

Basic Terrain Set Up in World Machine:

[World Machine](#) can be quickly become complex for the new user, there are many devices to learn and their actions are not always apparent. However you can do a lot with a simple set up, ignoring the other elements for now.

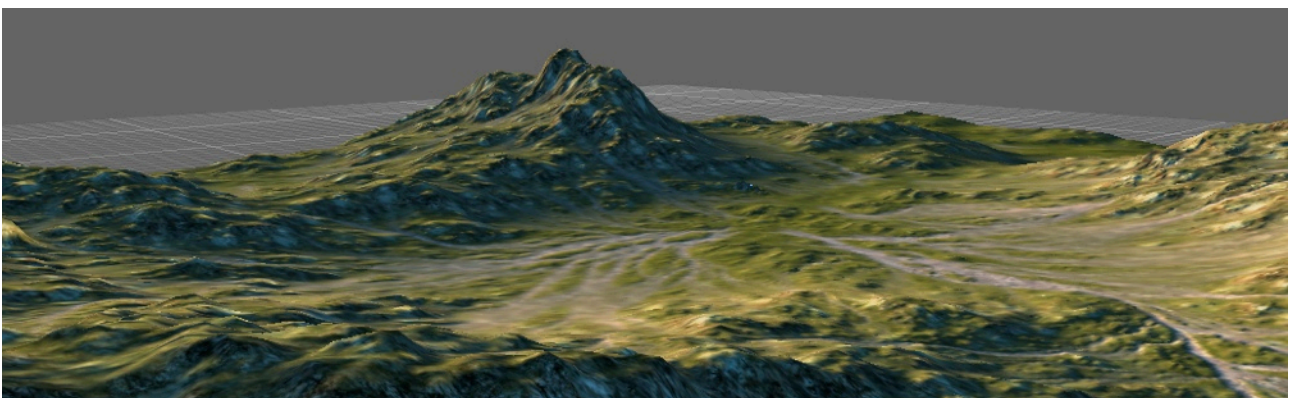
This tutorial tries to establish a basic set up that allows you to export a terrain *Heightmap* and texture *Splatmap* for use in a game engine such as Unity3D. In the case of Unity3D you will need these [scripts](#) to import a Splatmap.

Be aware this is meant merely as a supplement to the World Machine [manual](#), addressing what we have done in class. Please look at the manual for a proper understanding! The World Machine User Interface is quite idiosyncratic so you will have to go the trouble of exploring the UI by playing around yourself and also reading up on it. There is very little option to *Undo* for example and you will have to develop your workflow around this fact, saving regularly for example, or at least saving before trying something radical with a setup you are already happy with.

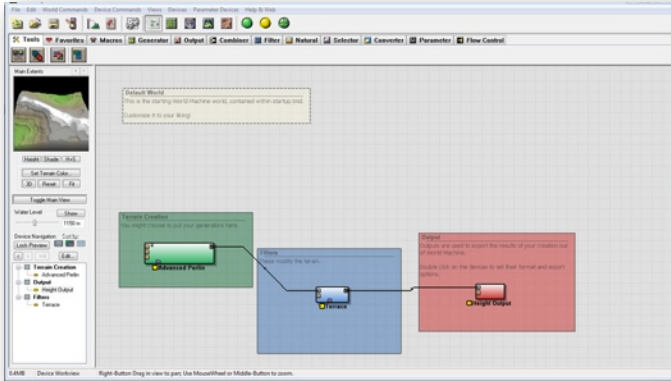
The [Device Reference](#) on the World Machine website is where you'll find detailed information about each device. Spend the time to at least read over the the devices we are covering in this tutorial. Of course the best way to learn what they do is to play with them.

We are looking at using *Advanced Perlin* devices as a basis for our terrain. Note that you can also use a *File Input* device from *Device > Generator > File Input* in the menu bar to load your own greyscale image. Perhaps you roughly sculpted what you want in Unity3D for example and want to apply some noise and erosion to it. you would export that as a Heightmap from Unity3D, convert it from a .RAW to a .tif and then import that into World Machine with the *File Input* device. Again, the Device Reference will explain this in detail.

If you are working towards quite a flat terrain where the environmental assets are the main focus, not really the terrain, then I recommend at least using World Machine to create a subtle noise on the ground rather than keeping it purely flat. Play with the *Elevation Center* and *Steepness* parameters inside the *Advanced Perlin* to get a nice low level noise.



When you first open World Machine you will see the *Device Workflow* screen. This is where you organise your *devices* which control the *noise* that will generate your terrain. To help you make a start there are 3 commonly used devices setup by default, an *Advanced Perlin*, a *Terrace* and a *Height Output* device.



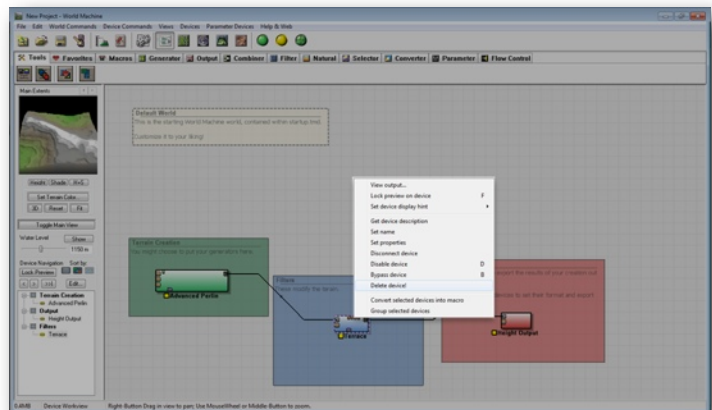
Access different views by clicking the icons to the right of the dice, or from the Views menu. You will mainly use the *Device View* and the *3D View*.

The colored boxes around the devices are simply there to help you organise this screen. When you move the colored boxes any device inside will be also moved. You can just ignore them if you like.

Right clicking on a device brings up some useful options such as:

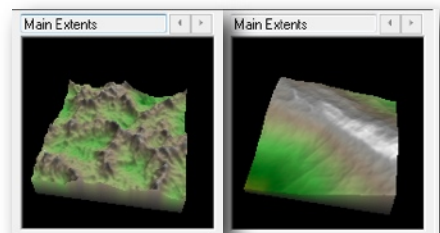
- *Disconnect device*
- *Disable device*
- *Bypass device*
- *Delete device*

You can scale the device layout with your mouse scroll wheel, pan with right click while moving the mouse and select a group of devices by drawing a marquee with left mouse button.



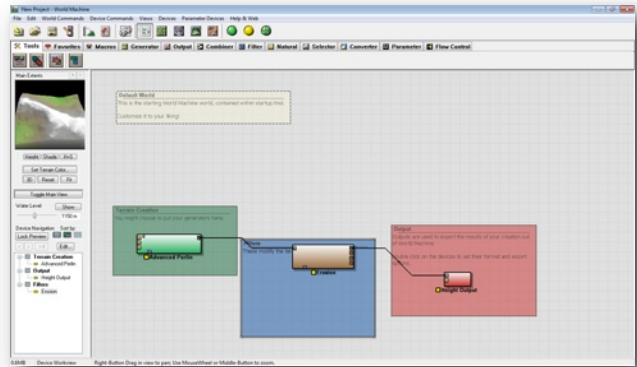
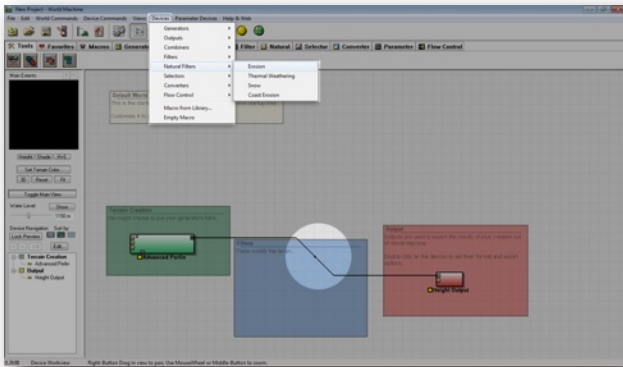
Usually you will begin your chain of devices with an *Advanced Perlin*, connect that to a series of other devices that add to and manipulate the noise it generates, and then end the chain with a *Height Output* device which allows you to export your Heightmap. Here we will add some other devices also.

I won't go into detail as to how you should setup the noise in your *Advanced Perlin* devices, but consider setting up one with small scale features and the other with large scale features and experiment with how they blend. More on that further down.

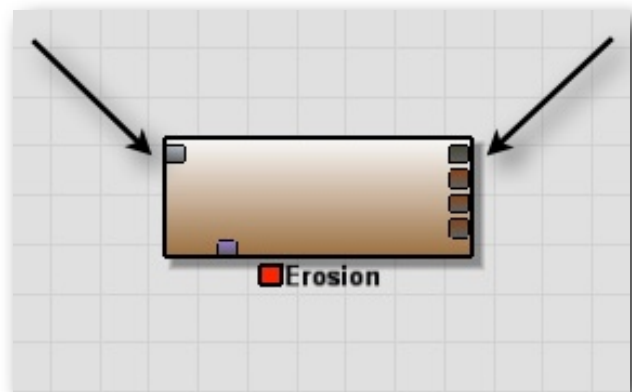
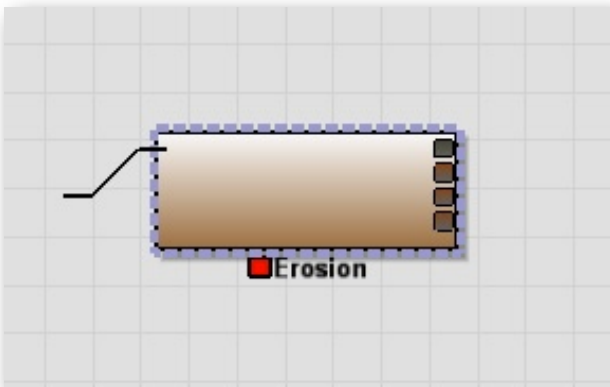


First let's delete the *Terrace* device and replace it with an *Erosion* device. If you want to add and experiment with other devices go ahead, but at least add this *Erosion*.

From the menu: *Device > Natural Filters > Erosion*.

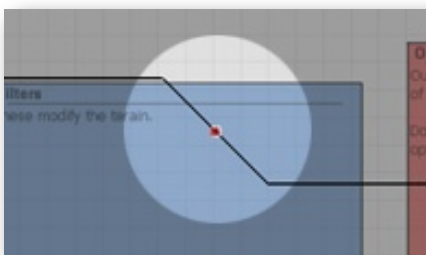


To connect devices click on the small grey (sometimes brown) squares on the left and right sides of the device. These squares are the inputs and outputs of the device. Note what information is given as you hover over them.



As you click the *input/output* a line will appear that sticks to your cursor. Drag the line to the *input/output* of the device you want to connect to.

Sometimes the line will make you angry! Just right click and it should go away..



If a new device can be connected between 2 existing devices, a red dot appears as you hover over the midpoint with your cursor while dragging the device.



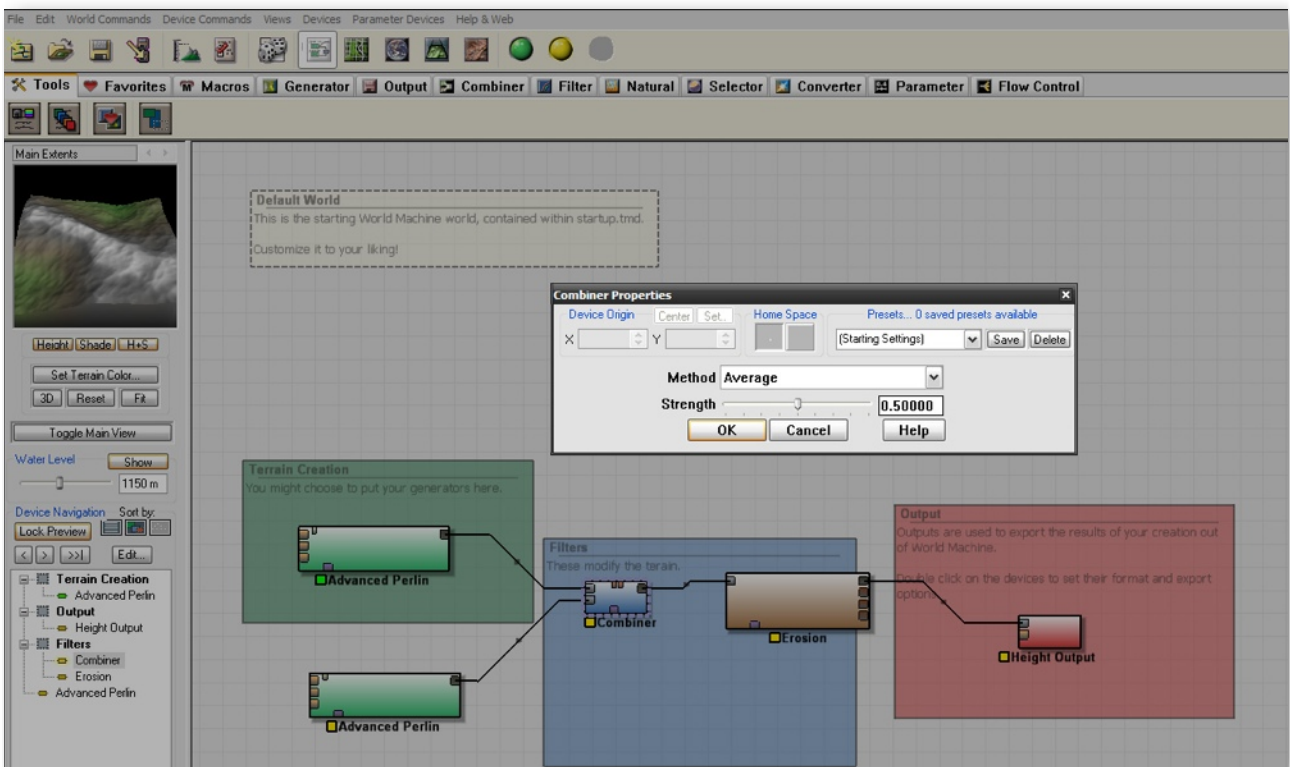
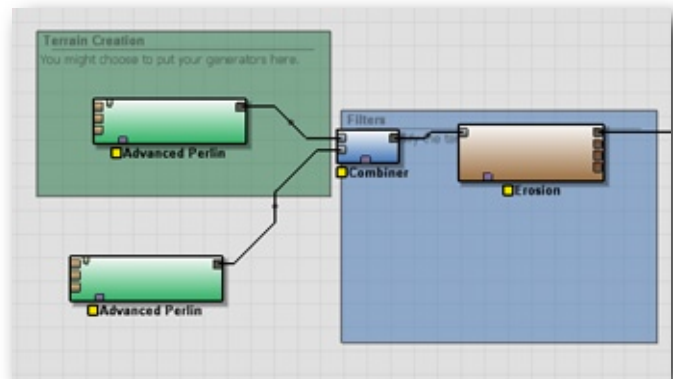
As a rule, when connecting new devices to existing devices, it is good practice to click *from* the new device and not the other way around. This is because if you already have several connections on an existing device you will lose those connections and have to make them again.

Also you will notice that as you activate an *input/output*, only the *input/outputs* on other devices that can accept the connection will be shown, the irrelevant ones will disappear. Taking notice of this will help when you are unsure where to make the connection.

Now that we have an *Erosion* device connected, let's add a 2nd *Advanced Perlin* device and a *Combiner*.

- *Device > Generators > Advanced Perlin*
- *Device > Combiners > Combiner*

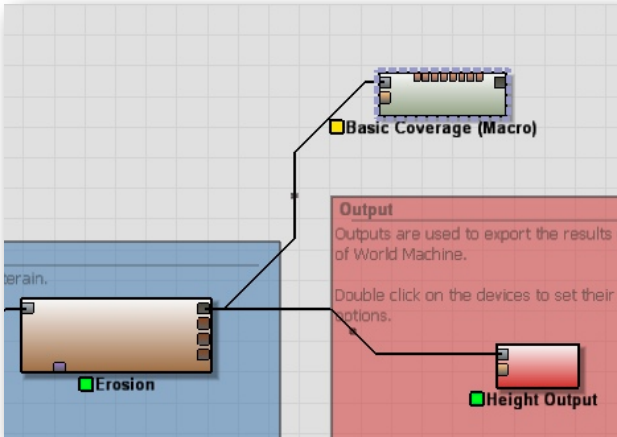
Double click the *Combiner* device and you'll see it is set to *Average*, which gives an even blend of the 2 *Advanced Perlin* devices. Let's leave it like that for now.



Hopefully you have access to the extra devices called macros which can be found in *Devices > Macro from Library*. If you don't have any *macros* and your library is empty, download and install the free version of World Machine and they should be available.

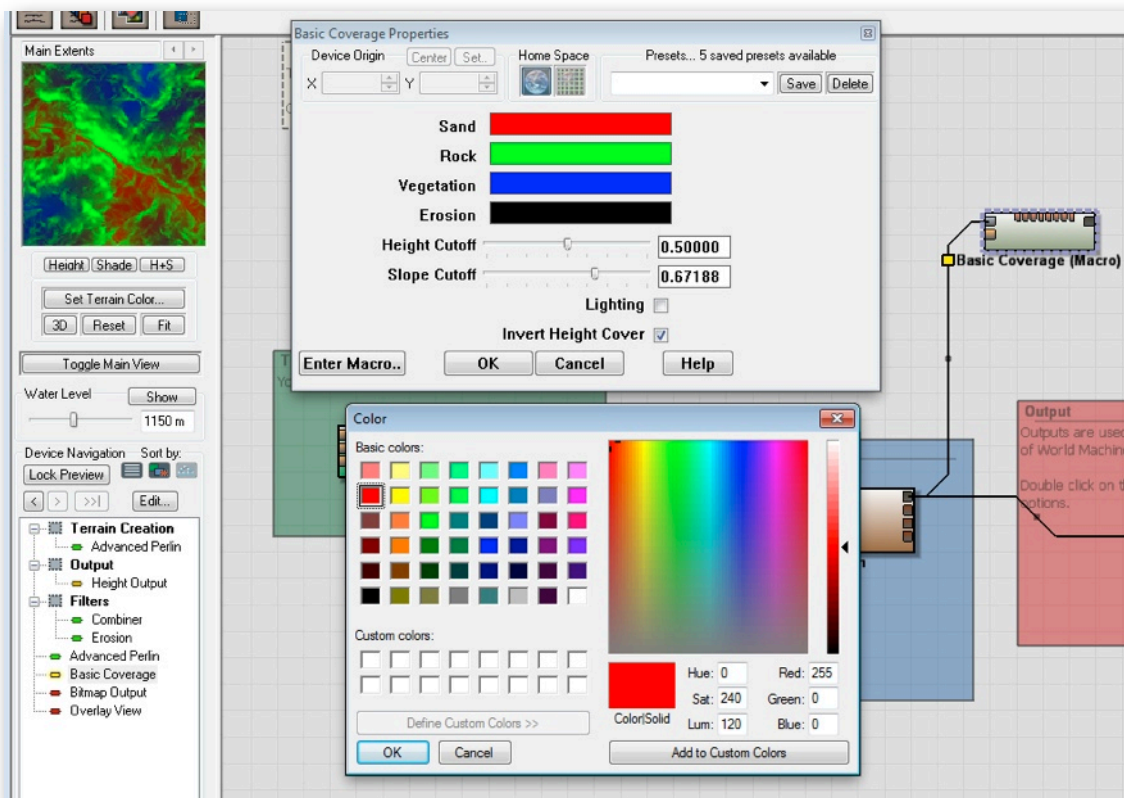
Select Basic Coverage and click load, then click anywhere on the *Device View*. This device will help enable us to create a *Splatmap* which I'll explain further later on.

The *Basic Coverage* device has 2 inputs on the left, the *Terrain Input* and the *Erosion Input*. Connect the *Terrain Input* to the *Primary Output* of the *Erosion* device. Do not use the *Erosion Input* as we will use the *Alpha Input* of the *Bitmap Output* instead. Got that?



Here you are feeding the Heightmap from the *Advanced Perlin*, through the *Erosion*, and into the *Basic Coverage* device.

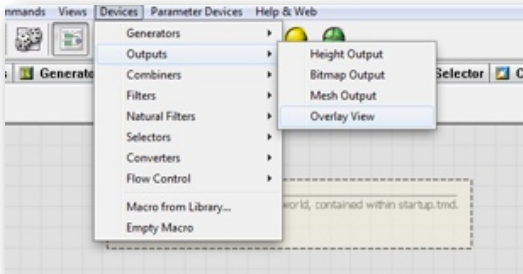
This device will help us to assign ground textures to height and slope parameters of our terrain according to settings you can control by double clicking the device and opening it up:



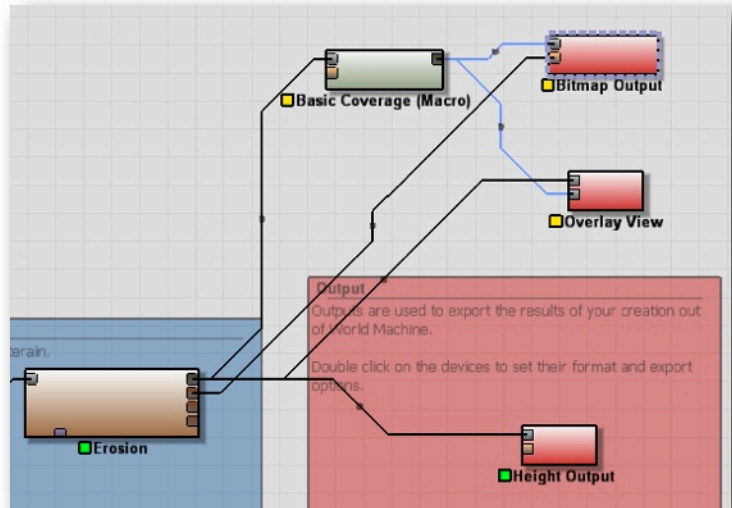
By default the *Basic Coverage* device will be set up with earth colors relating roughly to what is expected to happen at the slopes and heights these colors are assigned to. We can change these colors to whatever we want, and we want to use primary Red, Green and Blue. Notice you can pick a primary Red from the color picker: Red 255, Green 0, Blue 0. We'll leave *erosion* as Black.

For now play around with the *Height Cutoff* and *Slope Cutoff* and note the changes you see in the live preview window at the top of the left sidebar.

To finish our device setup we need a *Bitmap Output* and an *Overlay View*. Menu bar: *Devices > Outputs*.



Rather than further confuse you with words take a close look at the image to the right here and see how I've made the connections.



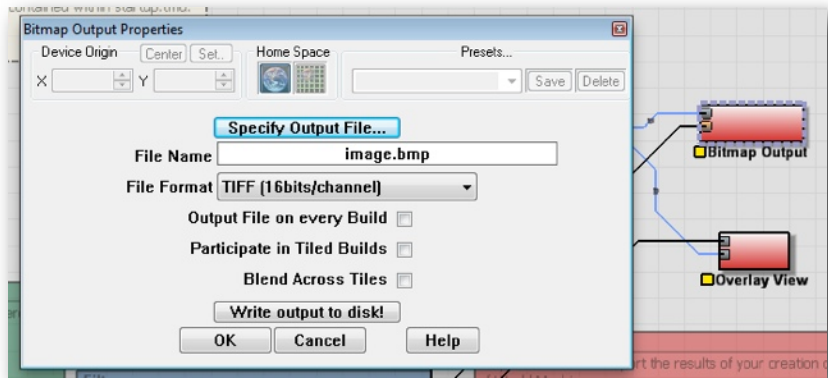
There are a few things you will notice. Firstly some of the connection lines are blue, these connections carry RGB image information rather than Heightmap information. You will also see that 4 devices are plugged into the *Erosion* device Heightmap output.

Finally you'll see that we've made our first connection using the secondary brown *input/outputs*. Remember that we set up 3 RGB colors in the *Basic Coverage* device. When we connect the *Alpha Input* to one of the 3 brown output squares on the *Erosion* device, we are assigning some heightmap information to the alpha channel of our Splatmap. So now we are making use of all 4 channels.

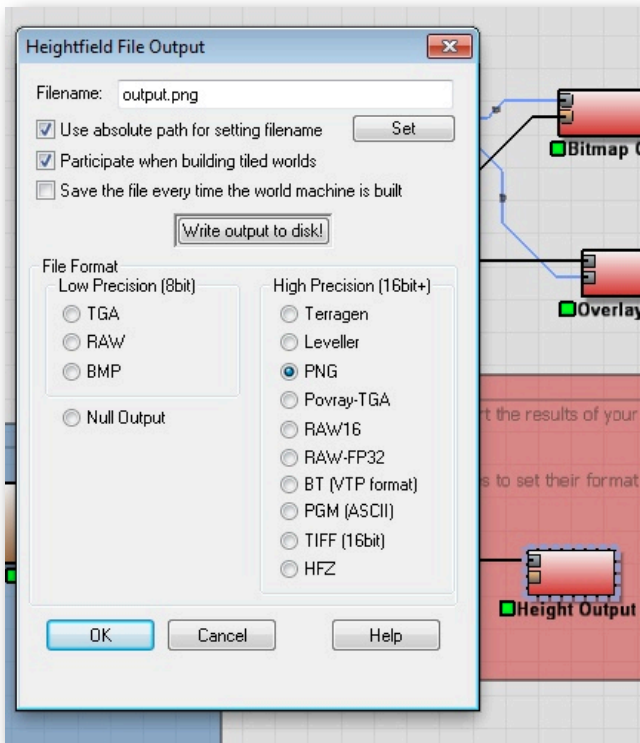
If in doubt as to which *Erosion* output to use, go with the *Flow*. *Flow* isolates the channels created by water-mimicking algorithms acting on the terrain over time and generally looks good.

The *Overlay View* allows us to see the Heightmap in the *3D View* in World Machine with the results of the *Basic Coverage macro* applied. It needs 2 inputs, first the Heightmap, which should come from the *Erosion* Output, and it also needs to connect to the output of the *Basic Coverage macro*.

The *Bitmap Output* allows us to export the final Image. When your set up is done, double click the *Bitmap Output* and give your image a name and a location for saving via 'Specify Output File'. Use the .TIFF file format. Finally, hit 'Write Output to Disk!'



When you try to 'Write Output to Disk' there will be a prompt: "*The World Must be Built Before You Can Export Your Terrain*". Click 'Yes', wait while World Machine builds your terrain, hit "Ok" and you will see a message, "File Written Successfully". It is finally done. You now have a Splatmap with 4 texture layers that you can import into Unity3D. Open the file up in Photoshop and take a look in the Channels view.

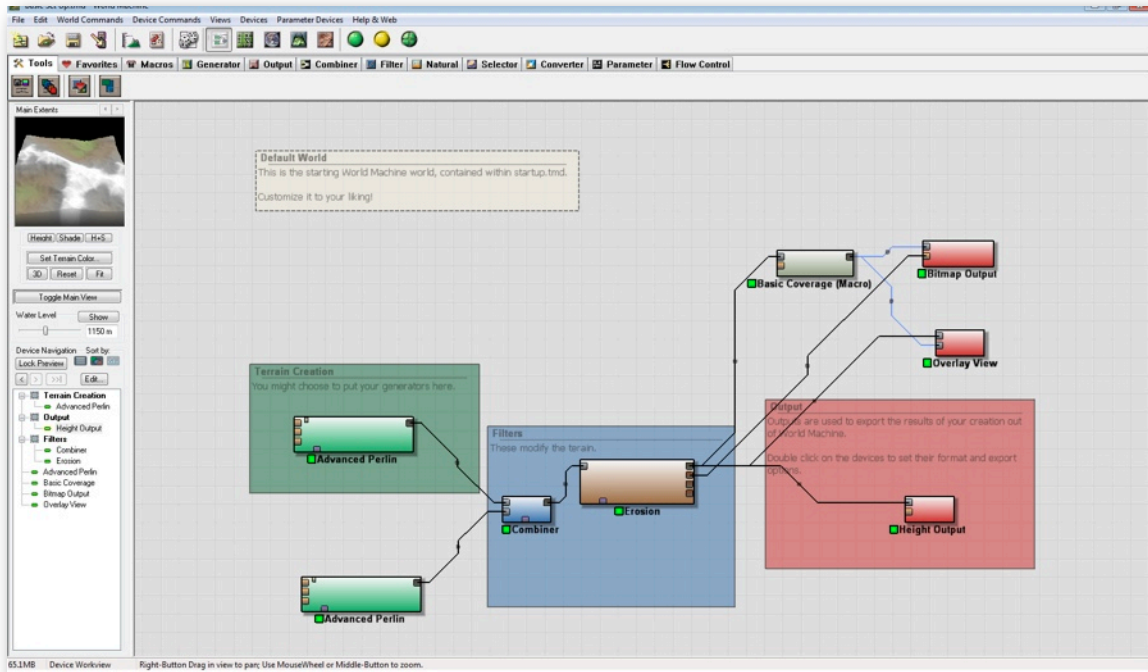


To create your Heightmap double click the *Height Output*, choose a file format, I recommend **Tiffs**. Use "Set" to give your Heightmap and name and location, and then click "Write Output to Disk!". You may need to wait for World Machine to build your landscape again, click "Ok" and you should see a message telling you "File *name.tif* Written Successfully".

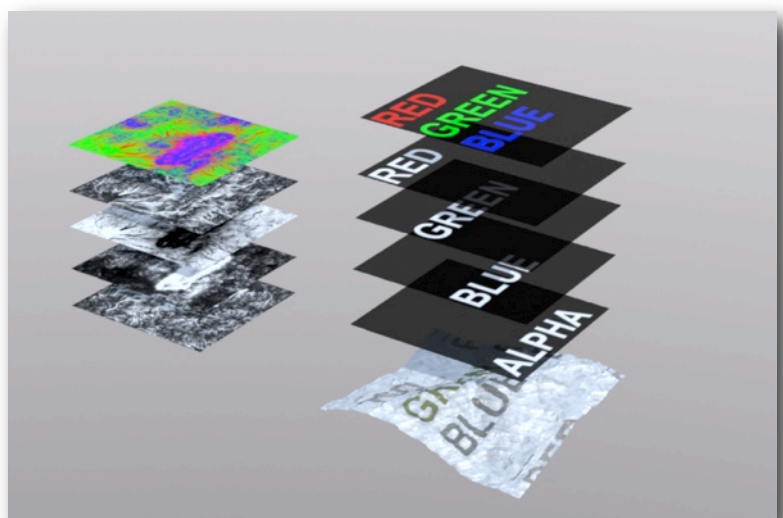
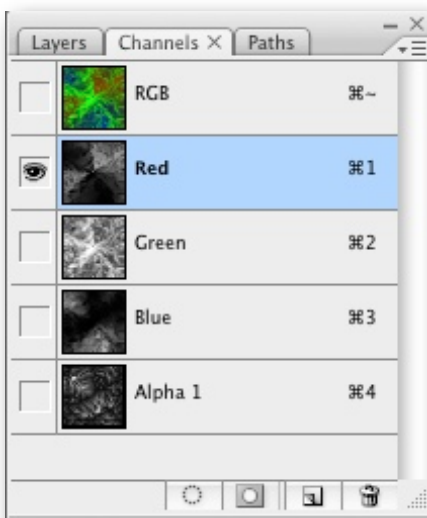
Game engines require Heightmaps to be in .RAW format. This can be tricky as there are several ways to import and export .RAW files, and this includes differences between mac and Pc. From my experience though, after loading your .tif into Photoshop and exporting it as Photoshop.RAW with default settings, and then importing it into Unity3D with default settings, you shouldn't have any trouble.

If your heightmap in the game editor is very spiky, the format is not correct and you need to try different settings. Good luck with that..

So this is what I recommend as a minimum setup before you embark on creating your terrain. The 2 *Advanced Perlin* devices give you broad control over the overall form of the terrain, both high frequency and low frequency characteristics, while the *Erosion* adds a high degree of naturalism and sophistication. The Basic Coverage allows us to export an image whose various color channels we can use to control where exactly ground textures are added to our terrain in Unity3D or any game engine that can import what we call *Splatmaps*.



Splatmaps: When we look an RGB image in photoshop we see it is made up of Red, Green and Blue channels and possibly an Alpha channel. Below I've tried to illustrate what is happening when we import a Splatmap into a game engine such as Unity3D.

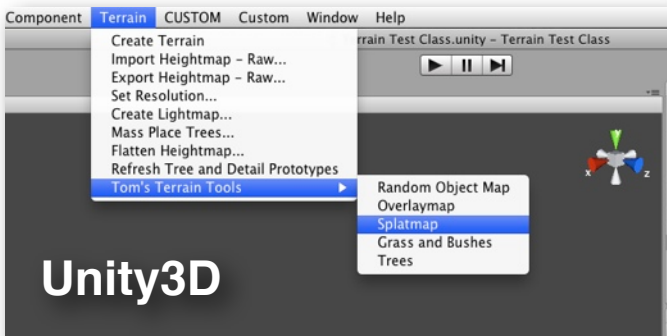
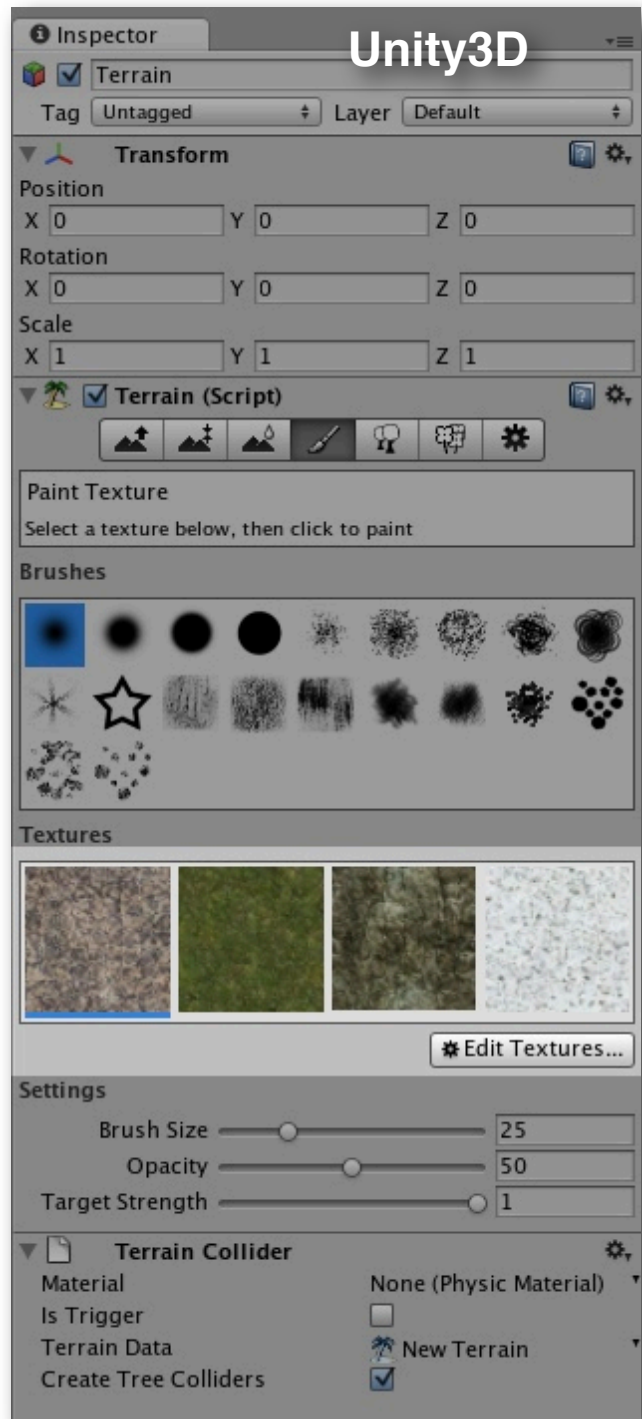


What we are doing is using each of these color channels to control where a ground texture is added to the terrain. White means the texture will be visible on the terrain.

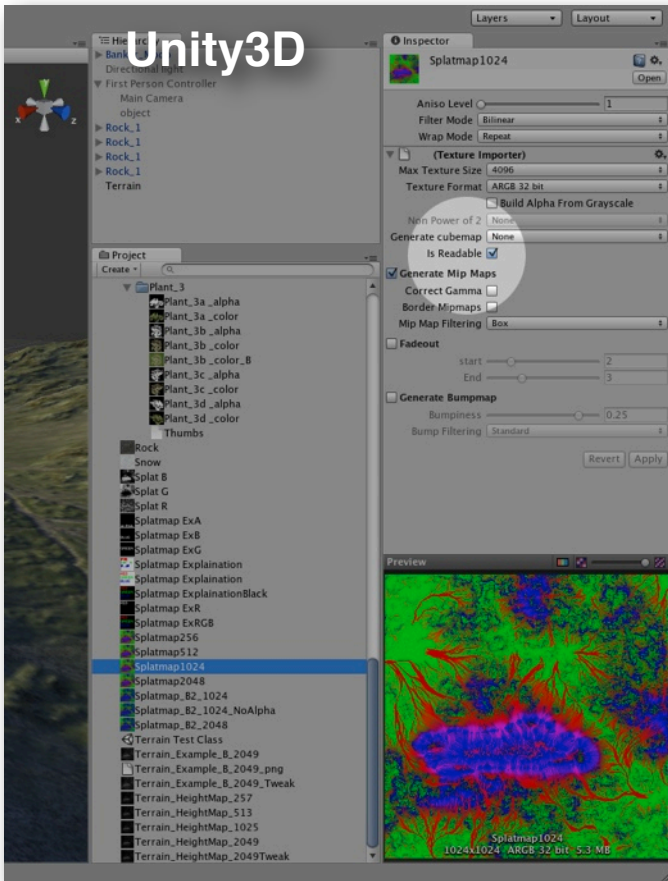
Using World Machine we can store information that locates for example only the steep angles of a terrain. You might want to apply a rock texture to these steep areas. If that information is stored in your red channel, which is read first in Unity3D (then green, then blue), then ensure your rock texture is the first texture you add when setting up your ground textures. If the Green channel represents your grass layer then introduce a grass ground texture next in Unity3D.

A final note about Splatmaps and Unity3D. The [terrain scripts](#) you need to setup the import process actually don't allow use of the Alpha Channel (!). If you have an alpha channel keep it black, otherwise just don't use it. I've included creating the Alpha layer here because I think it's good practice. Other game engines may be able to use it, and you can always create it in World Machine and then take it out to use as a separate Overlaymap.

However.. You can import additional Splatmap layers as an Overlaymap using the terrain scripts. And you can add as many of these as you like, but you just have to understand that you can't *Undo* these actions, only *Redo* them. So play around with your Splatmaps and Overlay maps until you think you have what you want, then start from scratch and apply them again, always naming them so you can maintain an organised understanding of what you are doing.



When using the Overlay map option you have the option to "Change Terrain". So the active area of the Overlaymap, the white areas, adjust the Heightmap as it is applied. So if you have an Overlaymap for snow coverage for example you can add say .5 in "Change Terrain" and the Heightmap will raise slightly where your snow texture is applied. You can also use a negative value, good for paths.



A few things to remember re Splatmaps:

Check this “*Is Readable*” check box in the Inspector panel in Unity3d for the Splatmap, otherwise the terrain script won’t accept it. Hit “*Apply*” after you’ve checked the box.

World Machine will export your Splatmap and Heightmap as ‘To the Power of 2’ resolution plus 1. So 512 becomes 513 and so on. This is good for your heightmap, but not your Splatmap. So resize your Splatmaps in Photoshop back down to 512, or 1024 or whatever size you are aiming for.