Muelsfell Multilayer Shader
DOCUMENTATION AND USER GUIDE

Contents

Introduction and Intended Usage

Thank you for your purchase of the **Muelsfell Multilayer Shader**!

This shader was designed to be used on large, expansive terrain pieces. Without this shader, texturing massive terrain meshes can often be prone to extremely large and memory intensive images, or very noticeable repeats due to tiling smaller textures.

The **Muelsfell Multilayer Shader** lets you stack multiple layers of tileable images, by masking them out with alphas to reduce both noticeable repeats and extreme texture memory usage. The ability to tile layers independently of the masks allows you to tweak as appropriate for close-up or distant renders.

If you're a novice and have no intention of diving into complex shaders or creating your own texture masks, not to worry -- this product contains three large, detailed tileable sample terrains which are ready to be placed into a scene and rendered.   Use and enjoy these varied pieces, and as you experiment with the shader parameters you may find yourself learning how to use the shader all on your own.

If you're a more advanced user or a content creator, you'll want to read on to learn how to incorporate this shader into your own creations. The more comfortable you are with how the shader works and how to create custom greyscale masks, the more elaborate your final texture work will become.

Understanding UV Mapping

To get the most out of the options available in the Multilayer Shader, it's important to understand how UV Mapping works.

The most basic way to explain UV Mapping is to imagine a box that you wanted to turn into a birthday gift. You would start with a flattened sheet of colourful wrapping paper, then wrap that around the box to cover all sides. If you carefully unwrap the gift, then you would be able to flatten the paper again.

3D meshes are textured in a very similar fashion. Fully detailed models might include all sorts of parts -- arms, legs, eyes, handles, wheels, bars, and so forth -- but on the UV layout, they would appear flat.
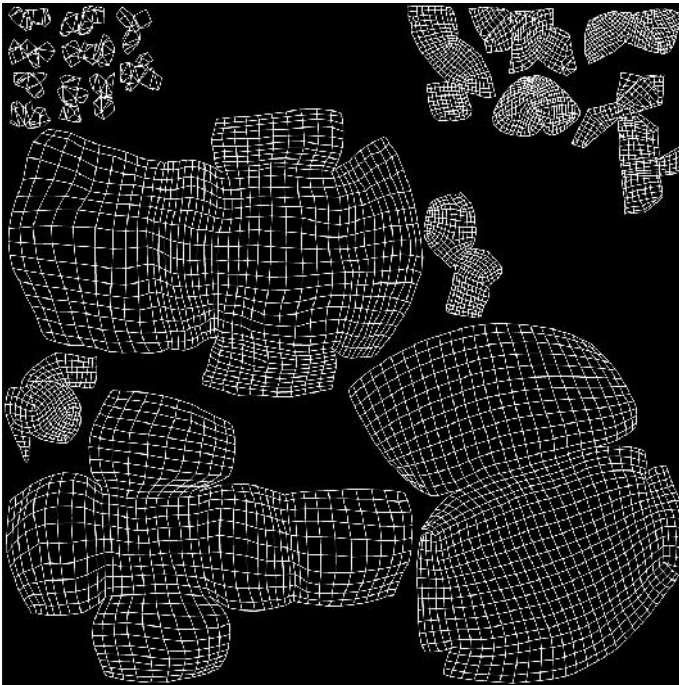
Shown is an example of the rocks and boulders used on the terrains to show how a model might be flattened on a UV map.

The **Muelsfell Multilayer Shader** uses texture masks to define how the layers are applied over one another. Models that do not have UV Mapping will not be able to make effective use of the Multilayer Shader.

The parameters for the layer masks use the entire UV Map, as if a flat plane had been spread out to fill the entire texture space.

Almost all models you use in Daz Studio will have UV Mapping, so in most cases this will not be a problem. However you should be aware that the Daz Studio primitives do not always use the entire UV Map area, so this can create unwanted results.

Layer Stacking

Now that you understand UV Mapping, it's time to learn how this shader blends different textures together.

This is an image of one of the sample terrains from the product. Notice how there are multiple textures all over the terrain, ranging from dirt and mud in the chasm, to a dark rock up the sides of the slope, and grassy vegetation scattered along the top.
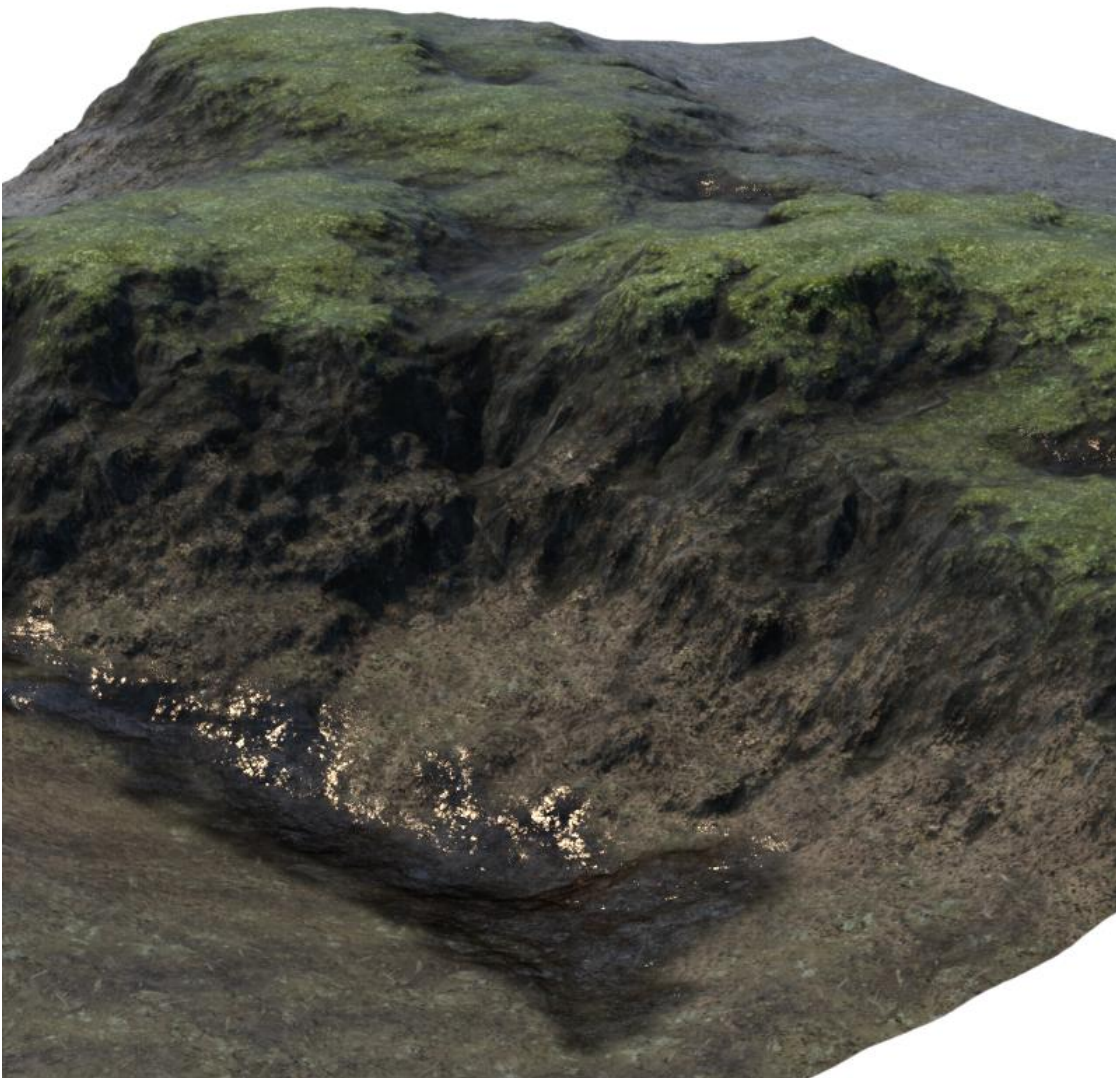
How the Layering Works

Each of the texture areas are defined by a black and white Global Mask.   Each mask covers the entire model across the maximum UV space. Black areas are hidden, while white areas are visible.

Here's the same terrain, only with solid colors to show the individual areas each mask controls. The Global Wetness Top Coat -- visible in the previous image as wet ground at the bottom of the chasm -- is not shown for simplicity's sake.   We'll get to that later.
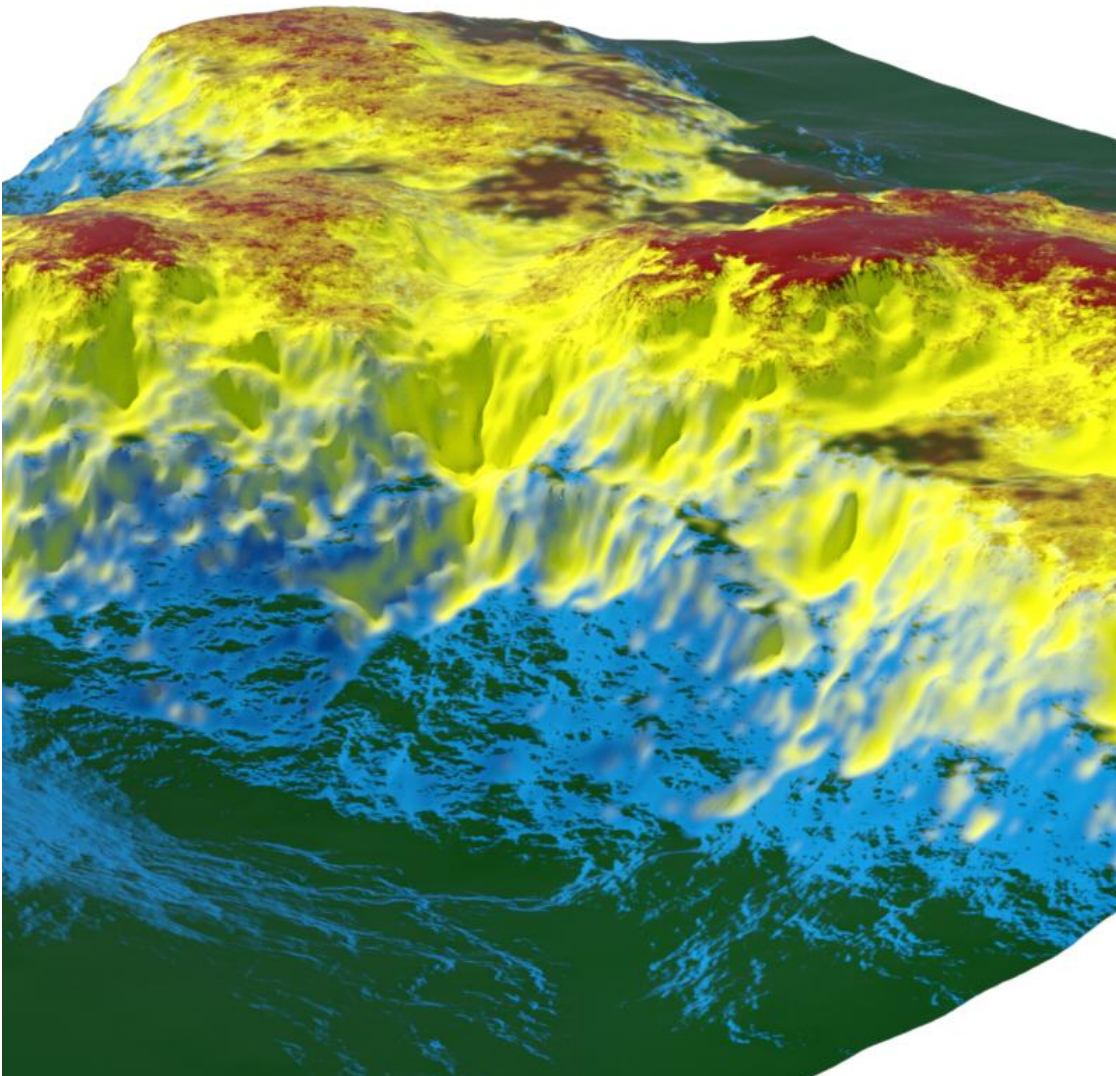
Another way to visualize how this shader functions is to imagine the entire surface flattened, and each layer seperated slightly to illustrate each layer in the stack.
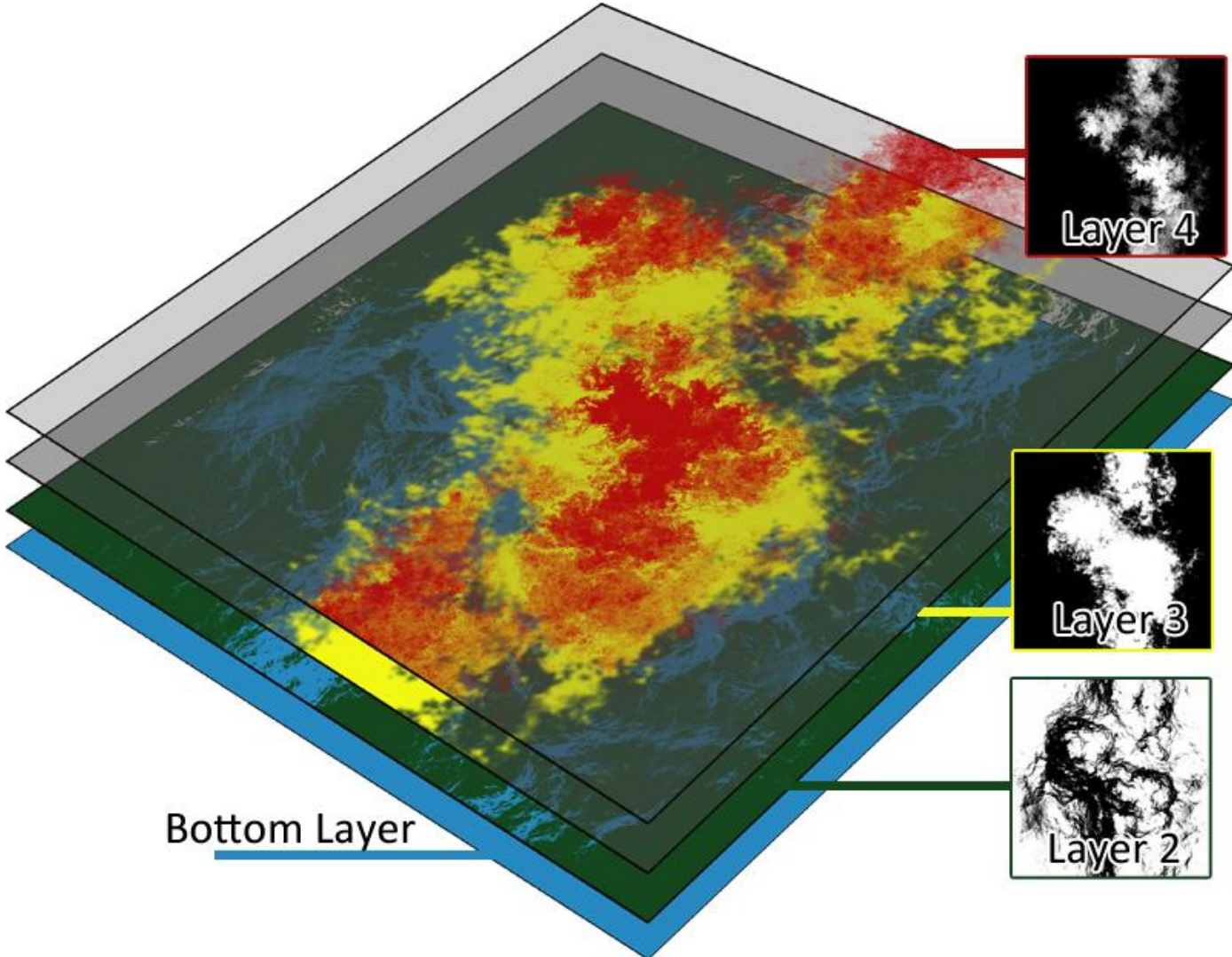
How the Layering Works

First there's the Bottom Layer, shown in blue. This layer covers the entire model. There is no need for a mask on the bottom layer as later layers will stack on top of it, covering and replacing all the elements of that layer such as base color, roughness, and normal maps. A good way to look at the Bottom Layer is to consider it the Base or Default Layer.

Next in the stack is Layer 2, which lies directly on top of the Bottom Layer. Layer 2 is represented in green in the diagram on the previous page.

This layer is driven by the Layer 2 | Layer Mix Weight parameter. It works identically to the Bottom Layer, except any textures on this layer will only appear where the mask allows them.

Above Layer 2 is Layer 3, shown in yellow. The higher the number, the closer to the top the layer is.   Layer 3 is driven by the Layer 3 | Layer Mix Weight parameter.

As you probably can guess by now, above Layer 3 is the top most texture layer, Layer 4. This layer is shown in red and is driven by its own Layer Mix Weight parameter.

Both Layers 3 and 4 work the same as Layer 2, covering up whatever is on layers beneath them and replacing those textures with their own.

Sub options such as diffuse, normal, roughness, etc will only appear on Layers 2, 3 and 4 if a mask image is plugged into the Layer Mix Weight parameter with the dial set to any positive non-zero number. Typically this would be a value of 1.

These masks define the individual layers.   Each layer can have its own base color, roughness, normal maps, and so forth.

In addition, the layers can be tiled.

Tiling Layers

All the layers tile together as if they were one, independent of the masks. This allows you to adjust the resolution of the textures as needed for close up or distant renders.

This does not change the position of any layer masks. Areas that are masked out will not shift to other parts of the model; only the resolution of the textures on the layers changes.
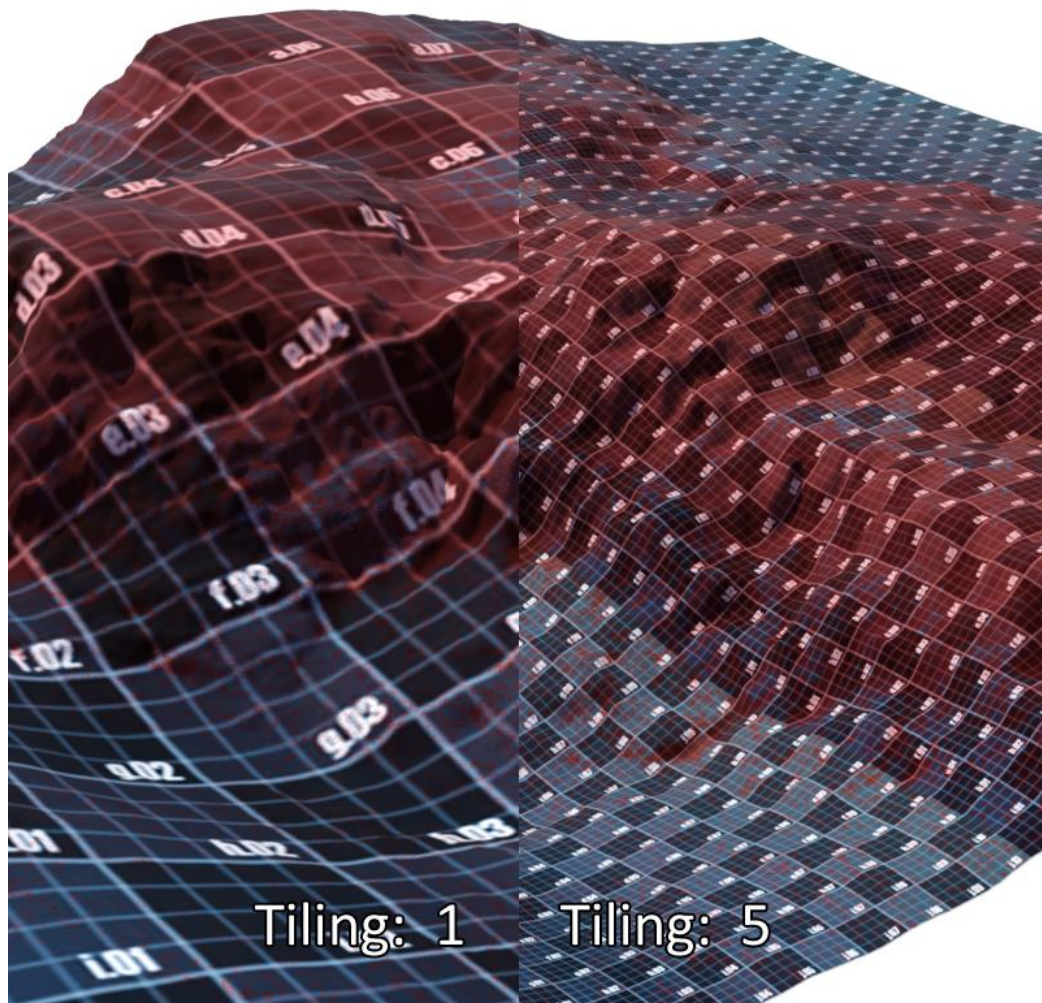
How the Layering Works

The shader uses specific terminology for the various parameters, to help make it easier to understand which setting is affecting what options.

GLOBAL settings use the entire UV Map and do not tile. The exception to this is the optional Micro Normal parameter, which can be tiled independently of everything else. More on that setting later in this documentation.

LAYERS settings affect all the layers. This term is only used for the tiling parameters.

Each layer is identified by name and color for its individual settings.

Note that the preview window in Daz Studio will not display changes to any other layers except for the Bottom Layer. You can use the NVIDIA Iray preview to view changes to all layers as you make them, or periodically render a small sized image as you go.

Creating Layer Masks

The key to blending the various layers together is the layer masks. Since there are an endless variety of possibilities, you will need to create your own to match your project. The masks you create will depend on what you intend to do with the shader.

Masks should be **greyscale** images. White areas will show the layer, while black areas will hide the layer. Shades of grey will let some of the color of the layer pass through.
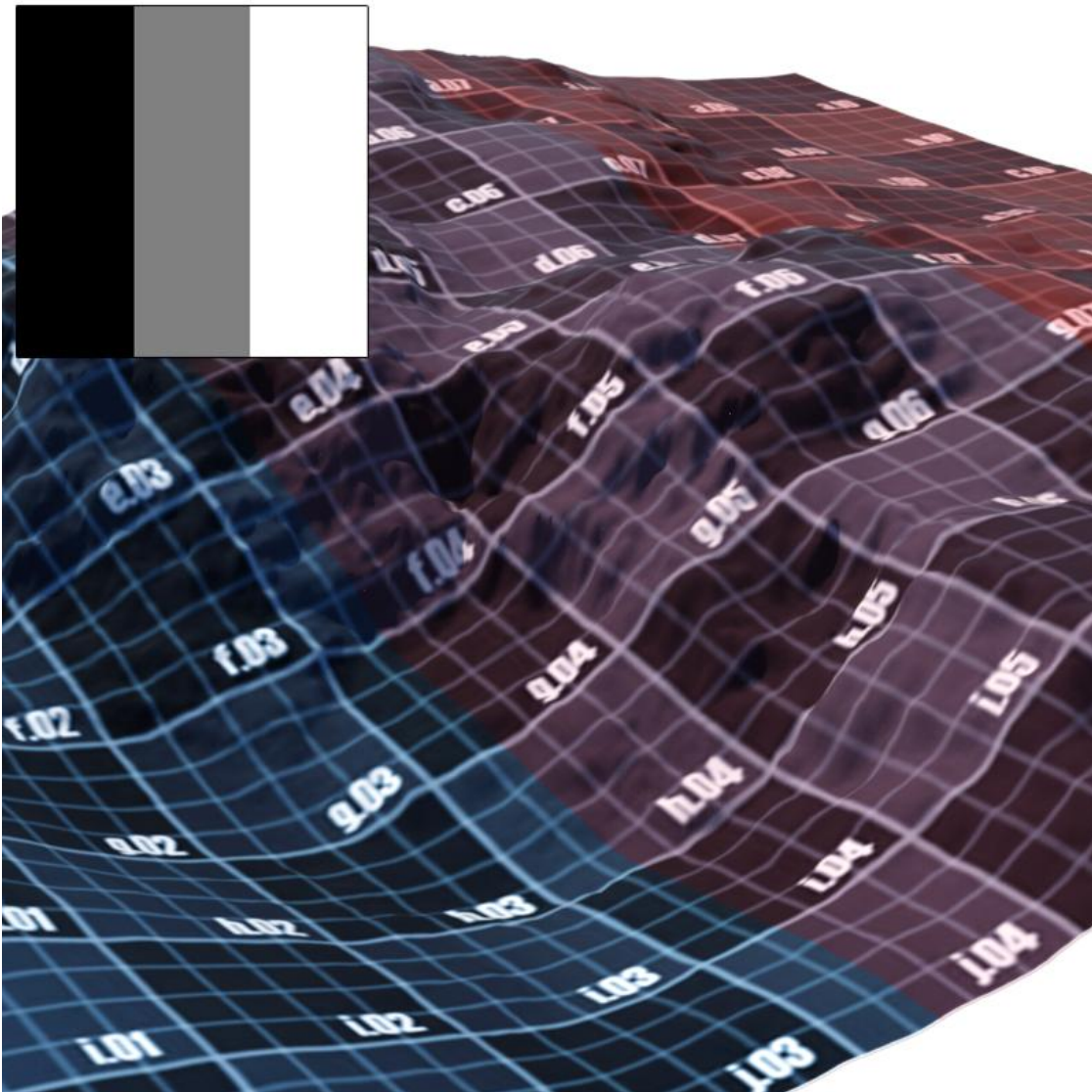
This product includes some sample masks to get you started. These will work fine for simple meshes with UV Mapping, and are great for quickly tossing together an environment from primitives.

You can find these sample masks located in:

```
Runtime\Textures\EArkham\muelsfell\multilayer_shader_terrain
                        \SAMPLE_MASKS
```

You can also hand paint your own masks in any painting software, such as Photoshop, Gimp, or Krita.

The real strength of this product however is being able to use masks generated from high poly meshes and 3D painting software such as Substance Painter, 3D Coat, Mudbox, or ZBrush. Combined with well made tiling textures this will let you create some extremely detailed surfaces.

Almost any black & white texture you create in any of the programs above can be used as a layer mask for different effects: Ambient Occlusion, Displacement, Thickness, Height, Altitude/Elevation, etc.

 To get a basic understanding of how the shader uses the alpha masks, it's wise to start simple. Included in the sample masks is a series of simple checkboard patterns, with and without numbered squares. Use these until you understand how the shader layers interact with one another, then move on to creating your own advanced masks in your software of choice.

The Bottom Layer

These settings are for the bottom, or base, layer. Everything set here will appear to be "below" the other layers.

For the most part, these parameters work very much like the standard Iray shader. All of these parameters only apply to this particular layer.
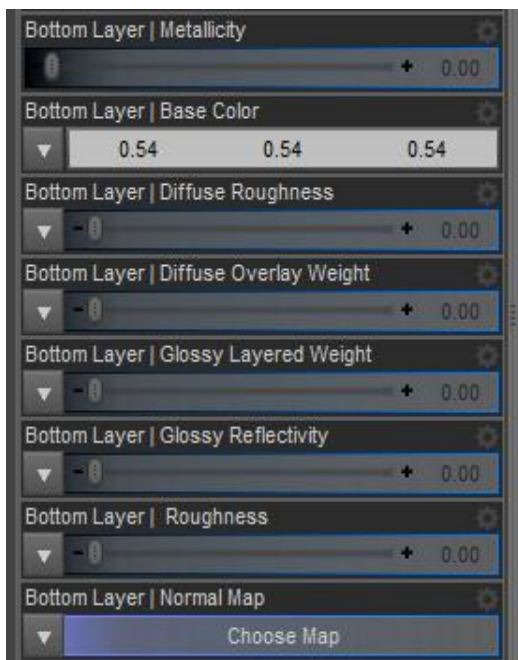
Metallicity: This controls the level of the metallicity of the layer.   Metallicity is only available for the two bottommost layers and texture maps are not available.

Base Color: Use a base color, albredo, or diffuse map here, or set a solid color. Remember this will be the texture that appears underneath all other texture layers.

Diffuse Roughness: Controls how light is reflected or absorbed by the material. This is useful for refining very matte surfaces, such as concrete or dry stone, compared to smooth surfaces like plastic or glass.

Diffuse Overlay Weight: An optional parameter useful for additional grit, dirt, or variations.

Glossy Reflectivity: Optional parameter that provides an additional control over how reflective the base surface is. In general, this should be left at 0.00 unless you have authored a specific texture map to control it.

Roughness: This parameter controls which parts of the surface are matte (rough) and which parts are reflective (smooth).

Normal Map: This parameter requires a map and determines how "bumpy" your surface will appear. Without a normal map, your surface will look smooth and flat.

Greyscale Bump/Height maps have been deprecated for the Multilayer Shader, as the information included in such maps is mostly redundant with a properly authored Normal map, and using an excessive number of texture maps on a single surface can overload the Iray render.

For your average terrain, the most important parameters will be **Base Colour**, **Roughness**, and **Normal Map**. You will be able to create a wide variety of appearances with just these three options.

The next most important parameters will be **Metallicity** and **Diffuse Roughness**. Refine these options if you're not able to achieve the look you're after with the basic parameters.

Finally, **Glossy Reflectivity** and **Diffuse Overlay Weight** are rarely used but available for advanced users and unique situations.

Please note that the Iray renderer in Daz Studio has a limit to the number of the texture maps that can be used on a single surface. Using a texture map in every possible parameter can easily result in rendering problems, so it's **strongly** recommended that you only use texture maps in the slots that are critically important to get the results you want.

The Bottom Layer is available in the Multilayer Shader x4 and Multilayer Shader x2, and referred to as the Base Layer in the standalone Macro/Micro Shader.

The Shader Parameters

The Global Controls

These settings govern all the stacked layers, in essence the "global" controls. Changing these settings will affect all layers equally, or apply across the entire mesh.

GLOBAL | Cutout Opacity: This works similar to the parameter of the same name in the default Iray shader. Place a greyscale mask here to "cut out" portions of the geometry, with no refraction or translucency. One of the more useful things you can do with this parameter is create piles of debris, dirt, or rubble that blend more realistically when placed on other terrain pieces.

Note that Daz Studio does not show you a preview of where the cut out will be. You will need to render or use the Iray preview mode for the effects of this parameter to be visible.

LAYERS | Horizontal & Vertical Tiles & Offsets: These control the tiling and offset of all the layers. Note that all the layers -- Bottom Layer, Layer 2, Layer 3, Layer 4 -- tile together as one.

The Shader Parameters

The Macro/Micro Controls

The Macro/Micro parameters allow you to add increased normal resolution to your surface. These are optional controls.

GLOBAL | Macro Normal: This parameter lets you apply a global normal across the entire surface which will be blended over the normals provided by individual layers. As with other Global settings, this applies across the entire UV surface.

An example use case would be when you have a high resolution mesh created in a third-party program such as ZBrush, Mudbox, or 3DCoat and wish to bake those details into a normal map. This slot is where you would place such a baked high resolution normal, and it will be applied on top of the normals of the tileable layers.

GLOBAL | Micro Normal: This option works similar to the Macro Normal, but is intended to be used with very fine detail normal maps. Micro Normal has its own tiling which is **independent** of other layers.

An example use case would be where you have some very fine detail in a tiling normal map that you would like applied across your surface, such as leather or cloth details that would be lost if used in a larger normal map.

GLOBAL | Roughness Squared: This works identically to the default Iray Shader parameter of the same name. It affects all layers.

The Shader Parameters

Layer 2 Settings

These settings affect the next layer in the stack, above the Bottom Layer but the third layer from the topmost.

All of these parameters function identically to those on the Bottom Layer. They only affect the textures on Layer 2.

Layer 2 | Layer Mix Weight: This is the parameter for the mask that determines where this layer is visible. It requires a texture, and the options of Layer 2 will not appear until a greyscale texture map is insert and the value dialed up above zero.

Once a texture is in place, the dial can be adjusted from 0% to 100%. This dial affects the overall visiblity. In general, you would want to set this to 100%, though there could be some cases where a partial 50% or 75% setting might be useful, depending on the effect you want to achieve.
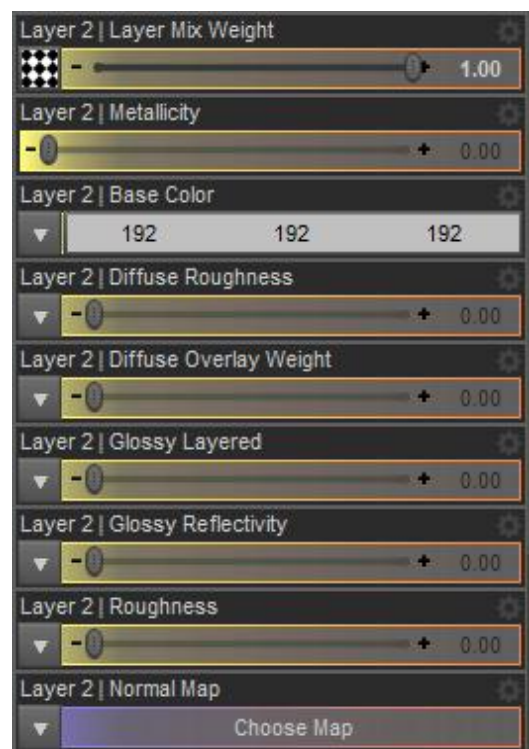
Layer 3 Settings

These settings affect the next layer in the stack, above Layer 2 but the second layer from the topmost.

All of these parameters function identically to those on the Bottom Layer and Layer 2. They only affect the textures on Layer 3. It requires a mask to define the layer mix weight, and for the parameters to appear.

As such, you should plan where you need your metallic settings carefully. In general, if you're using this shader for terrains, you shouldn't need many metallic maps.

Layer 3 | User Underlying Normals: This is an optional toggle. When turned on, this layer will not use any normal maps assigned to it and instead allow the normal maps on the lower levels to pass through.

Note that if this option is turned on but does not have any normal maps assigned, then it will replace lower layers with "blank" normals, the result of being a single solid colour.

The Use Underlying Normals option is useful if you want create fake shadow maps, to make subtle changes to color and roughness, or to overlay a design or pattern without affecting the normals on the lower layers. It can also be used to save on texture map slots.

Layer 4 Settings

These settings affect the topmost layer, the one that lies above all the others.

All of these parameters function identically to those on the Bottom Layer, Layer 2, and Layer 3. They only affect the textures on Layer 4. This layer also requires a mask texture to define the layer mix weight.

As with Layer 3, the Metallicity parameter is unavailable.

As with Layer 3, Layer 4 includes a **Use Underlying Normals** option. It behaves identically to the parameter found in Layer 3, but only applies to Layer 4.

Global Wetness Top Coat Map

Stacked on top of all the other layers is the Global Wetness Top Coat. This works almost identically to the Top Coat parameters in the default Iray shader, but some options can not be assigned texture maps. The Wetness Top Coat parameters are optional settings.

The most important distinction is that this layer applies globally across the entire UV map.

With these options, you can create the illusion of wet ground/mud, leaks, slime, etc independent of the underlying texture layers.

This layer requires a mask in the Wetness Top Coat Weight parameter. As with layer masks, this can be dialed from 0% to 100%.

Be very conservative when setting the values here. A small amount of "wetness" goes a long way.

The Shader Parameters

Layer 4 Emissive Settings

Exclusive to the Muelsfell Multilayer Shader Emissive shader, these settings are similar to those found on the default Iray shader.
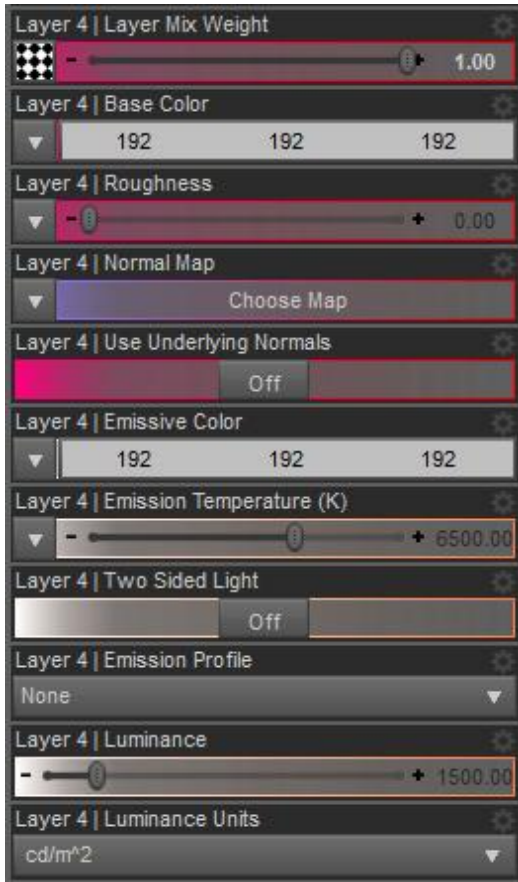
The Layer 4 settings include Base Color, Roughness, and Normal map options, but no options such as Diffuse Overlay or Glossy Layered.

As with the Layer 3 and Layer 4 options on other shaders, this one also includes a Use Underlying Normals parameter.

However what's different about this shader is the option to make Layer 4 behave as an Emissive.

Emissive Color, Emission Temperature, Two Sided Light, Emission Profile, Luminance, and Luminance Units all work as they do on the standard default Iray shader. These emissive parameters will not appear unless there is a non-black colour selected for the Emissive Color parameter.

All of the emissive light coming from this surface will be limited to what is masked off in the Layer Mix Weight parameter. It also tiles according to what's set in the LAYERS | Horizontal & Vertical Tiles parameters, and the LAYERS | Horizontal & Vertical Offset parameters.

Typically this would be to simulate magma or other hot surfaces, or special effects such as glowing grass or dust motes.

The Muelsfell Shader Suite

The Muelsfell Multilayer Shader x4

This is the primary shader. It is identical to the Muelsfell Multilayer Shader x4 LITE version in every way.

Included in this shader are the Bottom Layer, the Global Controls, the Macro/Micro options, Layer 2, Layer 3, Layer 4, and the Global Wetness parameters.

The Muelsfell Multilayer Shader Developmental Rainbow is identical to the x4 Shader but simply has colors preset in the Base Color to make it simple and easy to determine the effects of your greyscale masks.

The Muelsfell Multilayer Shader x2

This is a pared down version of the x4 shader, should you only need two tiling layers and wish to avoid using any more resources than necessary.

Included in this shader are the Bottom Layer, the Global Controls, the Macro/Micro options, Layer 2, and the Global Wetness parameters.

The Muelsfell Macro/Micro Shader

This shader behaves very similar to the standard Iray shader but includes the Muelsfell Macro/Micro shader options.

Included in this shader are the Base Layer (identical to the Bottom Layer), the Global Controls, the Macro/Micro options, and the Global Wetness parameters.

The Muelsfell Shader Suite

The Muelsfell Multilayer Shader Emissive

This is a variant of the core x4 shader. In addition to having three layers and a pared down fourth layer, it includes emissive light settings.

Included in this shader are the Bottom Layer, the Global Controls, the Macro/Micro options, Layer 2, Layer 3, a simplified Layer 4 with Emissive options, and the Global Wetness parameters.

Large Terrains

This is the primary use case and the reason this shader was created.

Large terrain meshes have always been difficult to texture. If you try to use a large texture to cover the entire mesh, you will either lack the resolution to get in to close to the terrain, or quickly end up with a texture that uses up too much memory. If you use tiling textures, you can get high resolution close up with lower memory consumption, but then you'll notice the pattern repeating unnaturally when too much of the terrain is in view.

The Muelsfell Multilayer Shader solves these issues by combining both methods into one: textures are tiled in up to four layers, with alpha masks breaking up any obvious repeats.

This is an example from the **ZWorld Winter Gas Station** set. An earlier version of the shader was used on the parking lot to seamlessly blend snow, ice and wet pavement to create a cohesive terrain piece that looks great closeup and far away. With the addition of grass and other details, terrain can become fairly impresive.

Weathered Objects

Although the shader has been designed for large terrain meshes, it can also be used on traditionally UV mapped objects.   Care should be taken when creating such meshes to avoid seams if you wish to use the tiling features available.

Even if you do not use the tiling features, the Multilayer Shader can be quite powerful in this situation.

In this example, the Multilayer Shader is applied across the rear wall of the **ZWorld Winter Gas Station**.   There are two tiling textures: a "clean" concrete block, and a "dirty" concrete block.   The lower green paint on the wall and all the weathering are handled solely by masking layers.

Example Uses

Debris, Dirt, and Rock Piles

By adding a cutout opacity map, you can turn terrain into debris piles.

Ambient Occlusion and Faking Shadows

If you bake an Ambient Occlusion map for your object, you can use the Multilayer Shader to create the illusion of shadows, add definition to make the model stand out in the scene, or create interesting lighting effects.

Surface Appears Faceted Even with Smoothing

PROBLEM: When rendering, the surface with the Multilayer Shader appears faceted (see image below). This occurs even if surface smoothing is set to ON.

SOLUTION: Remove unneeded or excessive texture maps.

Iray has a hard limit on how many BSDF slots can be used, which means there is a maximum number of texture maps that can be used on any particular surface. This limit can not by bypassed.

All texture maps ranging from diffuse to normal to alpha maps count towards this limit. If the limit is exceeded, renders can appear faceted.

The Multilayer shader and its variants are designed so that they can fulfill typical use cases while remaining under the Iray texture map limit.

However due to the extra options in the Multilayer shader, it is possible for a user to exceed this limit simply by plugging in a map into all available texture slots.

A recommended use case would include diffuse, roughness, and normal maps on all four layers plus a macro and micro map, or diffuse, roughness, and normal maps on all four layers plus a wet map.

The solution if faceting occurs is to remove unneeded or redundant texture maps. For example, Diffuse Roughness and Diffuse Overlay maps should generally not be needed, and certainly won't be needed on multiple layers, so should be the first to be removed.

While you can use the shader to have diffuse, roughness, and normal maps on all four layers, plus a macro and micro map, **plus** a wet map, be aware that you are pushing the limits of the shader and will likely run into faceting if maps are put into more than those slots.

Surface Appears an Extreme Bright White

PROBLEM: When rendering, some of the surface with the Multilayer Shader appears bright solid white (see image below). This occurs even if there are colors or maps plugged into the base color parameters.

SOLUTION: You are either using an old version of the Muelsfell Multilayer Shader or an older version of Daz Studio.

It is recommended that you make sure you are using the latest version of the Muelsfell Multilayer Shader product, and upgrade to Daz Studio 4.15 or later.

Nested Layer Parameters Don't Appear

PROBLEM: Despite having a texture map mask in a Layer Mask Weight parameter and having it dialed up to 1, the sub-options such as Base Color, Normal, etc still do not appear.

SOLUTION: This shader functionality is only available in Daz Studio 4.15 or later. First, make sure you are upgraded to the most recent version of Daz Studio.

This error can also sometimes occur if you use Daz Studio's built in functionality to *Copy Selected Surface(s)* from another surface with a different shader and then try to *Paste Selected Surface(s)* to the Muelsfell Multilayer Shader.

In those cases, if the Copy & Paste results in this error, you will instead need to reapply the Muelsfell Multilayer Shader of choice and then manually assign the texture maps and settings from the other shader to the Muelsfell Multilayer Shader surface.

Usage Rights

Included in this product are a set of four shaders, located in the following directory in your content library:

📁 Shader Presets\Multilayer Iray Terrain Shader\Merchant Resources\

They are:

- Multilayer Shader x2
- Multilayer Shader x4
- Macro Micro Shader
- Multilayer Shader Emissive
- Developmental Rainbow

The Developmental Rainbow shader is identical in all ways to the Multilayer Shader x4, with the addition that base colors are pre-assigned to the layers. This will make it easy to see exactly what effect your masks are having on the final texture.

These shaders are available to be used in commercial products. It should be noted that **ONLY** the four shaders located in the Merchant Resources folder are to be considered Merchant Resources.

The sample terrains, textures, presets, and material settings located outside this directory are **NOT** merchant resources, and may **NOT** be included in commercial products.

You may **NOT** redistribute the Merchant Resource shaders in part or whole in any collection or product that is being distributed for free. You must charge for any product that uses these shaders.

You may **NOT** modify these Merchant Resource shaders, either in the Daz Studio Shader Mixer or through modifying the parameter tags, appearance, and function, except for personal, private, non-redistributed use.

Attribution is not required.

Usage Rights

If you wish to use the Multilayer Shader in your own product, please read the following carefully as the Usage Rights have changed with the update to Daz Studio 4.15+.

To use this content in your own product:

- You **MUST** have purchased the full version of the Muelsfell Multilayer Shader to use any of the shaders in your products, but you do **NOT** necessarily need to require the full version (see below).
- Choose the Merchant Resource version of the shader you want and apply it to the material zones where you want to use it
- Save your asset with the shader applied as you normally would to prepare it for release (eg, Save As Support Asset, Save As Figure/Scene Subset, etc)
- Optionally save Material presets in an appropriate folder
- The Muelsfell Multilayer Shader parameters should work whenever you load up the asset or apply the material preset
- Make sure your product **requires** the appropriate version of the Muelsfell Multilayer Shader in the PA submission QC pipeline (see below).

The Muelsfell Multilayer Shader asset definition is required for the shader and materials based upon it.   As such, any products that use the Muelsfell Multilayer Shader should include one of the following products as a "Required Product."

If you use the Multilayer Shader x2, Multilayer Shader Emissive, or Macro Micro Shader in your product, **Muelsfell Multilayer Iray Terrain Shader** (SKU 60675) should be a "Required Product."

If you use the Multilayer Shader x4 in your product, either **Muelsfell Multilayer Shader LITE** (SKU 81048) or **Muelsfell Multilayer Iray Terrain Shader** (SKU 60675) should be a "Required Product."

You do not have to choose both, and it is preferable to choose SKU 81048 since this product is priced accordingly to ensure a low bar to entry for customers.

The template script used to open this documentation from with Daz Studio can be found here:

http://docs.daz3d.com/doku.php/public/software/dazstudio/4/referenceguide/scripting/api_reference/samples/general_ui/display_document_dynamic/start

The version included in this product was modified to point to the PDF you are reading now.