determine what corals are best for their system. If you are unsure if a coral would be compatible in their system, be sure to use your resources to better understand the care requirements of that specific coral.

NOTES:

HABITAT SETUP

Planning It Out

Substrate	22
Rocks	24
Decor	27

HABITAT SETUP



When animals are placed in a habitat that emulates their natural environment their colors will intensify and will be more resistant to stress factors. It is vital to the long term health and of your customer's fish to set up the ideal environment for the fish they are keeping. This can be done in a variety of ways and is only limited by the imagination.

As you walk your customer through the process of selecting the internal components such as substrate, rocks, and décor it can be a bit overwhelming if you are unfamiliar with the reason a hobbyist would need these items. Below is a guide to help you understand and how each item helps create the ultimate aquarium for your customer.

PLANNING IT OUT

It is easiest to plan it all out from the beginning with your customer than to randomly add items. Helping them create an overall layout of what they are envisioning will help you identify their needs and also show you where you can help. Offering a variety of size, shape, and types of decorations will give you a better chance of providing the ideal spot for each of your fish. Fish that instinctively seek out caves as territories will use these decorations for that purpose. Fish that like to hide among plants can thrive if they have natural or plastic.

Substrate

The most obvious role that substrates play is purely aesthetic. Whether your customer chooses bright, colorful gravel, naturalistic sand, or a minimalist bare bottom look, the overall visual effect of your aquarium is going to begin with your substrate.

The substrate your customer selects, or even your lack of substrate can have an enormous effect on the aquarium and the maintenance your customer will have to do. The substrate will change the look of the tank and potentially influence the water chemistry. Depending on the fish and plants your customer is keeping, you may find that certain substrates are more suitable than others.

Substrate plays an important role in adding substantial surface area in which good bacteria can grow in addition to the filter. You want to make sure that the gravel bed is not too deep in which harmful anaerobic bacteria can build up. One to two inches is a standard depth for most freshwater aquariums and an easy way to estimate this is to use one pound of gravel per gallon.

Standard aquarium gravel is fairly consistently sized because it offers a good compromise, being neither too large nor too small. It's large enough that uneaten food, fish waste, and other detritus can fall into the gaps between the pieces and be hidden from view. It has enough surface area for beneficial bacteria to colonize, and it's small enough to be easy to stir around or run a gravel siphon through in order to clean it out. Smaller grain substrates, such as sand and a lot of the planted aquarium substrates, will pack a lot tighter not allowing as much waste to fall between it. Plant roots are better able to snake their way through fine

substrates, helping them to anchor better. This is particularly true for very small plant species that have shallow root systems.

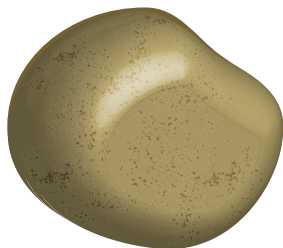
All dry substrates should be rinsed before placing them in the aquarium to prevent excess debris and cloudiness. Some gravels are pre-packed with beneficial bacteria in which can be added directly to the aquarium.

- **Gravel**

The size of the gravel is important as you will want to select one that is not so compact that nutrients become trapped between the spaces and not so large that waste settles to the bottom making siphoning difficult. Gravel between ¼ inch to ½ inch is what is often commercially available in the non planted substrate category and make a great choice.

Next you would want to consider the shape of the gravel and what species your customer is keeping. For animals who sift substrate such as large cichlids and goldfish, a smooth stone is going to be less abrasive. Gravel with sharp edges should be avoided for most bottom feeders as it can damage their mouths during foraging.

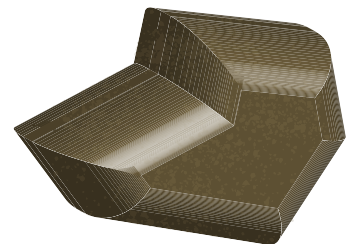
This simply can be broken down into two groups of gravel in which one is coarse and one is fine



**Round
Pebble**



**Smooth
Chipped Gravel**



**Sharp Edge
Gravel**

- **Sand**

A great choice for some planted aquariums, sensitive bottom feeders and substrate sifters but there are some challenges it presents. By nature sand is much more compact and nutrients can become trapped much easier causing pockets of anaerobic bacteria to build up. To avoid this, using a depth of one inch will help along with adding some animals who can help keep it aerated.

Burrowing species of fish and snails can be of great help in disturbing the sand bed keeping it from going stagnant. Some examples would include loaches such as Kuhli, horseface or snails such as Assassin and Rabbit. Always inquire with your customer to

find out if these animals are compatible with their other fish.

Maintaining sand is similar to gravel in which you do want to siphon but it should not be recommended to place the siphon all the way down to the glass. Doing so will most likely remove the sand during the water changes causing your customer to continually replace it. Instead you may find it easier to remove the large end of the siphon once you have started it and skim the top layers of the sand. Detritus should be easy to see and remove as it will settle on top of the sand. Make sure you inform the customer to siphon under décor as well as clean any potential dead zones.

In a tank with sand, filter placement will be important. Make sure to have the intake of the filters a few inches above the sand bed and away from areas of high flow where the sand would be blown into the intake. If too much sand enters the filter it can destroy the impeller causing it to seize up. It will be important to clean the impeller chambers to keep them free from sand particles on a regular basis. A simple rigid aquarium brush and a syringe can be used once the impeller is removed to perform this task.

- **Calcium Based Substrate**

There are aquariums in which your customer is setting up for hard water species such as African Cichlids. These substrates consist of various sizes of aragonite or crushed coral and will help naturally buffer the water as they slowly leech Calcium Carbonate into the water. This will help maintain a higher pH and stabilize the swings that can happen in between water changes.

****Do not recommend this substrate to customers wishing to keep a more neutral aquarium as over time it can buffer the pH beyond their targeted range.***

Planted Tank Substrate-See Plant Chapter on page 78 of this addendum.

Hardscape is a common term used for the rock and driftwood in an aquarium and can be a game changer in helping to create a successful aquarium for your customers.

ROCKS

Rocks play a pivotal role in creating places for fish to hide, build a beneficial biofilm for scavengers and overall can bring a whole new dimension to the aquarium. When helping your customer select rocks there are a few things you will need to know before hand.

Not all rocks are safe for aquariums as some of them may contain minerals that will not only alter the pH but also be harmful to the fish and other aquatic animals. Due to this as well as the addition of potential pesticides and other undetectable chemicals, rocks found outside should not be recommended.



Most likely, rocks that are commercially available through a pet store is something that should not be harmful to the animals and you should feel confident in recommending what your store carries.

All rocks going into the aquarium should be rinsed off in dechlorinated tap water to rid them of excess debris that may cause cloudiness. Soaps or chemicals should not be used in this process as they may soak into the rocks and leech into the aquarium water.

How rocks effect water chemistry

Depending on the origin and creation process of the rock, they can vary greatly in composition. The minerals can be inert or could be something that can alter the pH. If you are unsure a simple test of placing the rock in a bucket of reverse osmosis water buffered to a pH of 7.0 and test the water a few days later. If the water has remained neutral then you know that your rock most likely will not alter the pH of an aquarium.

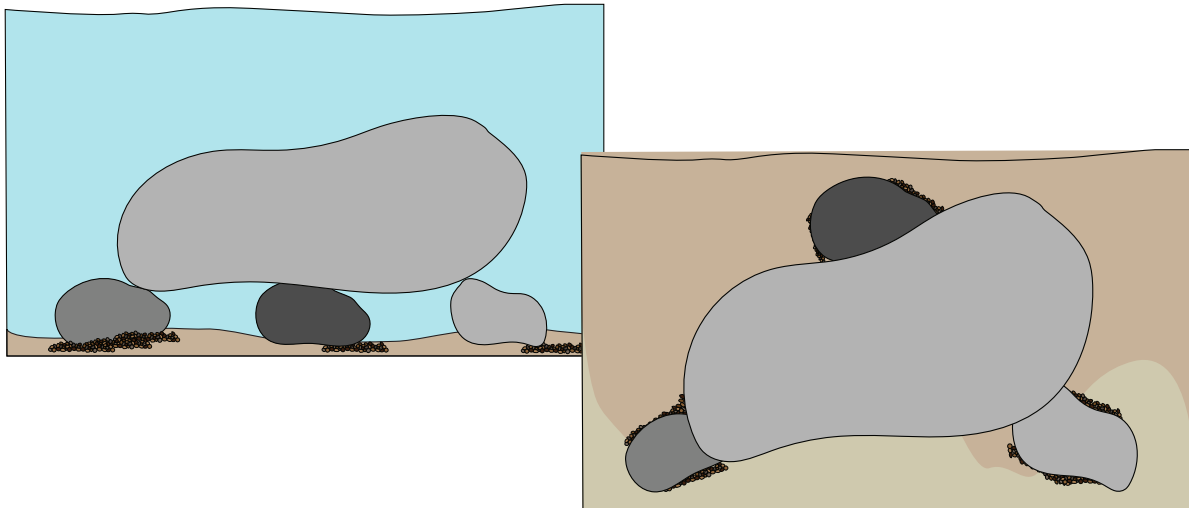
Most rocks that will buffer the water contain various amounts of calcium carbonate and often white or gray in color. These rocks will slowly leach calcium carbonate into the water column and raise the pH over time. For customers with well water or keeping fish that need a

hard water habitat such as African Cichlids, this is ideal. In other cases where customers are looking to maintain a more neutral pH these rocks can cause significant challenges. There are also rocks such as quartz and granite that are considered acidic in their makeup. This does not mean that they can not be used in the aquarium but your customer should be aware that they may alter the pH and regular testing is recommended to keep a stable chemistry. If your customer is using a small amount of rocks that will alter pH as an accent in a large volume of water it may not be of concern long term. In most cases these rocks can be used in this way for aesthetic purposes without significantly altering the pH.

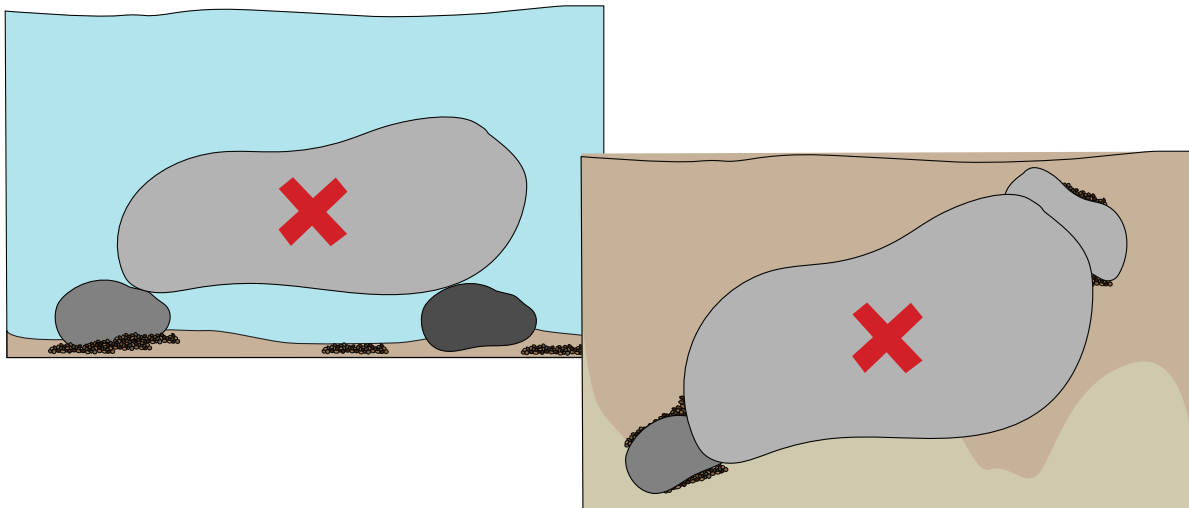
Rock Size

Mixing different sizes of rocks will help create a more natural feel to the aquarium and help provide shelter for various sizes of fish. This will also help to stabilize the rocks especially when building structures with height

CORRECT ROCK PLACEMENT



INCORRECT ROCK PLACEMENT



DÉCOR

Emulating Nature With Synthetic Materials

There are no rules when it comes to what aquarium safe ornaments should or should not be used in an aquarium, but there are some things to consider when choosing them. When selected properly, ornaments can replicate natural settings making fish feel right at home. Fish that instinctively seek out caves as territories will use decorations for that purpose. A plastic log or a plastic pirate ship can both provide a cozy hiding place for shy or nocturnal species. So go to town and deck that tank out with your customer to give them the ultimate experience. Below are some concerns to be aware of when selecting décor.

• **Size**

You may have a customer select a giant pirate ship or castle to place in the aquarium which may or may not be the best idea. First consider find out what fish the aquarium is or planning to be stocked with. As long as the fish have ample room to navigate the space and will not be inhibited then it is not going to be a problem. If you have concerns, show your customer decorations that come in separate pieces that achieve a similar look. This will give the flexibility to be able to move them apart while still achieving their aesthetic goals.

Another observation to make with your customers is to take a look at how the decoration is designed. Are there areas that fish can become lodged in or are there holes in which an animal could be stuck in. Animals such as loaches and plecostomus are more prone to finding themselves in this predicament and ornaments with a more open design should be selected for these species.

• **Placement**

When planning out the general scape of the aquarium it is helpful to consider the placement of the decoration in relation to your filters and heaters. Be sure that there is no contact between the decoration and the equipment to avoid failure.

• **Aggression**

Aggressive decorations? No were talking about aggressive fish and how they can take over ornaments if not careful. With keeping more aggressive species it all comes down to creating a balance in the aquarium where each fish can find a place to call its own but not so exclusive it can dominate the tank. It is best to have a combination of multiple hides and tunnels to help deter one fish from taking over a single hide. For customers with large cichlids offering ample options with ornaments with multiple openings can also help keep one fish from becoming king of the tank.

• **Artificial plants**

There are many varieties of artificial plants available in almost any color you can think

of. Ranging from the silk varieties that you could almost mistake for real plants to the out of this world neon plastic plants to let your imagination run wild. It is limitless. Either way these plants can be helpful in creating barriers to help break up aggression, add height to any aquarium and generally improve the overall aesthetics.

When selecting artificial plants with your customer find out first what species of fish they are keeping. Some plants that have sharp leaves can damage fish with long fins or delicate features. Selecting flexible broad leaf plants will help prevent that from happening and still leave a large variety to choose from.

If your customer keeps species that tend to dig, consider showing them the plants that are weighted to help keep them down once they have been dug up. It is also important to look at how the plant is constructed to see if there are sections that the fish can easily pull off. These pieces can become free floating and then become lodged in the intake of the filters.

- **Maintenance**

Decorations with a large base can cause dead zones in the aquarium and is often where waste accumulates. It is best to advise your customer to gently move or lift the décor to siphon underneath.

Cleaning decorations can be done as needed, just be aware that overtime many of them will lose color and even paint. Avoid heavy scrubbing with abrasive brushes to keep them from becoming damaged in the cleaning process. There are many commercial aquarium safe cleaners on the market that can be used.

Each of these items has great potential to turn into add on sales and is one of the easiest ways to bond with your customers. Now that you have gotten the essentials out of the way have some fun with this! If possible, get the tank out, show customers some inspirational pictures of tank set ups. Help them understand how easy it is to create a basic aquascape using whatever décor they choose. They may not purchase it all that day but you have now created an experience that they wont forget and often return for future purchases from your store.

NOTES:

PLANTED AQUARIUMS

Plants

Understanding Plant Care Levels	32
Spectrum	36
Planted Tank Substrate	37
Source Water	39
Introduction to CO ₂	41
Putting It All Together	47

PLANTED AQUARIUMS



There are a number of techniques that are unique to planted aquariums that other aquarium keepers don't really have to worry about. To successfully keep plants, you have to make sure you can balance the amount of light, nutrients, and even carbon dioxide they receive. To create an attractive aquascape, carefully consider the placement of any hardscape (rocks and driftwood) you use and how it interacts visually with the plants you choose to use.

When you have a customer that is interested in setting up a planted tank, it will be important to understand what their vision is and convey what is involved. Many hobbyist new to keeping plants do not know that there are different levels of keeping plants or that there is a range of easy care to advanced care. Your goal is to help guide them to the equipment they will need to use and understand the application of each component. Doing so will create not only a loyal bond to your store but also set them on the path for long term success. Below are the basics to starting a planted aquarium.

UNDERSTANDING PLANT CARE LEVELS

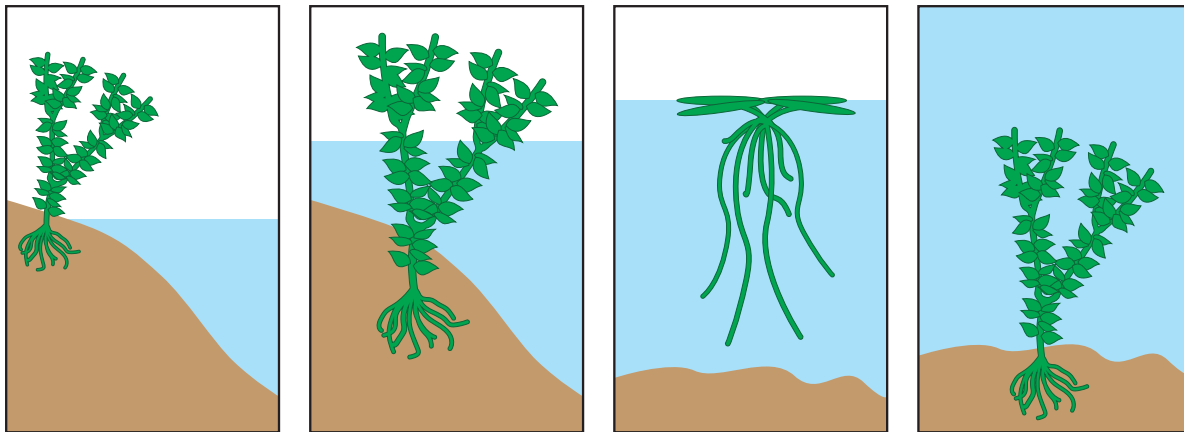
To simplify plant care, species are placed into one of three categories.

- Beginner
 - ◆ Low light
 - ◆ Propagates easily
 - ◆ Additional fertilizer may not be needed
 - ◆ Co2 is not needed
- Moderate
 - ◆ Medium light
 - ◆ Propagates with some additional care
 - ◆ Basic Fertilizer is suggested
 - ◆ Co2 is optional for added growth
- Advanced
 - ◆ High Light
 - ◆ Slow to propagate
 - may require specific water parameters
 - may require specific substrate
 - ◆ Regular fertilizer of Macro and Micro nutrients are needed
 - ◆ Co2 is highly recommended

How Plants Grow

Understanding how plants grow and propagate will help you guide your customer to the proper care and placement of each species. Plants can be placed in the substrate using their hands or there are specific planting tools that can be utilized to make this task easier. For plants that grow along rhizomes, fishing line or small zip ties can be used to anchor the plants to décor until they have take root. At that time the ties can be clipped off which is usually within a few weeks.

DIFFERENT TYPE OF PLANT GROWTH



SHORELAND

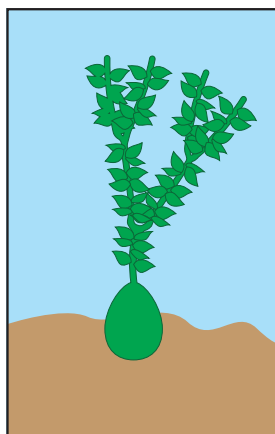
EMERGENT

FLOATING

SUBMERGED



RHIZOME



BULB



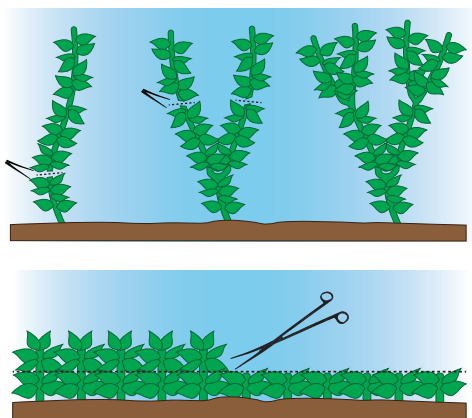
CARPETING

Prepping plants

For best growth some plants may need to be cleaned and prepped before your customer places them in the aquarium.

Trimming and Propagation

Each plant species can be trimmed for general maintenance or propagation but it is important to show your customers the best way to do so. Below is a chart to help you see what is the best way to keep your customers plants healthy.



Light

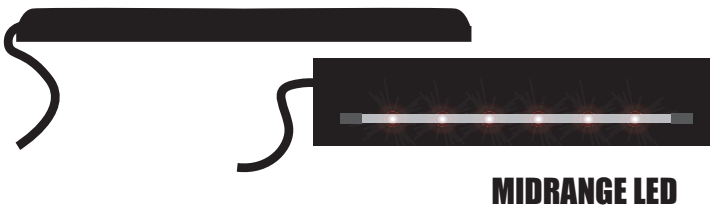
Through photosynthesis, plants will use the energy from light to convert nutrients into fuel for growth. Each plant has a specific set of requirements that will help it thrive.

To simplify, most people separate plants into three categories based on how much light they need to achieve the best growth. These categories are, low light, medium light, and high light. However, plants do have some flexibility and some can adapt to higher or lower light. Doing so can affect the growth rate and color of the plant especially as you reach the limits of high and low light. Be sure to research the species and variety of plants that your store carries to best guide your customer.

Using Timers

Planted tanks generally need 10-12 hours of light each day for optimum growth. To help keep this consistent a timer is a great item to recommend. These are available as a simple stand alone item, or incorporated into aquarium powerstrips. Both options will work well but if your customer has multiple lights or pressurized CO2 the powerstrip with day and night timer options will be the best option.

Lighting Options



Understanding what lighting types and fixtures are available can help you determine what will work best for your customer. With the advances in technology, there are many new fixtures coming on to the market every year making it a bit of a challenge to keep up. Breaking it down into three categories will help you understand the basics of lighting options available on a commercial level.

Fluorescent Lighting

As a cost effective option for low light aquarium some hobbyist choose fluorescent lights. While they typically dont emit a substantial amount of heat this type of lighting is becoming outdated. For optimum performance all fluorescent light bulbs should be changed every 9-12 months as their spectrum will continue to shift into the red as the bulb ages as well as lose intensity.

There are multiple styles of fluorescent lights, which are designated by the letter T followed by a number. The number refers to

the diameter of the bulb and not the intensity. Fluorescent bulbs come in a few different intensities but overall have become less popular from the introduction of LED fixtures.

- Low output
- High Output
- Compact Fluorescent

- **T12, and T8 bulbs**
 - ◆ Low output bulbs and fixtures are still available but becoming obsolete
 - ◆ Available in VHO (Very High Output) but are generally outdated and not as efficient as T5 or LED
 - ◆ Not available in a large variety of colors

- **T5 bulbs**
 - ◆ T5 lighting is one of the most reliable types of lighting and the initial cost is generally lower than then LED. T5 bulbs often come in fixtures with two, four, and even up to eight bulbs.
 - ◆ The spectrum of bulbs is not as customizable as LED but are still available in a variety of colors.
 - ◆ T5 lighting is available in T5HO (High Output) and T5VHO (Very High Output) which are the same size as a T5 but are even brighter still
 - ◆ The long term cost of replacing T5 bulbs will cost more than an LED fixture but is still a staple option for many aquarists

- **Compact Fluorescent Lighting**
 - ◆ Closely related to traditional fluorescent bulbs are compact fluorescent or power compact bulbs. In essence, these are bulbs that consist of multiple fluorescent tubes that have been bent and shaped to take up much less room and are generally able to fit into standard incandescent light fixtures. For their size, they put off much more light than alternatives. Although this makes them a good choice for small tanks that can't fit a normal fluorescent tube they do tend to give off a substantial amount of heat. If you are using this type of bulb, make sure you are using the correct wattage and that there is enough room to vent the heat away from the fixture. This is especially important when using compact fluorescent bulbs in an aquarium canopy fixture.
 - ◆ High output
 - ◆ Cost effective but becoming obsolete
 - ◆ High heat emission

LED Lighting

LEDs are becoming increasingly popular choices for many people, and more and more aquarium kits are changing from fluorescent bulbs to LEDs. They are much more energy efficient, put off virtually no heat, and have very long life spans. Additionally, LEDs allow for a wide range of customization in the light spectrum being produced.

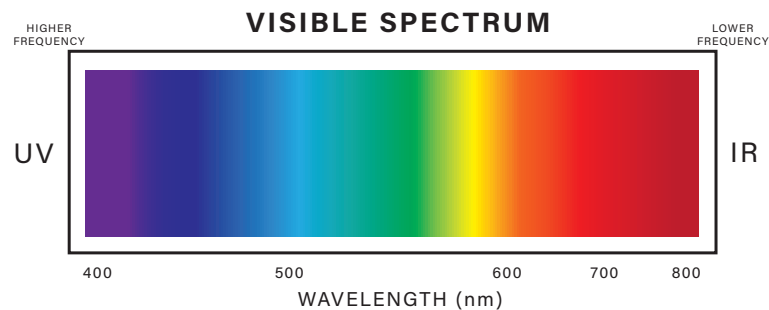
- Offered in a variety of intensities and spectrums
- Slim profile design makes installation easy
- Long Lasting (average 5-7 years)
- Low Heat emitting fixtures

SPECTRUM

Now that we have looked at the types of bulbs, it is important to understand the two biggest components and how they can impact plant growth.

Spectrum and Strength

- Lighting spectrum in this case refers to the visible color spectrum the light emits. For most plant tanks a mix of natural daylight bulbs that range in the red to yellow spectrum will achieve the best growth. This is measured on the Kelvin scale and is known as the color temperature of the bulb. Optimum plant bulbs will range from 6700-10,000 (K) on the scale giving your tank a natural daylight hue as well as be the most usable light for plants. The lower the color temperature of the bulb, the more yellow the light will appear.
- Strength is measured in PAR or Photosynthetically Active Radiation. Simply put, this is the amount of light that is penetrated through the water column and that is usable for photosynthesis. When selecting a light for a tank understand that different plants will require different strengths or intensities of lighting and should be known before purchasing a fixture.



Installation

Understanding how light spreads throughout an aquarium will help you determine how the lights should be placed. The closer the light is placed to the surface of the water the deeper the light may penetrate but less the spread of the light throughout the aquarium will take place and this is where PAR comes into play. To be sure you are setting your customer up with the right fixture, it will be helpful to know the PAR values at the maximum depth of their aquarium for each type. If their aquarium is particularly wide additional light fixtures may be needed or help them plan their aquascape to accommodate the lower light areas.

To increase the performance of fluorescent fixtures, reflectors are often used to help distribute the light more evenly throughout the aquarium and can increase the performance of each bulb.

Installation of Florescent bulbs

There are a few ways in which lighting can be installed for optimum performance.

- Standard fixture in a hood or on top of a glass top
- Mounted inside a canopy
 - ◆ Be sure that the canopy is vented to allow heat to escape
 - ◆ Small fans can be added to help draw out moisture in the back of the canopy
- Legs to hold fixture above the aquarium
 - ◆ Can be used with or without a glass top
- Hanging
 - ◆ Cables attach to the ceiling to suspend the light above the aquarium
- Bar Mounted
 - ◆ Metal racks are attached to the aquarium or wall to hold detachable light fixtures usually on cables or rails

PLANTED TANK SUBSTRATE

When it comes to planted tank substrate there are options specifically created to help fertilize the plants as they grow. Using these can be exceptionally beneficial in the long term success of your customers and their journey into the planted aquarium niche. For planted aquariums it is recommended that your customer uses 2-3 inches of substrate in order to give the plants room to root in. A simple guideline for this is to use one and a half pounds per gallon as a start. Some hobbyist may wish to add more if they are planning on terracing or sloping their base to create dimension.

Selecting your substrate

Before helping your customer select their substrate it will be helpful to know what their vision is. Are they looking to create a high tech tank with carpeting plants or just looking to create a low maintenance tank with some simple hardy plants? The four main topics to keep in mind with planted substrate are grain size, material, weight, and cec value. Aesthetically it is up to the customer as to what inspires them to create their ultimate habitat they envision. Some may choose a high contrast tank with black substrate and others may choose to go with a more natural setting with light substrate. Whatever their choice is, be excited that they selected you to help bring their vision to fruition. This will not only help create a loyal customer but also help you to be able to sell them items they may have not considered.

Below is a basic guideline on how to help guide them to the right substrate

• Grain Size

Again knowing what goals your customer has will greatly help you with this question. In general the larger grain sizes make it challenging for plants with fine roots to grow in. On the flip side extremely fine substrates should be avoided as the roots can become compacted and suffocate the plant from taking up nutrients. Aiming for a grain size between 1/8-1/4 inch is a good guideline. Not that a customer can not be successful

with larger gravel, they will just need to select plants that have more substantial root structures such as sword plants or rhizome plants such as Anubias and Java Fern. They will also need to consider root fertilization which you can learn more about on page---in the plant chapter

- **Material**

Some planted substrates are not inert and will alter the chemistry of the aquarium. Be sure to read the packaging if this is not something your customer is looking for in order to avoid long term challenges.

- **Weight**

Although is not a game changer it is something to be considered when planting particularly buoyant plants such as onions and Vallisneria or fine rooted plants such as baby tears. With a light weight soil these types of plants can be very challenging to maintain. Suggesting a different substrate or showing them planting tools can help defer this.

- **CEC Value**

Why are there so many options for plant substrates? It has to do with cation exchange capacity meaning the ability of the substrates ability to attract, retain, and exchange cation elements such as potassium, calcium and magnesium. The higher the CEC value the more the substrate can hold nutrients for the plants to absorb that are rooted.

This does not mean a customer can not be successful with standard gravel, but that they may need to select hardier plants or be diligent with the appropriate fertilizing schedule for their plant species demands and maintenance.

Types of Planted Substrate

- **Clay Base Substrate**

Laterite is a natural fertilizer that many of the rooted plants can benefit from. These substrates are often naturally red in color and will not lose their properties over time. This substrate will need to be rinsed heavily before adding it to the aquarium.

- **Soil Like Substrates**

Commercially there are soils out there made for the home aquarium. These make great substrates for a customer who is planning on focusing mainly on plants. The soft texture and playable nature of it allow for plants to thrive and spread easily. This substrate is best used for smaller with low bioloads that allow the plants to help reduce the waste produced in the aquarium. Large fish or ones who tend to dig may not do as well on this substrate as it is easy to stir up. Due to the composition of this substrate it does present some challenges for cleaning as well if there are large open areas. In this case slow steady siphoning the top will be best so as not to disturb the substrate too

much.

Over time this substrate does continue to break down and create a dense layer of mud. In the case where plants are well established this should not harm the aquarium but can be a problem if your customer is not aware of the nature of the substrate.

- ◆ To help avoid anaerobic bacteria from growing, adding animals that burrow in the soil such as loaches can help keep the soil from compacting.

- **Sand**

See page 23

- **Layering**

Some hobbyist choose to layer their substrate for plants which can help create a more substantial foundation for plants to be able to root and reduce the chances of the softer soil from being disturbed. For this technique, placing the soil like substrate on the bottom, spraying it with water and then adding the desired gravel on top helps keep everything in place long term.

Prepping planted tank substrate

It will be important to read the directions on the substrate you have available to your customers. Some of them may need to be rinsed where others even though dry and similar to soil should not be rinsed.

- **Rinse**

Due to the natural makeup of these substrates it will take some extra time to rinse these clean. It is best to recommend that your customer uses a five gallon bucket and rinses approximately five pounds at a time. This will help reduce the time it take to rinse it and is easier to clean in small batches instead of a full bag. If using tap water, be sure to add dechlorinator to the aquarium after substrate has been added.

SOURCE WATER

When starting a planted tank you will want to ask your customer what their source of water is to help them make the best selection of plant species. Many plants can adapt to different pH levels but it will often change their growth rate or color. Plants such as Java Fern and Anubias can thrive in hard or soft water where Red Foxtail requires fairly soft water to thrive. When possible, test your customers water before selecting plants. If this is not possible, ask a few questions to gain some insight as to what their water most likely looks like. Again many plants are adaptable and in this case selecting hardier plants will be your best option.

Below you can take a look at three common water sources to help you familiarize yourself with what to recommend.

- **Reverse Osmosis/De ionized Water**

- ◆ Pure water that is a blank slate and can be reconstituted for optimal pH levels and mineral content
- ◆ Planted tanks set up with RO water tend to have less algae problems due to the lack of nutrients and contaminants found in tap water
- ◆ Will not need to be dechlorinated

- **Tap water-pH and GH can range depending on the location of the city**

- ◆ Test your customers water source first to determine if it is the right water for their aquarium or select plants that will fit the profile
- ◆ Can contain nutrients and minerals that can contribute to algae growth
- ◆ Will need to be dechlorinated before using in the aquarium

- **Well water**

- ◆ Tends to have a high pH and GH
 - Select plants that are tolerant
- ◆ Will contain nutrients that can contribute to algae growth
- ◆ Will not need to be dechlorinated

Adding Fertilizer

As with all living things, plants need to take in nutrients that they can use to build new cells and grow. If your customer is running a low light tank, then odds are the growth is going to be slow enough that there will be enough nutrients entering the water column as a result of fish waste, fish food, and what is already present in your water supply. However, if you're trying to increase the plant growth by giving additional light and CO₂, then these nutrients will quickly become depleted. There are many elements that are vital to plant nutrition, commonly referred to as Macro nutrients and Micro Nutrients.

Macro nutrients (Nitrogen, Phosphorus, and Potassium) are what the plants will utilize in larger quantities and quickly become depleted where micro nutrients such as iron, manganese and cobalt are used but in much small quantities.

Depending on the care level your customer has selected they may be able to rely on what is available in their water and organics produced in the aquarium or they will need to regularly fertilize with both macro and micro nutrients. This will come down to what level of light is used, what plant species are selected and if there is an introduction of Co₂. The more demand there is on the plants for growth, the more fertilizers will need to be considered on a regular basis. For most beginners many available aquatic plant fertilizers will supply all three of these in a specific ratio which will work well for basic plant keeping. To target specific nutrient deficiencies they may need additional control over plant growth in which they can add the desired fertilizer individually to their tank accordingly. Finding the right balance will help control algae and increase plant growth. If your customer is having challenges with either, ask them if they are fertilizing and if so what are they using.

There are two main ways that plants take in nutrients:

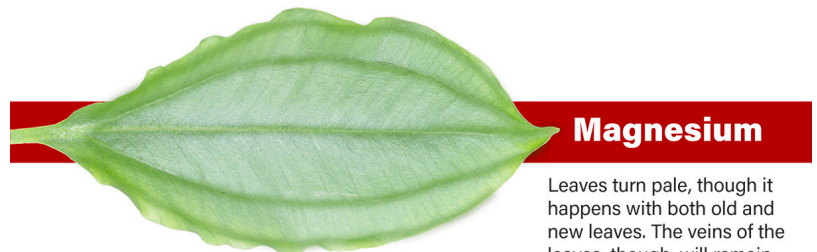
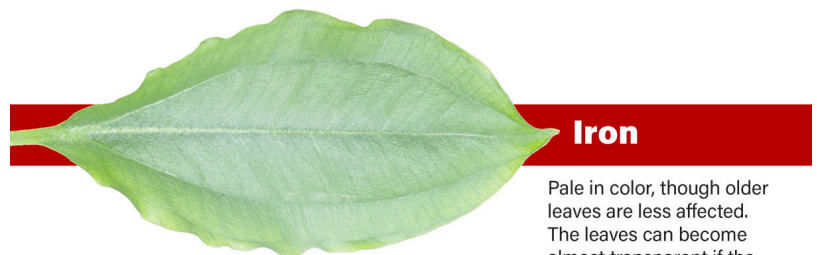
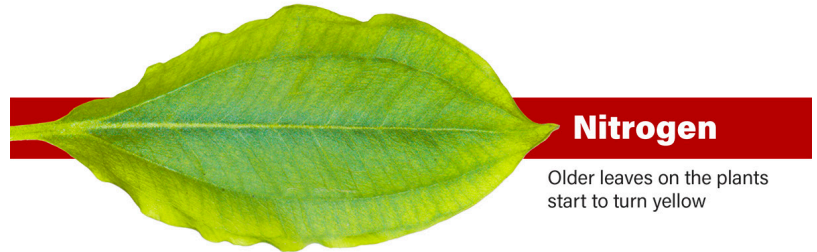
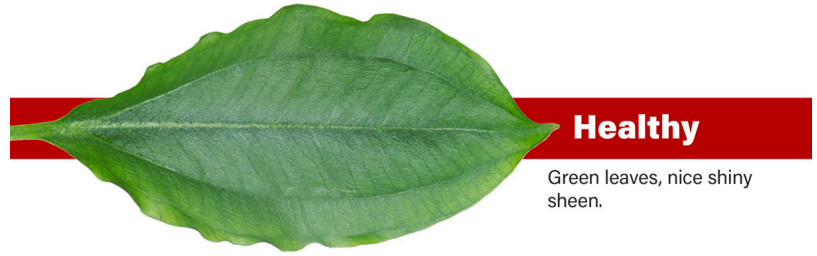
- **From the water**
 - ◆ Liquid Fertilizers
- **From the Substrate**
 - ◆ Plant specific substrate
 - ◆ Root tabs

While most plants will feed from both sources, certain plants are better at one method than the other. All plants will benefit from dosing fertilizers into the water column and as your customer moves more into the advanced plants it will be necessary for long term success. If they are not using plant specific substrate, root tabs can be added roughly every three months or per the packaging instructions. Root tabs can be especially helpful for plants such as swords and crypts who utilize a lot of nutrients from the substrate. Understanding how plants are effected by these nutrients will help you build the perfect regiment for your customers.

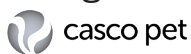
INTRODUCTION TO CO2

Carbon is the basis for plant growth and is why CO2 plays a pivotal roll in planted aquariums. As the plants take in the CO2, it is utilized for photosynthesis. This is the process where water, light and energy produce simple carbohydrates and oxygen as food for the plants. The amount of available CO2 is a direct limiting factor as once the plants have used what is available in their environment their growth is slowed dramatically.

Plant Nutrient Deficiencies



Adding CO2 supplementation in liquid



form or adding pressurized CO2 allows plants grow to their full potential, utilize even more of the spare nutrients in the water column, and create conditions where the plants can easily out compete algae. Both can be effective ways to introduce carbon to a planted aquarium but for more advanced setups the addition of continued CO2 is recommended.

With the addition of pressurized CO2 there must be an increase in fertilization to keep up with demand of nutrients the plants will need. Algae blooms often occur when this is out of balance as they will take up nutrients more readily than the plants. For advanced set ups it will be important to set your customers up with the appropriate Macro and Micro fertilizers to accommodate the additional CO2.

How pressurized CO2 alters pH

It is important to know that CO2 effects pH and can become deadly if not kept in check. Monitoring your CO2 levels with a few simple tools such as a pH indicator inside the tank, a pH probe or a KH, PH test kit. Using the chart below can help you determine the range of safety. When using fully pressurized systems it is recommended to add a pH controller which

		CO ₂ Levels - Planted Aquariums																											
		pH																											
		6	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9	7	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	8	8.1	8.2	8.3	8.4	8.5	8.6	
kH	0.5	14.99	11.9	9.5	7.5	6.0	4.7	3.8	3.0	2.4	1.9	1.5	1.2	0.9	0.8	0.6	0.5	0.4	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	
	1	30.01	23.8	18.9	15.0	11.9	9.5	7.5	6.0	4.8	3.8	3.0	2.4	1.9	1.5	1.2	0.9	0.8	0.6	0.5	0.4	0.3	0.2	0.2	0.2	0.1	0.1	0.1	
	1.5	45.01	35.7	28.4	22.6	17.9	14.2	11.3	9.0	7.1	5.7	4.5	3.6	2.8	2.3	1.8	1.4	1.1	0.9	0.7	0.6	0.5	0.4	0.3	0.2	0.2	0.1	0.1	
	2	60.01	47.7	37.9	30.1	23.9	19.0	15.1	12.0	9.5	7.6	6.0	4.8	3.8	3.0	2.4	1.9	1.5	1.2	1.0	0.8	0.6	0.5	0.4	0.3	0.2	0.2	0.2	
	2.5	75.02	59.6	47.3	37.6	29.9	23.7	18.8	15.0	11.9	9.4	7.5	6.0	4.7	3.8	3.0	2.4	1.9	1.5	1.2	0.9	0.8	0.6	0.5	0.4	0.3	0.2	0.2	
	3	90.02	71.5	56.8	45.1	35.8	28.5	22.6	18.0	14.3	11.3	9.0	7.1	5.7	4.5	3.6	2.8	2.3	1.8	1.4	1.1	0.9	0.7	0.6	0.5	0.4	0.3	0.2	
	3.5	105	83.4	66.3	52.6	41.8	33.2	26.4	21.0	16.6	13.2	10.5	8.3	6.6	5.3	4.2	3.3	2.6	2.1	1.7	1.3	1.1	0.8	0.7	0.5	0.4	0.3	0.3	
	4	120	95.3	75.7	60.1	47.8	37.9	30.1	23.9	19.0	15.1	12.0	9.5	7.6	6.0	4.8	3.8	3.0	2.4	1.9	1.5	1.2	1.0	0.8	0.6	0.5	0.4	0.3	
	4.5	135	107.2	85.2	67.7	53.7	42.7	33.9	26.9	21.4	17.0	13.5	10.7	8.5	6.8	5.4	4.3	3.4	2.7	2.1	1.7	1.4	1.1	0.9	0.7	0.5	0.4	0.3	
	5	150	119.2	94.6	75.2	59.7	47.4	37.7	29.9	23.8	18.9	15.0	11.9	9.5	7.5	6.0	4.7	3.8	3.0	2.4	1.9	1.5	1.2	0.9	0.8	0.6	0.5	0.4	
	5.5	165	131.1	104.1	82.7	65.7	52.2	41.4	32.9	26.2	20.8	16.5	13.1	10.4	8.3	6.6	5.2	4.1	3.3	2.6	2.1	1.7	1.3	1.0	0.8	0.7	0.5	0.4	
	6	180	143.0	113.6	90.2	71.7	56.9	45.2	35.9	28.5	22.7	18.0	14.3	11.4	9.0	7.2	5.7	4.5	3.6	2.9	2.3	1.8	1.4	1.1	0.9	0.7	0.6	0.5	
	6.5	195	154.9	123.0	97.7	77.6	61.7	49.0	38.9	30.9	24.6	19.5	15.5	12.3	9.8	7.8	6.2	4.9	3.9	3.1	2.5	2.0	1.5	1.2	1.0	0.8	0.6	0.5	
	7	210	166.8	132.5	105.3	83.6	66.4	52.8	41.9	33.3	26.4	21.0	16.7	13.3	10.5	8.4	6.6	5.3	4.2	3.3	2.6	2.1	1.7	1.3	1.1	0.8	0.7	0.5	
	7.5	225	178.7	142.0	112.8	89.6	71.2	56.5	44.9	35.7	28.3	22.5	17.9	14.2	11.3	9.0	7.1	5.7	4.5	3.6	2.8	2.3	1.8	1.4	1.1	0.9	0.7	0.6	
	8	240	190.6	151.4	120.3	95.6	75.9	60.3	47.9	38.0	30.2	24.0	19.1	15.1	12.0	9.6	7.6	6.0	4.8	3.8	3.0	2.4	1.9	1.5	1.2	1.0	0.8	0.6	
	8.5	255.1	202.6	160.9	127.8	101.5	80.6	64.1	50.9	40.4	32.1	25.5	20.3	16.1	12.8	10.2	8.1	6.4	5.1	4.0	3.2	2.6	2.0	1.6	1.3	1.0	0.8	0.6	
	9	270.1	214.5	170.2	135.3	107.5	85.4	67.8	53.9	42.8	34.0	27.0	21.4	17.0	13.5	10.7	8.5	6.8	5.4	4.3	3.4	2.7	2.1	1.7	1.4	1.1	0.9	0.7	
	9.5	285.1	226.4	179.8	142.8	113.5	90.1	71.6	56.9	45.2	35.9	28.5	22.6	18.0	14.3	11.3	9.0	7.2	5.7	4.5	3.6	2.9	2.3	1.8	1.4	1.1	0.9	0.7	
	10	300.1	238.3	189.3	150.4	119.4	94.9	75.4	59.9	47.5	37.8	30.0	23.8	18.9	15.0	11.9	9.5	7.5	6.0	4.8	3.8	3.0	2.4	1.9	1.5	1.2	0.9	0.8	
	10.5	315.1	250.2	198.8	157.9	125.4	99.6	79.1	62.9	49.9	39.7	31.5	25.0	19.9	15.8	12.5	10.0	7.9	6.3	5.0	4.0	3.2	2.5	2.0	1.6	1.3	1.0	0.8	
11	330.1	262.1	208.2	165.4	131.4	104.4	82.9	65.8	52.3	41.5	33.0	26.2	20.8	16.5	13.1	10.4	8.3	6.6	5.2	4.2	3.3	2.6	2.1	1.7	1.3	1.0	0.8		
11.5	345.1	274.1	217.7	172.9	137.4	109.1	86.7	68.8	54.7	43.4	34.5	27.4	21.8	17.3	13.7	10.9	8.7	6.9	5.5	4.3	3.5	2.7	2.2	1.7	1.4	1.1	0.9		
12	360.1	286.0	227.2	180.4	143.3	113.8	90.4	71.8	57.1	45.3	36.0	28.6	22.7	18.0	14.3	11.4	9.0	7.2	5.7	4.5	3.6	2.9	2.3	1.8	1.4	1.1	0.9		
12.5	375.1	297.9	236.6	188.0	149.3	118.6	94.2	74.8	59.4	47.2	37.5	29.8	23.7	18.8	14.9	11.9	9.4	7.5	5.9	4.7	3.8	3.0	2.4	1.9	1.5	1.2	0.9		
13	390.1	309.8	246.1	195.5	155.3	123.3	98.0	77.8	61.8	49.1	39.0	31.0	24.6	19.5	15.5	12.3	9.8	7.8	6.2	4.9	3.9	3.1	2.5	2.0	1.6	1.2	1.0		
13.5	405.1	321.7	255.5	203.0	161.2	128.1	101.7	80.8	64.2	51.0	40.5	32.2	25.6	20.3	16.1	12.8	10.2	8.1	6.4	5.1	4.1	3.2	2.6	2.0	1.6	1.3	1.0		
14	420.1	333.6	265.0	210.5	167.2	132.8	105.5	83.8	66.6	52.9	42.0	33.4	26.5	21.1	16.7	13.3	10.6	8.4	6.7	5.3	4.2	3.3	2.7	2.1	1.7	1.3	1.1		
14.5	435.1	345.5	274.5	218.0	173.2	137.6	109.3	86.8	68.9	54.8	43.5	34.6	27.4	21.8	17.3	13.8	10.9	8.7	6.9	5.5	4.4	3.5	2.7	2.2	1.7	1.4	1.1		
15	450.1	357.5	283.9	225.5	179.2	142.3	113.0	89.8	71.3	56.7	45.0	35.7	28.4	22.6	17.9	14.2	11.3	9.0	7.1	5.7	4.5	3.6	2.8	2.3	1.8	1.4	1.1		
15.5	465.1	369.4	293.4	233.1	185.1	147.1	116.8	92.8	73.7	58.5	46.5	36.9	29.3	23.3	18.5	14.7	11.7	9.3	7.4	5.9	4.7	3.7	2.9	2.3	1.9	1.5	1.2		
16	480.1	381.3	302.9	240.6	191.1	151.8	120.6	95.8	76.1	60.4	48.0	38.1	30.3	24.1	19.1	15.2	12.1	9.6	7.6	6.0	4.8	3.8	3.0	2.4	1.9	1.5	1.2		
16.5	495.1	393.2	312.3	248.1	197.1	156.5	124.3	98.8	78.5	62.3	49.5	39.3	31.2	24.8	19.7	15.7	12.4	9.9	7.8	6.2	5.0	3.9	3.1	2.5	2.0	1.6	1.2		
17	510.1	405.1	321.8	255.6	203.0	161.3	128.1	101.8	80.8	64.2	51.0	40.5	32.2	25.6	20.3	16.1	12.8	10.2	8.1	6.4	5.1	4.1	3.2	2.6	2.0	1.6	1.3		
17.5	525.1	417.0	331.3	263.1	209.0	166.0	131.9	104.8	83.2	66.1	52.5	41.7	33.1	26.3	20.9	16.6	13.2	10.5	8.3	6.6	5.3	4.2	3.3	2.6	2.1	1.7	1.3		
18	540.1	429.0	340.7	270.7	215.0	170.8	135.6	107.7	85.6	68.0	54.0	42.9	34.1	27.1	21.5	17.1	13.6	10.8	8.6	6.8	5.4	4.3	3.4	2.7	2.1	1.7	1.4		
18.5	555.1	440.9	350.2	278.2	221.0	175.5	139.4	110.7	88.0	69.9	55.5	44.1	35.0	27.8	22.1	17.6	13.9	11.1	8.8	7.0	5.6	4.4	3.5	2.8	2.2	1.8	1.4		
19	570.1	452.8	359.7	285.7	226.9	180.3	143.2	113.7	90.3	71.8	57.0	45.3	36.0	28.6	22.7	18.0	14.3	11.4	9.0	7.2	5.7	4.5	3.6	2.9	2.3	1.8	1.4		
19.5	585.1	464.7	369.1	293.2	232.9	185.0	147.0	116.7	92.7	73.7	58.5	46.5	36.9	29.3	23.3	18.5	14.7	11.7	9.3	7.4	5.9	4.6	3.7	2.9	2.3	1.9	1.5		
20	600.1	476.6	378.6	300.7	238.9	189.7	150.7	119.7	95.1	75.5	60.0	47.7	37.9	30.1	23.9	19.0	15.1	12.0	9.5	7.6	6.0	4.8	3.8	3.0	2.4	1.9	1.5		

will automatically regulate the CO₂ being injected into the aquarium depending on the pH range and turn off the CO₂ once the pH is out of the safety range.

Why is it important? As the concentration of CO₂ rises the pH lowers. If the customer's aquarium does not have the buffering capacity (KH) to keep the pH stable the pH can crash.

Mini Pressurized Setups

Designed with a bell system to dissolve the CO₂ as it comes into contact with the water.

- **Pros:**

- ◆ A low cost introduction for CO₂ for desktop aquariums
- ◆ Easy to install
- ◆ Easy to use

- **Cons:**

- ◆ CO₂ will cartridge will need to be replaced often depending on size of the aquarium
- ◆ Most do not have a way to control the amount of CO₂ going into the water
- ◆ Long term cost is more expensive than investing in a refillable CO₂ system

Fully pressurized CO₂ systems

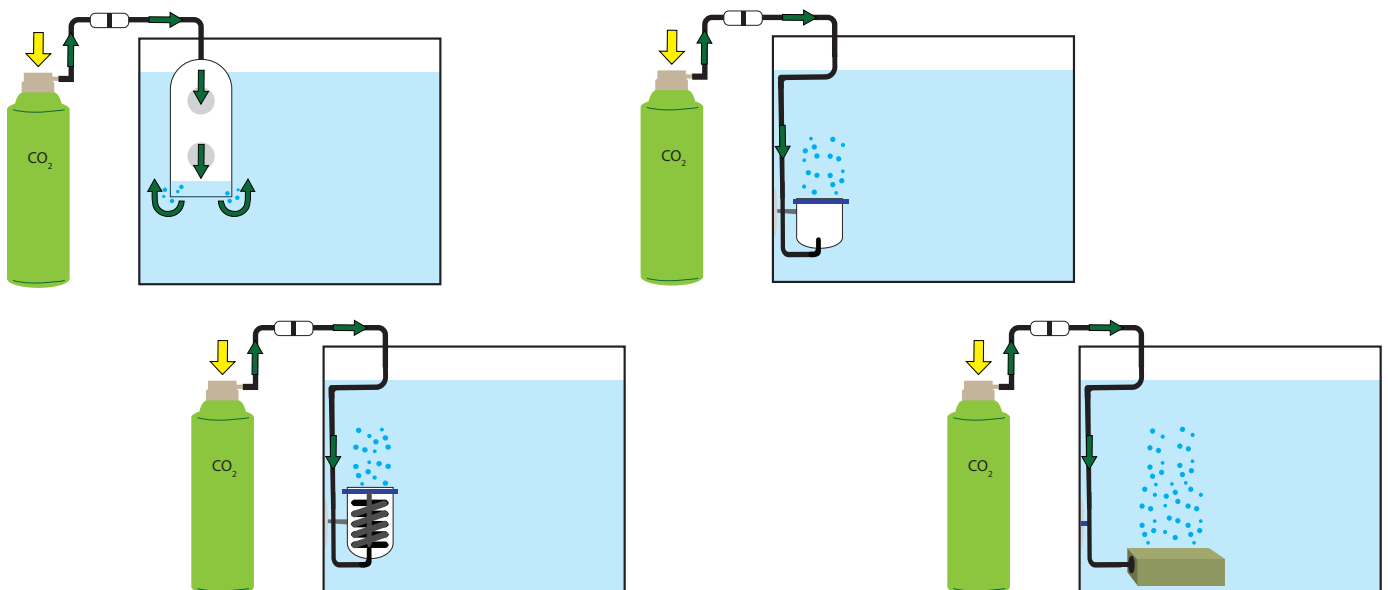
Pressurized CO₂ tanks typically 5,10,15 and 20 lbs inject CO₂ via a diffuser inside the aquarium. Best suited for larger aquariums

- **Pros:**

- ◆ Long lasting for larger tanks
- ◆ Long term refill costs are minimal
- ◆ Simple operation
- ◆ Optional equipment to utilize the CO₂ on multiple tanks
- ◆ pH controllers can be added for additional stability in CO₂ concentration and pH

- **Cons:**

- ◆ Can be intimidating at first



- ◆ Needs storage space for CO2 canister
- ◆ Can malfunction if not maintained properly

Hardscape

Hardscape refers to any rock or wood that is integrated into the overall design of the aquarium décor. Some hobbyist will come in with a specific style in mind or need some guidance on what would look best. This is the perfect opportunity to be able to bond with them and show them their options with what you have available. If they don't have a visual in their head showing them some examples will help you both decide what they will need to make the perfect scape. The two common hardscapes used in planted aquariums are rocks and driftwood but if they choose to incorporate synthetic décor embrace that and build around those items. To avoid adding potentially harmful chemicals all driftwood and rocks should come from a pet store.

• Driftwood

There are several types of driftwood that are suitable for aquariums all with different appearances and properties that can effect the water. When it comes to selecting the right driftwood it comes down to personal preference and the vision your customer has. What makes a suitable choice for aquariums are because they typically are of tropical origin and dense enough that they take quite some time to breakdown. Keep in mind that the addition of driftwood can naturally reduce pH in the aquarium. It is recommended that your customer performs regular water testing to maintain the proper water chemistry.

• Prepping Driftwood

Although the driftwood your store carries may be clean it is still a good idea to recommend pre-soaking it. Not all driftwood will sink right away and may need days to even weeks to become completely water logged and sink readily. There also may be some organics especially on spider or manzanita driftwood that will need to slough off before being placed into the aquarium. If the piece of driftwood does not have any excess organics left after soaking and still floats it can be weighted down using zipties and some slate attached to the bottom. Once the wood is completely water logged the zipties and slate can be removed.

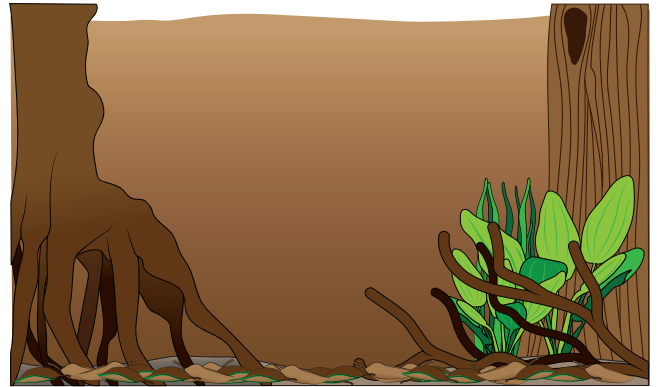
Common types of driftwood for aquariums

- Malaysian Driftwood
- African Root Wood
- Spider
- Manzanita
- Designer Driftwood

Tannins

Tannins are naturally occurring molecules in the driftwood that release once placed under water. Depending on the species of driftwood, some of the varieties release a large amount of

tannins and some very little. Most of the driftwood will eventually stop releasing tannins over time with the exception of very dense tropical species such as the African Root Wood. The tannins are harmless but will tint the water varying shades of brown and become darker unless removed with resins or water changes. These molecules also contain a minor anti-bacterial and anti parasitic properties that can be beneficial to your fish. This does not replace medication when needed but can help many species of fish stay healthy and reduce stress.



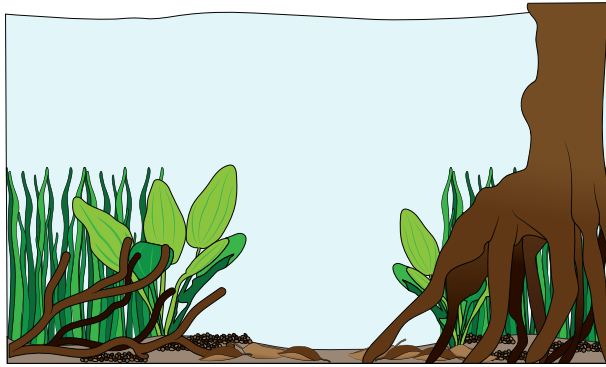
Many freshwater habitats contain tannins naturally in the wild and your customer may choose to let nature be rather than removing the tint. If they are trying to grow plants, you should recommend low light hardy species as the tint will diffuse some of the usable light and reduce the penetration into the water.

If they wish to remove the tannins there are commercial products available that can be placed in the filtration and replaced as they become used up.

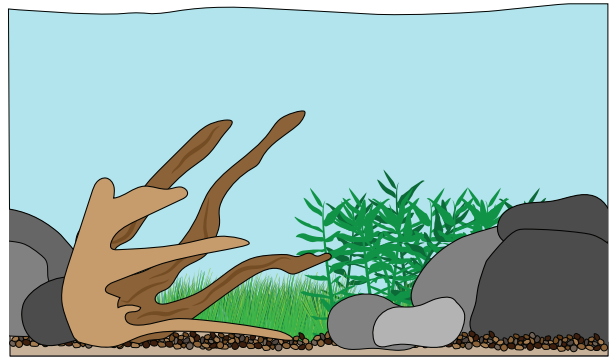
Rocks



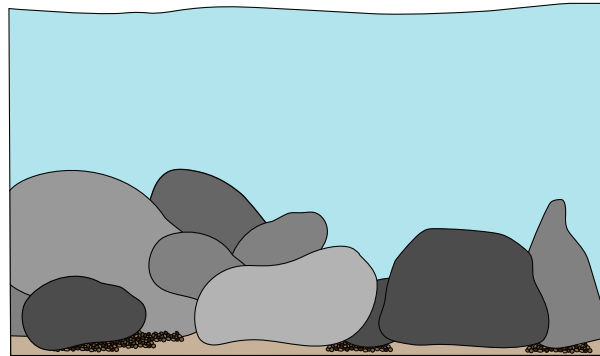
HARDSCAPE OPTIONS



Driftwood Only



Driftwood & Rock



Rock only

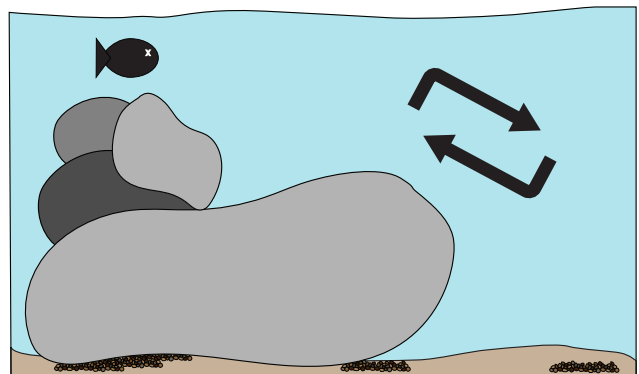
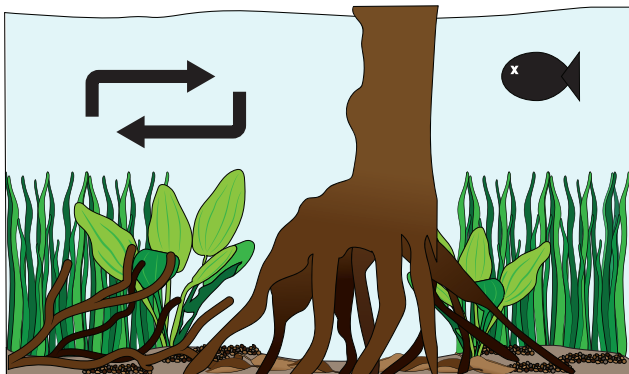
See page 24

Placement

Your customer may find it easier to scape their aquarium if they have a rough layout plan. Doing so will also help you guide them towards the right sized décor for their aquarium. If room allows, having them test out their hardscape in a dry aquarium will not only allow them to see their vision come to life but also build loyalty to your store and purchase more items. If your store does not have room for this then simply marking off the tank dimensions on the ground with tape or wooden dowels will also allow them to place items within the tank size.

Flow

One important thing to keep in mind when planning out hardscape and plants is that you



leave room to have even flow throughout the aquarium. If there are areas that will create low flow areas, placing a powerhead or airstone in those areas will help move water through them. See the chart below for examples:

Adding Plants

Plants can generally be added upon the set up of a new aquarium after the hardscape is set in place. The best time to add them is once the scape has been set and water has been added just enough to cover the surface of the substrate. When planting a larger aquarium, a spray bottle can be used to keep plants wet as they are added to keep them from drying out.

PUTTING IT ALL TOGETHER

Now that your customer is all set with the right ingredients for their planted aquarium it is just a matter of putting it all together. For established aquariums, plants can be added as desired and hardscape can be changed. If there are fish in the aquarium and much of the hardscape is being changed, it is a good idea to recommend doing this in small sections to avoid stressing out the fish.

If this is a new aquarium, it is best to have them place the gravel in the aquarium, add the hardscape, and then add enough water to cover the substrate. If your customer is using root tabs to help fertilize the plants this would be a good time to add them according to the instructions. This can all be done once the aquarium has been leveled and the equipment is in place. Using tools or their hands they can gently place the plants in their places. Once all of the plants are set, the rest of the water can be slowly added to the aquarium. To avoid uprooting the plants and disturbing the substrate, water can either be poured over smooth rocks or a flat surface such as a plate to help disperse the water. Plants that are laying sideways will stand straight within a few days and others will start rooting in. Liquid fertilizer can be added the first day and a regular schedule should be established for optimal growth.

Cycling a planted tank

Adding plants to a new aquarium will not negatively effect the cycle unless there is a substantial die off in which the organics can cause the ammonia and nitrite to rise. Your customer may notice that if the plants are thriving the ammonia and nitrite remain at low or even not present during the cycling process. So when can you recommend adding fish? As with a new tank without plants, you can add a small number of hardy fish as long as the ammonia and nitrite are at safe levels when the tank is new. Recommend feeding the fish a small amount of food each day to not bombard the system with organics which can cause an algae bloom or a substantial rise in ammonia and nitrite. The tank can still take 4-6 weeks to become fully cycled in which more fish can be added.

Avoiding Algae

Algae blooms happen when nutrients out of balance and can be fixed by restoring it. Usually you will find that there is something out of balance with the fundamentals such as lighting,


tank maintenance, fertilizer schedule, overfeeding the fish. Depending on the type of algae that is blooming, a water test may help you diagnose what caused the issue. If the test reveals that all is within range there is a series of questions that you can ask to help you solve the issue. To avoid having your customer feel that they are being judged and drilled for information, you can ask these questions in a more conversational manner. See page 80 of the main playbook for reference.

- How long has the aquarium been running ?
- What fish are being kept?
 - ◆ How many fish ?
- Is the aquarium receiving any sunlight ?
- Do they have a regular fertilizing schedule?
- What kind of substrate do they have ?
- Are they using RO water?
- How often are they performing water changes?
 - ◆ Ammonia and Nitrite may be in check but if they are topping off with tap water there are nutrients that will build up over time that will not show up on most of the basic water test kits
- What kind of lights do they have ?
 - ◆ How long is the light on?
 - ◆ How old are the bulbs?
 - This is only relevant if they have fluorescent bulbs
 - ◆ Do they have a UV sterilizer?
 - If so, how old is the bulb?
 - UV will only help with free floating algae such as green water

All of these answers can give you clues to help you diagnose the root of the issue and then decide the best course of action.

See algae chapter on page 68 of the main Aquatics playbook for more details

This may seem like a lot of information for keeping planted aquariums but don't let that intimidate you. There are many ways to have a successful planted aquarium journey with your customer and you might find it easier to take it in stride and start with understanding the basics. Just as you would take a new customer through the understanding of keeping a low tech tank to a high tech tank, take those same steps in your understanding of how it all works.



**CARE
GUIDES**

CORAL ICON LEGEND

PLACEMENT



Bottom



Middle



Top

LIGHTING



Low Intensity



Medium Intensity



High Intensity

WATER FLOW



Low Flow



Moderate Flow



Strong Flow

FOOD



Phytoplankton



Microplankton



Brine Shrimp

AGGRESSION



Non-aggressive
Usually peaceful to other corals



Semi-aggressive
could attack other corals



Aggressive
Will attack other corals under certain conditions

STARTER



Starter



Non Starter

ACROPORA



LOOK OUT FOR:

Prone to genus specific pests like Acropora eating flatworms
Highly susceptible to bleaching
Highly susceptible to rapid tissue necrosis



FUN FACTS

- Under the right conditions can grow faster than most other corals
- Is a natural habitat for most smaller reef dwelling fishes
- Can be easily cultured in aquaria through fragging

Minimum Tank Size: 29 gallons

Placement: Middle to Top

Lighting: High

Water Flow: Strong intermittent

Ideal Temperature Range: 72-78 F

Preferred Diet: Phytoplankton, Microplankton

KH: 8-12

pH: 8.1-8.4

Salinity: 1.020-1.025

Ca: 400-450 ppm

Mg: 1250-1400 ppm

Aggression Level: Non-aggressive

Starter Coral: No

Customer Shopping List:

Tank Size: 29 gallon
Aquarium Stand
Water Test Kit
Gravel Siphon
Algae Scraper
Lid

Light: T5 or LED
Filter
Heater
Substrate
Décor

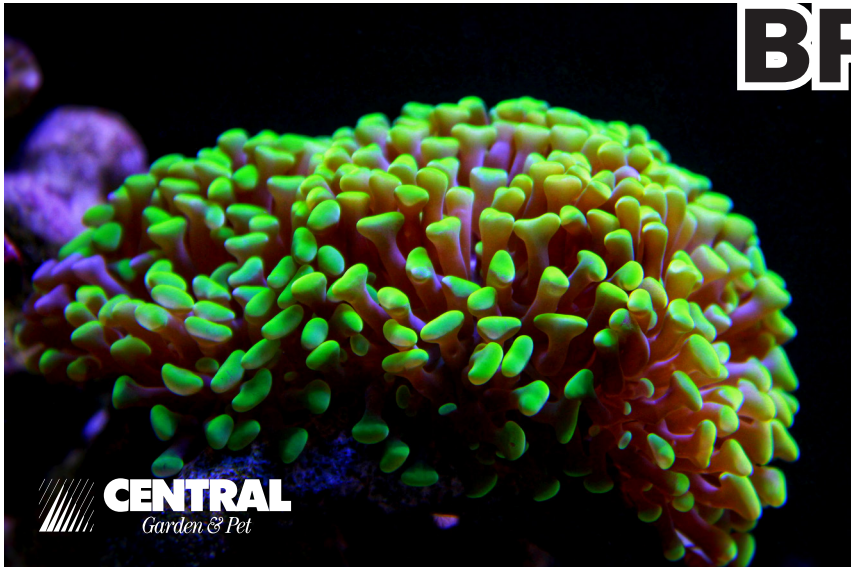
Background
Thermometer
Water Conditioner
Hydrometer
Calcium supplement
Magnesium supplement

Food: Phytoplankton,
Microplankton
Water Test Kit
Protein Skimmer

Optional:
Air Pump
Air Diffuser
Timer

Saltwater Safe Epoxy
Additional powerhead
Trace elements supplements

BRANCHING HAMMER



LOOK OUT FOR:

Produces stinging sweeper tentacles that can extend up to ten inches
The polyps retract at night and are often subject to predation by LPS predator species
Is prone to brown jelly disease

FUN FACTS

- Very similar to Wall Hammer Coral, except forms branches for each of the polyps
- Polyp color can range from green to orange to purple
- Can form colonies larger than six feet across

Minimum Tank Size: 29 gallons

Placement: Middle to Bottom

Lighting: Moderate

Water Flow: Moderate

Ideal Temperature Range: 72-78 F

Preferred Diet: Phytoplankton, Microplankton, Brine Shrimp

KH: 8-12

pH: 8.1-8.4

Salinity: 1.020-1.025

Ca: 400-450 ppm

Mg: 1250-1400 ppm

Aggression Level: Aggressive

Starter Coral: No

Customer Shopping List:

Tank Size: 29 gallon
Aquarium Stand
Water Test Kit
Gravel Siphon
Algae Scraper
Lid

Light: T5 or LED
Filter

Heater

Substrate

Décor

Background

Thermometer

Water Conditioner

Hydrometer

Calcium supplement

Magnesium supplement

Food: Phytoplankton,
Microplankton, Brine Shrimp

Water Test Kit

Protein Skimmer

Optional:

Air Pump

Air Diffuser

Timer

Saltwater Safe Epoxy

Additional powerhead

Iodine Supplement

Trace elements supplement



DISCOSOMA MUSHROOM

LOOK OUT FOR:

Spread aggressively and will sting nearby corals
 Can release from rocks and float freely throughout an aquarium
 If placed in too strong of light they will not fully open



FUN FACTS

- Are a corallimorph, not a true coral, although they are very similar
- Comes in a variety of different colors and patterns
- Under heavy blue lighting, they appear to glow

Minimum Tank Size: 10 gallons

Placement: Bottom

Lighting: Moderate to Low

Water Flow: Low

Ideal Temperature Range: 72-78 F

Preferred Diet: Phytoplankton, Microplankton

KH: 8-12

pH: 8.1-8.4

Salinity: 1.020-1.025

Ca: 400-450 ppm

Mg: 1250-1400 ppm

Aggression Level: Semi-aggressive

Starter Coral: Yes

Customer Shopping List:

Tank Size: 10 gallon
 Aquarium Stand
 Water Test Kit
 Gravel Siphon
 Algae Scraper
 Lid

Light: T5 or LED
 Filter
 Heater
 Substrate
 Décor

Background
 Thermometer
 Water Conditioner
 Hydrometer
 Calcium supplement
 Magnesium supplement

Food: Phytoplankton,
 Microplankton
 Water Test Kit
 Protein Skimmer

Optional:

Air Pump
 Air Diffuser
 Timer
 Saltwater Safe Epoxy
 Additional powerhead
 Iodine Supplement
 Trace elements supplement

ECHINOPHYLLIA CHALICE



LOOK OUT FOR:

Produces stinging sweeper tentacles that will sting other corals nearby
Chalice corals need stable and pristine water parameters
If growth is too quick, the ends can become fragile and easily break off

FUN FACTS

- The mouths, or “eyes” usually are brightly colored and contrast the color of the rest of the coral
- Are a plating coral that grows horizontally
- There are countless color varieties regularly available to the hobby

Minimum Tank Size: 29 gallons

Placement: Middle

Lighting: Moderate to Low

Water Flow: Moderate to Low

Ideal Temperature Range: 72-78 F

Preferred Diet: Phytoplankton, Microplankton,
Brine Shrimp

KH: 8-12

pH: 8.1-8.4

Salinity: 1.020-1.025

Ca: 400-450 ppm

Mg: 1250-1400 ppm

Aggression Level: Semi-aggressive

Starter Coral: No

Customer Shopping List:

Tank Size: 29 gallon
Aquarium Stand
Water Test Kit
Gravel Siphon
Algae Scraper
Lid

Light: T5 or LED
Filter
Heater
Substrate
Décor

Background
Thermometer
Water Conditioner
Hydrometer
Calcium supplement
Magnesium supplement

Food: Phytoplankton,
Microplankton
Water Test Kit
Protein Skimmer

Optional:
Air Pump
Air Diffuser
Timer

Saltwater Safe Epoxy
Additional powerhead
Iodine Supplement
Trace elements supplement



MICROMUSSA

LOOK OUT FOR:

Produces stinging sweeper tentacles that will sting other corals nearby
 They require targeted feeding of meaty foods in order to grow
 Prone to being picked on by LPS eating fishes



FUN FACTS

- Each polyp can be up to four different colors
- In the wild, they're found on sandy bottoms in shallow, turbid environments
- Can form colonies larger than eight feet across

Minimum Tank Size: 29 gallons

Placement: Bottom

Lighting: Moderate to Low

Water Flow: Moderate to Low

Ideal Temperature Range: 72-78 F

Preferred Diet: Phytoplankton, Microplankton, Brine Shrimp

KH: 8-12

pH: 8.1-8.4

Salinity: 1.020-1.025

Ca: 400-450 ppm

Mg: 1250-1400 ppm

Aggression Level: Non-aggressive

Starter Coral: No

Customer Shopping List:

Tank Size: 29 gallon
 Aquarium Stand
 Water Test Kit
 Gravel Siphon
 Algae Scraper
 Lid

Light: T5 or LED
 Filter
 Heater
 Substrate
 Décor

Background
 Thermometer
 Water Conditioner
 Hydrometer
 Calcium supplement
 Magnesium supplement

Food: Phytoplankton,
 Microplankton, Brine Shrimp
 Water Test Kit
 Protein Skimmer

Optional:

Air Pump
 Air Diffuser
 Timer

Saltwater Safe Epoxy
 Additional powerhead
 Iodine Supplement

Trace elements supplement

MONTIPORA CAPRICORNIS



LOOK OUT FOR:

In too bright of light, the coral will bleach, in too low of light, the coral will lose color and turn brown
Will often succumb to more aggressive coral species if placed nearby
As it grows larger, each spiral up will likely shade out the lower level
generally result in loss of color



FUN FACTS

- One of the true reef building corals
- As it grows, it spirals creating a vase like shape
- There are countless color varieties regularly available to the hobby

Minimum Tank Size: 29 gallons

Placement: Middle to Top

Lighting: Moderate

Water Flow: Moderate

Ideal Temperature Range: 72-78 F

Preferred Diet: Phytoplankton, Microplankton

KH: 8-12

pH: 8.1-8.4

Salinity: 1.020-1.025

Ca: 400-450 ppm

Mg: 1250-1400 ppm

Aggression Level: Non-aggressive

Starter Coral: No

Customer Shopping List:

Tank Size: 29 gallon
Aquarium Stand
Water Test Kit
Gravel Siphon
Algae Scraper
Lid

Light: T5 or LED
Filter
Heater
Substrate
Décor

Background
Thermometer
Water Conditioner
Hydrometer
Calcium supplement
Magnesium supplement

Food: Phytoplankton,
Microplankton
Water Test Kit
Protein Skimmer

Optional:
Air Pump
Air Diffuser
Timer

Saltwater Safe Epoxy
Additional powerhead
Iodine Supplement
Trace elements supplement

PALYTHOAS



LOOK OUT FOR:

Palythoa will out compete less aggressive corals for space
Contain Palytoxin which is an incredibly dangerous toxin
Safety equipment must always be utilized when handling palythoas

FUN FACTS

- Are available in a multitude of different color morphs
- One of the easiest to grow corals in marine aquariums
- Palythoa have the largest polyps of the zoanthid corals

Minimum Tank Size: 10 gallons

Placement: Any

Lighting: Moderate to High

Water Flow: Moderate

Ideal Temperature Range: 72-78 F

Preferred Diet: Phytoplankton, Microplankton

KH: 8-12

pH: 8.1-8.4

Salinity: 1.020-1.025

Ca: 400-450 ppm

Mg: 1250-1400 ppm

Aggression Level: Semi-aggressive

Starter Coral: Yes

Customer Shopping List:

Tank Size: 10 gallon
Aquarium Stand
Water Test Kit
Gravel Siphon
Algae Scraper
Lid

Light: T5 or LED
Filter
Heater
Substrate
Décor

Background
Thermometer
Water Conditioner
Hydrometer
Calcium supplement
Magnesium supplement

Food: Phytoplankton,
Microplankton
Water Test Kit
Protein Skimmer

Optional:
Air Pump
Air Diffuser
Timer

Saltwater Safe Epoxy
Additional powerhead
Iodine Supplement

RHODACTIS MUSHROOM



LOOK OUT FOR:

The most aggressive of the common mushroom corals
Can release from rocks and float freely throughout an aquarium
If placed in too strong of flow they will not open entirely



FUN FACTS

- Are a corallimorph, not a true coral, although they are very similar
- Are available in a variety of different colors and patterns
- Under heavy blue lighting, they appear to glow

Minimum Tank Size: 10 gallons

Placement: Middle to Bottom

Lighting: Moderate

Water Flow: Low

Ideal Temperature Range: 72-78 F

Preferred Diet: Phytoplankton, Microplankton

KH: 8-12

pH: 8.1-8.4

Salinity: 1.020-1.025

Ca: 400-450 ppm

Mg: 1250-1400 ppm

Aggression Level: Semi-aggressive

Starter Coral: Yes

Customer Shopping List:

Tank Size: 10 gallon
Aquarium Stand
Water Test Kit
Gravel Siphon
Algae Scraper
Lid

Light: T5 or LED
Filter
Heater
Substrate
Décor

Background
Thermometer
Water Conditioner
Hydrometer

Calcium supplement
Magnesium supplement
Food: Phytoplankton,
Microplankton
Water Test Kit
Protein Skimmer

Optional:
Air Pump
Air Diffuser
Timer

Saltwater Safe Epoxy
Additional powerhead
Iodine Supplement

Trace elements supplement

RICORDEA MUSHROOM



LOOK OUT FOR:

Spread aggressively and will sting nearby corals
Can release from rocks and float freely throughout an aquarium
If placed in too strong of light they will quickly lose all color

FUN FACTS

- Are a corallimorph, not a true coral, although they are very similar
- Two species are common in the aquarium hobby, Ricordea florida and Ricordea yuma
- Under heavy blue lighting, they appear to glow

Minimum Tank Size: 10 gallons

Placement: Middle to Bottom

Lighting: Moderate

Water Flow: Low

Ideal Temperature Range: 72-78 F

Preferred Diet: Phytoplankton, Microplankton

KH: 8-12

pH: 8.1-8.4

Salinity: 1.020-1.025

Ca: 400-450 ppm

Mg: 1250-1400 ppm

Aggression Level: Semi-aggressive

Starter Coral: Yes

Customer Shopping List:

Tank Size: 10 gallon
Aquarium Stand
Water Test Kit
Gravel Siphon
Algae Scraper
Lid

Light: T5 or LED
Filter
Heater
Substrate
Décor

Background
Thermometer
Water Conditioner
Hydrometer

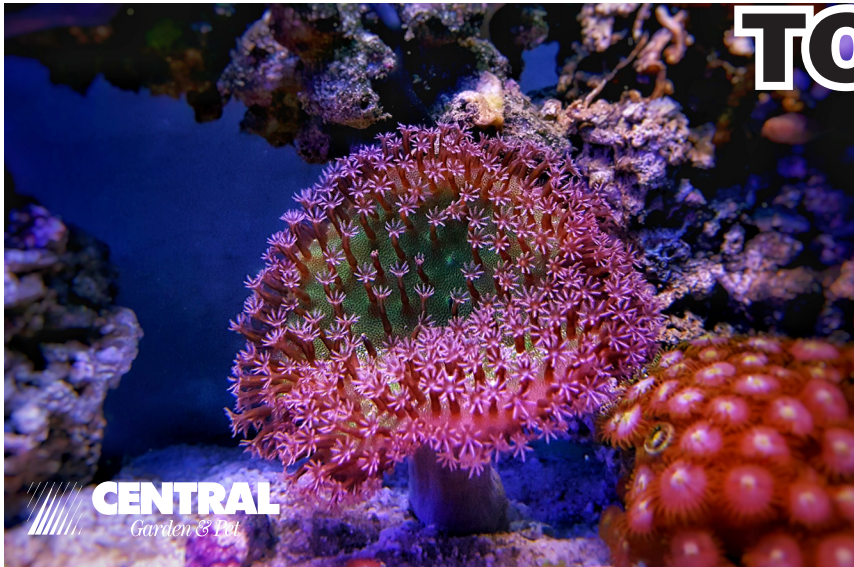
Calcium supplement
Magnesium supplement

Food: Phytoplankton,
Microplankton
Water Test Kit
Protein Skimmer

Optional:

Air Pump
Air Diffuser
Timer

Saltwater Safe Epoxy
Additional powerhead
Iodine Supplement
Trace elements supplement



TOADSTOOL LEATHER

LOOK OUT FOR:

Can produce toxins when threatened that can be harmful to other reef species
 Rapa rapa snails will consume them entirely from the inside out
 Regularly shed their outermost tissue which results in the polyps being closed for up to one week



FUN FACTS

- Colonies can grow to be over four feet wide
- Polyps can be white, yellow, or green
- Clownfish have been known to use large colonies as substitutes for anemones

Minimum Tank Size: 29 gallons

Placement: Middle to Top

Lighting: Moderate to High

Water Flow: Moderate

Ideal Temperature Range: 72-78 F

Preferred Diet: Phytoplankton, Microplankton

KH: 8-12

pH: 8.1-8.4

Salinity: 1.020-1.025

Ca: 400-450 ppm

Mg: 1250-1400 ppm

Aggression Level: Semi-aggressive

Starter Coral: No

Customer Shopping List:

Tank Size: 29 gallon
 Aquarium Stand
 Water Test Kit
 Gravel Siphon
 Algae Scraper
 Lid

Light: T5 or LED
 Filter
 Heater
 Substrate
 Décor

Background
 Thermometer
 Water Conditioner
 Hydrometer
 Calcium supplement
 Magnesium supplement

Food: Phytoplankton,
 Microplankton
 Water Test Kit
 Protein Skimmer

Optional:

Air Pump
 Air Diffuser
 Timer
 Saltwater Safe Epoxy
 Additional powerhead
 Iodine Supplement
 Trace elements supplement

PLANT ICON LEGEND

PLACEMENT



Foreground



Midground



Background

LIGHTING



Low Intensity



Medium Intensity



High Intensity

CO₂ REQUIRED



CO₂ Required

PROPAGATION



Bulb Splitting



Clipping



Carpeting



Runner



Rhizome

CARE LEVEL



Beginner



Intermediate



Advanced

ANUBIAS



Origin: Central Western Africa

Care Level: Beginner

Light: Low

pH: 6.5-8.5

Temperature: 72°-82°F

Co2: No

Max Height: Varies with each species

Placement: Midground, Rocks and Driftwood

Propagation: Rhizome

Trimming Technique:

Trim leaves as needed, Rhizome can be cut to split the plant

Tips:

- Exceptionally hardy plant that will do best when attached to driftwood, rocks or other porous surfaces.
- Fishing line can be used to attach the rhizome and then cut off when the plant is anchored

ROOTALA ROTUNDIFOLIA



Origin: India

Care Level: Intermediate

Light: Moderate to High

Co2 Required: No

Temperature: 72°-82°F

Max Height: 12 inches +

Placement: Midground to background

Propagation: Trim individual Stems and replant

Trimming Technique: Trim individual stems

Tips:

- This plant will do best with less boisterous fish as the leaves are small and delicate
- Comes in both green and red color forms
- Thinning out the plants over time will help them grow more robust
- Prefers warmer temperatures

JAVA FERN



Origin: South East Asia

Care Level: Beginner

Light: Low

pH: 6.0-8.2

Temperature: 68°-82°F

Co2 Required: No

Max Height: 8 Inches

Placement: Midground

Propagation: Adventitious plants, Rhizome

Trimming Technique: Trim leaves and cut Rhizome for manual propagation

Tips:

- Exceptionally hardy plant that will do best when attached to driftwood, rocks or other porous surfaces
- Will grow new plants off of the leaves which can be trimmed and replanted

VALLISNERIA



Origin: Tropical and Subtropical regions of Asia, Africa and North America

Care Level: Beginner



Light: Low to Moderate

pH: 7.2-8.0

Temperature: 70°-80°F

Co2 Required: No

Max Height: 12 inches+

Placement: Background

Propagation: Runners

Trimming Technique: Runners can be split, Leaves can be trimmed as needed

Tips:

- Does best in calcium rich environment and hard water but will adapt to most water parameters
- Can grow in sand but will do best in nutrient rich gravel like substrates

MICRO SWORD



Origin: Brazil

Care Level: Beginner

Light: Moderate

pH: 6.8-7.5

Temperature: 70°-83°F

Co2 Required: No

Max Height: 6 inches

Placement: Foreground to midground

Propagation: Runners

Trimming Technique: Trim leaves

Tips:

- Once rooted in, Micro Sword can grow very quickly
- Runners can be clipped and placed in elsewhere in the aquarium
- Thrives best in nutrient rich aquariums

LUDWIGIA



Origin: North and Central America

Care Level: Intermediate

Light: Moderate

pH: 6.5-7.5

Temperature: 72°-82°F

Co2 Required: No

Max Height: 18 inches +

Placement: Midground to background

Propagation: Trim stems and replant

Trimming Technique: Trim stems

Tips:

- There are several species of Ludwigia available with various leaf shapes and color forms
- Dosing iron can help red color form plants stay vivid

BACOPA



Origin: Australia, South East Asia and India

Care Level: Beginner

Light: Low to moderate

pH: 6.5-7.5

Temperature: 72°-82°F

Co2 Required: No

Max Height: 12 +

Placement: Midground to background

Propagation: Stems can be trimmed and replanted

Pruning Technique: Trim stems

Tips:

- Once rooted in, Micro Sword can grow very quickly
- Runners can be clipped and placed in elsewhere in the aquarium
- Thrives best in nutrient rich aquariums

SWORD PLANTS



Origin: South America

Care Level: Intermediate

Light: Moderate to high

pH: 6.5-7.8

Temperature: 72°-84°F

Co2 Required: No

Max Height: Varies with each species from 4 inches to 24 inches

Placement: Middle to background

Propagation: Off shoots can be trimmed and replanted

Trimming Technique: Leaves can be trimmed at the base of the plant

Tips:

- Sword plants will thrive best when supplemented with both Macro and Micro Nutrients and may require extra iron
- Sword plants will fill in large spaces so planning for the long term growth will help to not need to uproot the plant at a later time

DWARF HAIRGRASS



Origin: North America

Care Level: Intermediate

Light: Moderate to high

pH: 6.5-7.5

Temperature: 70°-83°F

Co2 Required: Recommended

Max Height: 4 inches

Placement: Foreground

Propagation: Runners

Trimming Technique: Grass can be trimmed to desired height

Tips:

- Dwarf Hairgrass will grow best when initially divided and small plugs are placed 1 inch from each other
- Prefers a softer substrate
- Co2 and Fertilizers will help this plant to propagate much faster to create a fuller look

CRYPTOCORYNE



Origin: Southeast Asia

Care Level: Beginner

Light: Low

pH: 6.0-7.8

Temperature: 74°-84°F

Co2 Required: No

Supplements: Substrate and water column

Max Height: Varies for each species

Placement: Foreground to midground

Propagation: Split and divide the roots

Trimming Technique: Trim leaves

Tips:

- Crypts are a very hardy plant and spread easily on their own
- Crypts stress out when being moved and may go through a “melting” period but come back under the right conditions
- Crypts are available in many colors and heights



CABOMBA



Origin: North and South America

Care Level: Intermediate

Light: Moderate

pH: 6.5-7.5

Temperature: 72°-82°F

Co2 Required: No

Max Height: 12 inches +

Placement: Midground to background

Propagation: Trimmings

Trimming Technique: Stems can be cut and replanted occasionally

Tips:

- Does best in neutral water
- Leaves tend to drop off when there is poor water chemistry or Co2 and nutrient deficiency
- This species does not thrive when trimmed or replanted too often



DWARF SAGITTARIA



Origin: Eastern United States

Care Level: Beginner

Light: Moderate

pH: 6.5-7.8

Temperature: 72°-82°F

Co2 Required: No

Max Height: 4 inches

Placement: Midground

Propagation: Runners

Trimming Technique: Leaves can be trimmed at the base

Tips:

- This plant is amphibious and can grow both in and out of the water
- It can thrive in various water conditions and adapt to temperature changes easily.

JAVA MOSS



Origin: Southeast Asia

Care Level: Beginner

Light: Low

pH: 6.0-8.0

Temperature: 70°-80°F

Co2 Required: No

Max Height: 2.5 inches

Placement: Foreground to midground

Propagation: Division

Trimming Technique: Can be trimmed to desired height

Tips:

- Will do best when anchored to driftwood, rocks or other porous surfaces
- Can become dislodged and grow in undesired places when kept with boisterous fish or high flow



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