

D.I.Y. Aquatic Biomes

You can make your own (ideally) self-sustainable, enclosed, mini aquatic ecosystem, or biome. Your biome will contain plants and animals that together provide everything each needs to continue to live, grow, and reproduce.

These instructions are for Austin, TX and surrounds where you can find a kind of tiny freshwater shrimp (*Hyalella*, commonly called Scud), and many kinds of water plants. The shrimp eat decaying plant and animal matter, and provide carbon dioxide for the plants. The plants provide matter for the shrimp to eat and oxygen for them to 'breathe'.

Make your own! Here's what you'll need:

A Container



You can use anything clear that closes, but an attractive glass container will make your biome much nicer. Mason jars and empty glass beverage bottles work well.

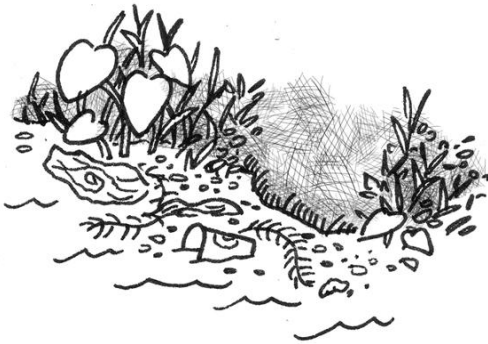
I recommend clear glass 4" Christmas balls: their spherical shape magnifies the little creatures, and you can find them at many hobby stores. I use corks to close them up, and you can use food container lids as bases. Be careful though - these are fragile!

Collection Equipment



A large bowl and a scoop, a spoon / ladle, a suction device like a turkey baster or medicine dropper, a funnel if your container has a small opening, and whatever else you find useful.

A Pond, Lake, River or Stream



We found the plants and animals for our biomes in Ladybird Lake.

Respect your collection site and try not to disturb the environment. What you collect for your biome is too small to have any impact (collect only what you need), but destroying habitat on the shore or in the water can be harmful. If possible, collect from a dock, rock, boat, or stable shoreline.

Respect the plants and animals you collect. These are living things; please treat them gently - you want them healthy and happy for a

successful biome.

Collect, and Put Your Biome Together

Here are the things your aquatic biome will need:

Water

- Clean water from your collection site. Water should be 50% - 75% of your biome.

Sediment

- Rocks, sand, soil, or mud from your collection site. For clearer water, use sand and rocks instead of silty sediments. Sediment should be 10% - 25% of your biome.

Air

- Leave some room for air in your biome. Air should be 10% - 25% of your biome.

Plants

- Many underwater plants like Fanwort have fronds that naturally break and float off. These make ideal biome plants. Try to collect plant pieces that have roots or root buds. Algal strands also make good biome plants.

Animals

- Hyalella shrimp live in many different environments, and you'll find them along the shore on bits of floating wood or other flotsam. There are many other little animals that will do well in your biome like snails and copepods. Hyalella, copepods, and snails are very hardy and have a good chance of adapting to your biome environment. I recommend only 10 - 20 shrimp per 8oz water to start with: enough for a breeding population, but not too many to overwhelm your biome's resources.
- You want to avoid any animals that are too big, or that don't live their entire lives in water. Water beetles, fish, salamanders, crawfish, tadpoles, or other large creatures will not have enough food or oxygen to live in your biome; do not collect these. Insect larva like caddisfly larva or dragonfly nymphs will turn into flying insects that need to be free; do not collect these.

You can put your biome together at your collection site, or collect what you need and put it together at home or school. Just remember to return any unused living things back to nature.



Put in your sediment and water first, then add plants and animals. Experiment with the amounts of water, sediment, and air. Experiment with different types and amounts of plants and animals.

I recommend scooping up some water in a big bowl and using a dropper to suck up only the animals you want. A spoon can help with larger items and help to gently look through your finds.

Give your Biome a Home

Your biome needs a *very* sunny place, but without too much direct sunlight. In direct sunlight, your biome will become hotter than the air temperature around it. Hyalella and copepods tolerate a wide range of temperatures, but are happiest from 68°F to 82°F. At 90°F your shrimp will start to die from heat, and it can take only a few hours of your biome being above 90°F to kill all your shrimp. Hyalella and copepods can

survive low temperatures, but don't let your biome freeze, and try to keep it above 40°F. A good rule of thumb is that your biome should be cool to the touch, but not cold.

Given time, your biome will come into its own balance of plants and animals. You may see partial die-offs or population blooms: don't worry and give it some time to stabilize.

Hyaella have a breeding cycle around 33 days, and copepods around 10 days, but many of the creatures you catch may already be carrying eggs. Hyaella carry orange eggs in a brood pouch on their body. If you see two Hyaella swimming around holding each other, they are mating; they swim together like this for about a week. Copepods carry eggs in two egg sacks at the back end of their body. When you see a copepod that looks like it has two fins on its tail, these are actually eggs. These breeding cycle times are why you should give your biome around a month for your populations to stabilize.

Pay attention to your plants and animals to see what conditions your biome is happiest in. If your plants start to look unhealthy, try more sunlight. If you start to get algae, or your shrimp die on hot days, try less sunlight. If you notice your water getting cloudy or noticeably discolored, do a partial water change (pond/river or distilled water will work, never use tap water) and try a different spot for your biome (probably more sun). Each biome is an experiment, so if something isn't going right after you've given it time to stabilize, you can open it up and try something else. It is most important to pay attention during your first few weeks: after you have found a good spot, your biome should need little intervention (just make sure to pay attention during seasonal changes to ensure the spot is still ideal).

Signs of a failed biome:

- bad or sulphurous (rotten egg) smell
- strands of whiteish-clear bacterial growth
- most or all shrimp are dead
- most plants dead

What happens if your biome fails? It's okay to feel sad; part of this experiment is to bring you closer to nature and make you care about it. This experiment is also about giving you a greater understanding of how ecosystems work: disasters and environmental change are part of the world around us, and dangers are part of the daily lives of the plants and animals you collected. As long as you treated your biome with respect, there is nothing to regret. I suggest returning the contents of your biome to your collection location, so the remains can become part of new plants and animals in the home ecosystem. If you want to salvage and start over, change the sediment and water, and rinse in natural or distilled water any healthy plants that you want to reuse. If your container has algal or bacterial film on the sides you can clean it with soap and tap water, just make sure to rinse very well before refilling.

