Arid Substrate Mixes

One of the first questions keepers ask is “what should my animal live on?”; our groups strongly advocate for replicating our animals’ natural habitats as closely as possible. To do this it is best to look at where they live in the wild and the conditions they thrive in naturally. It’s a common misconception that arid species need loose sand for substrate, but this comes from “arid” being mixed up with true “desert”. In reality, very few species in the world are found on straight sand. Arid and semi-arid species (such as leopard geckos, bearded dragons, western hognose snakes, etc.) tend to live in more scrubland-like areas with a wide range of textures stemming from densely packed earth rich in clay, sandy rocky areas, and thick grass. When creating a substrate for your enclosure it’s important to keep this in mind, and therefore it’s great to add as many “ingredients” as you can to the substrate!

Premade Blends

If you are uncomfortable or uninterested in making your own blend of substrate then there are some options where it’s created for you, ready to go into your setup without any additives. Our Shopping List files (species-specific in each group) goes over specific brands and what countries each option may be found in, please head over to that file if you’d rather go that route! Not all blends are available in every country due to various laws and regulations.

Basic Mix

Our basic mix is just that, an easy mix consisting of only two ingredients! We recommend mixing about 70% soil with about 30%

sand. The simplest way to achieve this is to use some sort of scoop and combine 7 scoops of soil with 3 scoops of sand, mix, and repeat. Continue this process until you have the depth you are trying to achieve. We recommend a minimum depth of 4-6in / 10-15cm with 6in/15cm or more being preferable for burrowing species that will benefit from more substrate depth.

Soil : This can be a reptile safe brand such as ZooMed ReptiSoil™, however it is typically much cheaper to buy non-reptile-specific soil. When buying soil that is not manufactured for use with animals it is important to check all ingredients to ensure their safety. **Soil should be fertilizer and additive free**.

Avoid soils that contain ingredients such as manure, poultry litter, lime, bat guano, and other pH leveling ingredients or fertilizers. Ingredients such as compost are at your own risk as you do not know what was used during the breakdown process to turn the rotting matter into compost, unless the packaging specifically specifies. Most composts are safe as this is done in a natural process, however there are the rare ones that use additives to speed up the process that could be harmful to your animal. Perlite and Vermiculite are not dangerous in and of themselves but can pose a risk if ingested. If you cannot find soil without these two ingredients then it is best to try and sift out as much as possible. Perlite is a naturally occurring volcanic rock, whereas Vermiculite is a baked volcanic glass.

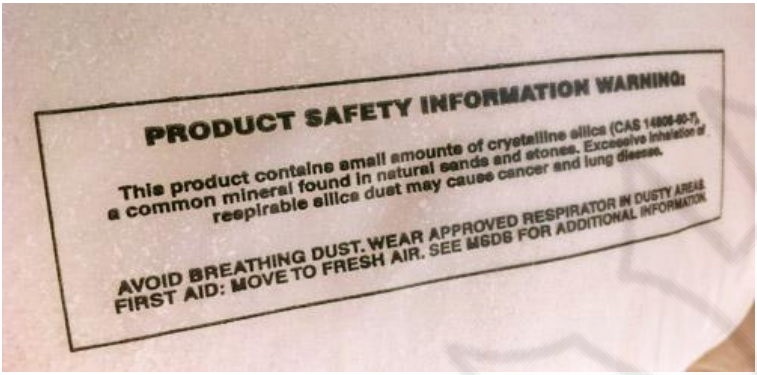
Some commonly used brands of safe soil include **Scott's** (*please note that this soil is locally sourced and so some bags may contain unwanted items such as trash or slow release fertilizers), **Timberline**, and **Miracle Gro Performance Organics Container Mix** (*While this does contain both Perlite

and slow release fertilizers, the team has thoroughly checked the ingredients and has come to the conclusion that the fertilizer used is indeed safe, this is meant to be a 'last' option for those who are having trouble finding safe fertilizer free soils in store). If you are having trouble finding safe soil in stores then we recommend checking out local plant nurseries as well as landscaping companies! Oftentimes a landscaping company will allow you to show up with a container and take as much as you need.

Sand : This can also be found as a reptile safe brand in Reptisand, but just like the soil there are cheaper options out there. Play Sand (the kind used for children's sand boxes) can be easily found at most hardware stores for a fraction of the price, rule of thumb is that if it is non-toxic and safe for children then it will be safe for our reptiles as well.

Please note that some brands have some very **concerning labelling** on their sand, such as labels claiming to use only with gloves as it may cause illness such as cancer. This is due to the ingredient silica which is naturally occurring in sand, but is only a concern when it's dust is inhaled in large amounts for extended periods of time, such as those who work in warehouses or other places where silica is used in processing. Due to certain

regulations in some areas these warnings must be added to any product containing silica, however the **risk is virtually non existent when using the product as a consumer**.



Intermediate Mix

Some species burrow, A LOT, and these guys will benefit from adding just one more ingredient to their mix even if their keeper isn't able or comfortable enough to create a more advanced mix yet. This would be clay! When using clay it is recommended to use a mix with a ratio of 60/30/10 soil/sand/clay respectively. Just like before you will want to use the scoop method to measure, but the clay will help firm your substrate up a bit allowing it to hold burrows more easily.

Clay : When it comes to clay there are many options available. The most commonly used and well known would be **Excavator Clay by ZooMed**. This is a finely milled clay that can be used both for moulding structures as well as an additive to your substrate. A newer product on the market would be **Stone Desert by Exo Terra**, this is not finely milled at all which makes it not as great for moulding structures, however it adds some great texture to your substrate and comes in three naturally derived colors (ochar, red, grey). A

third option would be to use **food grade bentonite clay**, this can usually be found either online or in specialty stores.

Advanced Mix Additives

If you want to take it a step further and create an even more natural textured substrate, or you are wanting to create a substrate suitable for a bioactive enclosure, then you will want to create an advanced mix. This is to add extra bits to make it feel more like the soil in the animal's natural habitat, after all there isn't just soil and sand in nature, while adding much needed biodegradables in bioactive enclosures. This is to ensure proper health of the soil by providing an added food and moisture source for the custodians (Clean Up Crew). The more ingredients the better, however there is no set ratio once you've reached an advanced mix. The idea is to create your intermediate mix and gradually add as many of the advanced additives as you can, while adjusting ratios and measurements as you are mixing to ensure that the proper dry (but not too dry) texture is maintained.
Remember: You want to add a little bit of moisture retaining ingredients to help create pockets of moisture (especially with bioactive), but not enough so that the entirety of the substrate retains high levels of moisture.

Mulch / Orchid Bark : Mulch, orchid bark, and other wood based additives are great for adding texture, help retain moisture a bit, and add a much needed food source for custodians. If going bioactive then a wood product is absolutely recommended as the primary food source for terrestrial isopods in the wild is decaying wood matter. Healthy, well fed CUC makes for a healthy bioactive.

Leaf Litter : Leaf litter is great to both mix directly into the substrate as well as create a thick layer over the surface. When mixed directly into the substrate it gets slowly broken down, adding more nutrients to the soil for plants while providing food for the custodians. It also helps create good texture and small pockets of moisture. When used as a thick layer over the surface of the substrate it helps trap some of the moisture in the substrate itself, preventing it from drying out too quickly, and provides shelter for custodians in bioactive enclosures so that they feel safe and secure.

Stones / Rocks / Gravel : Stones, rocks, and gravel help add natural texture to the substrate as well as helps break it up a bit so it's less likely to compact quickly. Of course, the substrate can still compact even with these additives but it's a much slower process.

Sphagnum Moss : The primary function of moss is to help create pockets of moisture in the substrate. This helps it dry out slower while also creating little underground hideaways for custodians.

Coco Coir / Husk : Similar to moss, the primary function of coco coir is to help retain moisture in the substrate. Unlike moss though, this is typically much more finely shredded and so can help create higher moisture content throughout the entirety of the substrate as opposed to small pockets

Substrates To Avoid

Please keep in mind that when you are creating or choosing your own substrate that you never want to use only one item (excluding pre-made blends) as the soil these animals found on is never made up of just soil. There are many components needed to create an enriching blend for our animals but even with that in mind there are some substrates that should be avoided.

Calcium Sand / VitaSand : Sand with added vitamins and minerals encourage the animal to eat the substrate. Geophagy is a common occurrence in nature, and is typically used to aid in digestion and mineral consumption. However, if your animal is in any way deficient in these vitamins and minerals it may encourage them to eat the substrate in excess if it is rich in what they are missing. Because of the way these synthetic sands are created, with their many additives, they do not behave the same way as regular sand in the digestive system. These sands tend to clump up much more easily, making it harder for the animal to pass any ingested substrate. As the sand sits in their gut it slowly neutralizes their stomach acid, causing further digestive issues, and then can cause irritation and swelling in the intestines. In extreme cases this all combines to create a higher probability of impaction regardless of husbandry.

Aspen : Aspen has long been a community standard for it's high combustion point (making it less likely to catch fire) and its ability to hold burrows. Unfortunately aspen is very dry, taking away the animal's ability to gain higher humidity while burrowing as they would in the wild (dry outer layer of soil, with moist lower layers below) and has a nasty habit of molding when wet at all. While its dryness can be seen as a selling point for arid species, it's too dry in most cases, making it harder for the keeper to maintain proper ambient humidity overall.

Crushed Walnut : Absolutely nowhere in the world is there naturally occurring crushed walnut shell in a reptile's habitat. This course material is small but can cause irritation of the intestines when ingested and passed, which can lead to inflammation and subsequent issues passing waste. It does not hold burrows, humidity, or replicate a natural texture in any way.

Wood Chips : While a great additive in some enclosures, they are not great as a base ingredient. They are very loose, do not hold burrows, and can cause irritation around the mouths of snakes due to their abrasiveness while slithering around.

Eco Earth / Coco Coir / Coco Husk As A Base : Eco Earth, Coco Husk, Coco Coir, are all pretty much the same materially. Some are finely milled like EE, while others are less so such as husk. Similar to walnut shells, this is not a naturally occuring substrate base. It tends to be incredibly dusty when dry, and holds too much moisture when wet, both being able to lead to respiratory irritation and/or infection in extreme cases. It doesn't hold burrows, and is not a natural texture. Great as an additive, but this should not be used as a replacement for soil.

Sterile Substrates Outside Of Quarantine : These would include paper towel, tile, reptile carpets, reptile rock mats, shelf liners, etc (more on the last three below). Many arid species of reptile are burrowing species, this is because arid environments tend to be relatively warm and dry, and one of the best ways to escape the heat and get a little more humidity would be to dig down into the earth. Not only do sterile substrates remove this ability to cool via burrowing, they also remove the ability to perform a natural behaviour that is oftentimes necessary for good mental health. Sterile substrate also tends to be dense and uniform in texture and elevation, which can be hard on joints in larger species, such as bearded dragons, having a negative impact on their physical health long term. While we do understand that not all are comfortable with full loose substrate right off the bat (there is a lot of scary misinformation out there!) we do highly recommend at least offering a dig box for your animal if not using loose substrate throughout the entirety of the enclosure.

Reptile Carpet / Reptile Rock Mats : These products are close to impossible to thoroughly wash and/or sterilize. Even a carpet that has been run through a washer machine is not fully sterilized. The carpets are also well known for catching tiny nails and teeth, whereas the rock mats are known for causing injury due to their abrasive texture.

Non Adhesive Shelf Liners : Shelf liners are probably the most well known sterile substrate. Join any reptile group and they will tell you it's cheap and easy to clean, and an easy long term quarantine or sterile substrate option, just be sure to use one without the toxic adhesive. They'll also tell you that they are perfectly safe to use as they are made from vinyl which has a high melting point of about 170°F/77°C meaning there is very little risk of off gassing. Unfortunately that's not entirely true. While it is true that vinyl has an incredibly high melting point, and it is the main material in shelf liners, it is not the only material in shelf liners. Vinyl is a very stiff and brittle material when in a thin sheet, in order to make it more malleable so it may roll up and be used as a liner there are various soft plastics added to it. These soft plastics unfortunately have an incredibly low melting point, and this is why most companies state that their liners should not be used with temperatures above average ambient temperature. On top of that, many (not all) are also not food safe, and we don't believe in housing an animal on a surface that we cannot safely eat off of.

Please check out our announcement on shelf liners, located in our terrestrial lizard groups and on the Advancing Husbandry business page. This contains a screenshot where one of the leading manufacturers in shelf liners states that their non adhesive line is both non food safe, and that they should not be used with temperatures above **80°F/27°C**! A very low temp indeed.

Humid Hide

The goal of the humid hide is to create an enclosed area of higher humidity so that the reptile can experience higher humidity when they choose to. For many species of reptile this acts as a way to aid in shedding, however some species (such as bearded dragons) dry shed and so a humid hide is not absolute necessity. You want a humid hide to remain humid, not wet.

Moss : Moss is a great material as it holds humidity well, is easily hydrated and rehydrated, and is readily available in a number of places such as reptile specialty stores, chain pet stores, hardware stores, gardening centres, and so on.
Tip! When using moss be sure to use some scissors to cut it up into smaller pieces. This is so if a couple pieces are accidentally ingested during shed, the reptile is able to safely and easily pass the small pieces!

Eco Earth : While not recommended as a base ingredient for the overall substrate in the enclosure, it can be a great option for humid hides! Many people find it holds humidity slightly longer than moss, and because it already comes shredded it doesn't need to be cut up. The downside to Eco Earth is that if it is allowed to fully dry out then it can become hydrophobic and be a total pain to rehydrate.

Paper Towel : Paper towel isn't the best option long term as it needs fairly regular rehydrating, and can sometimes be mistaken for shed if it begins to pull up during the shedding process (especially an issue for species who eat their shed). That being sad, it is a good option for quarantine and hospital setups as it's cheap and disposable.

Adding The Substrate To Your Enclosure

Once you get all your ingredients together it's time to mix! When using a basic mix that has set ratios (e.g. 70/30) it's best to use the scoop method. This is where you take a container of any size and then just count your scoops! For the basic mix this would mean 7 scoops of soil, and then 3 scoops of sand. Repeat until you have your desired depth. Some will do a crude mix in the enclosure, meaning it's not super thoroughly mixed so as to create different patches of texture (after all, nature isn't uniform), while others will thoroughly mix in a separate container to ensure everything comes together as intended. Both ways work!

For depth, you will want a minimum of 4-6" / 10-15cm however for burrowing species or for bioactive enclosures it's recommended to fit in as much as you can.