Habitat Design Guide

This article will cover several different tropical habitats that one could attempt to replicate in the vivarium. Possible plant genus and species are recommended to help get an idea of the typical foliage found in that particular habitat. Certain habitats also give an example of a possible exhibit design using featured animals and the plant species that they are naturally found with. This is intended to be used as a starting guide and all species should be thoroughly researched before including them in the display.

The Lowland Forest Floor Habitat

Much of the existing tropical rainforest is characterized by flat floodplains and expanses of forest. Here the trees grow to enormous proportions and their dense canopy shades the understory creating a damp environment. This habitat is the home of many of the popular reptiles and amphibians that are kept in terraria such as various poison dart frogs. Since the trees block out much of the light, the forest floor is dominated by smaller herbaceous plants like *Spathiphyllum, Calatheas, Maranta*, and gesneriads like *Kohleria* and *Episcia.* Tree saplings grow in brighter patches of the floor, and vines and epiphytes congregate on the huge tree buttresses. The main distinguishing feature will be the abundance of plant debris that is constantly dropped from the canopy.

A terrarium design that accurately recreates this habitat should have as much ground space as possible. A tree buttress or fallen log can form the background of the enclosure, leaving most of the bottom area open. Start with a few inches of growing substrate that is well draining but has enough weight to hold plants down. Cover this with at least one inch of leaf litter containing both small and large leaves. Then add a few large decorative items like palm stems or a whole coconut. Sprinkle in a few nuts, twigs, and pods into the litter mix; creating the illusion of randomly fallen debris. The plant diversity in this system should be rather small, maybe around 5-10 species depending on the size of the design. Try to plant a few gesneriads and ferns up against the background. A smaller vine such as *Philodendron* can grow up the back, as can smaller epiphytes. For extra realism, smaller slow growing tree saplings or coffee plants (substitute) can be added in the middle of the tank. The end result should be a display that is heavy with brown shades, and just a couple of green patches here and there.

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Tree Trunks

Designing a tree trunk display is one of the more challenging terrariums to build. It requires an enclosure that is significantly taller than wide. An example would be 24L X 24W X 36H. The bottom can get similar ground treatment as the forest floor display. Two possible ideas would be to have one large tree trunk or buttress that forms the entire background, or several smaller trunks and lianas. If you use to cover the back with one large trunk, a foam and epoxy/cement trunk will need to be made to fit for the most realistic appearance. Run a few artificial vines and aerial roots up the trunk in various places. Tangles of vines and lianas grow up any trees they can find in the rainforest and are often covered in epiphytes. One or two centerpiece plants such as *Anthurium* could be attached to the trunk. A nice final touch would be to place a shingle plant *(Margravia, Monstera, or Raphidaphora)* at the base of the trunk and let it grow straight up. This setup is perfect if you are keeping certain geckos or *Anolis*; and essential in keeping the Helmeted Iguanas *Corytophanes* sp.

Tree Branches and Epiphyte Gardens

Here we have diversity at its fullest. The canopy level of the rainforest is home to more plant and animal species than anywhere else on Earth. A display recreating this should be tall and wide, with more equal proportions than the tree trunk display. This type of habitat can be successfully scaled down to smaller setups such as a ten gallon tank. The lighting system should provide relatively intense full spectrum light, preferably using compact fluorescents or metal halide bulbs. For optimum humidity, a misting system timed to spray the tank at least three times a day at 1-3 minute intervals would be great. Ground cover should be leaf litter and debris, but the majority of the tank should include both vertical and horizontal branches and vines. Another idea would be to plant the whole background with bromeliads and epiphytes, creating a green wall similar to a large tree crotch or trunk. Planting can be extensive, with species numbers much higher than in other designs. An average sized terrarium (30-75 gallons) could easily hold 10-30 species of plants. You'll want a mix of larger epiphytes such as bromeliads, and smaller specimen plants like orchids and tiny ferns. Vines like *Syngonium* and *Philodendron* can grow up the back corners and sides of the tank to fill out the corners. Try to stick with a few repetitive plantings of the same species, mimicking colonies of plants in the wild. For instance; pick one or two species of larger bromeliads like *Vriesea* and put them throughout the habitat. Then fill around them with a wide variety of smaller plants, using the same species in more than one location looks more natural.

An example for this habitat could be a terrarium designed to house the Mimic Poison Frog, *Ranitomeya imitator*. This tiny frog lives in northern Peru, where it lives in epiphyte covered trees and walls. They breed in large water holding bromeliads such as *Aechmea, Guzmania,* and *Vriesea;* so their terrarium should be large enough to grow a number of these plants. Plant a few

large Peruvian bromeliads on the background and branches, ideally a few in each corner and one in the middle to provide breeding sites in different areas. Add a few aroids such *as Anthurium polyschistum* or *croati*; and a few large climbers in the corner such as *Philodendron squamiferum* or *verricosum.* There will still be a lot of bare background material and branches that need covering. For this you can use some of the many Peruvian *Peperomias* such as *P. puteolata, prostrata,* and *tricolor;* and shingle plants like *Marcgravia* and *Monstera dubia.* Finish the habitat by adding a few choice specimen plants such as *Pleurothallis* or *Lepanthes* orchids. With regular misting and high light levels the plants will fill in the terrarium to create a solid wall of green diversity.

Bamboo Forest/Ginger Thickets

This habitat most often occurs in areas that have been disturbed or area exposed to more light, such as areas where large trees have fallen. It is characterized by dense thickets of one or two species of large herbaceous plants. Typical plant families would be bamboos, *Costus*, Gingers, Ferns, *Heliconia*, *Musa*, Palms, etc. For this display you would want a very tall enclosure, something along the lines of 48L X 24W X 40H for a bigger exhibit or 24L X 24 X 36H for a smaller one. This habitat cannot be scaled down too much or the illusion will not be convincing. Start with a good layer of heavier organic substrate with lots of small leaf litter, such as bamboo or willow oak. If you will be creating a ginger *(Costus)* or *Heliconia* stand, than you will want to use smaller growing species and plant them along the back and sides of the enclosure. In the unplanted areas place a few large dead banana leaves, they're curled appearance will look very appropriate. Plant a few smaller pieces in the middle to achieve a random pattern. Now you can add a few small terrestrial plants at the bases like *Pilea* or creeping *Peperomia.*

A bamboo stand is a bit different because it is such a large habitat as far as scale goes. You will need to substitute dead bamboo stalks to recreate the mature growth. The easiest way to do this is to cut around seven or more thick bamboo stalks of varying diameters, long enough to reach the top of the exhibit. Then make a base out of foam, concrete, or a piece of wood and attach the stalks using stainless screws or epoxy. An easy way would be to use a large board such as a 2x8 and drill out holes big enough to set the bases of the stalks in. If durability is a concern, you can brush on several thin layers of clear epoxy on the wood and the actual bamboo. Now set the whole base and bamboo in the exhibit and place several inches of substrate and bamboo leaves over the base. A few dead bamboo stalks on the bottom and leaning against the sides will provide texture and shelter for the animals. There are a variety of smaller ornamental bamboo species that do not grow taller than four feet, and planting a few of these along the back of the tank will add realism. They will fill out the background with time and begin weaving in with the dead

stalks, looking exactly like young and old bamboo. Then add one or two small terrestrial plants around the bottom.

Cloud Forest and Rocky Slopes

Occurring in practically all areas of the world, these habitats can be temperate or tropical. Tropical regions that feature these habitats include northwestern South America, Central Africa, and the South East Asian countries. The highlands and mountain ranges in Colombia, Ecuador, and Peru are a perfect example of this habitat and the incredibly diversity that can be found here. These areas are characterized by rock formations and boulder covered slopes, with a much lower tree canopy then found in the lowland forest. Trees typically are less dense too, letting much more available light reach the ground. Clouds hang over the higher elevation forest and a cool mist keeps the air temperatures much lower. Water is plentiful in this environment and it trickles down over the rocks, where abundant mosses and lithophytes grow. Often every square inch of available surface substrate is colonized by moss and herbaceous plants.

When designing any of these habitats you can use almost any size or shape enclosure. A rather equal proportioned tank will work well here, such as a 20L X 18X 20H. This setup will need to have water actively flowing though multiple drip lines in the back, preferably into a sump below so make sure the enclosure has adequate drainage holes. A more dramatic background is called for, and the material of choice would be a custom designed epoxy/concrete over foam structure. Try to make lots of bigger boulders and position them so they look like they have settled together over millions of years. This is a great time to visit a rocky stream or cliff to observe nature patterns in rock settlement. Add a few roots or artificial vines to replicate trees that are growing over the rocks. Once the main background structure is in the tank, add an extremely well draining mineral substrate containing very little organics.

If you are attempting to create a moist rainforest display, it will need misting or drip lines to maintain the right humidity levels. Place the drip lines near the top of the background in various positions so that water trickles and seeps down the cracks just as it would in nature. Only a slow drip is needed, just enough to barely keep the rock surfaces damp. A couple palm fronds or stems and leaves complete the look, especially tucked in between boulders as if they became lodged there. As with the Epiphyte Gardens, plant diversity can be taken to the extreme. Use lots of small orchids and other moisture loving lithophytes and tuck them into the crevices and rocks. Aroids and bromeliads should fill out bigger holes in the rock while an abundance of live mosses and ferns can be planted around their bases.

There are plenty of temperate versions of this habitat too, such as the misty slopes of various southern mountain ranges. A great example would be a habitat designed to house the various Appalachian salamanders. The mountain regions of Tennessee and North Carolina are home to the greatest diversity of salamanders in the world. You could start by assembling a rock

background with lots of boulders and caves, without making any areas too inaccessible for maintenance. Then position several drip lines, leaving some areas of the terrarium drier than others. A rotten log or root mass would provide some decoration. For planting, start with a lot of live moss tucked in between the rocks and on any exposed wood. Then add a few temperate ferns like common polypody or lady fern to the cracks. Finish the tank with one or two small specimen plants such as the rattlesnake plantain orchid (*Goodyera).*

Cascades and Waterfalls

A display designed to accurately represent this habitat is going to be one of the more complex systems to build. It should have a sump or aquarium kept under the display to hold the majority of the water, as well as both a main circulatory pump and a smaller one for drip lines. The water should quickly flow through the entire system and completely cycle at least once every hour. Light and temperature levels will depend on the species being kept.

The predominating surface feature will be a large amount of rock, both on the background and in the substrate. If possible, use an artificial rock wall for the entire back of the enclosure, and include crevices and holes for water to run down. Since this will be exposed to water constantly, epoxy will be the most inert material to use in making it. Concrete or grout over foam is fine too, but let the system run with vinegar water for a few weeks to stabilize the pH. To give a natural look, create a depression for the majority of the water to flow and then use several drip lines to divert a small amount of water around the rest of the habitat.

Since this habitat is constantly wet, stay away from organic substrates and use either pea gravel or a laterite/clay blend. A few bigger dead leaves and twigs should be jammed into crevices and in between the rocks. Planting could be simple or elaborate, and a variety of semi-aquatic and lithophytic plants can be used. This is one display where a large amount of live moss would look appropriate, and should be all over the exposed rocks near the water. Moisture loving plants like ferns and *Selaginella* can be placed in the shady areas; larger aroids like *Anubias* and *Philodendron* can go on ledges and in crevices.

An example of a biotopic display that would showcase this habitat could be created for the harlequin toad *Atelopus varius.* This species is native to Costa Rica, where it lives around waterfalls and streams in higher elevations. Larger plants like *Anthurium scandens, A. radicans, A. bakeri, A. clidemiodes, Adiantum microphyllum, Philodendron squamiferum, Syngonium rayii,* and *Caladium* could be used. Smaller epiphytes like *Microgramma, Peperomia prostrata, Pleurothallis,* and *Selaginella erythropus* would be used as specimen plants.

Tepuis

These “islands in the sky” are one of the most unique habitats in the world. Formed over millions of years of erosion; they are isolated plateaus located primarily in the Gran Sabana region of Venezuela, Guyana, and Brazil. Many of these plateaus reach over 3000 feet in height, with sheer walls on all sides towering above the rainforest below. This effectively has isolated the habitat on top for so long that many of the species are endemic, found nowhere else on Earth. With the tops in the clouds; the climate is cool and misty with constantly high light levels. The surface is bare rock, with many arches and formations caused by erosion that give it an otherworldly appearance. Rainwater runs through the rock and down the sides, creating caves and sinkholes in the rock as well as an abundance of waterfalls.

These conditions are incredibly demanding on the plant species that live here, with constant temperature extremes and little organic nutrients. Many of the low areas are filled with bogs and marshes, home to a fascinating array of carnivorous plants and orchids. While there are not any animals native to this area in the trade, one could easily design a display solely to showcase these unusual plant species.

For this display you will want an enclosure just like the one described for the waterfall habitat, with ample drainage and a circulating water system. Since all of the featured species grow in full sun, a very bright lighting system will be required. To start with the unique landscape, begin by creating a background and landscape out of gray spray foam. Foam a little at a time, keeping the whole structure open and airy, with lots of holes and tunnels. The goal is to get a surface that is similar to lava or lace rock in texture. Make sure you have lots of planting pockets with the biggest one in the center of the tank. In this case you can either leave the foam bare or coat with epoxy. Then run a few drip lines through the rocks, allowing water to pool in the lower parts of the tank. This display will need a very cool temperature with almost 100 percent humidity, and the use of either an ultrasonic humidifier or mist system will be essential to accurately recreate the conditions found here. A timed misting system should ideally spray the tank at least three times a day at 1-3 minute intervals, using distilled or RO water. Then prepare the planting areas by tucking some course tree fern and live sphagnum moss in the holes and pockets.

Now that you are ready to plant start with the centerpiece; such as a larger clump of Sun Pitcher *(Heliamphora)* or *Brocchina reducta.* This will be the main visual attraction and the dominant feature of this display. Around the base of these plants, add a mix of smaller orchids like *Pleurothallis*, marsh grasses, and a few clumps of sundews such as *Drosera roraimae* or *montana.* If you include some larger water holding bromeliads like *Aechmea;* then you will be able to grow certain bladderworts like *Utricularia humboldtii* in their tanks. Most of these carnivorous plants grow in the same areas of the Tepui, so quite a few could easily be grown in the same tank. The end result should show lots of bare rock with gardens of greenery in the crevices.

Caribbean Dry Forest

This unique tropical habitat is widespread throughout the Caribbean and Central America and is home to a fascinating array of reptiles and plants. Although tropical, coastal breezes and constant sun keep this type of forest much drier than true rainforest habitats. The forest generally begins just past the coastal dunes and mangroves, consisting of scrubby hardwoods and palms. Coconut and various fan palms are plentiful here; and the trees are often filled with bromeliads and epiphytic cacti such as *Ripsalis* and *Hylocereus*. This is the home of many tropical reptiles that do well in terrariums, specifically anoles, amievas, and curytails.

This is one of the easier habitats to design, simply because it does not require any special plumbing or water systems. The main requirement is a large, tall enclosure with very powerful full-spectrum lighting. Unlike terrariums designed for amphibians, this enclosure should have lots of basking sites and adequate ventilation. Ideally you will want daytime temperatures in the high 80's, cooling to room temperature at night. A misting system should be set to spray the tank for several minutes once a day and some sort of concealed water dish should be included to provide drinking water for the lizards. For the back you can either use some sort of tree trunk, cork bark, or a rock background; but try to leave several bare branches sticking out for basking perches. The substrate in this habitat needs to be well draining but still have moisture retentive qualities; such as one part sand, one part coir or potting soil and one part fine bark. This should be covered with a thick layer of dry leaves and a few palm fronds for detail. Additional detail can be achieved using a palm fruit stem or coconuts of various sizes.

To replicate the epiphyte laden trees, try to plant a few clumps of cacti at the top of the background. Now pick one or two species of bromeliads or *Tillandsias* and scatter them in with the cacti. Then finish the wall off with a species of *Epidendron* or *Polyrisia* orchid. The ground can be planted with small palm or tree seedlings, as well as yuccas and the cycads (*Zamia*). For detail a terrestrial cactus *Cereus* or vining *Mandevilla* could be added along the sides.

One of the great things about this habitat is that a variety of reptiles can be kept in the same habitat together provided there is adequate space and they are all of similar size. Some of the prettier anoles like *A. trinitatus* or *extremus* would live in the higher parts of the enclosure; while a few curytails and a smaller species of ameiva could populate the leaf litter. You could even add a few smaller land hermit crabs to keep the bottom clean. A much smaller tank could be designed to house the tiny Caribbean day geckos *Gonetodes* and *Sphaerodactlyus.*

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