MicroSplat

Overview

The MicroSplat decal system allows you to project texture onto a surface. Unlike traditional decal systems, the MicroSplat decal system works entirely within the MicroSplat shader system, allowing it to do things like modify the splat map data or fx maps (wetness, etc) as well as traditional style decal effects.

Comparison to Traditional Decal Systems

The MicroSplat decal system is pretty different from a traditional decal system. The three common approaches to decals are:

- Geometric Decals. These involve creating a new mesh which matches the topology they are projected onto

- Deferred Decals. These only work in deferred rendering, and work by modifying the values in the GBuffer

- D-Buffer. These use a separate buffer to render decals into and composite with the scene.
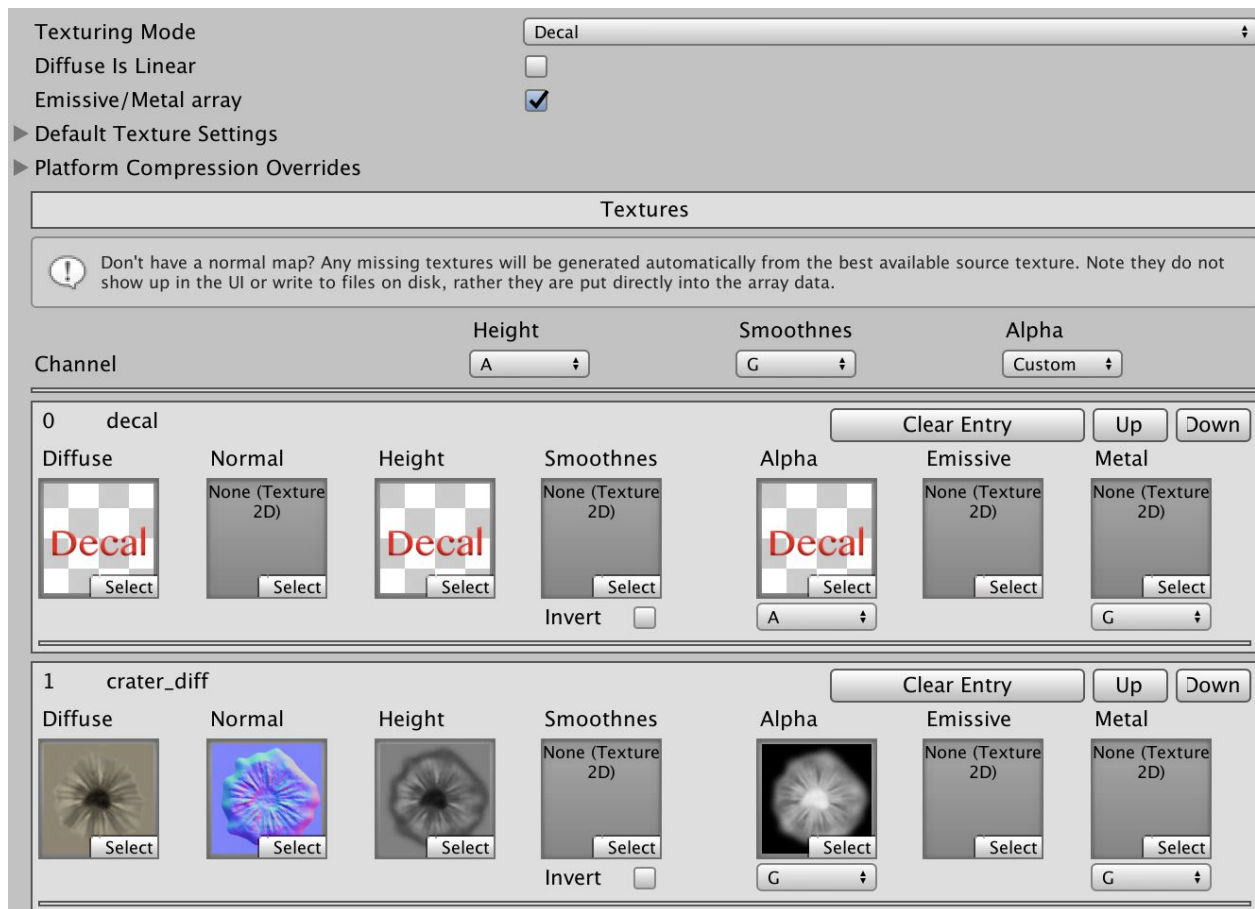
Each of these systems has certain disadvantages, such as only working in certain rendering modes, being computationally expensive to compute when moving, only allowing certain types of blends, projecting on things you don't want them to, or not being able to modify certain data such as normals. Further, since most of these systems project over another shader, they can only work on top of the existing material, and are not covered by things like snow fall.

MicroSplat's decal system does not have these disadvantages - it runs in any rendering path, can potentially modify any parameter of the MicroSplat surface it's on, correctly integrates other effects like snow over decals, does not require expensive full screen buffers, and does not need to generate geometry at all. However, MicroSplat's decal system only works with MicroSplat's shaders, so if you want to project onto non MicroSplat shaders you would need to use another system.

Getting Started

MicroSplat's decal system, like much of MicroSplat, works with Texture Arrays. You can have up to 32 decals packed into a texture array to use on a given MicroSplat material. If you haven't created decal textures already, you can skip this section and use the included example textures for experimentation.

To pack your textures, you will need to create a TextureArrayConfig from the right click context menu in your project's browser (Create->MicroSplat->Texture Array Config). It is recommended to create this in the MicroSplatData directory with your terrain. Once created, give it a name like "Decals".

Texturing Mode   Decal   ⬍
Diffuse Is Linear   ☐
Emissive/Metal array   ☑
▶ Default Texture Settings
▶ Platform Compression Overrides

Textures

ⓘ Don't have a normal map? Any missing textures will be generated automatically from the best available source texture. Note they do not show up in the UI or write to files on disk, rather they are put directly into the array data.

	Height	Smoothnes	Alpha
Channel	A ⬍	G ⬍	Custom ⬍

0   decal   Clear Entry   Up   Down

Diffuse	Normal	Height	Smoothnes	Alpha	Emissive	Metal
Decal	None (Texture 2D)	Decal	None (Texture 2D)	Decal	None (Texture 2D)	None (Texture 2D)
Select	Select	Select	Select	Select	Select	Select
			Invert ☐	A ⬍		G ⬍

1   crater_diff   Clear Entry   Up   Down

Diffuse	Normal	Height	Smoothnes	Alpha	Emissive	Metal
			None (Texture 2D)		None (Texture 2D)	None (Texture 2D)
Select	Select	Select	Select	Select	Select	Select
			Invert ☐	G ⬍		G ⬍

At the very top of the texture array config, set the Texture Mode to "Decal". You can then provide the various images for creating the texture array. Note that the array has entries for height maps and alpha maps, but Ambient Occlusion is generated automatically from the normal map.
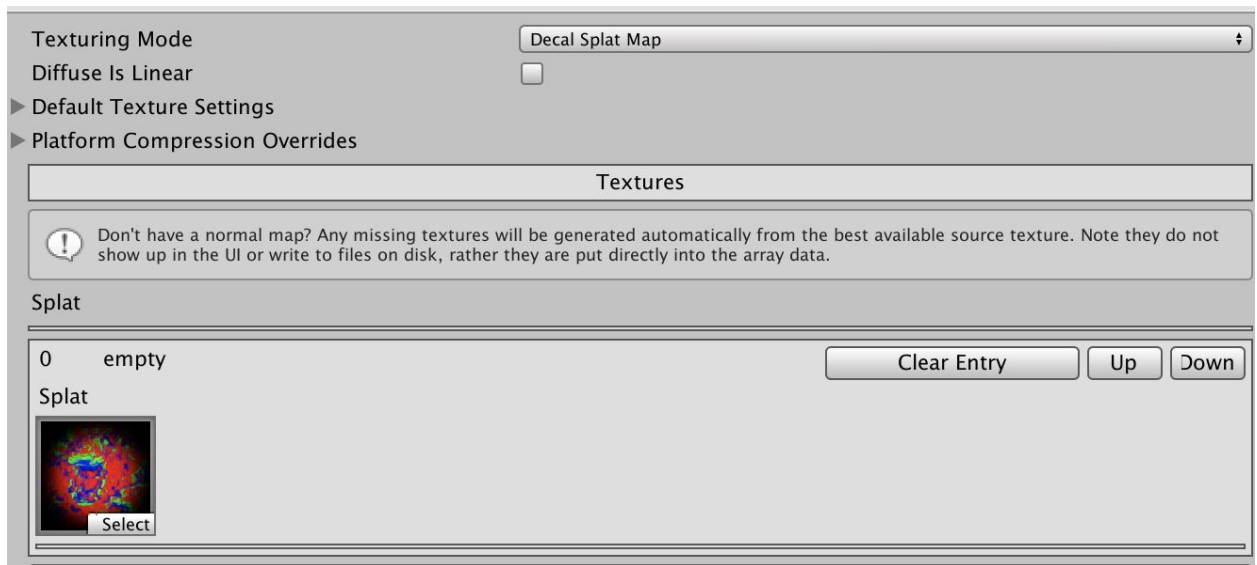
Another mode "Decal Splat Map" is available for packing splat map based decals. A Splat Map texture provides a 4 channels, which can be used to select different textures where the decal is placed, or modify the wetness(R)/puddles(G)/streams(B) and lava(A) levels where the decal is placed if you have the Streams module installed.

Once you textures are set, you will need to press the Update button to generate the arrays.

Material Options

Once the texture arrays have been packed, you will need to turn on the decals feature in the MicroSplat materials Shader Generator section:

Once enabled, you can select additional options.

- Max Dynamic

    - This sets the upper limit on how many fully dynamic decals can be on a MicroSplat material at once. Higher values have higher performance cost, so keep this as low as possible. If you do not need dynamic decals, you can turn this off. Note that values over 32 may not compile on some APIs, due to limits with shader loop unrolling.

- Max Static

    - This lets you set the maximum number of static decals per MicroSplat material. Static decals are more expensive to move, but have a fixed rendering cost. The only cost of increasing this value is a small amount of memory.

- Effect Diffuse/Normal

    - When enabled, the decals can affect the diffuse, normal, smoothness, and ao values of the surface they are on.

- Support emissive/metallic map.

    - When this is enabled, you can use a separate emissive/metallic texture array to give decals emissive or metallic properties

- Effect Splat Maps

- When enabled, you can assign a splat map array, allowing you to modify the underlying splat maps or fx data (wetness levels, etc)

- Effect Displacement

    - When enabled, decals will be computed in the tessellation stage, allowing them to adjust the surface displacement as well.

- Decal Tint

    - When enabled, each decal instance can have it's own tint color
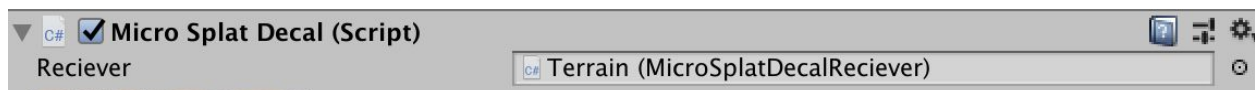
Once your options are selected, you will need to assign the texture arrays to your material:
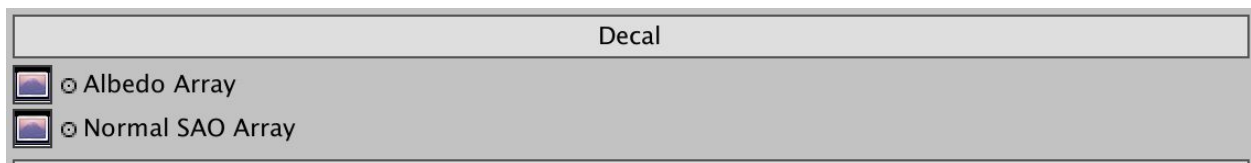
If the splat map mode is active, a splat map array will also be available.

Decal Editing

You can create a new decal by going to Window->MicroSplat->Create Decal, or adding a new game object to the scene and assigning the MicroSplatDecal component to it.

The first thing you will want to do is assign your decal a decal receiver. To turn a MicroSplat terrain into a decal receiver, simply add the MicroSplatDecalReviewer Component to your terrain. The same can be done for other MicroSplat objects, like Mesh Workflow's, etc. Once added you will be able to assign this decal to project onto that terrain.
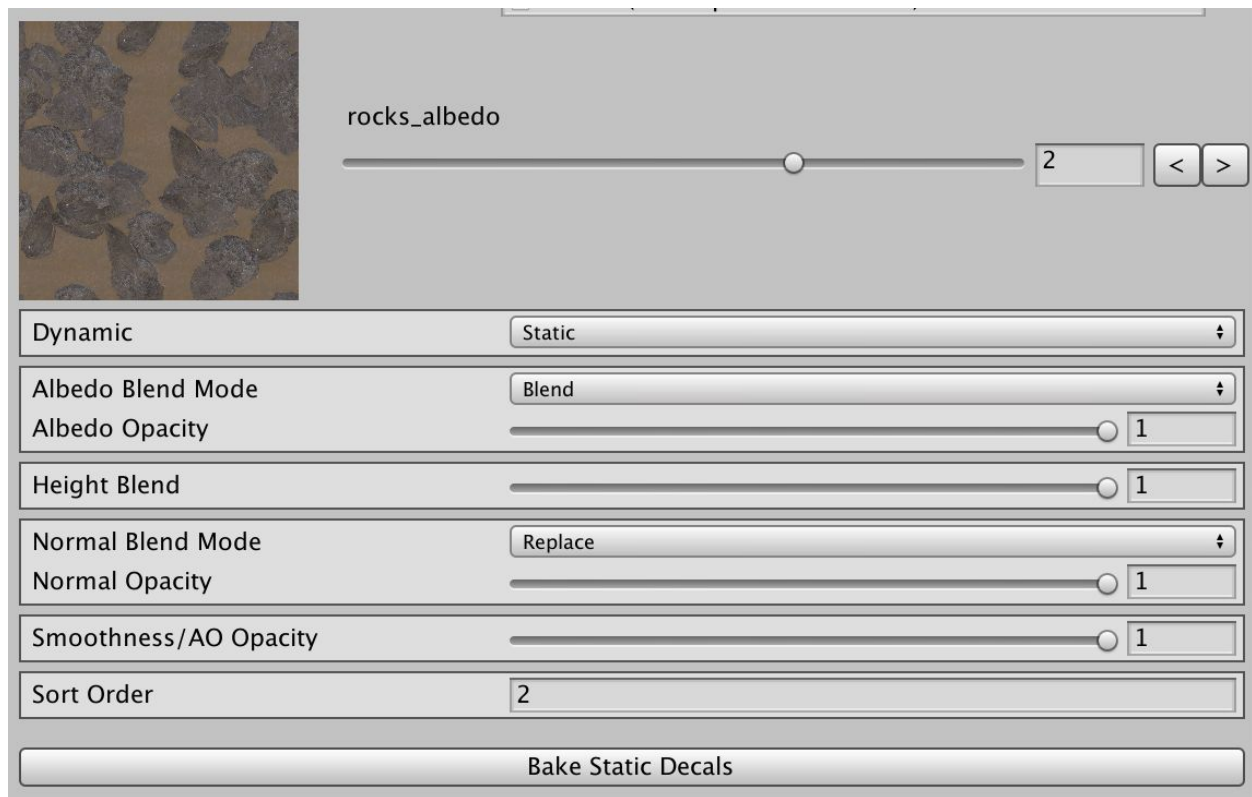
Once a decal receiver is set, the decal will show controls to let you select which decal you would like to project along with various options. By default, the decal will project downwards, and you can move, rotate, and scale the detail until it intersects the surface how you like.

- Dynamic

    - This lets you choose between dynamic and static decal options. Dynamic decals are optimized for being able to be moved every frame with low cost, where as static decals render faster but require more CPU resources if they are moved.

- Albedo Blend Mode

    - You may blend the albedo normally, or with a multiply 2x blend mode

- Albedo Opacity

- This lets you control the opacity of the albedo blend with the main surface

- Height Blend

  - This controls the contrast of the height map blend with the underlying surface. At 0 the texture is linearly blended, at 1 the texture is fully height map blended with a very small blending area.

- Normal Blend Mode

  - Normal Blend mode allows you to blend or replace the normals with the underlying surface

- Normal Opacity

  - Normal Opacity controls how much of the normal is blended into the underlying surface

- Smooth/AO opacity

  - This controls how much of the smoothness/ao from the decal should be blended with the underlying surface

- Sort Order

  - This controls the sorting order of the decal. Decals with higher sort order values will be drawn over ones with lower values

Static vs. Dynamic Decals

Dynamic decals have a fixed cost when drawing the material. Having large amounts of dynamic decals will make the shader go slower regardless of how many decals are actually on the surface. However, dynamic decals update very fast, so are useful if you are going to have decals move across the surface. Try to keep the number of dynamic decals as low as possible, or even turn them off. Note that non-terrain surfaces like MicroSplat meshes, mesh terrains, digger meshes, or polaris meshes, only support dynamic decals.

Static decals are very efficient to draw. To make static decals efficient, a small texture is generated which is sampled to decide which decals need to be rendered for any given area of

the map. This prevents the cost from increasing, but this map needs to be updated when a decal is moved, and is rendered with a small software rendering system. Static decals are only available on Unity terrains.

Note that for any given pixel, a maximum of 4 decals are ever rendered.
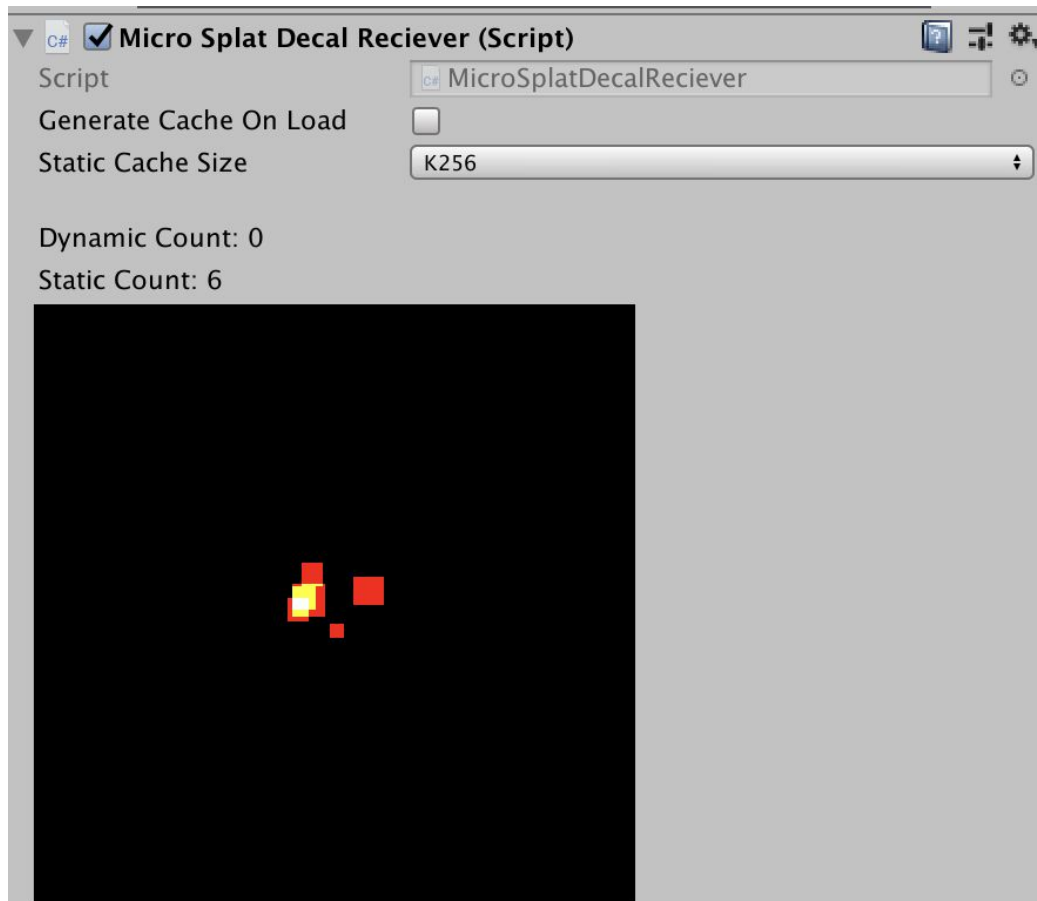
When the MicroSplat Decal Receiver component is on a Unity Terrain, you will find a few properties. By default, the decal system will serialize out the static cache and restore it on load, rather than rendering the decals on the fly. However, if you want to force it to render the decals on load, you can enable "Generate Cache On Load".

The static cache size controls how detailed the index map is. In this example, I have a 256 map for a terrain which is 512 meters in size. This means that each pixel on this map is 2 meters in size. Thus, I am only allowed to have 4 decals within any 2 meter area of the terrain.

Finally, you can see a display of the index map. Areas which are red have 1 decal on them, areas which are yellow have 2, and areas which are white have 3 or 4 decals.

Note that as you move decals around, you can watch this map update. Updating decals is fast enough to do in realtime in the editor, however at runtime the delay might be too great, especially if the map has lots of decals and you are doing an operation which requires a full re-rendering of the data.

Splat Map Decals

Splat map decals allow you to modify the texture choices or levels of wetness, puddles, streams or lava in the decal area. When Splat Map mode is enabled for your shader and the splat map texture array is packed and assigned, you will have an interface to select which splat

map is used on your decal.
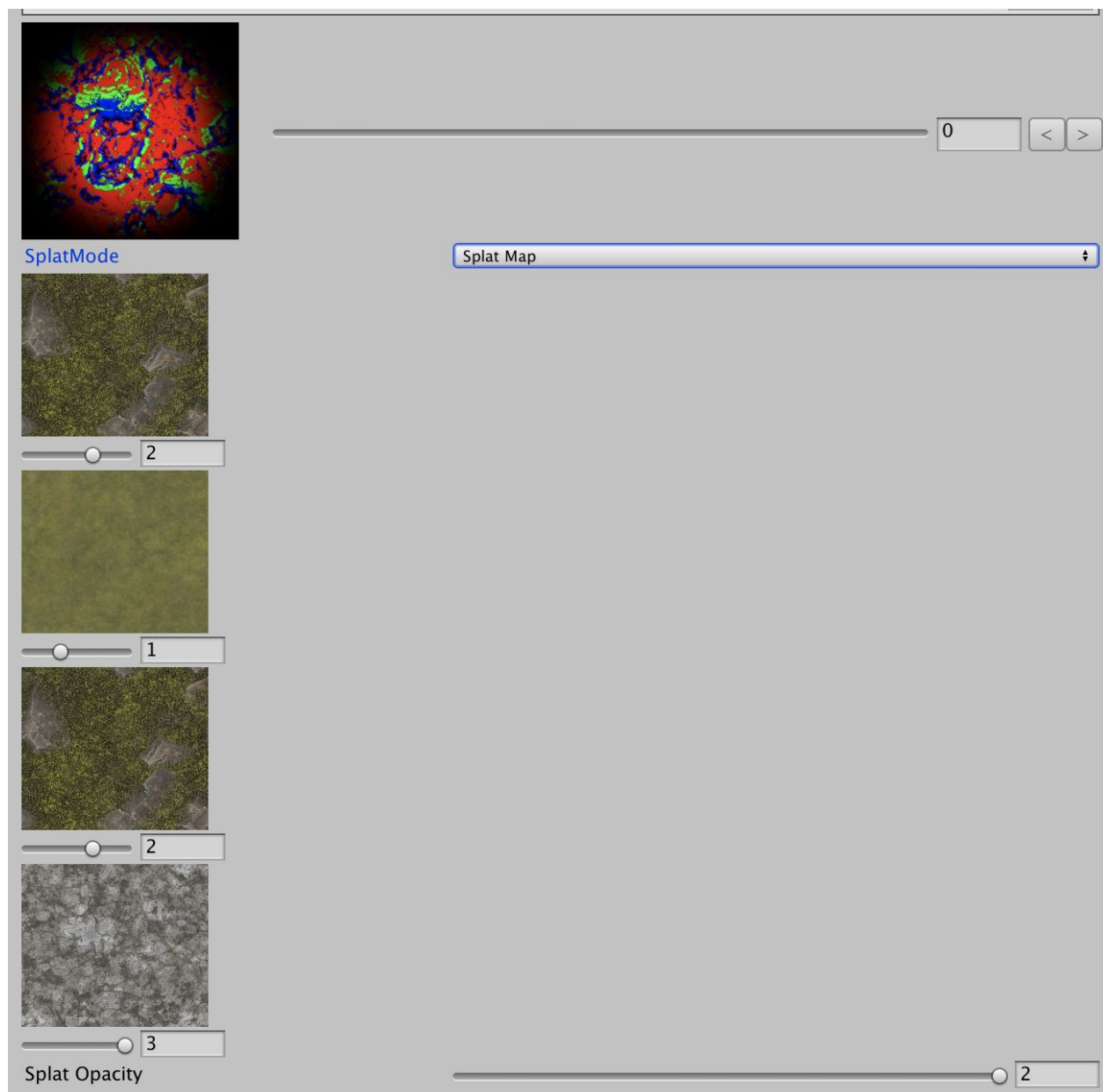
You can select between the 'Splat Map' mode and 'Stream Map' mode. In Splat Map mode, you will be given a choice of 4 textures to be blended in, which correspond to the Red, Green, Blue, and Alpha channels of your splat map. Note that when these channels represent weights, so a value of 0 means no weight is given to the corresponding texture.

When in Stream Map mode, these channels modify the weights of the fx channels- Wetness in Red, Puddles in Green, Streams in Blue, and Lava in the alpha channel.

Finally, an overall opacity for the effect is available as well.