MicroSplat

Puddles, Streams, Lava and Wetness

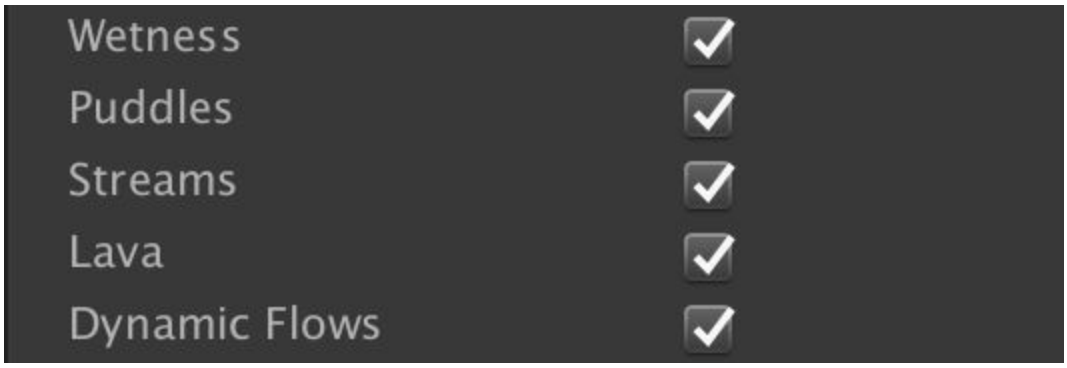
Documentation

Overview

This module offers four effects for the MicroSplat terrain shading system, and includes painting tools for working with the effects, along with code for generating flows at runtime or

editor time. All four effects can be used in combination, and interact with other modules like snow and tessellation.

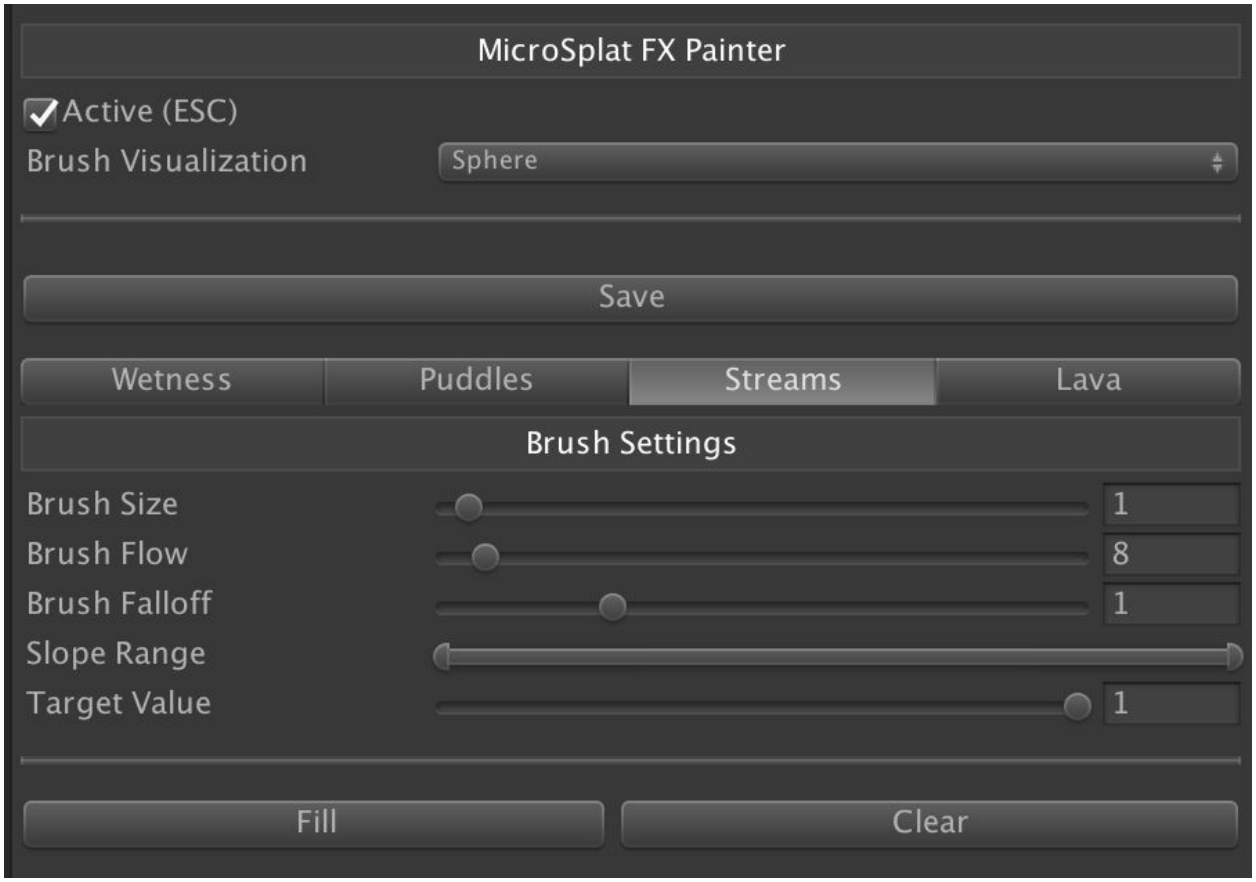
Shader Features



Each of the four effects can be toggled on or off in the shader generation section of the material editor. Dynamic Flows can be turned on if you would like to use the simulation system to spawn flows at runtime, which is discussed below.

Painting Interface

Once your features are enabled, you can open the painting interface by going to Windows/MicroSplat/FX Painter.



You can activate and deactivate the painting system with the active toggle, or use the Escape key to quickly toggle it.

Please note the **SAVE** button. You will need to press it when you are done painting, otherwise your work will not be saved automatically.

Below it, you will find controls to adjust the brushes size, flow rate, and falloff curve. There is also a “Slope Range”, that can be used to filter painting based on the angle of the terrain - this is very useful for things like puddles, which want to only appear on flat terrain.

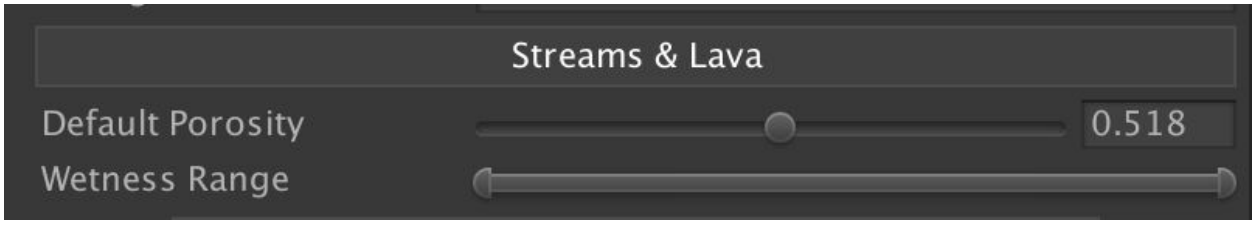
A target value is used to determine if you are painting or removing the various effects. Changing target value to a specific number can be very useful, so you can easily paint an area with a specific value.

Finally, there is a fill button to fill the terrain with the current parameters, or a clear button to clear the current effect from the terrain. Note that the paint tool will work across any number of terrains at a time, as long as they are in your selection.

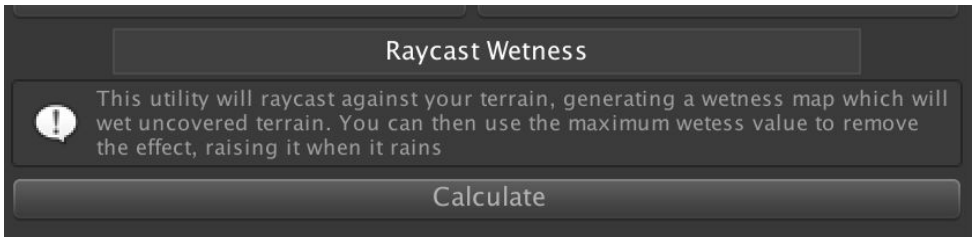
Effect Guide

Wetness

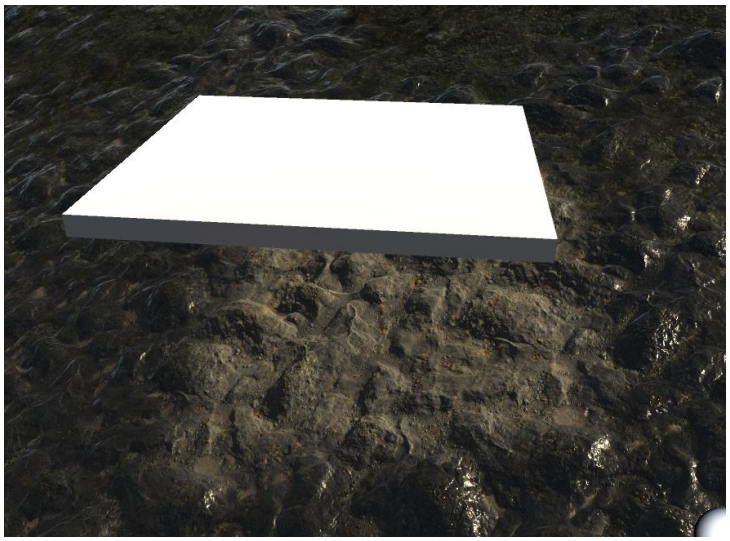
Wetness simulates surfaces which are wet. In general, a wet surface has a darkened albedo and increased smoothness, with the amount of the effect being controlled by the porosity of the surface. A porous surface has small holes in it which trap water, which in turn makes the surface appear darker but with a higher specular response. In most cases, this corresponds very closely with the smoothness of an object. As such, MicroSplat will generate a porosity value from the smoothness map.



When wetness is enabled, a Default Porosity value is available, which scales the porosity computed via the smoothness map. The Wetness Range controls the minimum and maximum amount of wetness on the material.



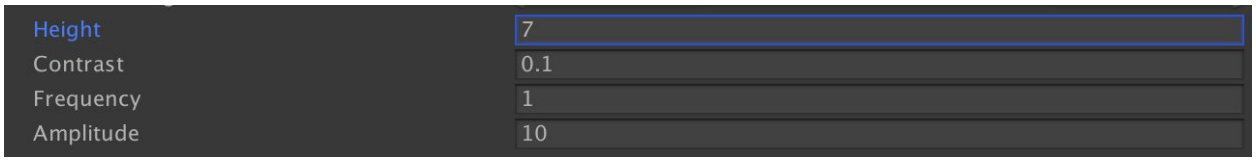
A common technique is to adjust the global wetness amount when rain is present. However, just raising the minimum wetness will make every surface wet, including those covered by roofs. You can use the “Generate Wetness Mask” feature in the painting tool’s wetness tab to raycast across your terrain and determine which areas would be hit by rain or not.



Once the mask is generated, you can set the max global wetness to 0, then increase it when it rains, and only areas which are not covered will get wet. The Snow module can also respond to this mask, allowing you to filter which areas receive snow or not.

Shorelines

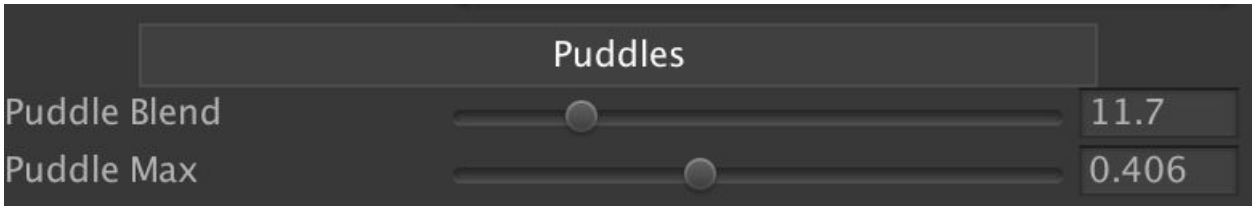
When Wetness is enabled, a second option is available for “Height Wetness”. When this is enabled, you can make any area of the terrain below a certain height wet, which can be useful for shoreline effects.



The contrast controls the blend width between wet and dry areas. The frequency and amplitude are used to control the animation of the wetness height. Frequency controls how quickly the wetness height moves up and down, while amplitude controls how far it moves.

Puddles

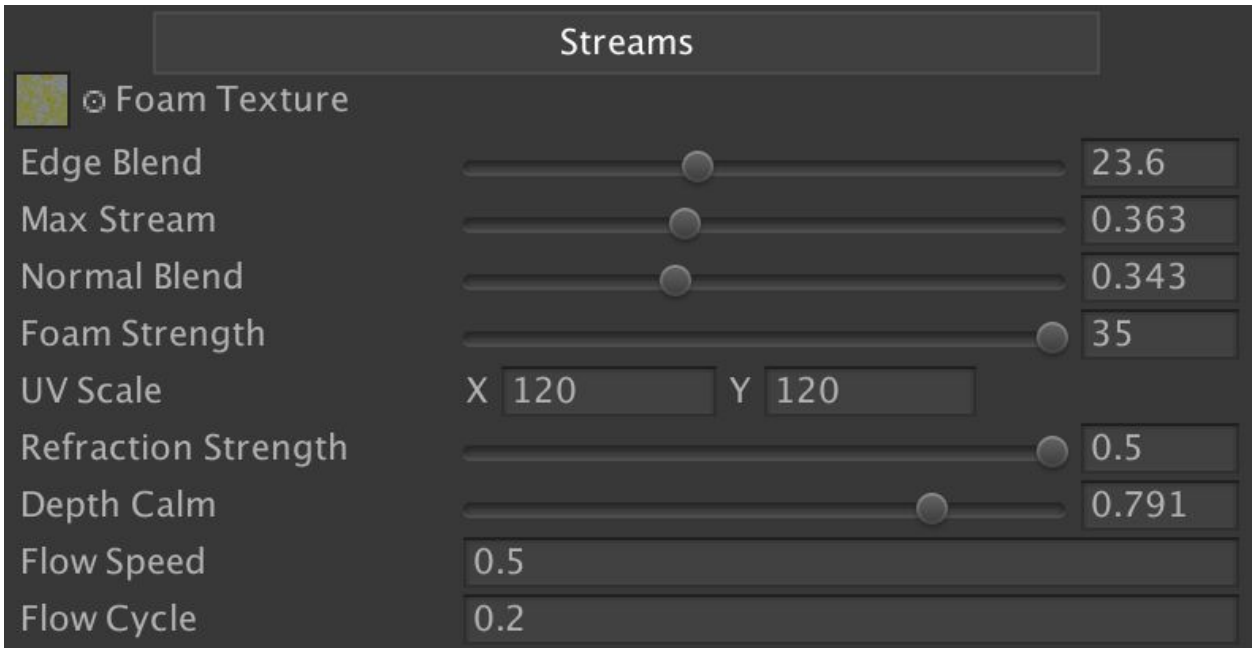
The puddle system can be used to simulate small bodies of stagnant water. These generally look good on flat surfaces in combination with Wetness.



The Puddle Blend value controls the transition between dry and puddled areas, and a Max value is available to ramp puddles in and out of the scene.

Streams

The stream effect creates high quality water which interacts with the terrain based on the height map- this is best used for small streams and water flows, and can add amazing details to your terrain. Water refracts the terrain below it and foams up around rocks.



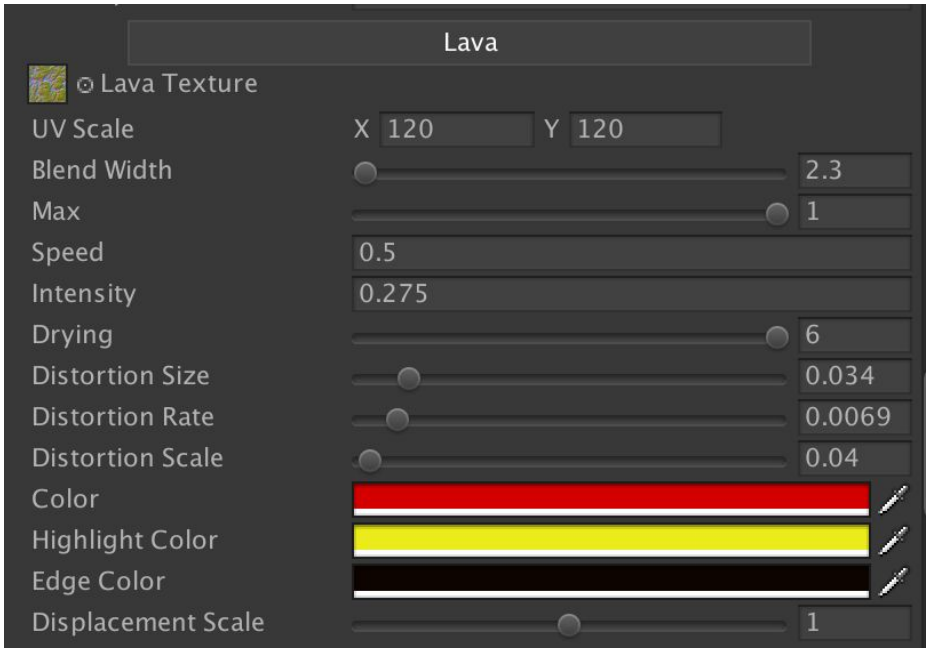
The Foam texture is the only texture needed for streams. If you wish to make your own foam texture, the first two channels are the first two channels of a normal map, used to refract the surface under the water and light the water surface. The third texture controls the pattern and density of the foam effect. I find it best to keep this texture uncompressed, as compression can cause a noticeable visual quality decrease. The other properties are:

- Edge Blend
    - This controls the softness of the transition between water and land
- Max Stream
    - The maximum amount of stream allowed. Use this to remove streams, or clamp the depth of the stream so that rocks always poke out above the water.
- Normal Blend

    - This controls the opacity of the water, at one extreme, the water will look dark, like a puddle of murky water, and at the other, it will look very clear, like a fresh stream.
- Foam Strength
    - Controls how much foam is present on the water
- UVScale
    - Controls the UV scale of the foam and refraction texture
- Refraction Strength
    - Controls how much the water distorts the terrain underneath of it.
- Depth Calm
    - Depth calm reduces refraction in areas of deep water, simulating a less turbulent water in deep areas away from the shoreline
- Flow Speed
    - The water is flow mapped so it looks like it's flowing down hill. The speed controls the speed of that flow.
- Flow Cycle
    - Flow mapping requires that we loop the texture at some point, hiding the transition by interpolating between two separate loops. Flow Cycle controls how long the loop takes. When set too fast, the water may look to pulse.

Lava

The lava system can be used to generate different types of Lava flows across your terrain.



The lava system uses a special texture which contains the first two channels of a normal map, a height map, and a texture that darkens the lava to simulate drying rock. Changing this texture can radically change the look of the lava. A second example is included.

This texture goes through several passes of flow mapping and distortion to create the rolling lava effect. The actual color of the Lava is controlled by three color values, which represent the color in the highest part of the resulting height map (highlight color), the lowest part (Color), and the color in the area where the lava meets the terrain (edge color).

The other properties are:

- UVScale
    - UV Scale of the lava texture
- Blend Width
    - How soft the blend is between lava and non-lava areas
- Max
    - Maximum amount of lava on the terrain
- Speed
    - Speed of flow mapping
- Intensity
    - Cycle time of flow mapping
- Drying
    - How much the lava should dry into rocks
- Distortion Size
    - The overall strength of the distortion applied to lava
- Distortion Rate
    - The rate of change caused by distortion
- Distortion Scale
    - The size of the distortion

- Displacement Scale
    - Only shown when tessellation is enabled, it controls how much lava protrudes up from the terrain

Dynamic Flows

The module also contains a system for spawning dynamic flows of Lava or Water, which cascade down hills automatically. These flows can leave a trail of wetness or burned terrain behind them, evaporate, and even interact with each other.

Follow these steps to setup the system:

1. Enable “Streams” and/or “Lava” on your shader and turn on the “Dynamic Flows” option.
2. Add the “Stream Manager” component to your terrain
3. Generate a terrain descriptor by pressing the “Generate Terrain Descriptor Data” button in the MicroSplatTerrain component. Any time you change the height map, you will need to press this button to update the required data.

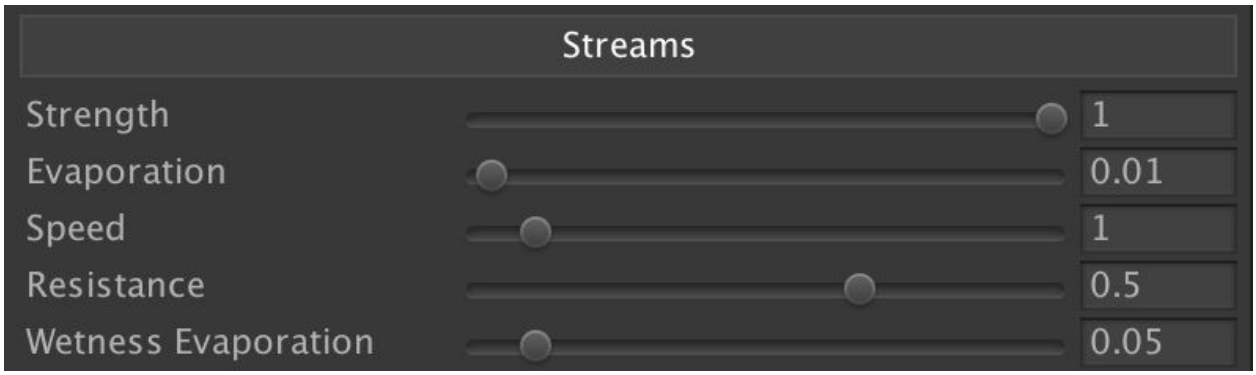
Emitters and Colliders can be created easily by going to the Windows/MicroSplat menu and selecting the appropriate option, or by creating a game object and adding the StreamEmitter or StreamCollider component.

You can scale the Emitter or Collider objects to increase the area of the effect, and adjust the strength property on the emitter to adjust the amount of liquid deposited on the surface below them.

Emitters and colliders can be moved at runtime, but the terrain they are associated with is determined at startup. If you need to move one to a new terrain at runtime, disable the object, move it above the new terrain, and re-enable it.

There is a maximum of 32 emitters per terrain and 64 colliders.

Dynamic Flow Parameters



Streams and Lava have a number of high level parameters to help control the simulation.

- Strength
  - Controls the overall strength of all spawning
- Evaporation
  - How much water or lava is removed from the system over time
- Speed
  - Speed of the simulation
- Resistance
  - High resistance will produce smaller and weaker flows
- Wetness or Burn Evaporation
  - Controls how long it takes for the trail left behind a flow to revert back to normal. May be set to 0 so that the trail is never removed.

When running, a “Save State” button will appear under the Dynamic Flow Parameters section, allowing you to save the state of the water or lava back to the statically painted map.

Data Format

The Data format for the FX data is quite simple. It is a single texture which stores the weight or height of each effect on each control point:

- Red: Wetness
- Green: Puddles
- Blue: Streams
- Alpha: Lava

When Dynamic Flows are enabled, each terrain gets two extra texture buffers with are used to animate the flows. The red and green channel contain a mask of areas which have been affected by water and lava respectively. These masks are used to make the ground stay wet after the water has left, or the ground remain burnt after the lava is gone. The blue and alpha channels hold the amount of water and lava at a given control point.