Chapter

16

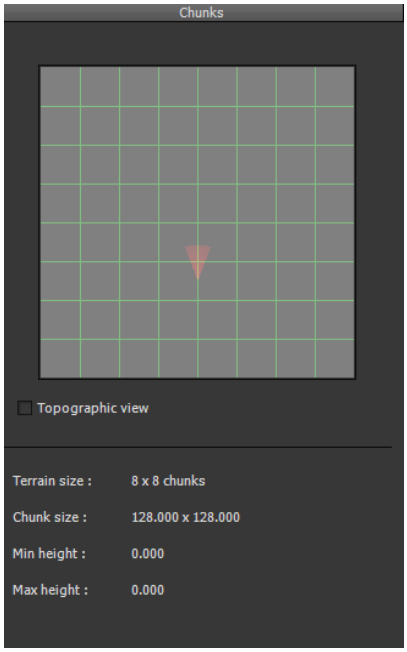
Creating a Terrain

Most Games require some sort of Terrain for the Models to move around on, and also to make the Game look more interesting for the Player! To create a Terrain for our Scene, open the Terrain Editor module and click on "Terrain" and then "Create". We will create a fairly big Terrain, so input the following in the Terrain Editor and click on "OK":

Chunk Count:	8 x 8
Chunk Size:	32 x 32
Unit Size:	4

This will give us a Terrain consisting of 64 "Chunks" each being approximately 1Km square (actually 1024 metres). This means that our total Terrain area will be approximately 64 square Kms in size, with each side being approx. 8Kms in length.

The Terrain Editor will now appear:



You can see from the above that the "Terrain size:" is 8x8 "Chunks", with each "Chunk size:" being 128x128. You will also notice that both "Min height:" and "Max height:" are 0.

There is also a check box labelled "Topographic view", this is useful to see an eagle's eye view of the whole Terrain, so when we have created some Terrain, we can check this box and our new Terrain will be visible in this roll-up.

Now we need to actually create some Terrain. I'm going to show you how to create the Terrain following the Terrain Creation Tutorial from the SDN (ShiVa Developers Network). Firstly we need to select our "Chunks", so click on the first "Chunk", and then drag your mouse down to the last "Chunk". All the "Chunks" should now be highlighted.

Open the "Materials" roll-up in the Terrain Editor, and click on "Receive dynamic lighting". Next, open the "Geometry" roll-up, click on the "Add" button (), and select the "Noise" option. Adjust the parameters as follows:

Operator:	Replace
Amount:	1.00
Soft Borders:	0.00
Frequency:	0.010
Persistence:	0.750
Octaves:	4
Amplitude:	38

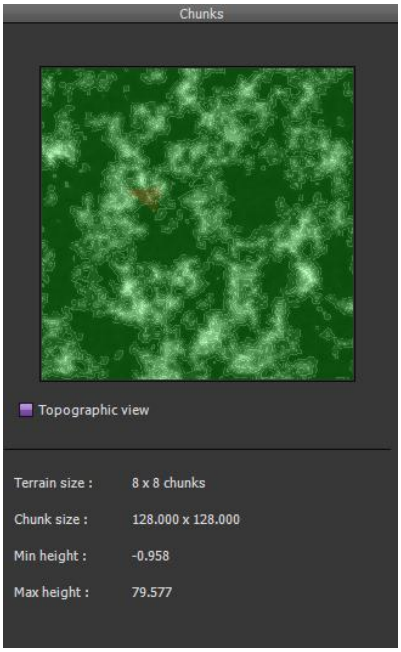
Also, make sure you check the "Auto Update" option, so you can see (in real time in the Scene Viewer) what changes are made to your Terrain when you play with the above amounts. PS: Don't forget to click on "OK" when you're satisfied with your terrain!

Now, we'll add a "Level" layer. To do this, click on the "Add" button and select "Level". Again, adjust the parameters as follows:

Operator:	Max
Amount:	1.00
Soft Borders:	0.00
Level Height:	0

One thing that you will find with the Terrain Editor is that you have to keep selecting the "Chunks" to be affected, and also that you'll have to keep checking the "Auto Update" option, after each operation! So be careful and you won't have any unpleasant surprises.

If you now go back to the "Chunks" roll-up, and check the "Topographic view" box, you should see something similar to the following:

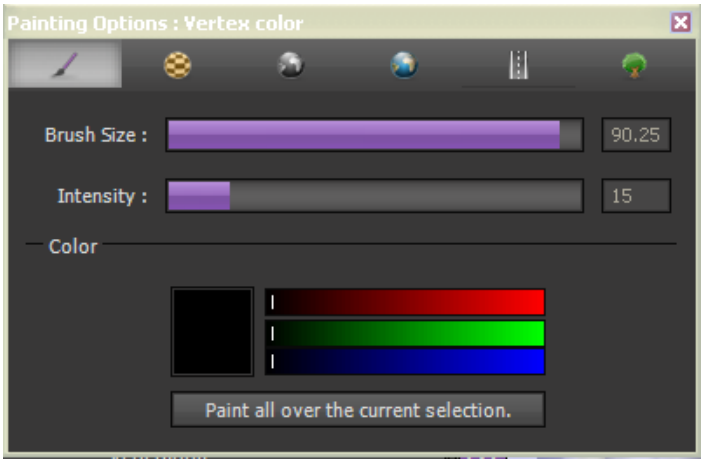


You will now see your Terrain from above with the different colour scales indicating different heights. Also, notice that, for my Terrain, the "Min height:" is now -0.958, and the "Max height:" is now 79.577 (this screenshot was taken after I'd created my entire Terrain, so your values may be different at this point), which means we have some leeway to introduce water (i.e.: below say 0.00), and maybe even snow (i.e.: above say 58).

Now it's time to get fancy and add some noise at higher altitudes, and also do some eroding of our Terrain.

However, before we do that, I'll just quickly mention the painting options available.

To use these options, you have to select the "Noise" layer that you just created, and click on the "Paint" () button. This will display the following dialog, which allows you to paint the selected "Chunk(s):



This dialog has 6 options:

Vertex color: This is a straight colour painting option.

Texture blending: This allows Textures to be blended across the Terrain.

Terrain height: This allows the painting of Terrain height across the Terrain.

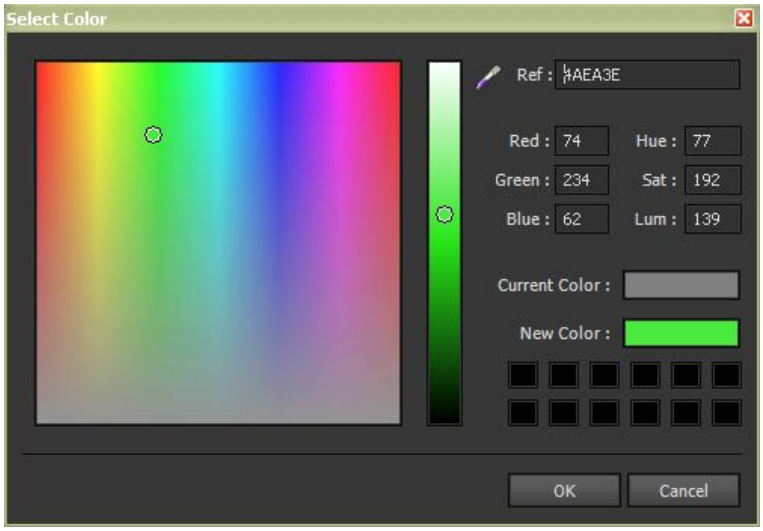
Terrain material: This allows a Material to be painted across the Terrain.

Terrain road: This allows roads to be painted across the Terrain.

Terrain vegetation: This allows vegetation to be painted across the Terrain.

For more information on these options, see the SDN.

Tip!
To select a colour, you can either use the sliders, or open the paint dialog that appears when you click on the colour square next to the sliders, as shown below:



Next, we'll add another "Noise" layer. To do this, click on the "Add" button and select "Noise". Again, adjust the parameters as follows:

Operator:	Max
Amount:	1.00
Soft Borders:	0.00
Frequency:	0.060
Persistence:	0.801
Octaves:	8
Amplitude:	1

Finally, we'll erode some of the Terrain. To add an "Erosion" layer, click on the "Add" button, and select "Erode". Select the following parameters:

Operator:	Replace
Amount:	1.00
Soft Borders:	0.50
Iterations:	4

Important!
You **MUST** turn the "Auto Update" option off before starting the erosion operation, or it will take a long time to complete! This is due to the size of the Terrain. So, if you left "Auto Update" on, then now would be a good time to make yourself a tea or coffee, do the shopping, the ironing, watch a movie (or two) etc.! (I tried it, just for fun, and it was still running when I terminated it over 4 hours later!)

The next step in creating the Terrain is to add some different Materials, such as soil, snow, water and rocks.

To do this, select all of the "Chunks", switch to the "Materials" roll-up, and add a new "Snow" layer by clicking on the "Add" button (), and adjust the parameters as follows:

Name:	Snow
Operator:	Replace
Albedo Map:	Leave BLANK
Color:	"White"
Normal Map:	"Snownm"
Soft Borders:	0.20
Height Min:	58.00
Height Max:	1000.00
Height Min Soft:	0.00
Height Max Soft:	0.00
Slope Min:	0.00
Slope Max:	1.00
Slope Min Soft:	0.00
Slope Max Soft:	0.00
Offset U:	0.00
Offset V:	0.00
Scale U:	8
Scale V:	8
Relax UVs:	0

Now click on the "OK" button.

To create the "Soil", "Rocks" and "Water" layers, repeat the above with the following differences:

SOIL

Albedo Map:	"SoilColour"
Color:	"Dark Tan" (R 74, G 69, B 40)
Normal Map	"Soilnm"
Height Min:	-1000.00
Height Max:	30.00
Relax UVs:	1000

ROCKS

Albedo Map:	"RockColour"
Normal Map	"Rocknm"
Height Min:	-29.95
Height Max:	58.05
Relax UVs:	1000

WATER

Albedo Map:	"WaterColour"
Normal Map	"Waternm"
Height Min:	-1000.00
Height Max:	0.00
Relax UVs:	1000

Before we go any further, I think I'd better explain the options available in both the "Geometry" and "Materials" roll-ups. These may seem a bit daunting, but once you've played with creating your own Terrain, they won't seem so bad!

GEOMETRY ROLL-UP:

The "Geometry" roll-up allows the creation of the following types of layer:

Level

Noise

HeightMap

Terrace

Erode

All of these layers have the following options in common:

Operator: This option allows the selection of the operator that will be used to combine this layer with the previous one. The available options are:

Replace: This option will overwrite the previous layer with the current one.

Add: This option will add the two layers together.

Subtract: This option will subtract the current layer from the previous one.

Multiply: This option will multiply the two layers together.

Min: This option will use the minimum value for each point, which will be calculated using both layers.

Max: This option will use the maximum value for each point, which will be calculated using both layers.

Average: This option will use the average value for each point, which will be calculated using both layers.

Amount: This option allows the setting of the factor used to combine this layer with the previous one [0 to 1]. This acts in a similar way to an opacity value.

Soft borders: This option allows the setting of the size of the soft borders [0 to 1]. Note that a value of 0 will result in hard borders, and a value of 1 will result in a border size equal to half of a "Chunk".

Auto Update: Checking this option will automatically update the Terrain when changes are made.

The individual layers also have the following options:

Level

Level height: This option allows the setting of the height of the level, in world units [-100 to 100].

Noise

Frequency: This option allows the setting of the frequency value for the noise function [0.001 to 1.000].

Persistence: This option allows the setting of the persistence factor for the noise function [0.001 to 1.000].

Octaves: This option allows the setting of the number of octaves for the noise function [1 to 8].

Amplitude: This option allows the setting of the amplitude for the noise function [1 to 1000].

HeightMap

Heightmap: This option allows the selection of the HeightMap resource which will be used to generate the displacement. The drop-down list will display all HeightMaps available in the current project.

Scale: This option allows the setting of the scale to be used on the HeightMap [0 to 1].

Terrace

Level height: This option allows the setting of the height, in world units, for the terrace level [1 to 100].

Offset: This option allows the setting of the height offset factor, in world units [1 to 100].

Strength: This option allows the setting of the terrace strength factor [0 to 1].

Erode

Iterations: This option allows the setting of the number of iterations to be used by the erosion process [1 to 16].

MATERIALS ROLL-UP:

The "Materials" roll-up allows the attachment of Materials and Textures to the created Terrain.

Name: This option allows the setting of the name for this Material.

Operator: This option allows the setting of the operator that will be used to combine this Material with the previous one. The available options are the same as for the "Geometry" operators above.

Albedo map: This option allows the setting of the Texture that will be used as the albedo map. The drop-down list shows all of the Textures available to the current project. (Albedo is the extent to which the object will diffusely reflect light - taken from Wikipedia). Also, a view of the selected map will be generated next to the drop-down list, and clicking on the  will delete the albedo map.

Color: This option allows the setting of the colour that will be modulated with the albedo map (if any), and will display the standard ShiVa colour selection dialog box.

Normal map: This option allows the setting of the Texture that will be used as the normal map. The drop-down list shows all of the Textures available to the current project. (The normal map can be used to add details to the shading of an object, without adding additional polygons, and also to enhance the appearance of low poly models - both taken from Wikipedia). Also, a view of the selected map will be generated next to the drop-down list, and clicking on the  will delete the normal map.

Use terrain UV space: If checked, this option will normalise the Texture coordinates to the whole Terrain instead of to the "Chunks".

Soft borders: This option allows the setting of the size of the soft borders [0 to 1]. A value of 0 will result in hard borders, and a value of 1 will result in a border size equal to half of a "Chunk".

Height min: This option allows the setting of the minimum height, in world units, at which the Material will be applied [-1000 to 1000].

Height max: This option allows the setting of the maximum height, in world units, at which the Material will be applied [-1000 to 1000].

Height min Softness: This option allows the setting of the softness factor near to the minimum height [0 to 1].

Height max Softness: This option allows the setting of the softness factor near to the maximum height [0 to 1].

Slope min: This option allows the setting of the minimum slope, in world units, at which the Material will be applied [0 to 1].

Slope max: This option allows you the setting of the maximum slope, in world units, at which the Material will be applied [0 to 1].

Slope min Softness: This option allows the setting of the softness factor near to the minimum slope [0 to 1].

Slope max Softness: This option allows the setting of the softness factor near to the maximum slope [0 to 1].

Offset U: This option allows the setting of the Texture coordinates' offset, in U [0 to 2].

Offset V: This option allows the setting of the Texture coordinates' offset, in V. [0 to 2]

Scale U: This option allows the setting of the Texture coordinates' scale, in U [1 to 64].

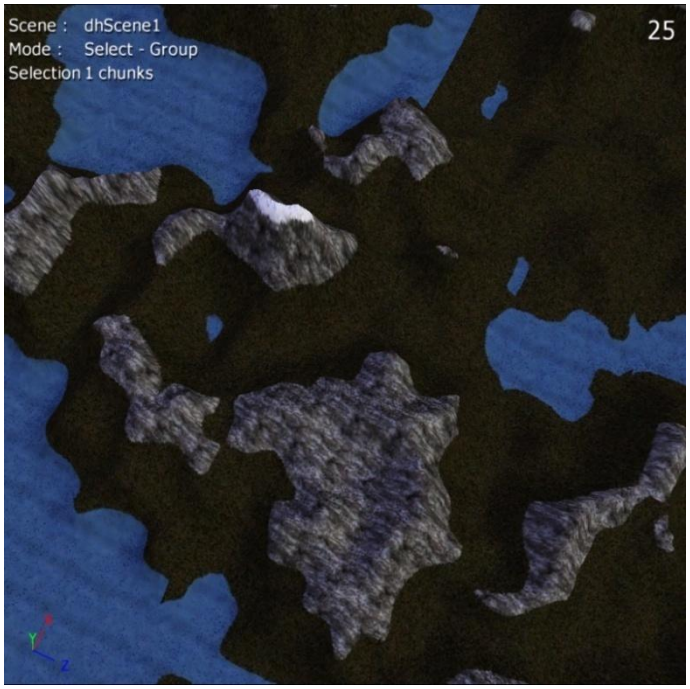
Scale V: This option allows the setting of the Texture coordinates' scale, in V [1 to 64].

Relax UVs: This option allows the setting of the Texture coordinates' relaxation factor [0 to 1000].

That's it. You have created your Terrain.

To be able to see your new creation in all of its glory, open the "Chunks" roll-up, select all of the "Chunks", switch back to the "Materials" roll-up, and click on the "Preview" button next to "Texture:".

ShiVa will now display its "Processing" splash screen for a while, and then your Terrain will re-appear as if it's been snowing heavily! All you have to do now is select an area of your Terrain, by left-clicking, and hey presto!, your Terrain now has a much more interesting look to it! A portion of mine looked like this:



Not bad for a few minutes work! Obviously this Terrain is not really finished as far as a commercial Game would require, but it will do as a general introduction to Terrain creation with ShiVa, and also for our Dino Hunter Game.

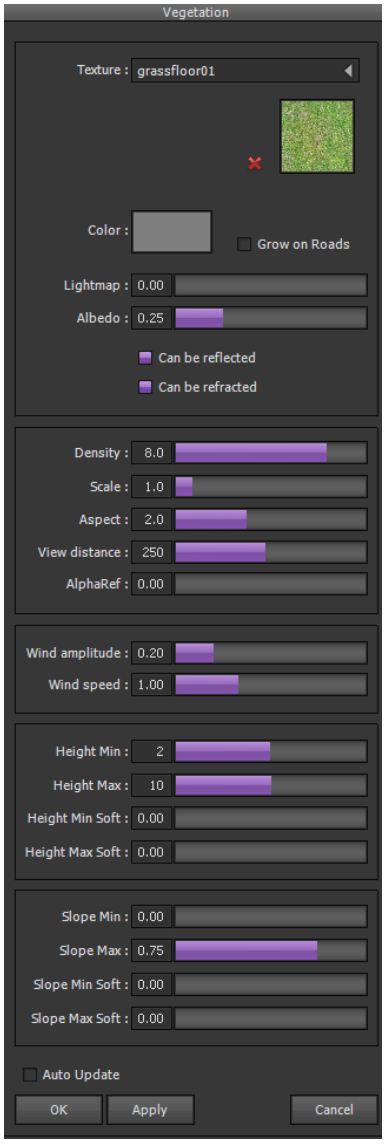
After all that I think now might be a good idea to take a bit of a break, and maybe go and create your own Terrain by playing with all of the available features of the Terrain Editor.

ADDING VEGETATION TO OUR SCENE

Ok, now it is time to add some grass to our Scene, so open up the Terrain Editor and we'll get started.

Firstly, you'll need to open the "Vegetation" roll-up, after selecting your "Chunks" of course!

To add a layer of vegetation, you'll need to click on the Add button (), and, from the menu that pops up, select the "Grass" option. This will open up the following in the "Vegetation" roll-up:

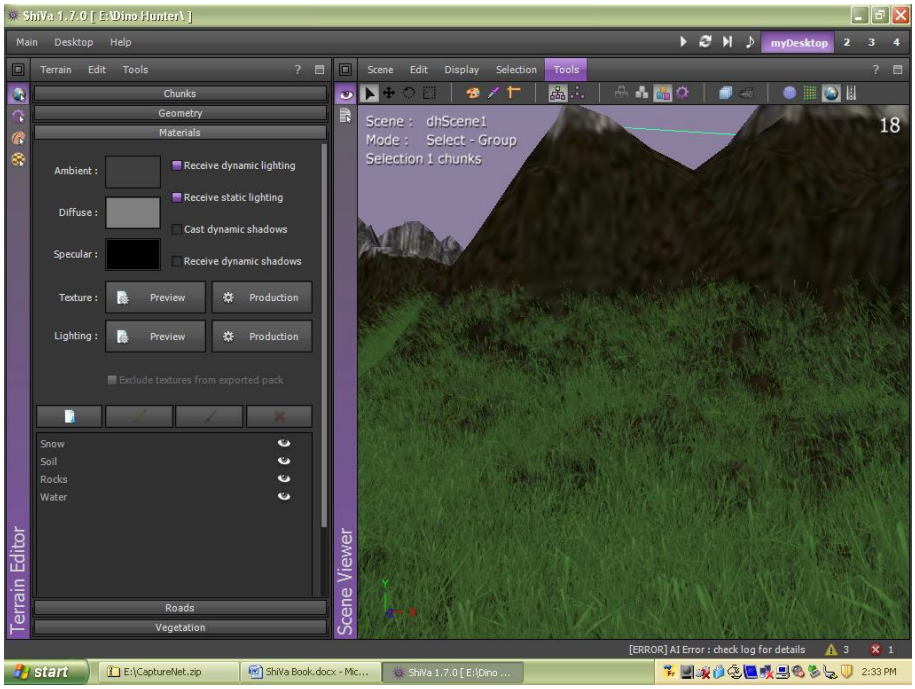


To set up your grass, enter/select the following (I've added a few comments to help you understand some of the choices):

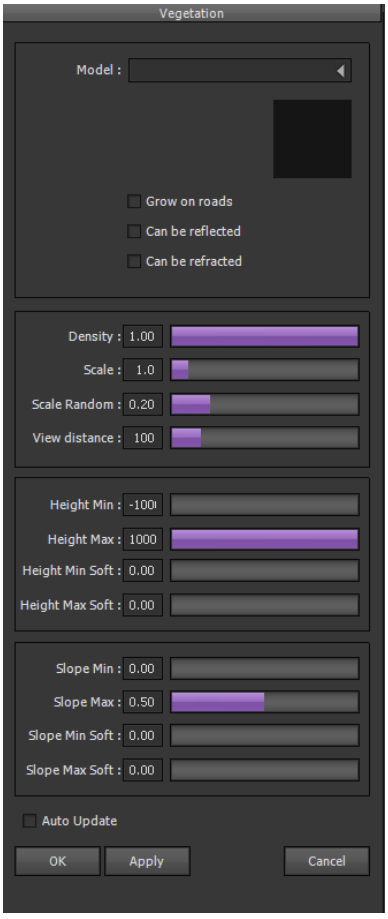
Texture:	"Grass02"	Obviously!
Color:	"Green" (R: 109, G: 173, B: 82)	The colour to be modulated with the Texture.
Grow on roads:	"Unchecked"	Well, we don't have any!
Lightmap:	0.08	The amount of the lightmap modulated with the Texture.
Albedo:	0.27	The amount of albedo colour modulated with the Texture.
Can be reflected:	"Checked"	We want reflection.
Can be refracted:	"Checked"	And refraction.
Density:	8.0	I've set this value quite high, but feel free to reduce it if you want less grass!
Scale:	5.0	The size of the grass (I've multiplied by 5), as Velociraptors like to hide in long grass!
Aspect:	2.0	The aspect of the grass (I've doubled it)
View distance:	250	This setting means you can see the grass at distances of up to 250m.
AlphaRef:	0.26	This opacity of the grass.
Wind amplitude:	0.20	The amplitude of the wind that will be applied to the grass.
Wind speed:	1.47	The speed of the wind (in m/s).
Height min:	0	The minimum height we want our grass to grow (must be above the water height, unless you want some reeds!)
Height max:	15	The maximum height we want our grass to grow (obviously not all the way to the top of our mountains! Plus, we'd like some rocks).
Height Min Soft:	0.00	The softness factor near the minimum height.
Height Max Soft:	0.50	The softness factor near the maximum height.
Slope min:	0.00	The minimum slope we want our grass to grow on.
Slope max:	0.75	The maximum slope we want our grass to grow on (grass is pretty tenacious stuff!)
Slope Min Soft:	0.00	The softness factor near the minimum slope.
Slope Max Soft:	0.50	The softness factor near the maximum slope.

Now you can click on the "Apply" button, and your Terrain will be covered in beautiful grass. Feel free to play with the above values, as I only used those as I thought they gave a reasonable idea of what a layer of grass will look like. Also, you can add grass to specific "Chunks" if you want, by selecting the relevant "Chunks" and then adding your grass layer.

This is what part of my Scene now looks like:



The last things we need to add to our Terrain are some trees, and maybe a forest or two? To do this, we'll use the custom vegetation option, so click on the "Add" button again, only this time, select the "Custom" option. The "Vegetation" roll-up will now look like this:



As you can see, this is almost identical to the "Grass" option, but with the following differences:

- **no** Color modulation option
- **no** Lightmap modulation option
- **no** Albedo modulation option
- **no** Aspect option
- a **new** Scale Random option
- **no** AlphaRef option
- **no** Wind amplitude option
- **no** Wind speed option

So, what do we have to do to add our trees? The easy answer is that we can use the "myTree2" Model, and enter the following values (again, this is only to demonstrate how it works, not to produce a perfect Terrain! I'll leave that up to you!):

Model:	"myTree2"	The Tree!
Grow on roads:	"Unchecked"	Well, we don't have any!
Can be reflected:	"Checked"	We want reflection.
Can be refracted:	"Checked"	And refraction.
Density:	0.1	I've set this value low on purpose, but feel free to increase it if you want more trees!
Scale:	2.0	The size of the trees (I've multiplied by 2).
Scale Random:	0.5	The random sizing of the trees. I've used 0.5 here, just so that the trees are different heights.
View distance:	350	This setting means you can see the trees at distances of up to 350m.
Height min:	0	The minimum Terrain height we want our trees to grow.
Height max:	25	The maximum Terrain height we want our trees to grow.
Height Min Soft:	0.00	The softness factor near the minimum height.
Height Max Soft:	0.50	The softness factor near the maximum height.
Slope min:	0.00	The minimum Terrain slope we want our trees to grow on.
Slope max:	0.25	The maximum Terrain slope we want our trees to grow on.
Slope Min Soft:	0.00	The softness factor near the minimum slope.
Slope Max Soft:	0.50	The softness factor near the maximum slope.

At this point, my Terrain now looks like this:

Not too bad, and it will do for the purposes of our Game (after all, this is only a tutorial, and it wouldn't be fair if I did everything for you, would it?).

By the way, the tree that I created for this demo was made in a little program called "Tree Generator" by Nicolas Bonneel (available for 38 euros from www.treegenerator.fr.st – I used the free version 1.2, though the most up-to-date version is 2.0)

Now, I suppose, we had better get on with the rest of the Game. Next I'm going to be adding another Model (the "Gun") and showing you how to place it just in front of the Camera (so you can see it!). I'll also be adding the ability to "Shoot", Bullets, our Dinos, and a little bit of Artificial Intelligence.

So, let's get on with it.....