Tutorial – Creating Terrain in Unity

In this tutorial we will use Unity's built-in terrain system and the provided terrain assets to make ourselves a small landscape.'

Our landscape will have a small lake, a hill, and a path, as well as some trees and grass.

Activity 0 - Prepare our project:

Open Unity and create a new project.

Import the "Environment" asset package. You can do this either during the project's creation, or afterwards by selecting Assets -> Import Package -> Environment.

Activity 1 - Create a Terrain object:

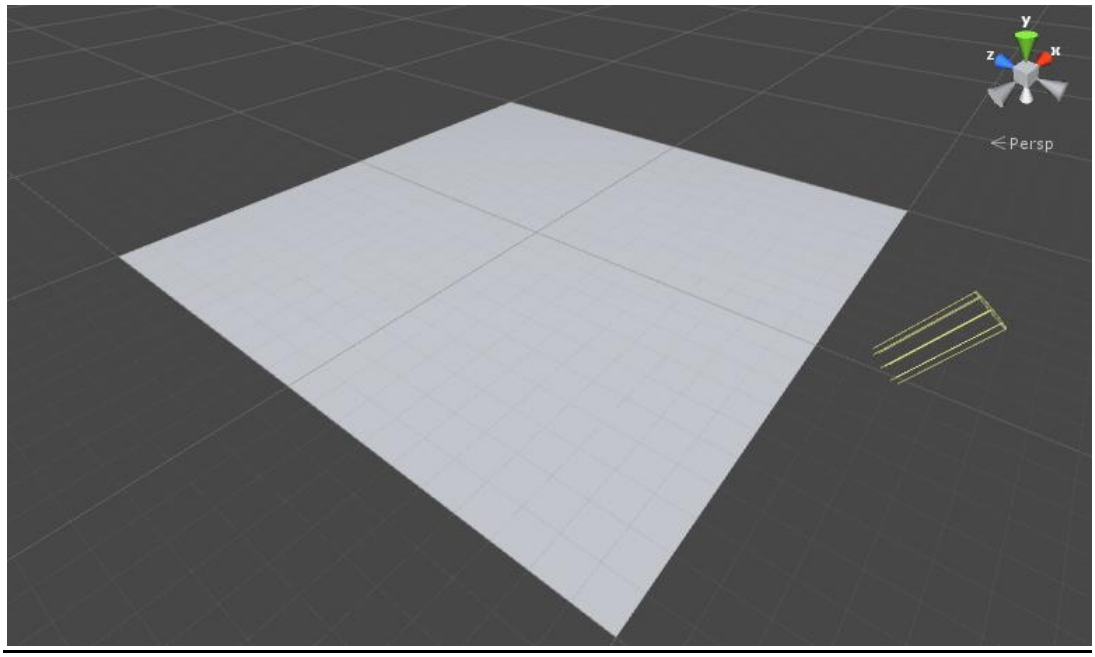
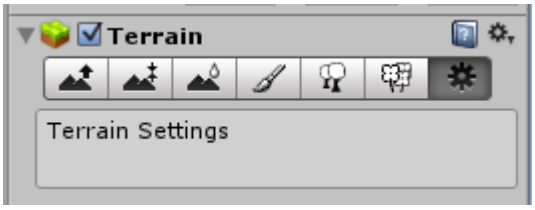


Figure 1: Our scene with a Terrain GameObject.

We'll start by creating a Terrain object to work with, and doing some simple setup.

1. Create a default Terrain by selecting GameObject -> 3D Object -> Terrain.
2. Note that this has created a "New Terrain" asset in our Project view. This file stores the data representing the terrain and all of its settings, so make sure you don't delete it. It is important to give these files meaningful names, otherwise it is easy to get them mixed up. Rename this one to "Tutorial Terrain".

3. Before we start working with the terrain, let's take a look at its settings. Select it's GameObject in the Hierarchy, then click on the "Terrain Settings" tab in the Terrain's Inspector.



4. Near the top we can see that the "Material" is set to "Built In Standard". This is what we want.
5. The default Terrain Width and Terrain Length values are both 500. Let's change these both to 200, so we've got a smaller area to work with.
6. The default Terrain Height is 600. We won't be doing anything particularly high or low, so let's change that value to 100.
7. Let's also add a directional light to our scene. GameObject -> Light -> Directional Light. The default settings are fine. This light helps in two ways. First, the scene is quite dark by default. Secondly, using a directional light instead of changing the ambient light level helps to shade our terrain, making it easier to see its shape.

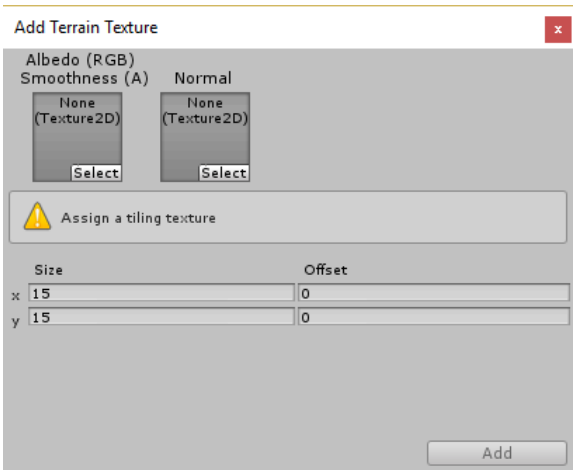
Note: While the Terrain is selected it overrides some of the keys used for navigating around the scene, specifically the W, A, S and D keys.

Activity 2 - Add a texture:

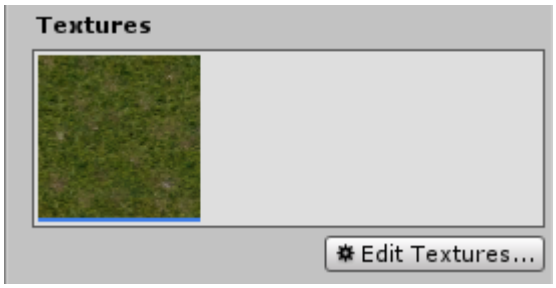
While we could start sculpting straight away the default white material is quite difficult to work with. We'll start by setting up some textures.

1. Select the Terrain GameObject in the Hierarchy.
2. Select the "Paint Texture" tab in the Terrain's Inspector.

3. No textures have been configured for use yet. Press the "Edit Textures..." button and then "Add Texture..." so that we can set up our first. The following dialog should appear:



4. Select the "GrassHillAlbedo" texture in the first slot. There is no normal map texture supplied to go with the albedo texture, so leave the second slot blank.
5. You will notice that sliders for "Mettalic" and "Smoothness" properties will appear. The "Smoothness" slider only appears if the provided texture does not include an alpha channel. Leave these sliders at their default values for now - you can tweak them later if you would like.
6. Leave the Size and Offset properties at their defaults, and click "Add". Your Terrain's Inspector should now show an entry in its Textures panel, and the Terrain object in your Scene view should be covered in the grass texture.



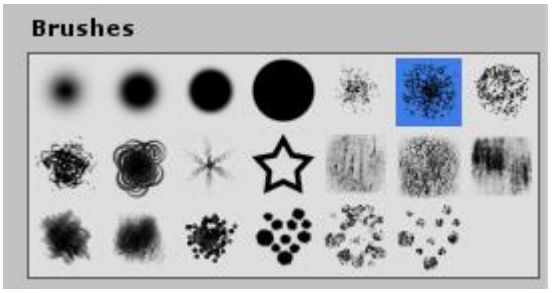
7. Repeat this process to add two more textures to your terrain.
    a. For the first set use "MudRockyAlbedoSpecular" and "MudRockyNormals".
    b. For the second set use "SandAlbedo".

Activity 3 - Draw a path:

Next we'll draw a path into our scene. This will give us a bit of a guide when we dig out our lake and raise our kill, afterwards.

1. Ensure that the Terrain GameObject is still selected and you are on the Paint Texture tab of the Terrain Inspector.
2. Select the sand texture by clicking it. A blue line will appear below it to show that it is selected.
3. Lets configure our brush:

a. Frist, select a brush shape from the Brushes panel. This determines the shape used when applying actions to the Terrain. I've selected this one:

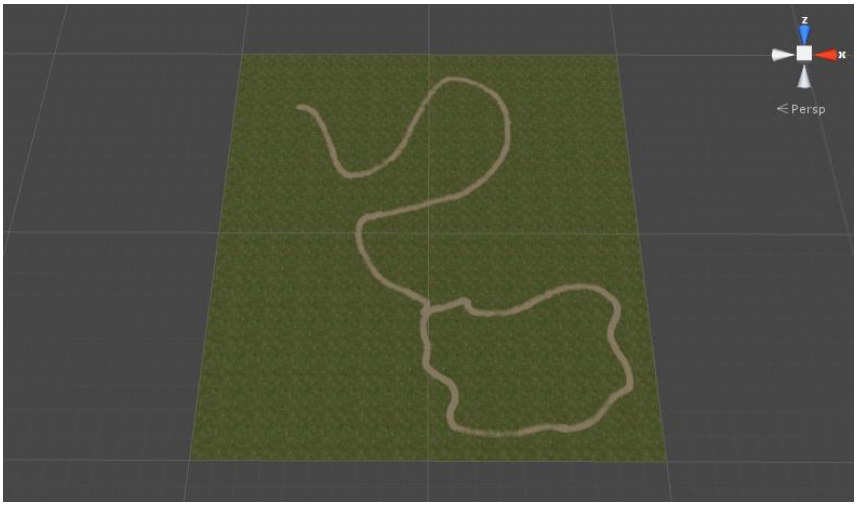


b. Next, set the "Brush Size". I'm going to use a size of 10, for a relatively wide path where two people could comfortably walk side by side.
Note: The "Brush Size" is *not* set in world units, as its size depends on the brush texture and other Terrain settings. For size reference, put a cube on the surface of your terrain and try out your brush, tweaking as necessary. You can "undo" your test painting afterwards.

c. The "Opacity" setting determines how much the painted texture overrides any existing texture on the terrain. I want my path to be solid, so I'm going to leave it at 100. This setting is very useful when painting subtle effects into your terrains.

d. The "Target Strength" is related Opacity as well. It sets the maximum amount that a new texture can be blended into the existing texture. This is useful when doing detail work at low Opacity settings if you don't want to completely overwrite the underlying texture. I'm going to leave this at 1, because I want my path to be solid.

4. With our brush set up, I'm now going to draw a path into my terrain.



The bottom area of the path is where my lake will be. The top part of the path will work its way up my hill.

Activity 2 - Dig the lake:

We want to dig a lake, but if you try lowering the terrain right now you'll see that it's already at its lowest height.

1. Go to the "Paint Height" tab of the Terrain Inspector.

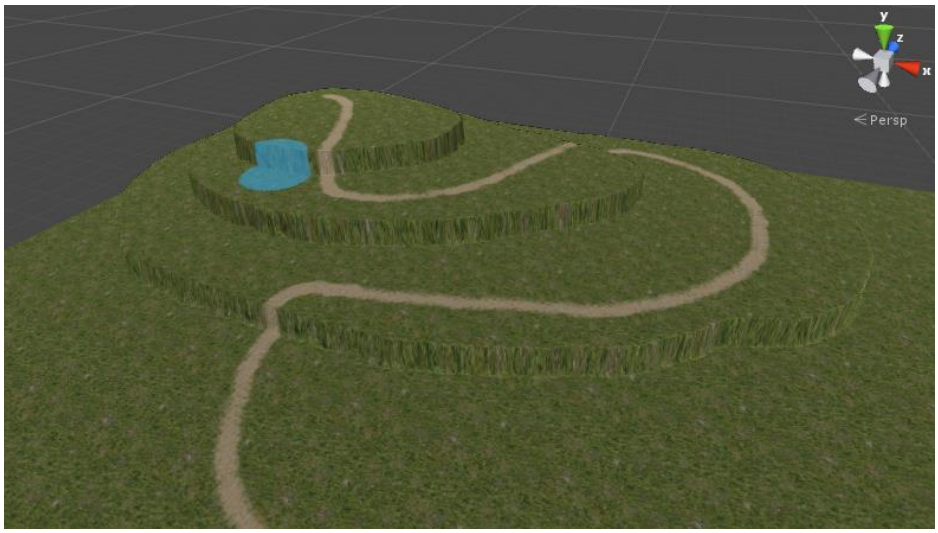
2. Enter "10" into the "Height" field, and then press the "Flatten" button. This sets the Terrain so that it is flat at a height of 10 units. This means that we have 10 unit's worth of space which we can dig into.
3. Now we want to dig a hole for our lake. There are two ways we can do this:
    a. Using the "Raise Lower Terrain" tab we can use the brush to paint the terrain downwards. Note that you will want a low "Opacity" value on your brush so that you can control this nicely.
    b. Using the "Paint Height" tab, we can use the brush to paint the terrain towards a specific height.

    Whichever approach you use, it will be easiest to control the brush if your scene camera is looking vertically downwards onto your terrain.

Activity 3 - Raise the hill:

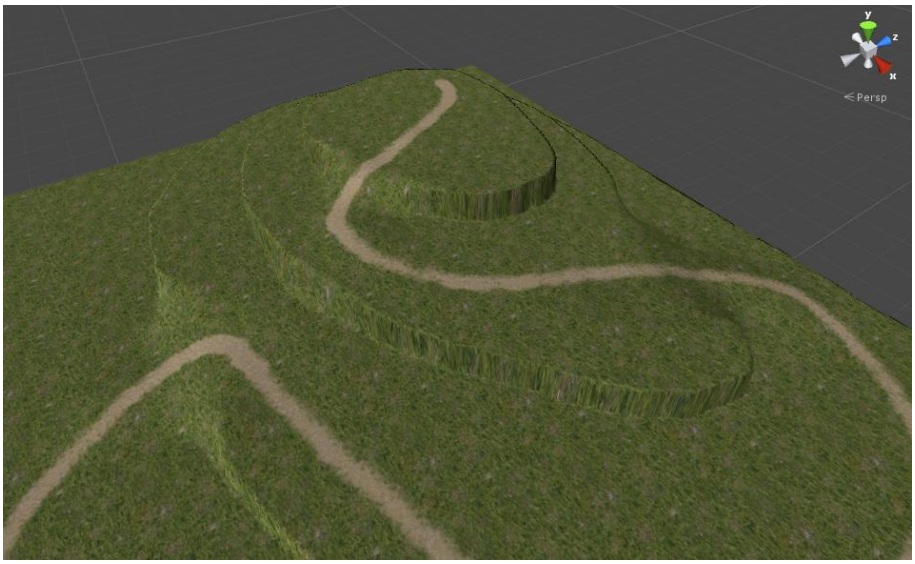
Next, lets make the hill on the other side of the map.

1. Using "Paint Height", draw in the parts of the hill that we want to be flat at specific heights.



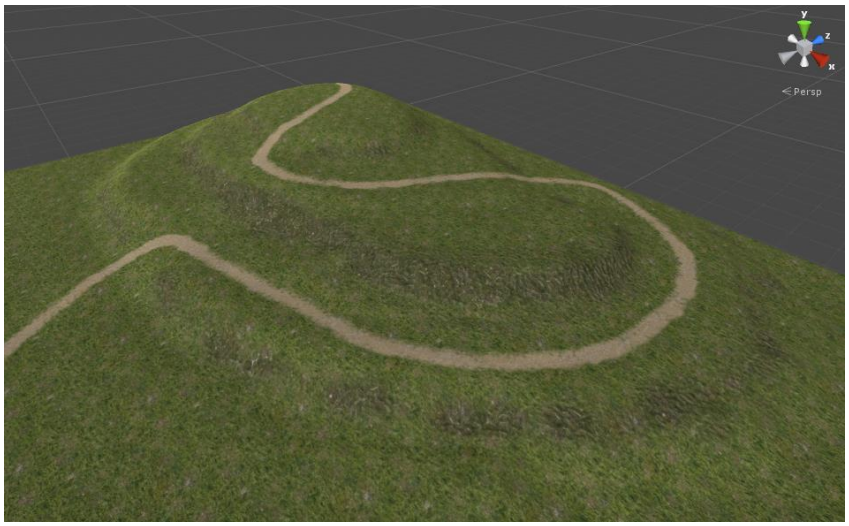
2. Then smooth out the places where the path steps up the hill. For each of the steps up the hill:
    a. First, select the "Smooth Height" tab and paint along the path at the step. Use a Brush Size of around 50 and an Opacity of 100.
    b. Then, select the "Raise / Lower Terrain" tab. Select a brush size of around 30 and a very low Opacity of around 1. Extend the ramp by lowering some terrain at the top of the step and raising some at the bottom.
    c. Then, return to the "Smooth Height" tab, set a high Opacity value, and smooth along the path again.

    You should now have relatively gentle ramps leading up your hill.



3. The rest of our hill is still made up of ugly vertical steps. We can improve this.
    a. Use the "Smooth Height" and "Raise / Lower Terrain" tabs and painting along and across the edges. Experiment with different brushes, sizes and opacities to practice with them.
    b. Use the "Paint Texture" tool with a low Opacity (around 15) and a medium Target Strength (around 0.5) to blend in some muddy texture for the more vertical parts of the ground. This helps visually define the hill's shape.

    The more time you spend the better your results will be, especially as you get more practice.



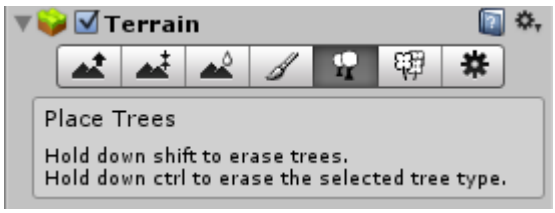
If you'd like, you can also apply these techniques to improve your lake.

Note: In this tutorial we're just focusing on how to use the tools. When building terrains for your games, however, it's always a good idea to find some reference images of places similar to the one you're building and use them to help with your design. This will help you avoid making mistakes that could make your game feel unrealistic, and any subtleties you can copy from reality can help add a lot to the look and feel of your game.

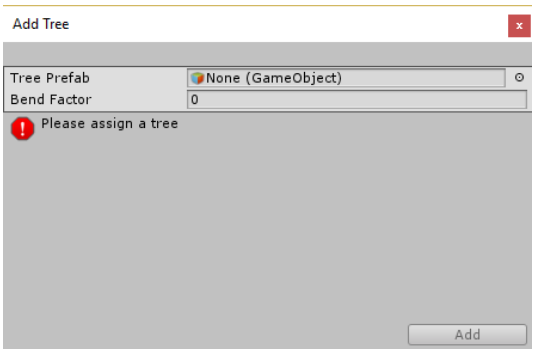
Activity 4 - Add trees and grass:

So far our grass is just a flat texture. That's often enough to get the job done, but in many games it's good for nearby areas be more detailed.

1. In the Terrain Inspector select the "Place Trees" tab.

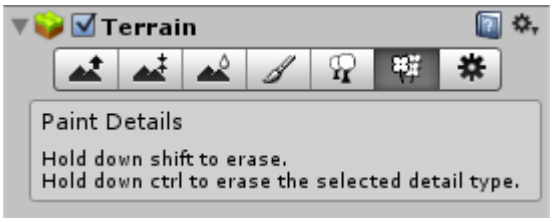


2. Just as with textures, we need to configure trees for use with the Terrain system. Select "Edit Trees..." then "Add Tree...". The following dialog should appear:

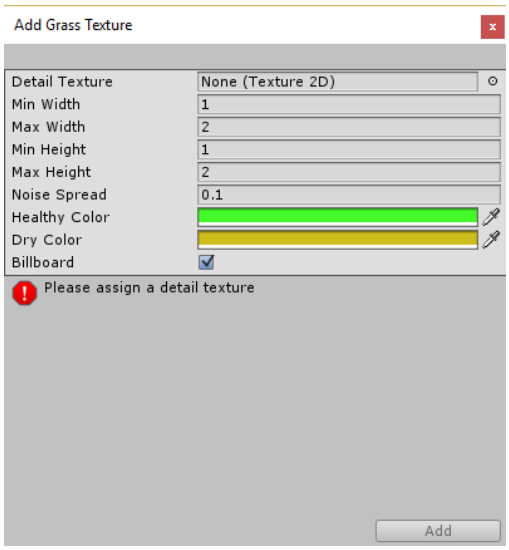


3. A number of tree prefabs created with SpeedTree are included in the Environment bundle. In the "Tree Prefab" slot select the "Connifer_Desktop" and then press "Add".
4. In the Terrain Inspector, you will see that trees can now be selected and painted onto your Terrain just like textures. The system will even randomly tweak the size and rotation for you. This is *very* handy for when working with large landscapes - you don't want to have to place and tweak every tree by hand! For now, set "Brush Size" to 1, "Tree Density" to 100, and leave the other settings as default. Then, place some trees around your terrain to taste.

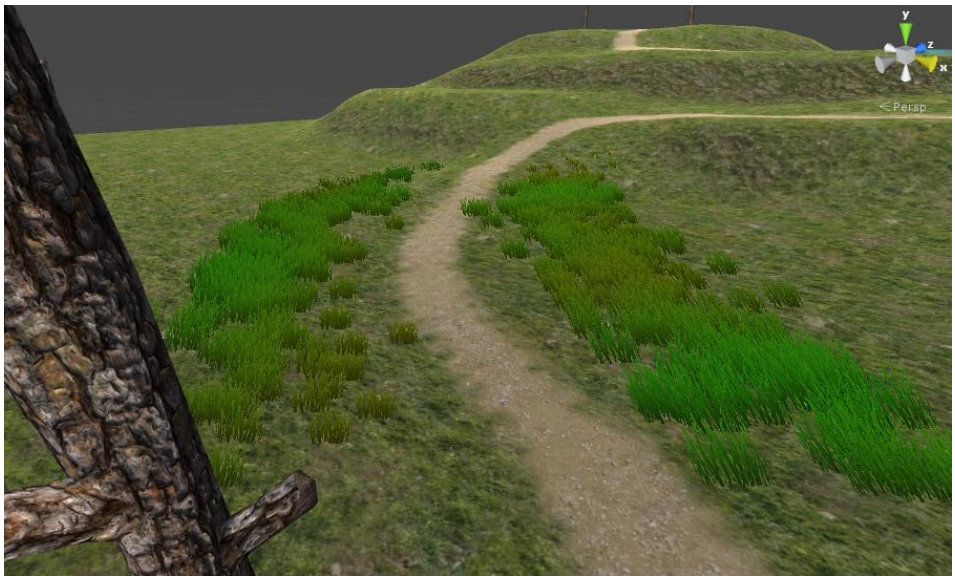
5. Moving onto grass, select the "Paint Details" tab of the Terrain Inspector.



6. As with textures and trees, we need to add "Detail Objects" to the Terrain before we can use them. Select "Edit Details..." and then "Add Grass Texture...".



7. In the "Detail Texture" slot select one of the "GrassFrond0xAlbedoAlpha" textures. It's hard to judge the effect of the other settings at the moment, so leave them at their defaults and click "Add".
8. Grass is painted onto the Terrain just as textures and trees are. However, to improve performance grass is only rendered when it is nearby. (The distance is determined by the "Detail Distance" setting in the Terrain Settings tab.) So, when painting grass onto your Terrain, make sure that you first move the Scene view's camera nearby - otherwise the grass will paint but you will not be able to see it! Move the camera to somewhere near the path between your lake and your hill.
9. When painting grass you want to use a *very* low Opacity setting on your brush, because it gets very dense very quickly, and this is expensive to render. Set the Opacity to 0.01 and then paint some grass in on either side of your path.



10. Now that we can see some grass, lets go back to the Terrain Inspector's "Paint Details" tab. Select your grass in the "Details" panel, then click "Edit Details..." and "Edit".
11. Now as you change the settings you can see their effect. Tweak your grass to taste.

Activity 5 - Fill the lake with water:

At the moment our "lake" is really just a "hole". Let's fix that.

1. Included in the Environment asset package there are a couple of different options for adding water to the scene. There are a number of prefabs of different styles you can try out. Start by adding a Standard Assets/Environment/Water/Water4/Prefabs/Water4Advanced instance to your scene. Position it in your lake and scale it appropriately.

2. Position your Main Camera so you've got a nice view of your lake, and play the scene. Do you think this water is appropriate for a lake? Select the water's material and play around with its settings.
3. Also, try out the other provided water prefabs. They are each of a different style, and might be useful in different circumstances.

As you can see, different scenes can have very different requirements of their water. Thankfully, in addition to those included in Unity's Standard Assets there is a wide variety of water assets available via Unity's Asset Store.