

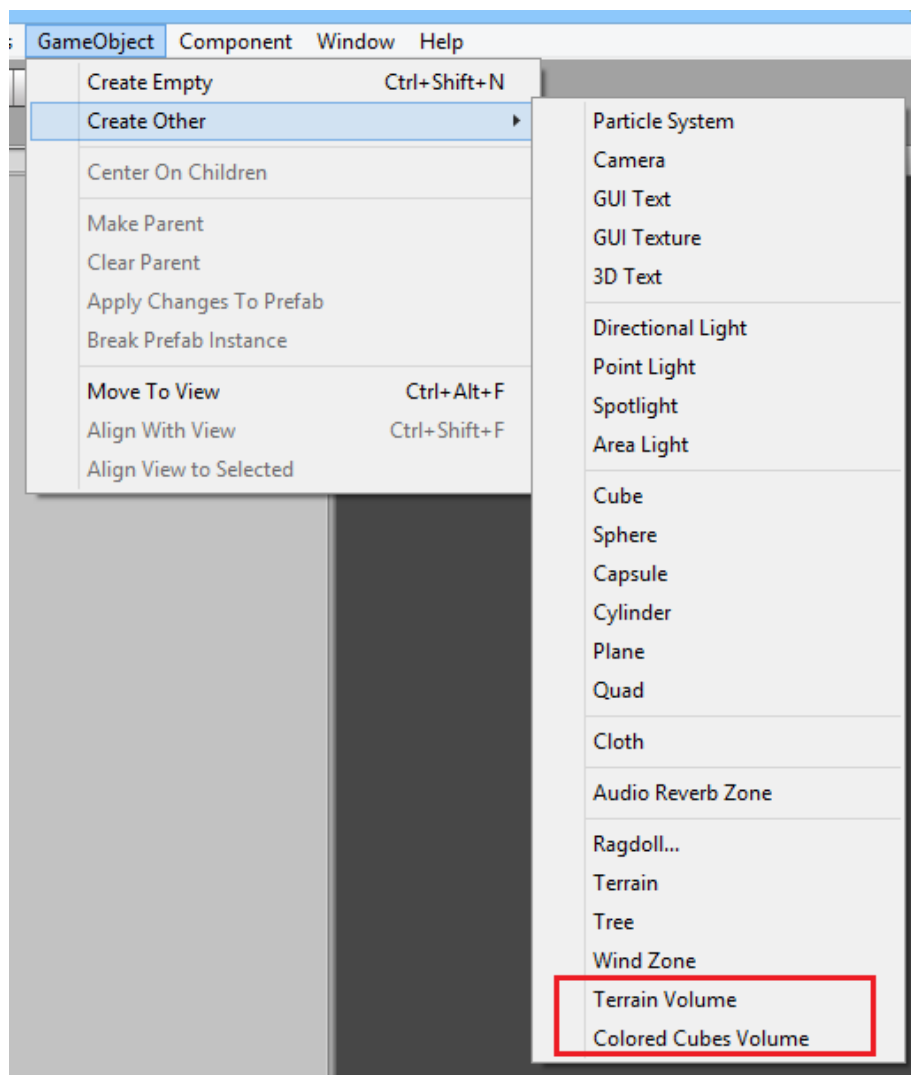
## User Interface

Cubiquity for Unity3D is tightly coupled with the Unity3D editor and strives to follow similar design and usage approaches to those used in other parts of Unity. This means that concepts such as component-based design, assets, inspectors, transform gizmos, and materials should all work in similar way to what you are used to, and the interface to the TerrainVolume also takes significant cues from Unity's standard terrain.

We hope that you will therefore find the system intuitive, but none-the-less we use this section of the manual to outline the key user interface elements and how they fit together.

## Adding Volumes To The Scene

A new terrain volume or colored cubes volume can be added to the scene via the main menu.



Creating a new volume through the main menu

This adds a new game object to the scene and automatically attaches Volume and Volume Renderer components. Note that no VolumeCollider is added - this has some performance overhead so we prefer you to add it manually is required. It also creates a small volume data with just the floor filled in so that you have something from which to start your editing. Note that you are not given any options during the creation process (it is intended to be a simple one-click-and-you're-done' interface), but you can later create bigger/different volume data as discussed in the section on [Creating New Volume Data And Assets](#).

## Transforming Volumes

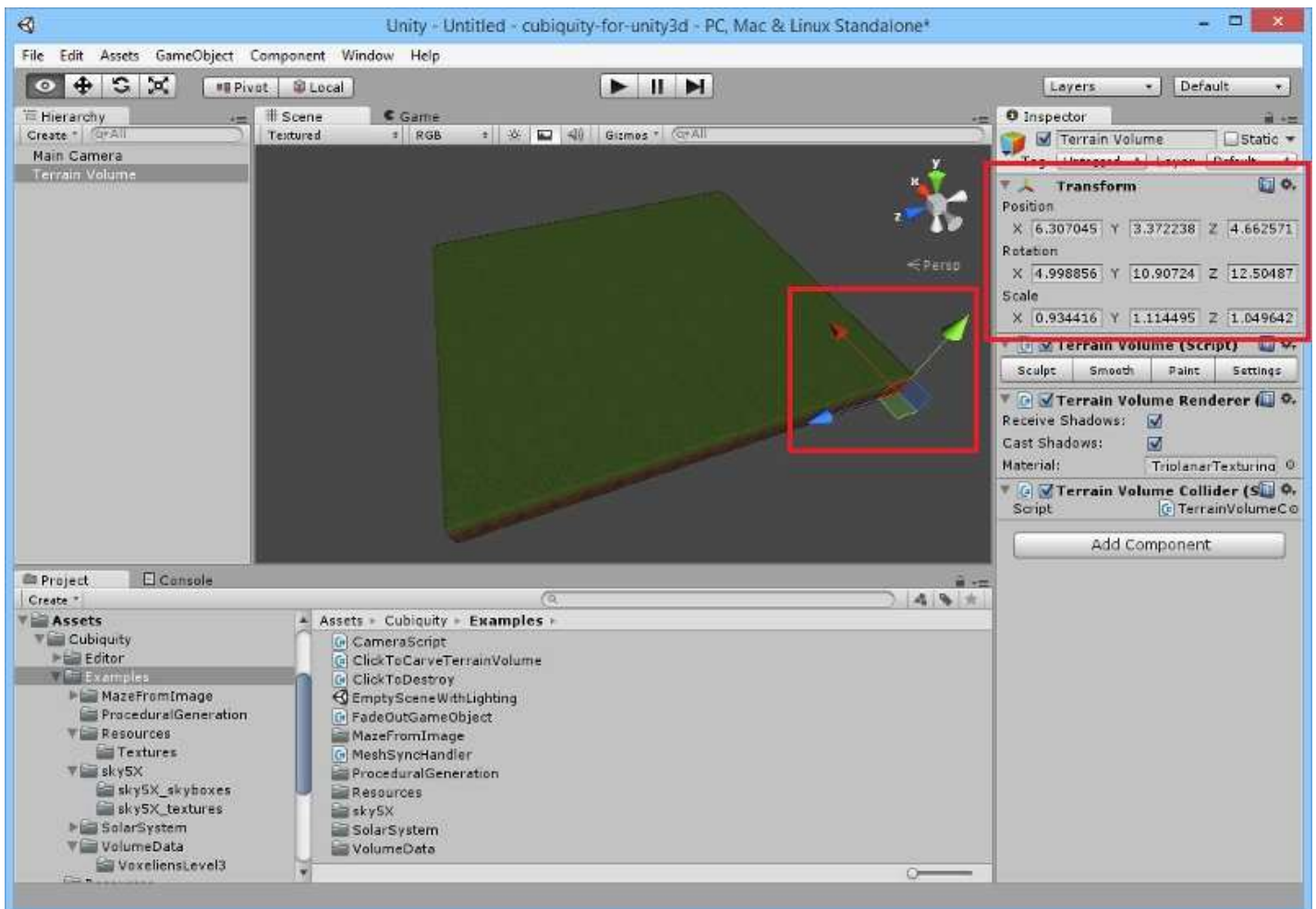
Because a Cubiquity volume is just a GameObject with some specific components attached, it can be transformed much like

any other object in Unity. Try selecting a volume and clicking one of the following buttons on the toolbar:



**The standard controls can be used to translate, rotate and scale your volume**

You should see the corresponding transform gizmo appear on the volume and you can use this to manipulate it. As you drag the mouse you will see the transform changing in the inspector, and you can also enter the desired transform directly.



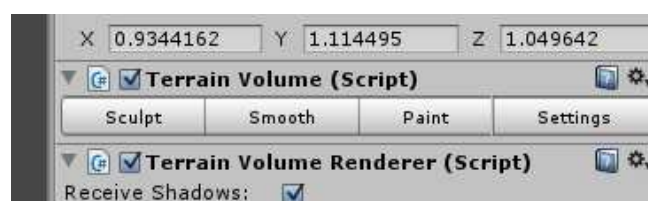
**A volume after undergoing some transformations, with the transform gizmo and transform component highlighted.**

## Editing Volumes

We provide tools for editing the volumes from within the Unity editor (you can also edit the volumes in play mode but we don't provide tools for this - just use the API to implement your own game-specific tools).

### Editing Terrain Volumes

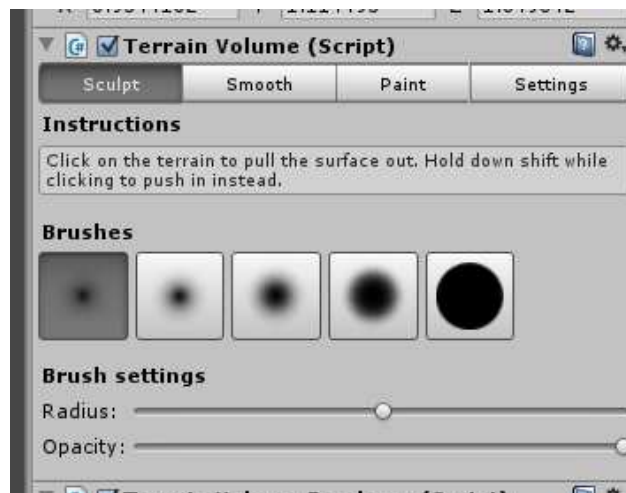
When a terrain volume is selected you should see the 'Terrain Volume (Script)' component in the inspector.



**Click the tool buttons to open the corresponding options**

You can cycle through the tabs to access the various functionality which is available:

## Sculpt Mode

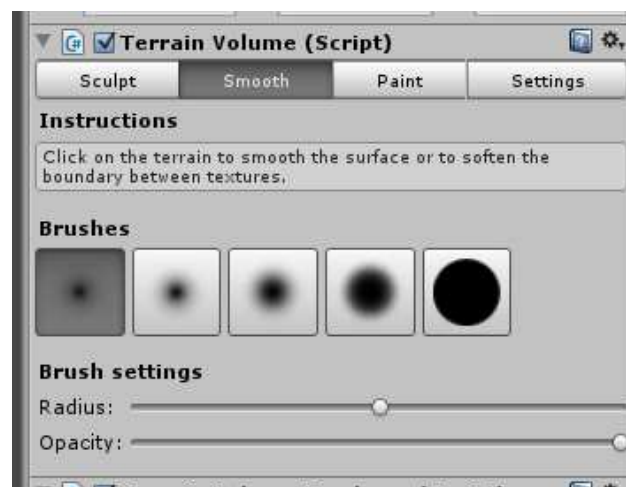


**Sculpt mode options for changing the terrain shape.**

This mode is used to make most changes to the shape of the terrain. You can choose the desired brush (gentle vs. sharp falloff) and set the brush's radius. The 'Opacity' setting controls how quickly the changes are applied, so having the slider to the left will allow finer control than having to the right.

Changes are applied by left-clicking on the desired part of the terrain. Note that changes are only applied when the mouse is moved, so you can't simply hold down the mouse on the same spot but must instead move it slightly. You can also hold down the Shift key when sculpting to remove material from the terrain instead of adding it.

## Smooth Mode

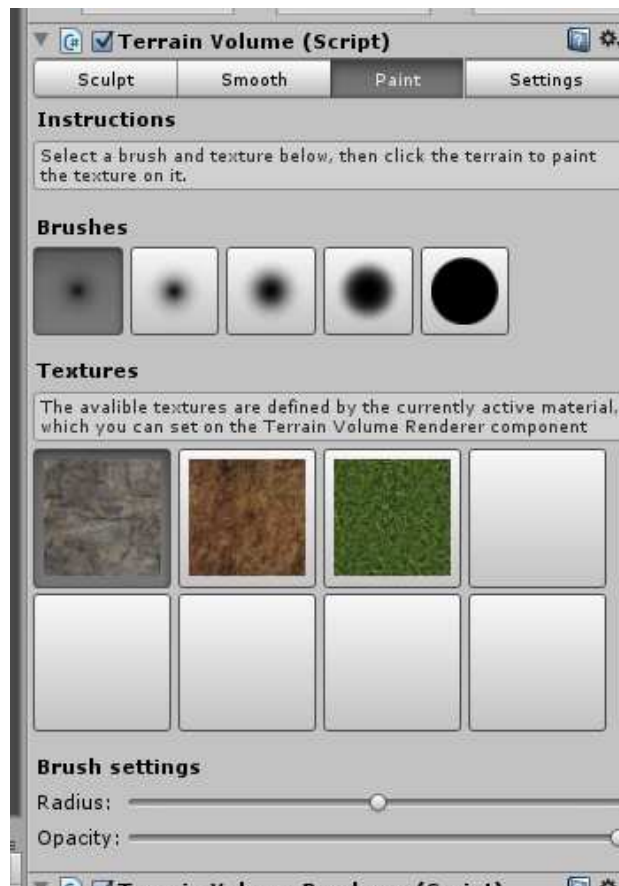


**Smooth mode options (currently the same as for sculpting)**

The smooth mode is used to eliminate jagged edges and sharp features on the terrain, as well as softening the boundary between different textures. It does this by averaging together a voxel with its neighbours - a kind of 3D equivalent to the 'blur' operation found in many 2D image editors. It is again possible to change the falloff, radius, and opacity of the brush performing the smoothing.

## Paint Mode

Textures can be applied to the terrain by using Cubiquity's paint mode.

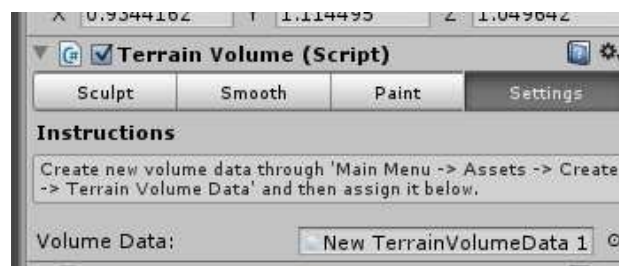


Paint mode options for applying textures to the terrain.

Note that the range of available textures is defined by the currently applied material, and this can be changed via [The Volume Renderer](#) as discussed later. The textures are not simply painted onto the mesh but are instead painted into the volume - i.e. the brush is not a circle but a sphere which also changes the texture of underground voxels. You can see the effect of this if you choose a large brush, paint part of the terrain, and then dig into the part which you have painted.

## Settings Mode

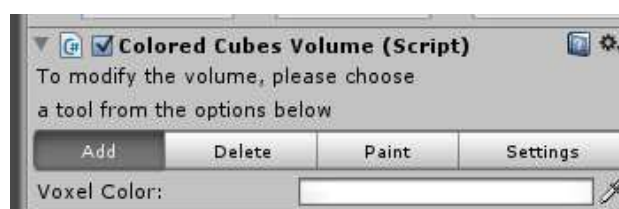
Currently the only setting which is exposed is the volume data which is being rendered. You can drag new volume data onto this field, or click the small circle to select from a pop-up window. More settings will be exposed in future versions of Cubiquity.



Settings currently lets you change the volume data which is being used.

## Editing Colored Cubes Volumes

The built in editing capabilities of the colored cubes volume are currently very basic compared to those of the terrain volume, and it is expected that users will instead generate their volume in external applications or via other means (see [Obtaining Volume Data](#) for various options). However you can use them for making small adjustments.



**The colored cubes volume inspector lets you add, delete, or paint cubes.**

The Add, Delete and Paint options are all applied to a single cube at a time, with the Add and Paint offering the ability to chose a particular color for the voxel to be drawn. There is also a setting panel which, as in the case of Terrain Volumes, allows different volume data to be specified.

## Other Volume Components

When creating a volume through the main menu Cubiquity for Unity3D ensures that certain other components are automatically added to the GameObject. These are optional though usually desirable, in particular the default added components provide the ability for the volume to be rendered and to participate in collisions.

### The Volume Renderer

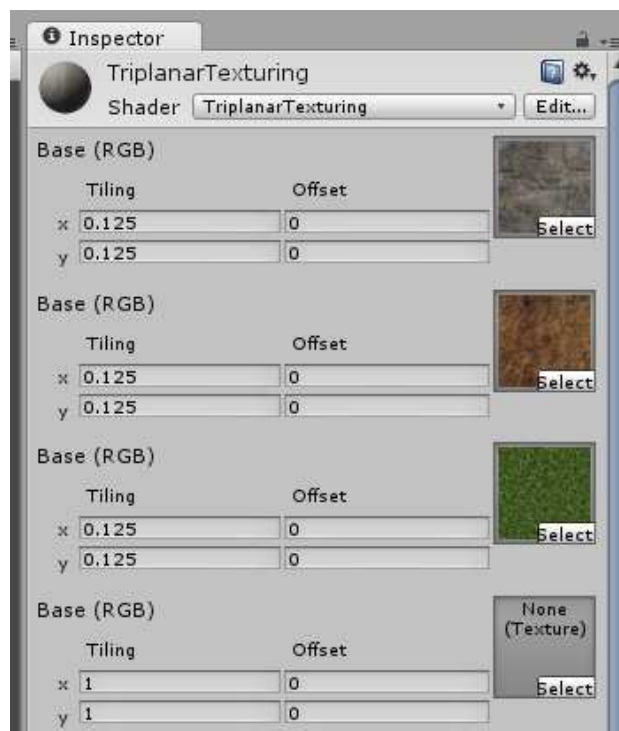
The VolumeRenderer component (actually one of its subclasses) needs to be added to any volume which you wish to be visible in edit mode or during gameplay. It serves a purpose which is conceptually similar to the standard Unity MeshRenderer, and exposes properties through the inspector shown below:



**Note that 'Material' only exists for the Terrain Volume Renderer and not the Colored CubesVolume Renderer.**

The 'Cast Shadows' flag controls whether this volume get drawn into Unity's shadowmap (i.e. whether it can cast shadows on to other objects) while the 'Receive Shadows' flag controls whether the shadowmap gets sampled when rendering the volume (i.e. whether other object can cast shadows on to the volume). If you want the volume to exhibit self-shadowing then both of these flags need to be set, which is the default.

In the case of the *terrain volume* the 'Material' field lets the you specify which material should be used for drawing the terrain. The default material uses a technique known as 'triplanar texturing', though you can write and connect your own shaders and materials if you wish (strong graphics programming knowledge required). Even if you don't change the material you can also use this field to open the material so that you can specify which textures should be used. Double-click on the material to open it in the inspector as below:



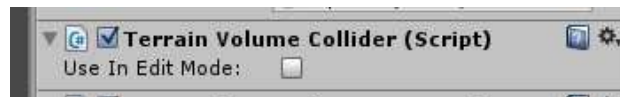
**You can specify which images are linked to which texture slot.**

From here you can change the images, offsets and scaling factors associated with the different texture slots (currently up to eight). You should see the rendered volume being updated in real-time as you make changes.

Note that it is not currently possible to change the material associated with a colored cubes volume renderer but this will probably change in the future.

## The Volume Collider

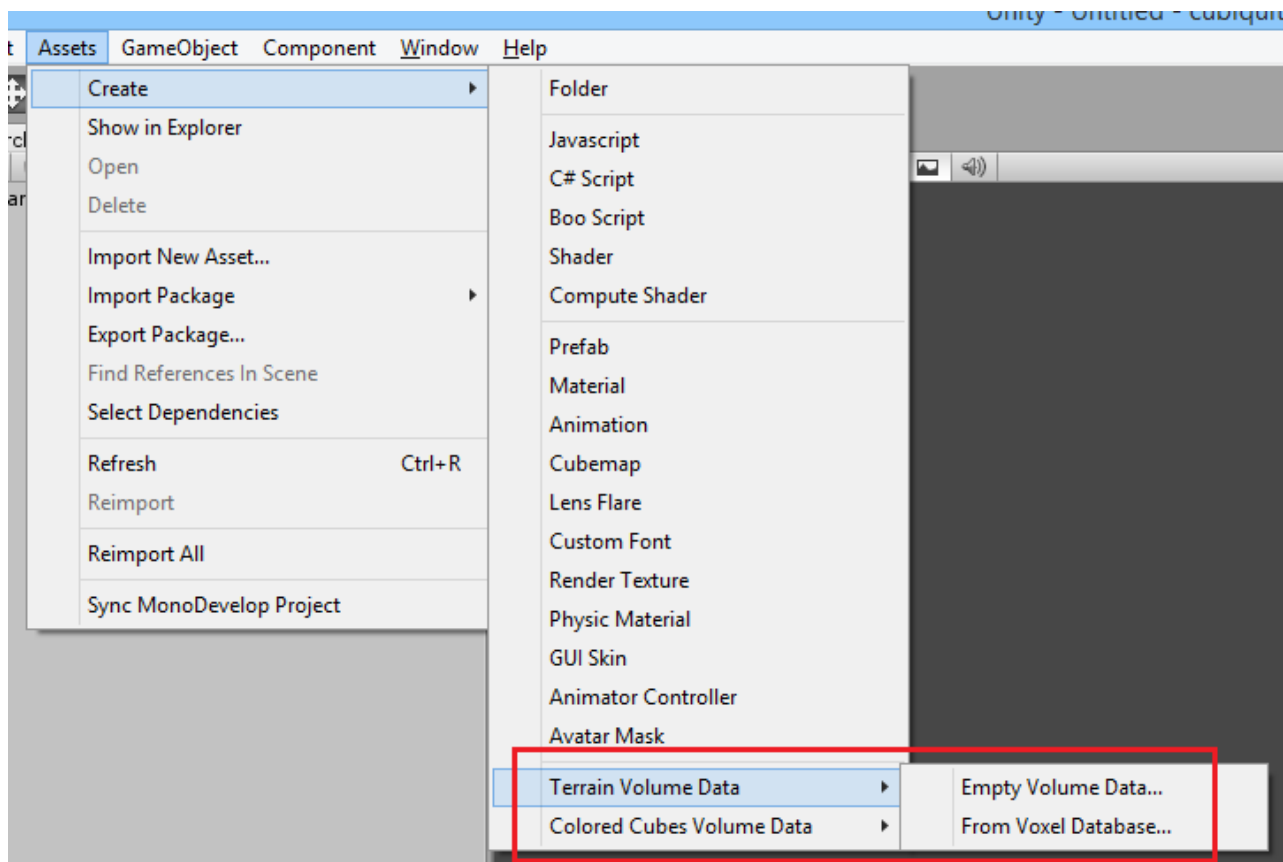
The VolumeCollider should be added to a volume if you want it to be able to participate in collisions. Internally, the presence of a VolumeCollider causes MeshColliders to be generated for the meshes which represent the volume. Although this component currently does not expose any real properties, it is possible to toggle whether the collider is active in edit mode. This is generally not desirable because the additional overhead makes sculpting difficult, but it can be useful when working with third-party tools which expect the collider to be present. An example would be a tool which can place objects (buildings, trees, etc) on the surface of the terrain.



The volume collider has only minimal settings.

## Creating New Volume Data And Assets

When you create a volume through the main menu Cubiquity for Unity3D will automatically create an almost-empty volume data (with just a floor) to accompany it. It is quite possible you will want to replace this volume data with a larger empty one or to import a Cubiquity voxel database which you have generated elsewhere. Both of these can be achieved through the 'Assets' menu as shown below:



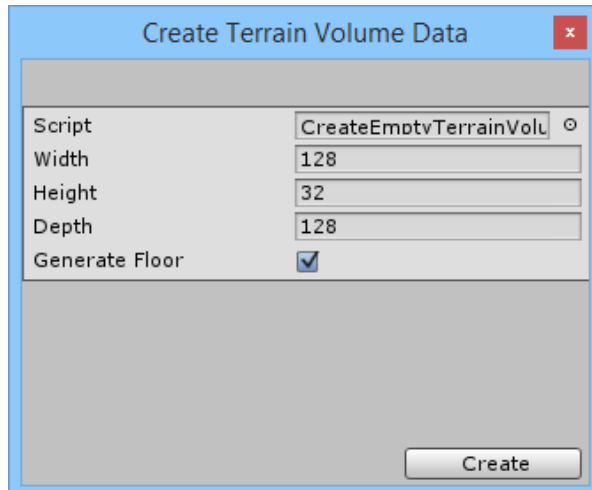
Note that there are separate entries for the two volume types (terrain vs. colored cubes).

For both terrain volumes and colored cubes volumes you have the option to create 'Empty Volume Data...' or 'From Voxel Database'. In both cases Cubiquity will also add the volume data to Unity's asset database, meaning an asset file will appear in your project. You can drag this on the 'Volume Data' field in the 'Settings' tab of the volume inspector in order to set this as the active volume data for the volume.



## Creating Empty Volume Data

Selecting this option will present a dialog similar to the one below:

A screenshot of a software dialog box titled "Create Terrain Volume Data". The dialog has a blue title bar with a red close button. Inside, there is a table with five rows: "Script" with a dropdown menu showing "CreateEmptyTerrainVoll", "Width" with a text box containing "128", "Height" with a text box containing "32", "Depth" with a text box containing "128", and "Generate Floor" with a checked checkbox. Below the table is a large empty gray area, and at the bottom right is a "Create" button.

Create Terrain Volume Data	
Script	CreateEmptyTerrainVoll
Width	128
Height	32
Depth	128
Generate Floor	<input checked="" type="checkbox"/>
<div>Create</div>	

**You can configure the parameters of the new empty volume.**

From here you can specify the size of your desired volume as well as whether it should include a floor. Note that the dimensions you specify should not be too large (probably 512 is the limit for a reasonable desktop PC). The floor flag controls whether the first few layers of the volume are filled solid - you almost certainly want this as otherwise you will not be able to see the volume and will have no starting point for further editing.

## Creating From An Existing Voxel Database

If you already have a Cubiquity '.vdb' file then you can use this menu item to create a volume data which will reference it (see [Obtaining Volume Data](#) for ideas about how you might create an existing voxel database). You will be presented with a standard file selection dialog from which you can choose the .vdb file that you wish to wrap. Take care to ensure that the .vdb file you select contains a type of data (MaterialSet vs. QuantizedColors) matching the type of volume you are working with (terrain volume vs. colored cubes volume).