HOW TO CREATE AN NCLOTH BLANKET

A Technical Maya Paper By Grace Cusimano

SYNOPSIS OF TECHNICAL PAPER

This paper will address and explore two topics under the umbrella of "How to create an nCloth blanket":

Part 1:

How to create a high-poly nCloth with an actual thickness to the model (not just a 2D plane) and allow it to be animated like an nCloth easily

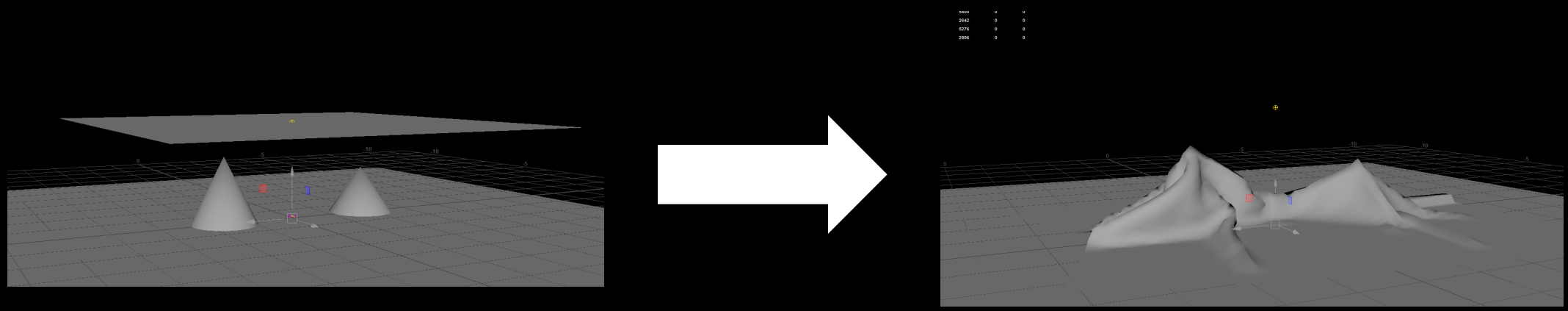
Part 2:

How to add a normal map to create the illusion of depth on a high-poly model to give it added complexity

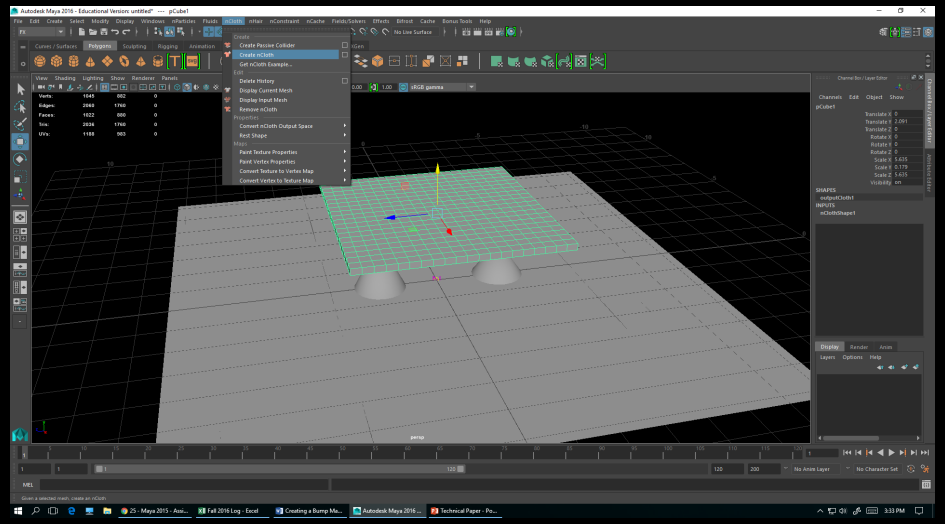
PART 1: CREATING A THICK, HIGH POLY, NCLOTH BLANKET

Creating an nCloth is generally done with a flat, 2D Plane that is then turned into an nCloth. This works well enough if you want to make sheets, etc. But if you want to make a fabric with actual depth and thickness, such as a blanket, this task gets a bit more technical and much harder.

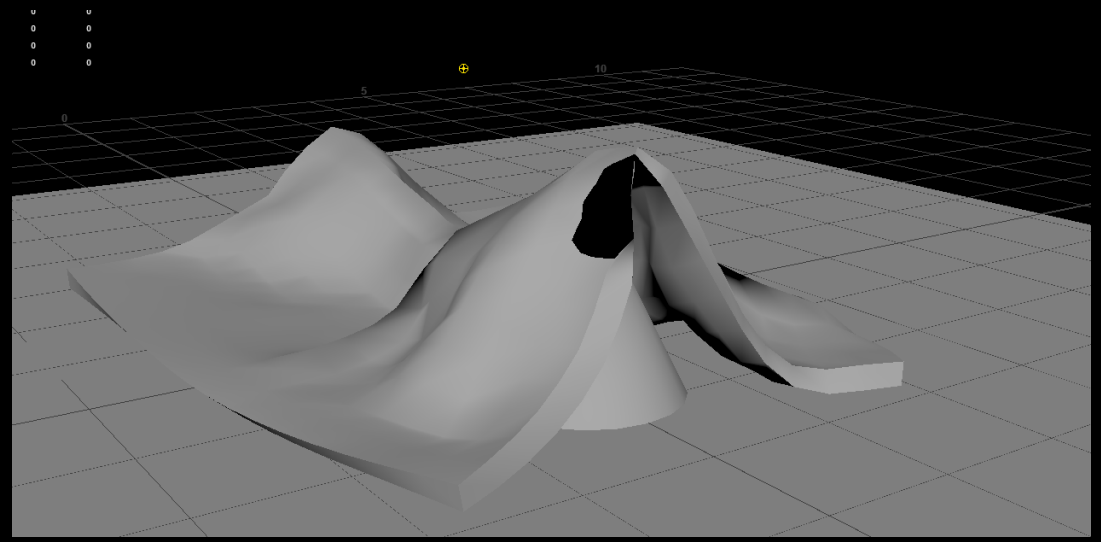
Below is an example of turning a 2D plane and turning it into an nCloth and dropping it over some cones. It deforms and takes shape well.



THE DILEMMA OF HIGH-POLY NCLOTHS



Why is this harder with a more complex object, such as a thick, high-poly blanket? Well, take the example below, if the blanket with thickness is turned into an nCloth and dropped over these cones, the vertices will inner-penetrate one another, creating an issue for animation as well as rendering.

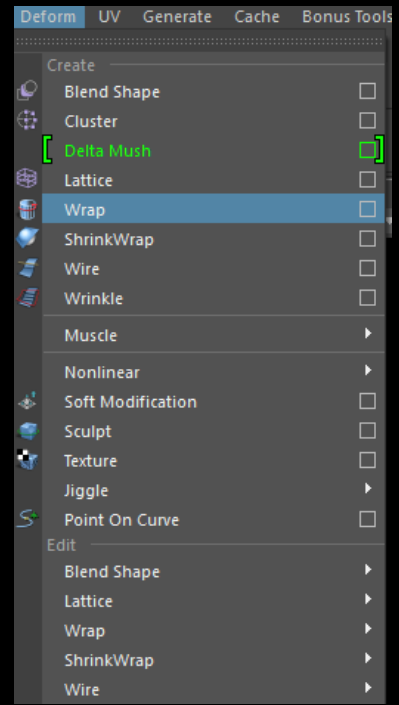


INTRODUCING THE WRAP DEFORMER

So how do we get around this dilemma?

We will use something called the

“Wrap Deformer.”



THE WRAP DEFORMER DEFINED

What is a Wrap Deformer?

A nurbs or polygonal object used by a wrap deformation to influence another object (such as a nurbs or polygonal object) that controls, influences, and ultimately deforms that object. The deformed object will mimick the shape or transformations on the wrapped object.

As Autodesk Maya states in its explanation of the Wrap Deformer:

"When you create a wrap influence object, Maya makes a copy of the influence object and uses it as a base shape for the deformation. Any difference in position, orientation, or shape between the base shape and the wrap influence object results in a deformation of the surface being influenced by the wrap deformer."

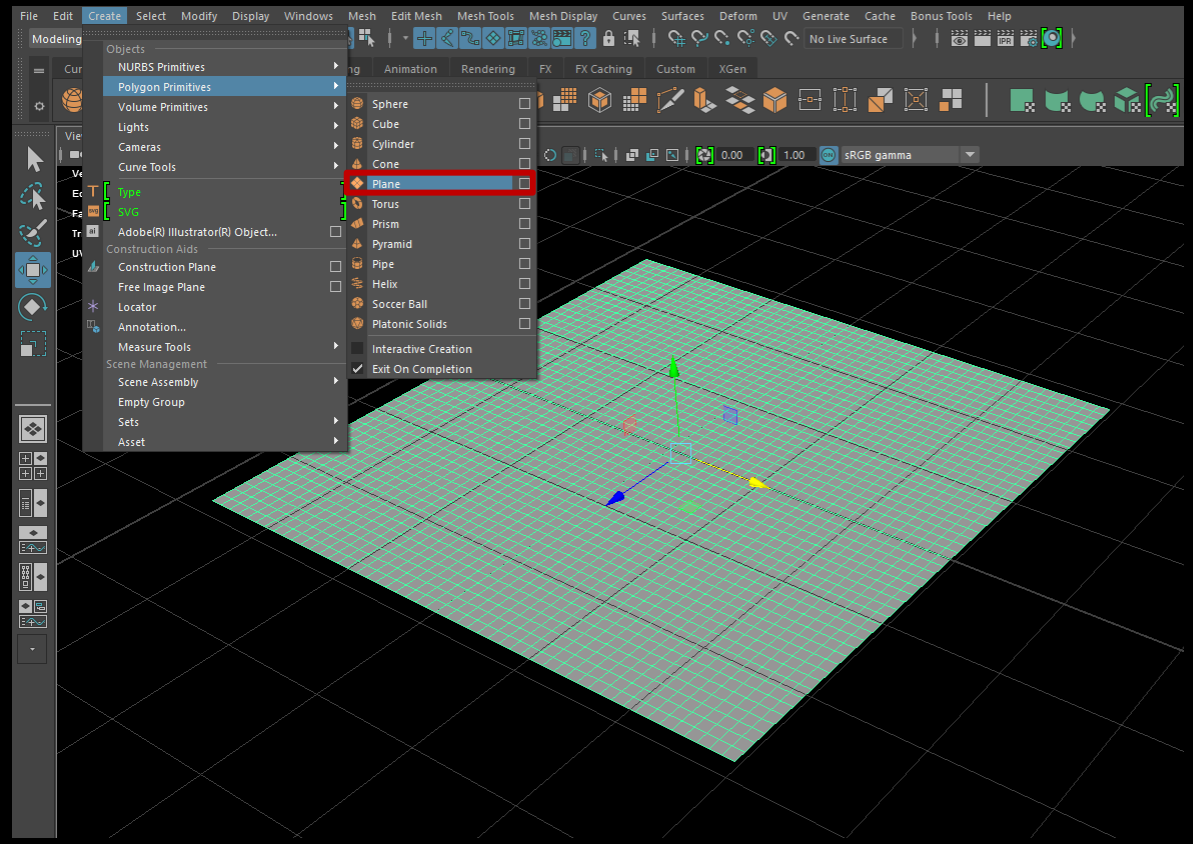
EXPLANATION OF PROCESS

A brief explanation of how this wrap deformer will be used to make sure that the vertices of a thick blanket do not penetrate each other is as follows:

1. We will create a flat 2D plane in the relative shape of a more complex 3D Blanket
2. We will make the 2D plane an nCloth
3. We will create the wrap deformer and use it to drive the complex 3D blanket so that the blanket is not an nCloth, but following and shaping DEPENDING on the nCloth deformer

Sound fun? I think so! Lets see an example!

CREATING YOUR OBJECTS: 2D PLANE



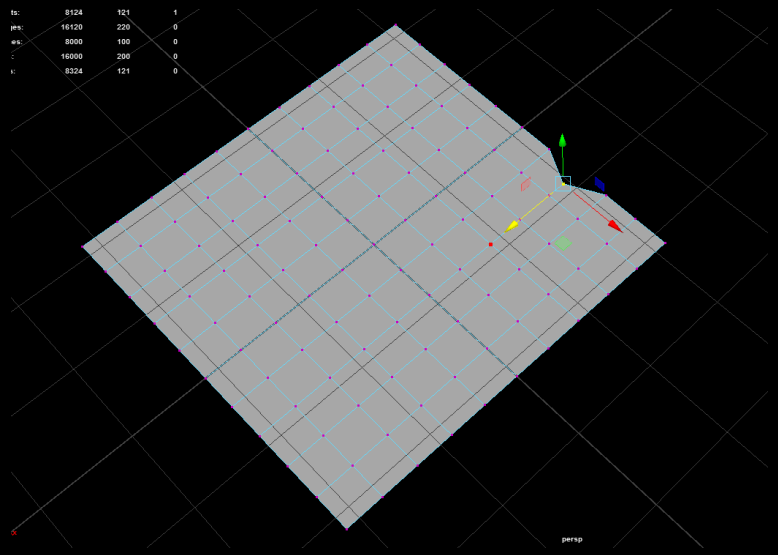
We want to first create a 2D Plane (In the Modeling Menu, go to Create>Polygon Primitives>Plane).

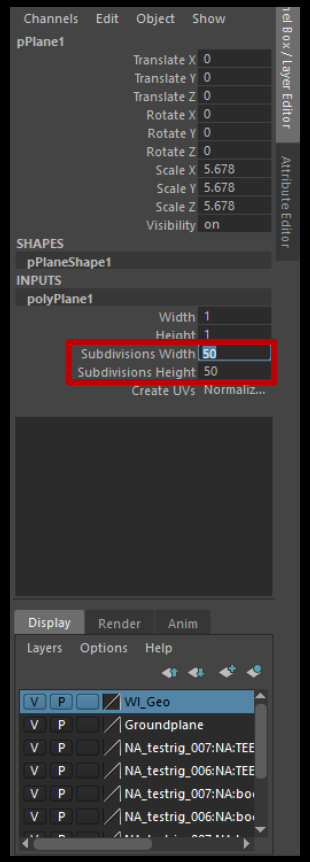
After the plane is made, You need to form it to look like the plane you want it to (since we will use this 2D plane to create the blanket model).

CREATING YOUR OBJECTS: 2D BLANKET

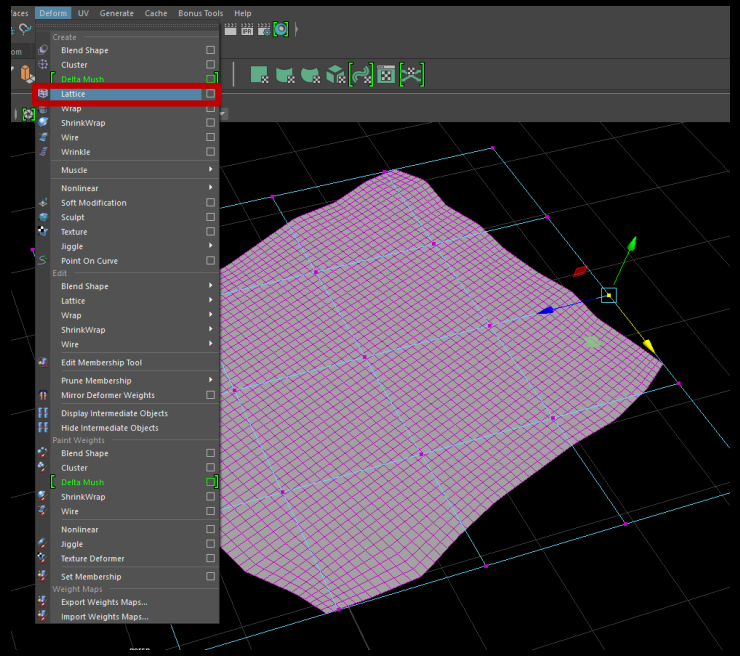
There are two options on how to do this:

1) Take the planes vertices and move them to your desired place and then bump up subdivisions for both width and height to 50 (Found in the channel box under “polyPlane1”).





OR

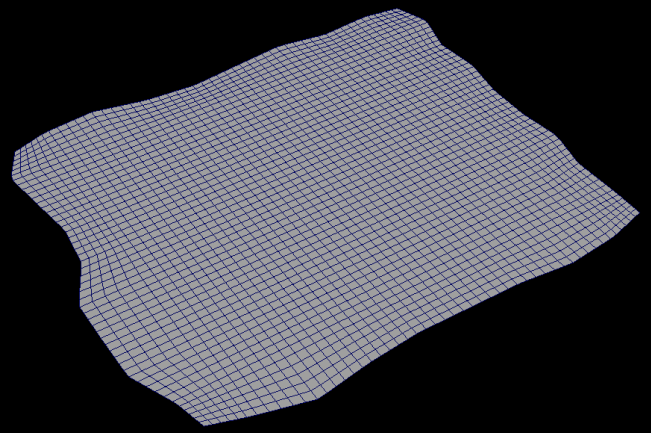


2) Bump up subdivisions for both width and height to 50 right away and then use a lattice deformer to give it the desired shape.

CREATING YOUR OBJECTS: 2D BLANKET

Either way you decide is up to you. The point is to create the 2D blanket that you desire BEFORE moving forward (Also note that if you deform with the lattice to delete history afterward).

This is my end blanket look:



NOTE

The reason we are bumping up the subdivision height and width is due to the fact that nCloth calculations work better when the cloth has more vertice points to work with. It will give it a smoother as well as deformers need more vertice points to deform correctly.

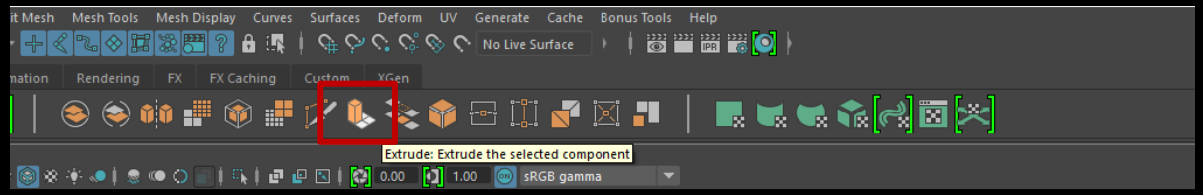
CREATING YOUR OBJECTS: 3D BLANKET

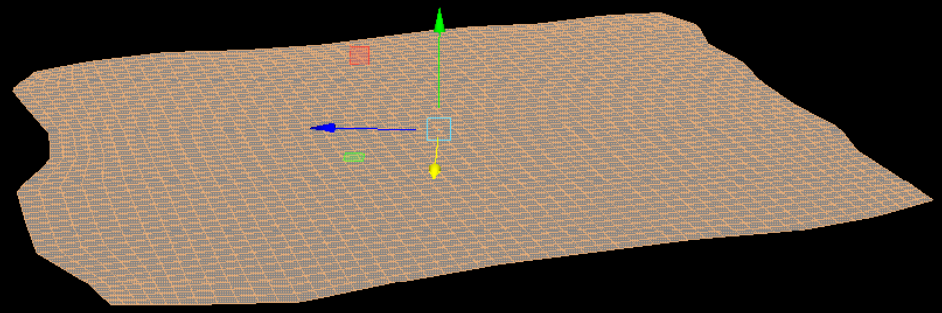
Moving on to the 3D blanket, we want to select our 2D blanket and duplicate it (Ctrl+D).

Once Duplicated, grab the duplicate model (as this is what we will create the 3D blanket from.

Left Click and select “Faces” with your mouse and then select all the faces of the blanket.

Up in the Toolbox area, select the figure that looks like a rectangle popping out of the ground (This is a shortcut to Extrude the model).

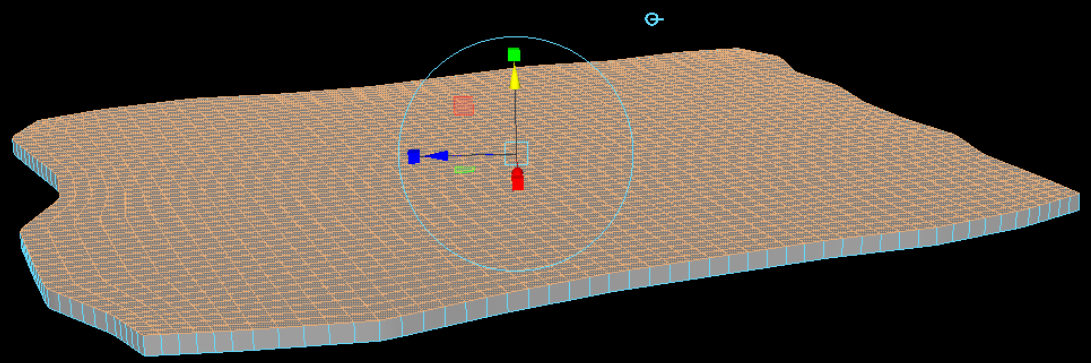


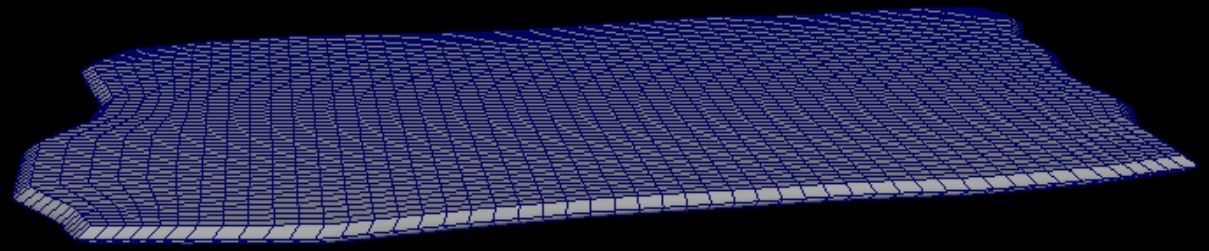


CREATING YOUR OBJECTS: 3D BLANKET

Once Extruded, your controller will get these handles to work with to transform and move the faces, etc.

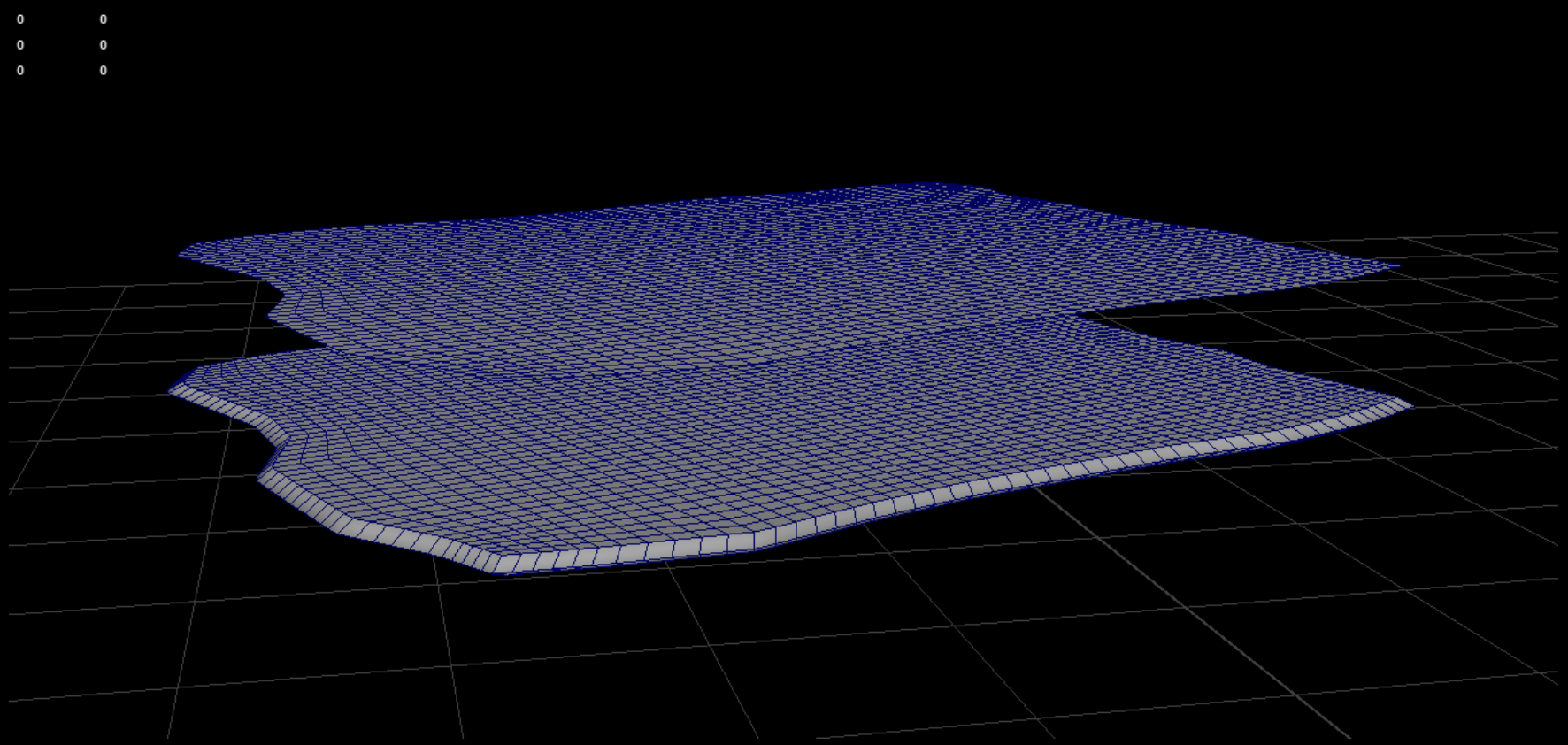
Give it the thickness you want this





The above is my 3D model blanket with thickness.

CREATING YOUR OBJECTS



My two blankets side by side for comparison

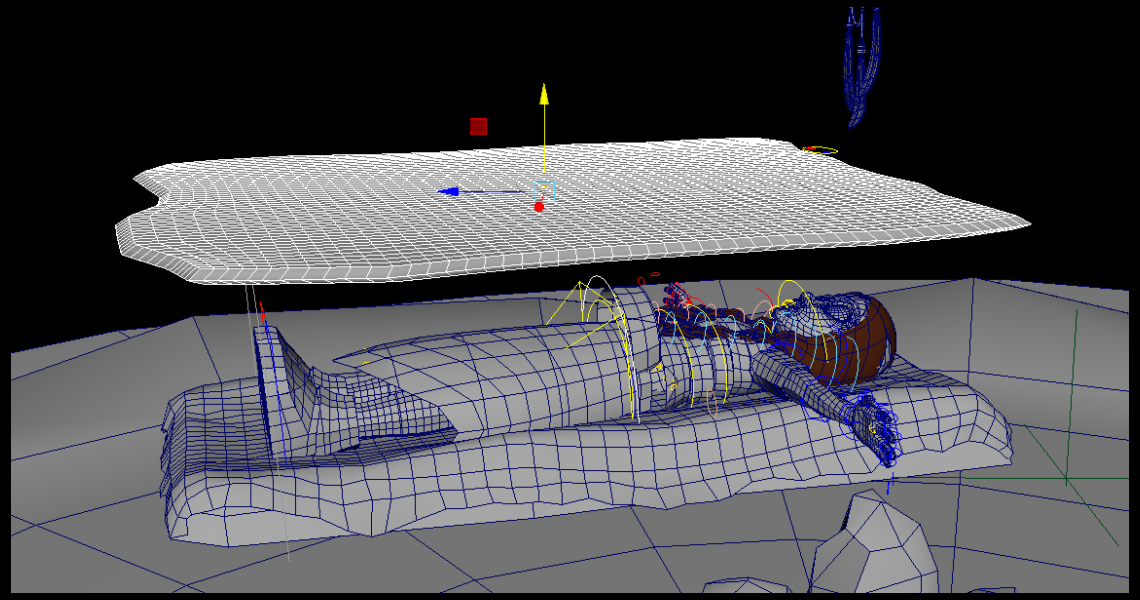
APPLYING NCLOTH

The next step is to apply the nCloth to the 2D plane and make sure that it works properly.

We start by importing your 2D and 3D plane into the scene/shot you would like it to be in.

NOTE

Make sure the 2D Blanket is located inside the 3D Blanket (transformations match). Then delete history on both objects (Edit>Delete by Type > History) and then to Freeze Transformations (Modify>Freeze Transformations).



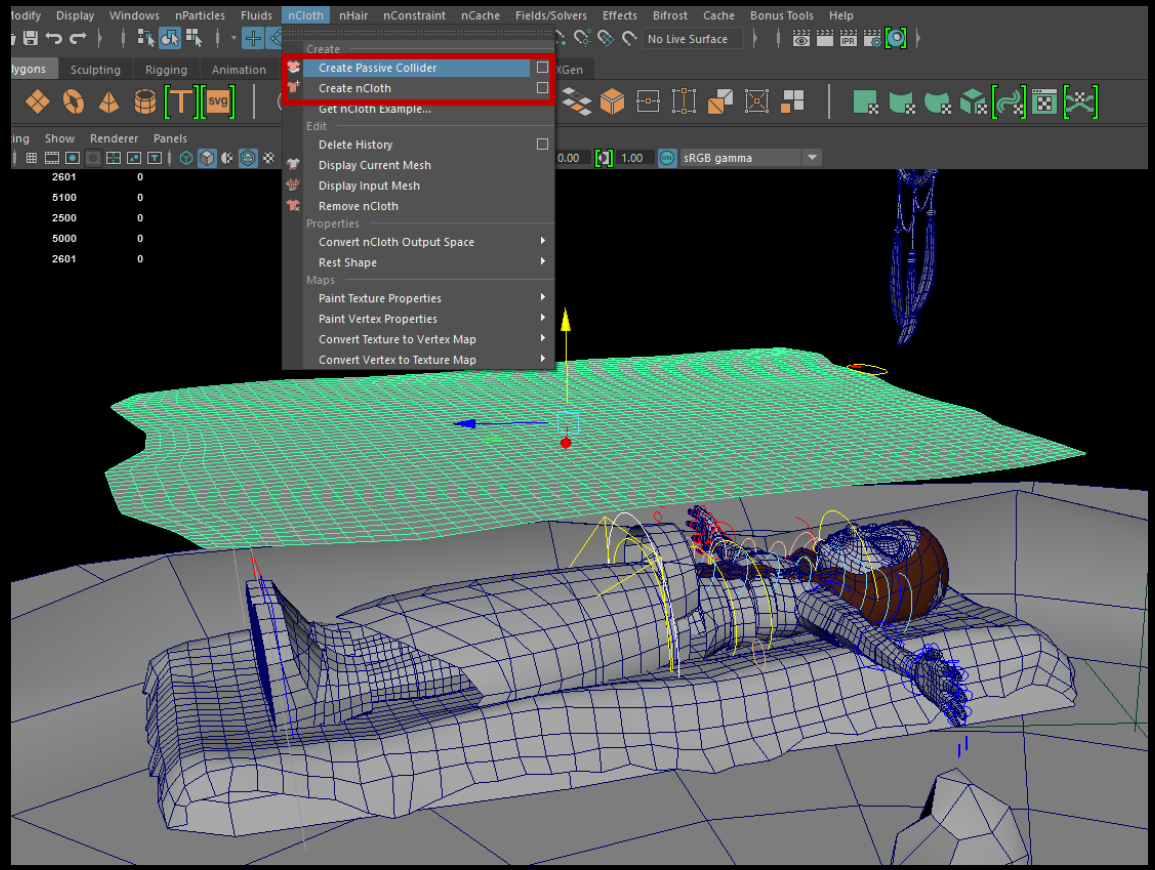
APPLYING NCLOTH

Select the 3D Blanket and hide it from the scene (Ctrl + H).

You then want to select the 2DPlane and select the FX Menu Set and go to nCloth>Create nCloth.

Then grab whatever the blanket needs to collide with, and in the FX Menu, go to nCloth>Create Passive Collider.

This ensures that your blanket will not go through objects but will collide with them.



APPLYING NCLOTH

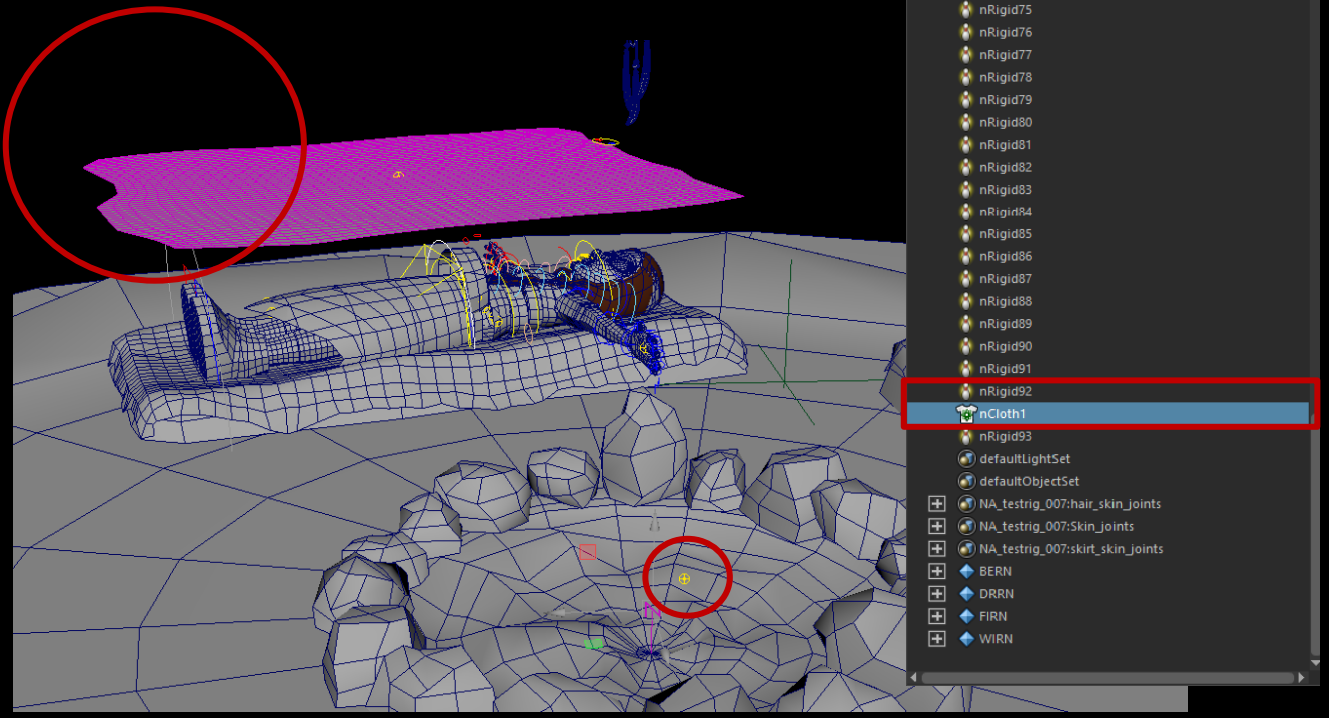
This is what your scene should look like if you applied the ncloth and passive colliders right:

There should appear yellow crosshairs with a circle around them to depict everything that is going to collide with the nCloth.

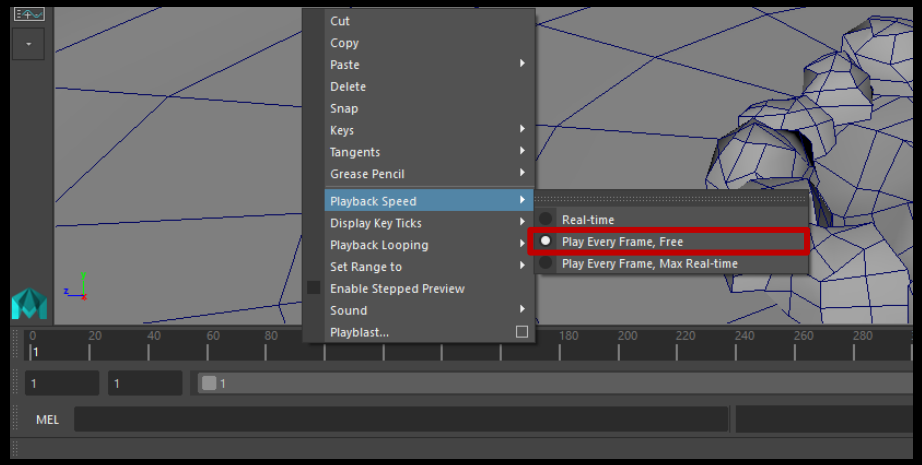
NOTE

You can also check to see if your passive colliders and nCloths are working based on your Outliner (which can be found by going to Windows>Outliner). You should be seeing an “nCloth1” node as well as an “nRigid1” node (and possibly more” to depict your colliders and nCloths in your scene.

Your 2D blanket should also glow purple showing that there is an nCloth in the scene.



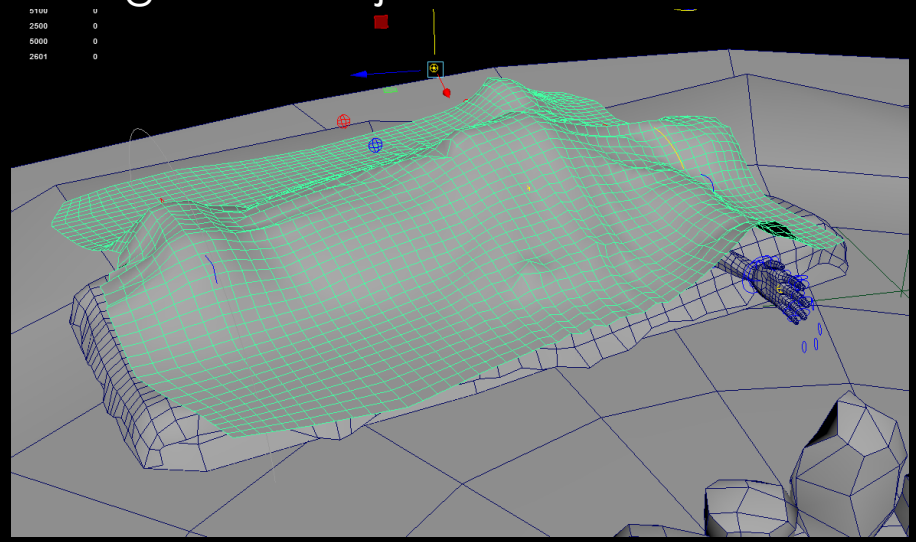
APPLYING NCLOTH

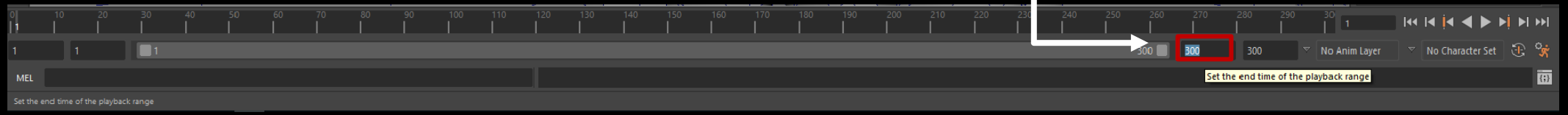


1. The next step is to go to the timeline, right click and hold and choose playback speed>Play Every Frame, Free

2. Then in the box below and to the right of the timeline, change the timeline to go for 300 frames (this gives the object/nCloth some time to collide underneath.

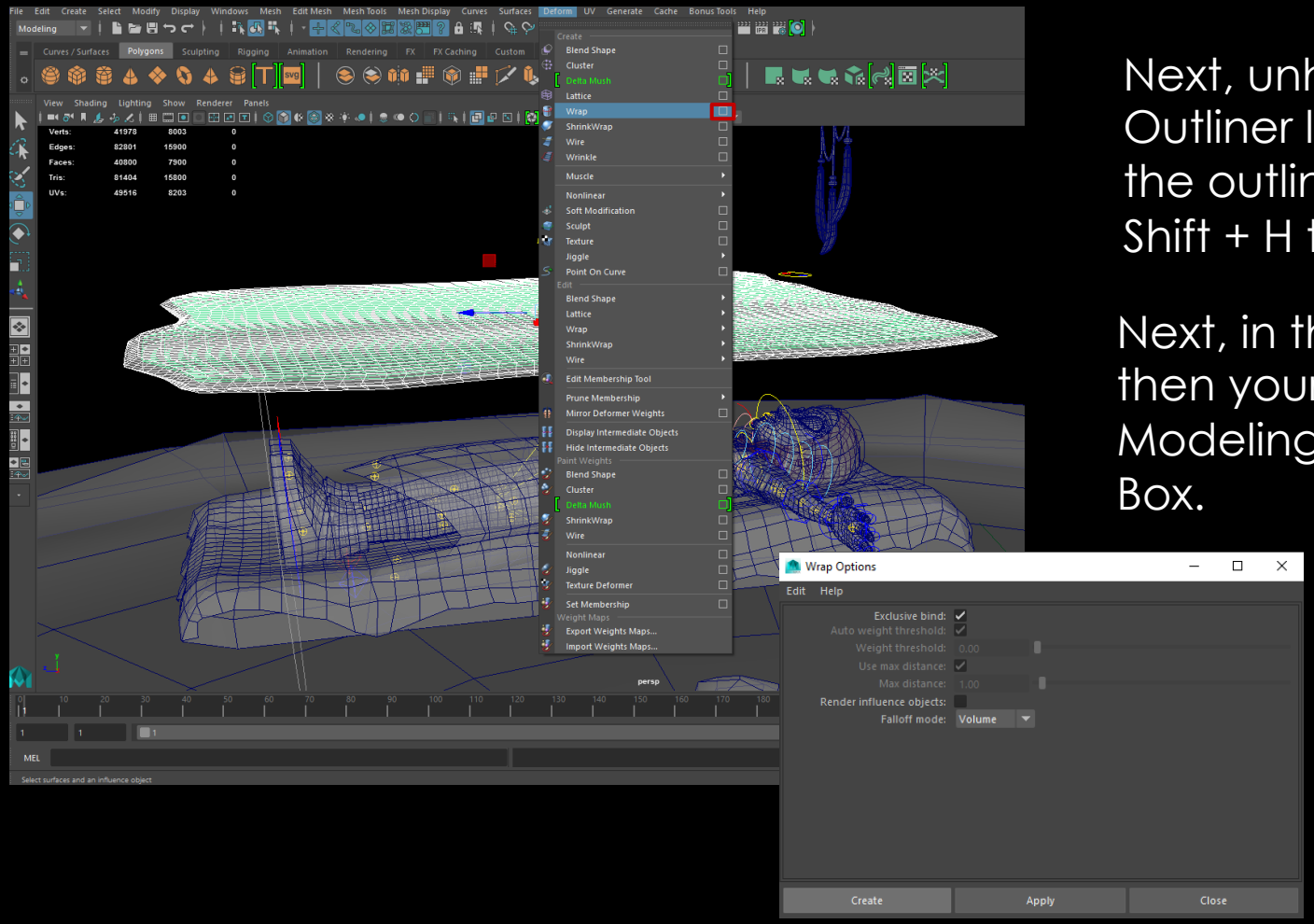
3. The final text is to let it play and make sure it does, in fact collide with the designated object.





4. When this is done, rewind the timeline to frame 1.

APPLYING A WRAP DEFORMER



Next, unhide your 3D blanket by going into the Outliner located under Windows>Outliner. In the outliner select your 3D blanket and press Shift + H to unhide the 3D object.

Next, in the outliner select your 3D Blanket and then your 2D Plane (your nCloth), and in the Modeling Menu Set, go to Deform>Wrap>Options Box.

In the Options Box, Click Exclusive Bind and Click Create.

APPLYING A WRAP DEFORMER: QUESTIONS

What is Exclusive Bind?

"When on, the wrap deformer's target surface will behave like a rigid bind skin and
Weight Threshold is disabled. Each surface point on the wrap deformer's target surface will only be affected by a single wrap influence object point.

Note: Exclusive bind only works with polygon mesh target surfaces."

(Autodesk Maya Definition)

APPLYING A WRAP DEFORMER: QUESTIONS

What Does Using This Wrap Deformer Do?

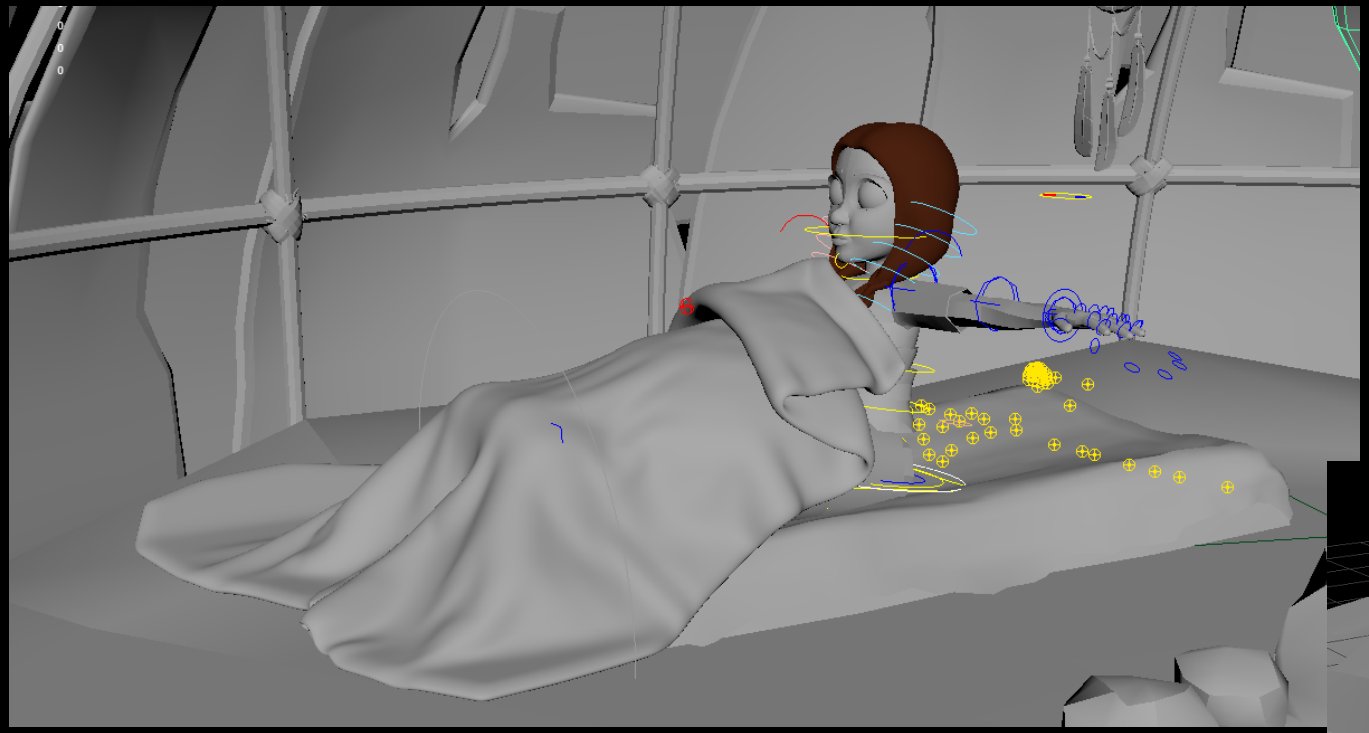
Well, like the definition described earlier, a 3D nCloth does not work due to both sides of that object going through each other and penetrating.

With this deformer, we are not turning the 3D Blanket into an nCloth. We are using a 2D Plane with the same number of vertices as the nCloth and then using a deformer on the 2D plane to lead the 3D object into what LOOKS like an nCloth.

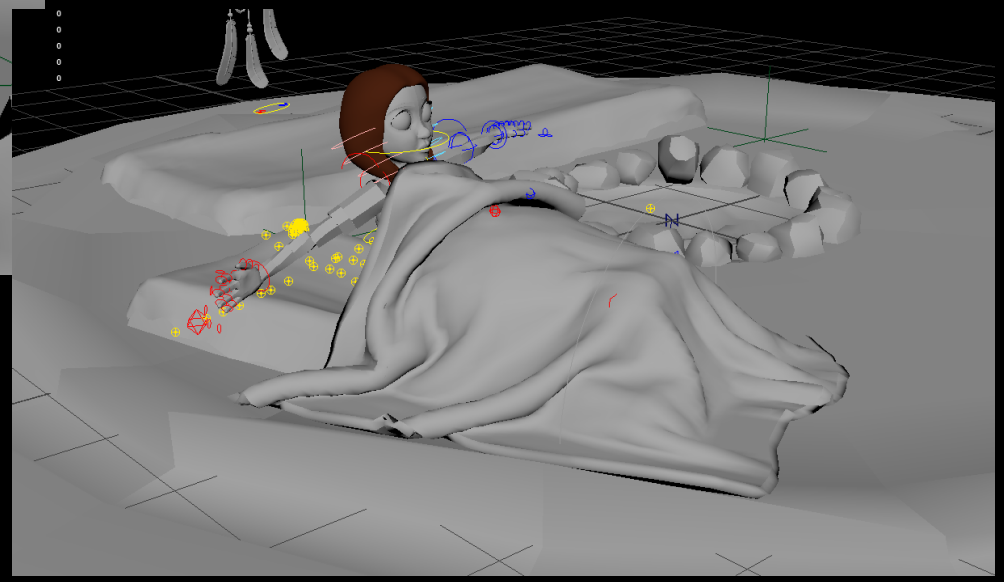
All the 3D blanket is doing is changing the shape of its vertices to match the 2D blanket through the wrap deformer.

This is how this is possible!

ANIMATION OF A 3D BLANKET



Now, since we have done all the steps above, the 3D blanket should follow the 2D blanket as a nCloth and deform/change shape with it without penetrating.



To check this accurately, I took the girl in my file, made a few key frames of her laying down, and then her sitting up to see if it would follow appropriately. The effects of it are below!

ANIMATION OF A 3D BLANKET: LAST THOUGHTS

Now that we have the nCloth working appropriately. A last few things:

1) Make sure to hide the 2D nCloth blanket (Ctrl + H)
2) Rewind back to frame 1
3) Save your Project!

That's how you make a 3D Blanket Animate without self-penetrating!

NOTE

Since this Technical Paper is focused on making a 3D Blanket able to move like an nCloth, and is not about an nCloth effect in the first place, please take note that there is much more information regarding the nCloth effect but is not spoken of or talked about inside this paper.

FOR MORE IN DEPTH RESEARCH ON ANIMATING A HIGH-POLY BLANKET, LOOK BELOW:

The Below is taken word for word from a CGTalk Thread by DrYo User

"If it is thick cloth then your best option is to create a simple 2D plane for the nCloth simulation. Make sure it has enough geometry (squares only) to deform the way you want. Also model the thick blanket that will actually render. Use a Wrap Deformer to drive the renderable geometry with the nCloth. Make sure to turn Exclusive Bind on in the Wrap Deformer."

"Use a Transform Constraint for each place on the cloth that you want the character to touch. Link or constrain the dynamic Constraint locator to your character and key the Enable attribute off, then on when the character picks up the cloth."

"Optionally, you can use a Strength Dropoff ramp in conjunction with Dropoff Distance in the dynamic Constraint node. To make this work properly, select the vertices near the point of contact before adding the Transform Constraint. Or else use nConstraint > Add Members."

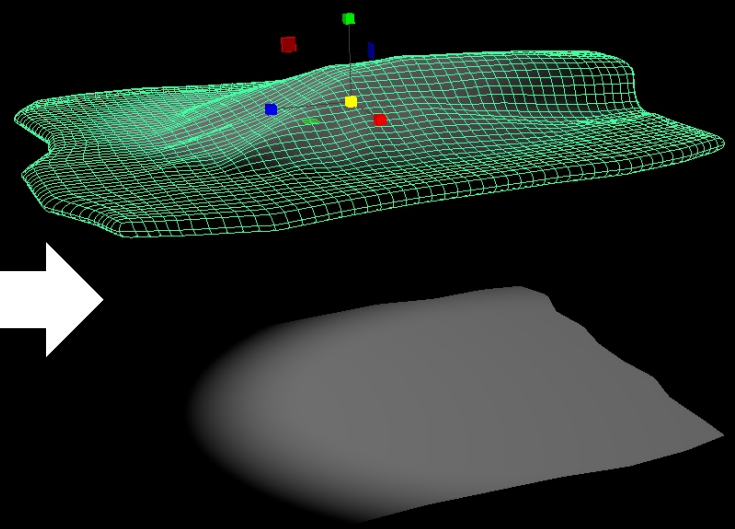
"Most importantly, you must set the Space Scale in the nucleus node to correspond to the scale of your scene. For scenes at 1/100th scale, leave Space Scale at 1.0. For scenes modeled at 1 to 1 scale, set the Space Scale to 0.01."

PART 2: HOW TO CREATE A NORMAL MAP

Now we will be learning how to take the blanket that can be animated, and attach/create a normal map to add depth

As you can see

I took the flat plane, and the extruded blanket (3D model) and dropped it on something and duplicated the ncloth for this example. A spotlight is currently on it.



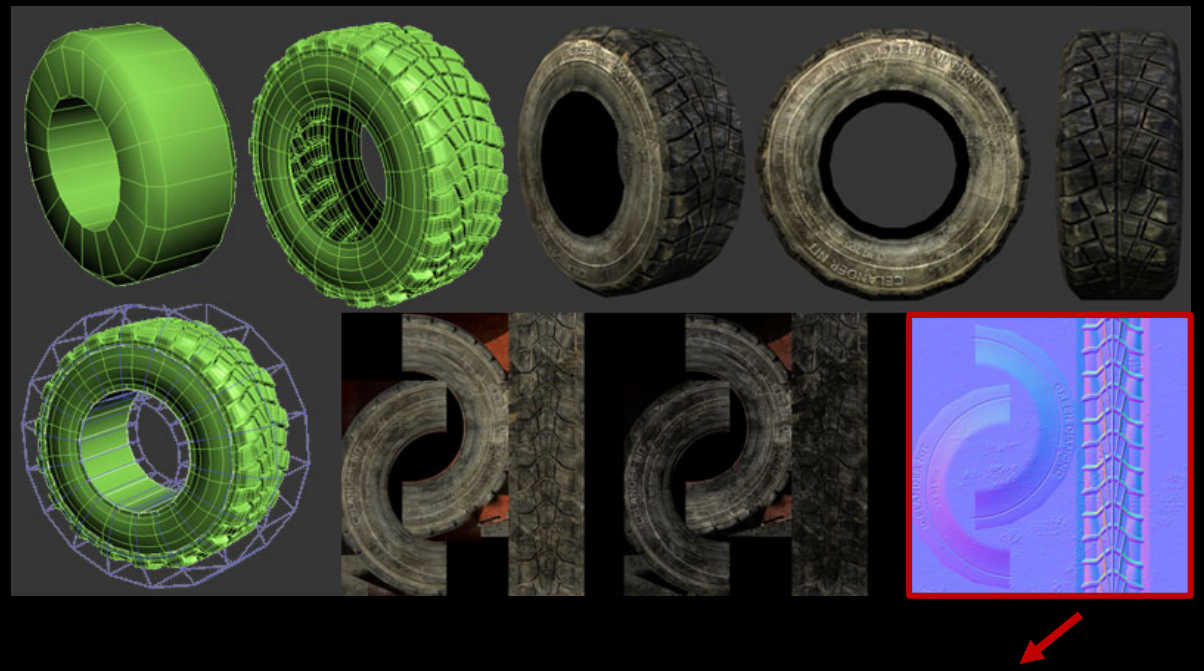
You need to make sure you have a light inside of the scene as it will help you see the normal map.

This is because all a normal map does is change the way light reflects off the object. It does NOT change the model geometry.

WHAT IS A NORMAL MAP?

"A normal map uses RGB information that corresponds directly with the X, Y and Z axis in 3D space. This RGB information tells the 3D application the exact direction of the surface normals are oriented in for each and every polygon. The orientation of the surface normals, often just referred to as normals, tell the 3D application how the polygon should be shaded."

Pluralsight (Digital Tutors Blog)



Simply put, a normal map is three texture maps laid over one another in the x and y and z direction using the RGB scale that does NOT add geometry but gives the illusion of depth.

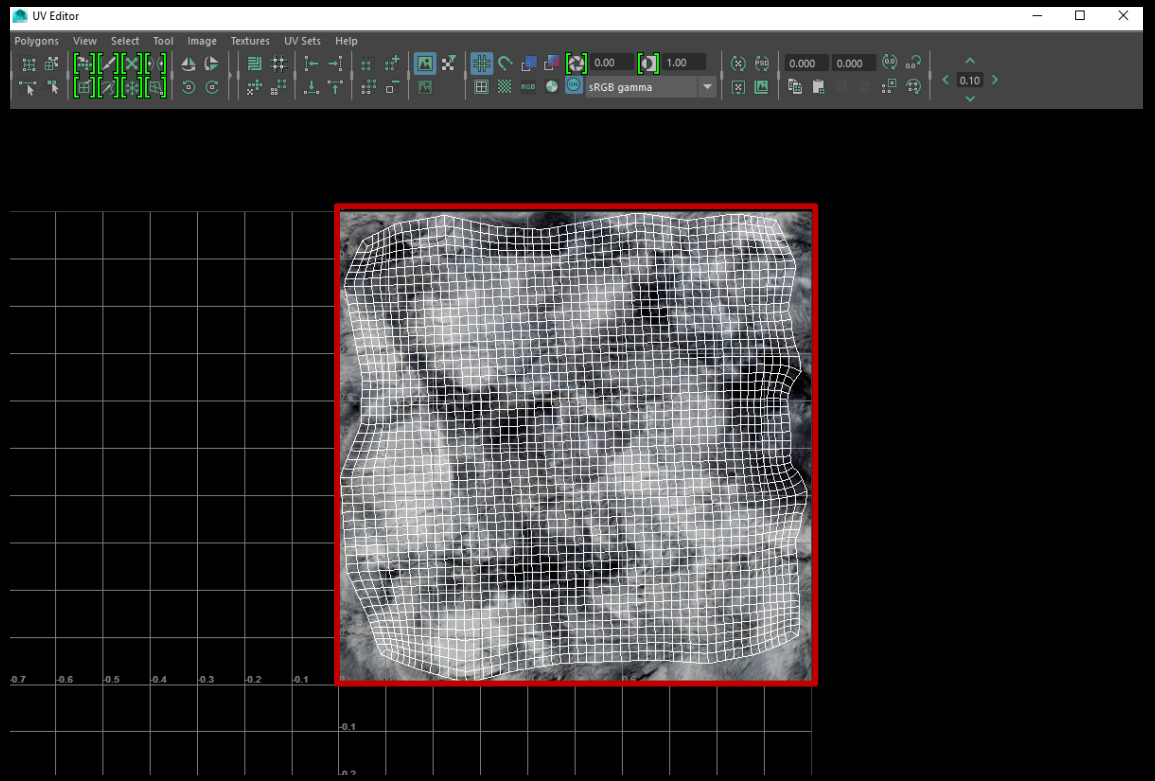
UV THE OBJECT

UV's

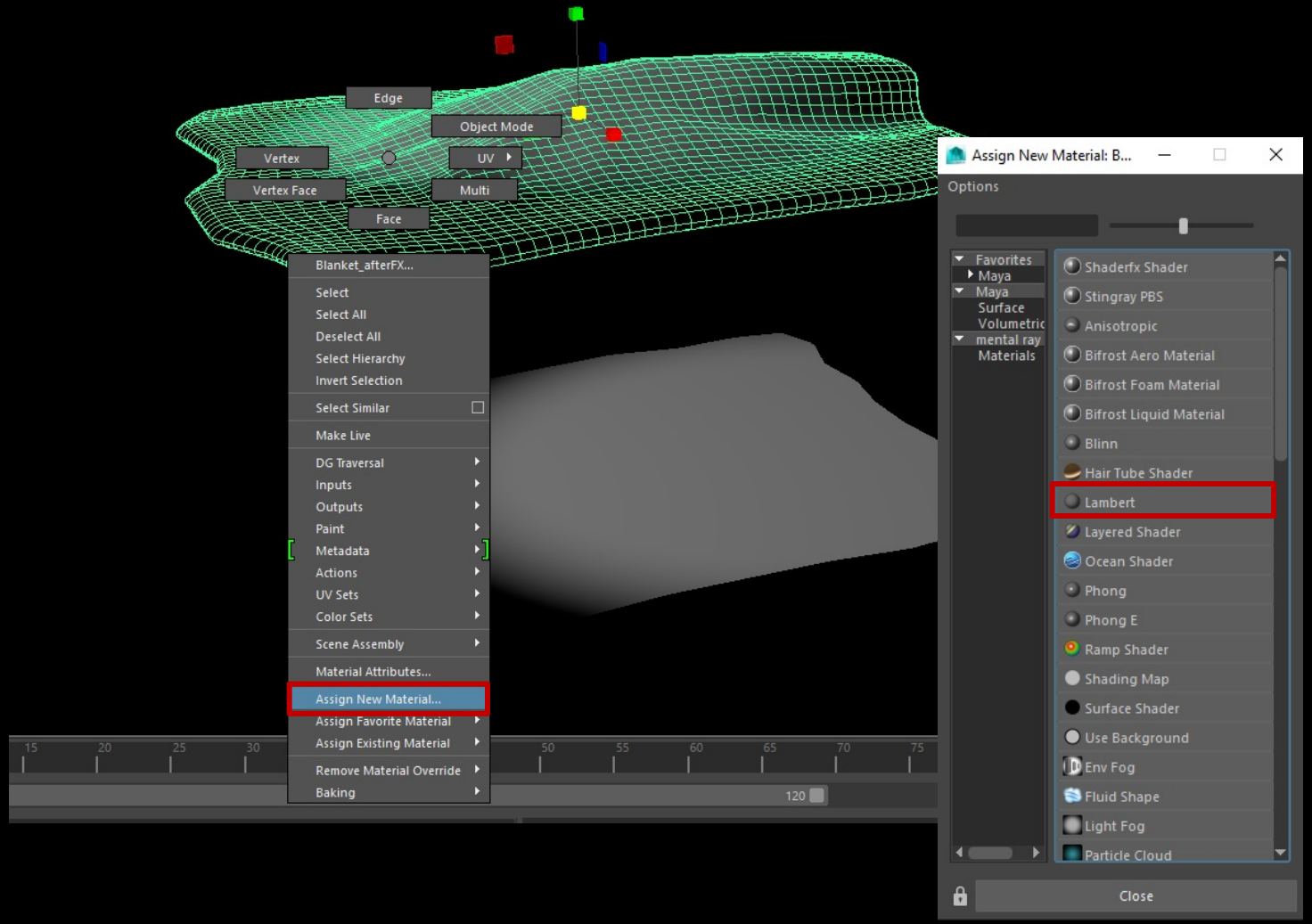
UVS! They are extremely important. Before Texturing and Before creating your Normal Map, make sure to UV your object.

As you can see, I have already done so. This way my object knows how to take in the texture when its time to render, appropriately.

Uving is very important part to this process but will not be discussed during this paper.



ASSIGNING A SHADER

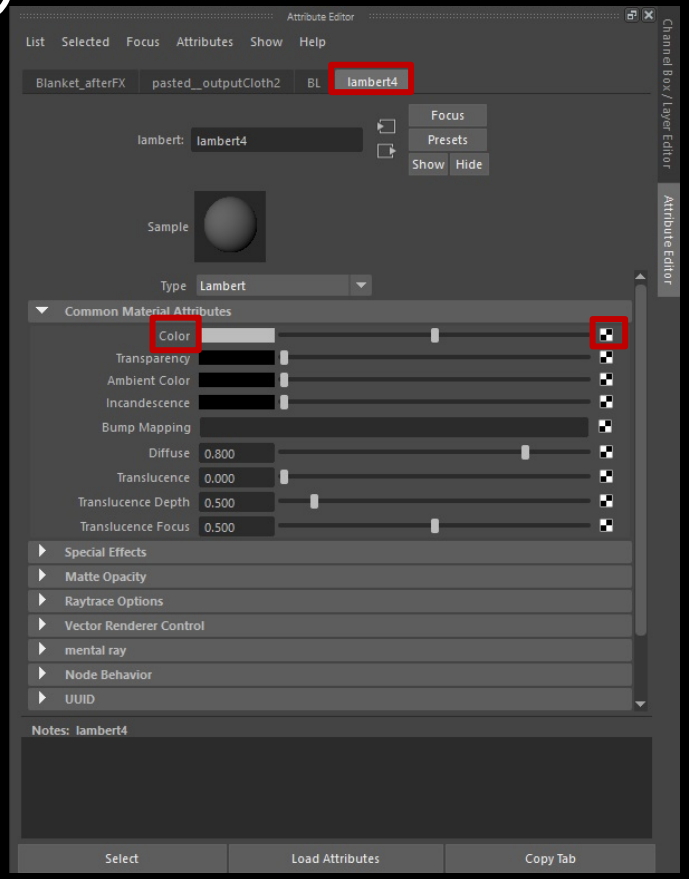


Once UVing is completed, we begin by taking your object, and assigning a material to it. You do this by selecting the material, right-click + hold and select "Assign New Material."

A menu will pop up allowing you to select a material. We will choose "Lambert" as it is a shader within Maya that is good for a fur blanket (since we don't want shininess/ a lot of light reflectivity).

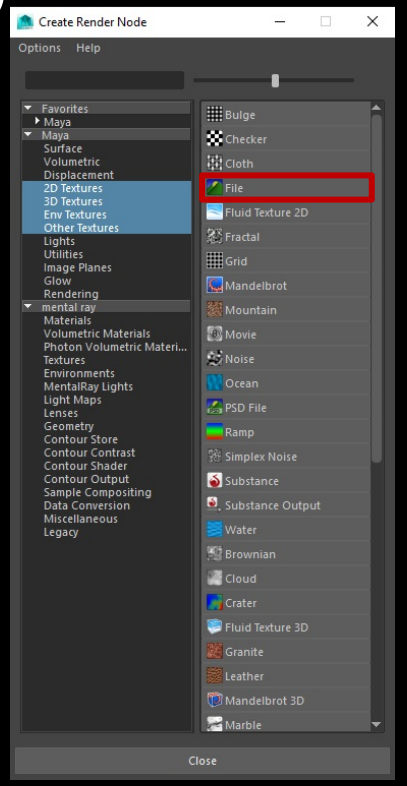
IMPORTING YOUR TEXTURE INTO THE SCENE

1



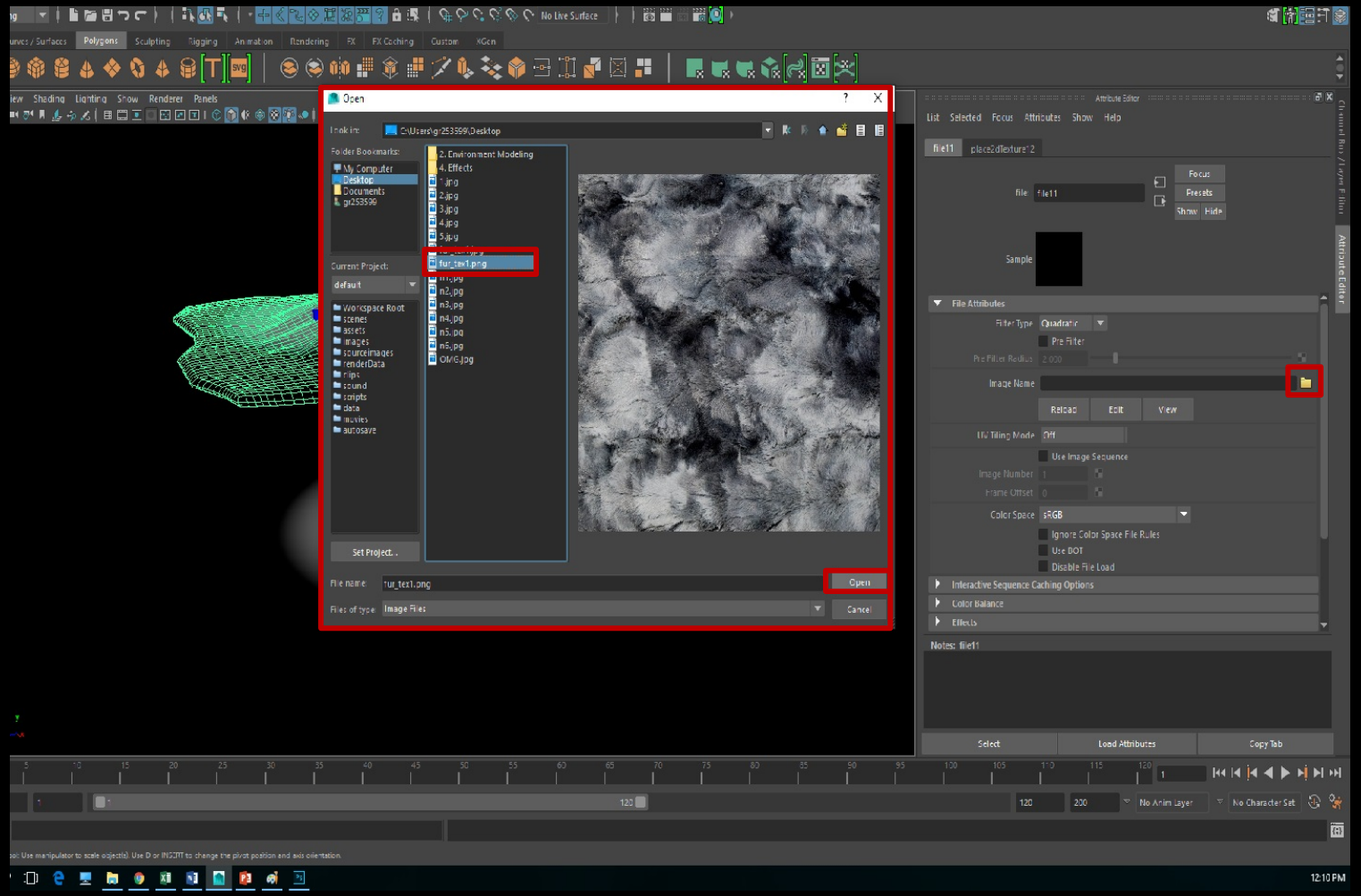
Inside of your attribute editor, click on the lambert node. Once inside, on the line that says "Color" click the checkerboard box to the right.

2



This will make a menu pop up again. This time around, choose "File."

IMPORTING YOUR TEXTURE INTO THE SCENE



Once open, select the file image to the right of "file name."

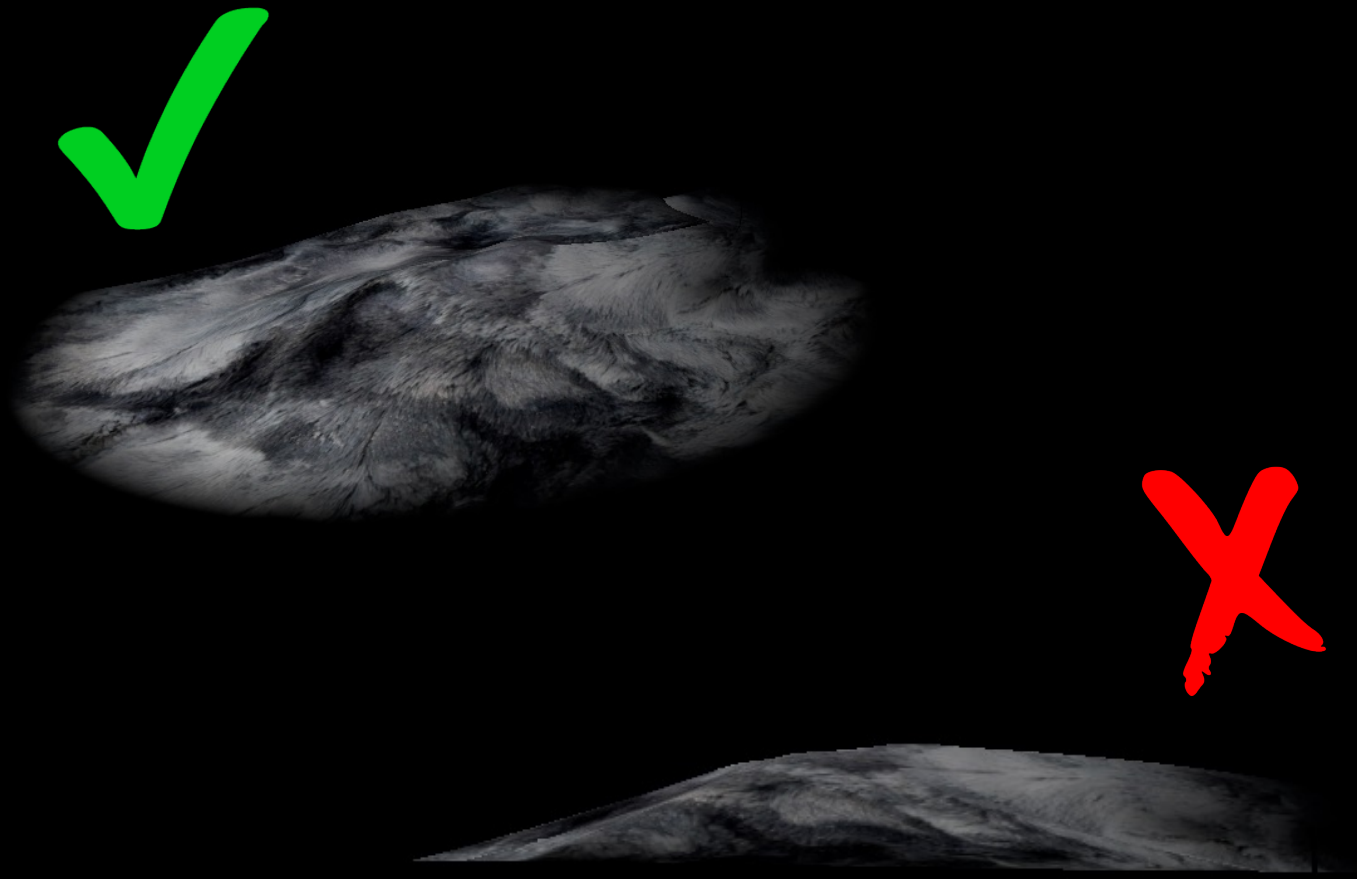
In the pop-up window, select your desired texture (I grabbed mine from the internet for the sake of this tutorial), and click "Open."

THE RESULT OF ADDING HIGH-DEF TEXTURES

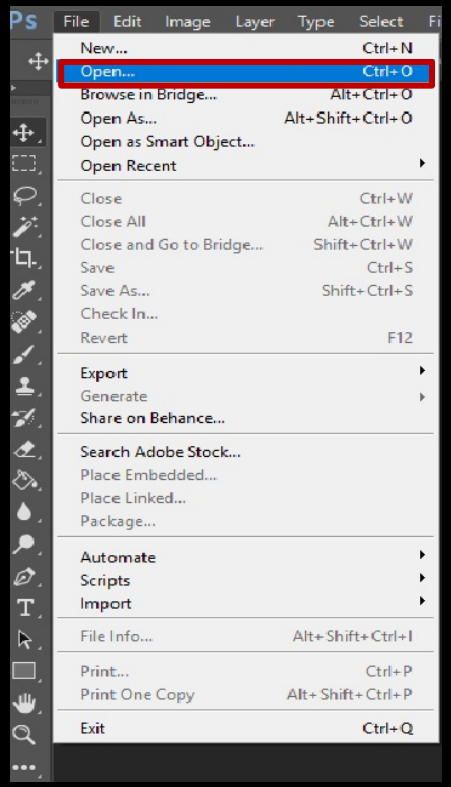
From first look, it looks great and realistic!

BUT if we check the blanket out from another angle with the camera, we can see that textures, by themselves, have no illusion of depth.

So now we will create the normal map and then add it to see how this changes.

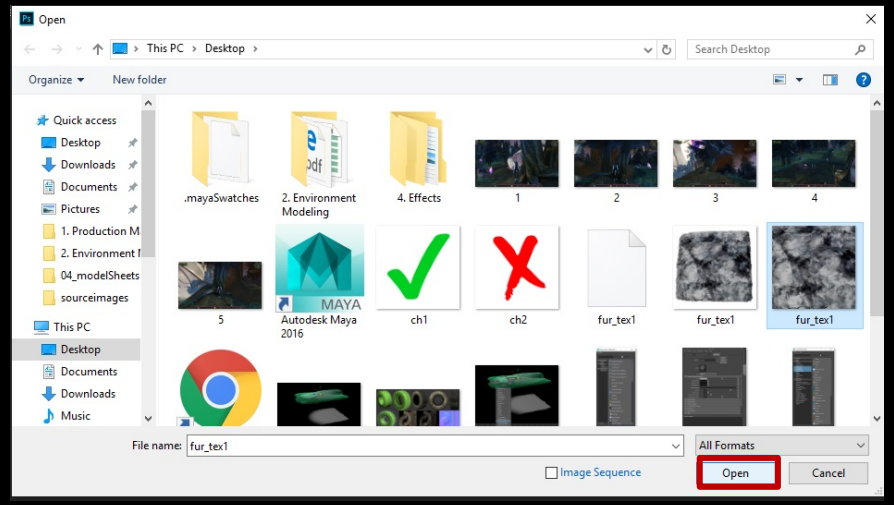


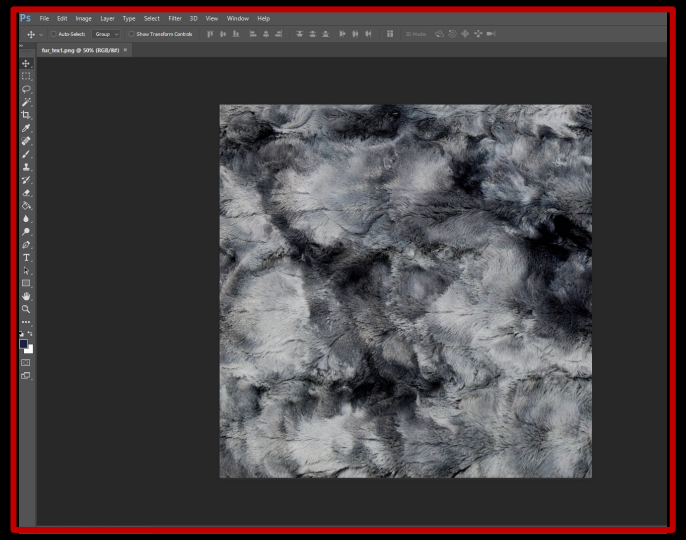
CREATING A NORMAL MAP



Step 1: Open Photoshop

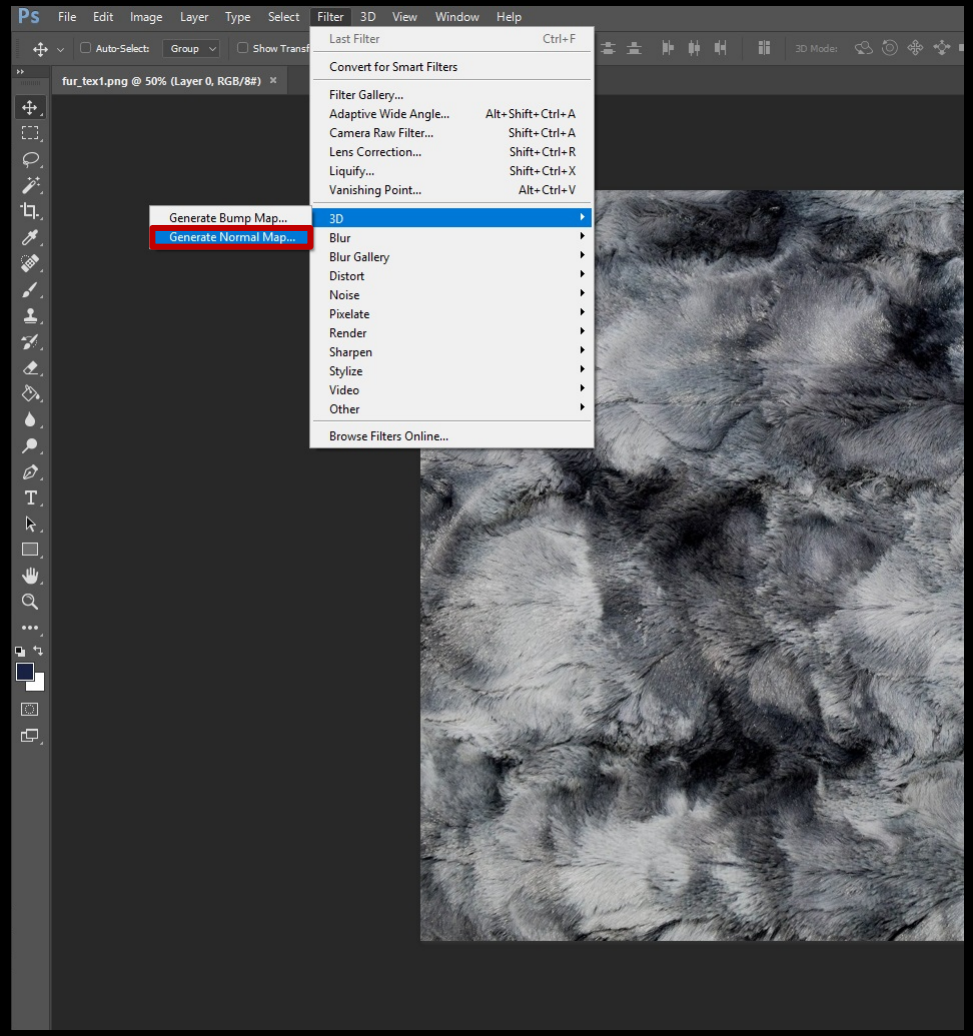
Step 2: File > Open and select the current texture assigned to your object (or in this case, our blanket)





Step 3: Photoshop opens your texture and turns it into a layer

CREATING A NORMAL MAP

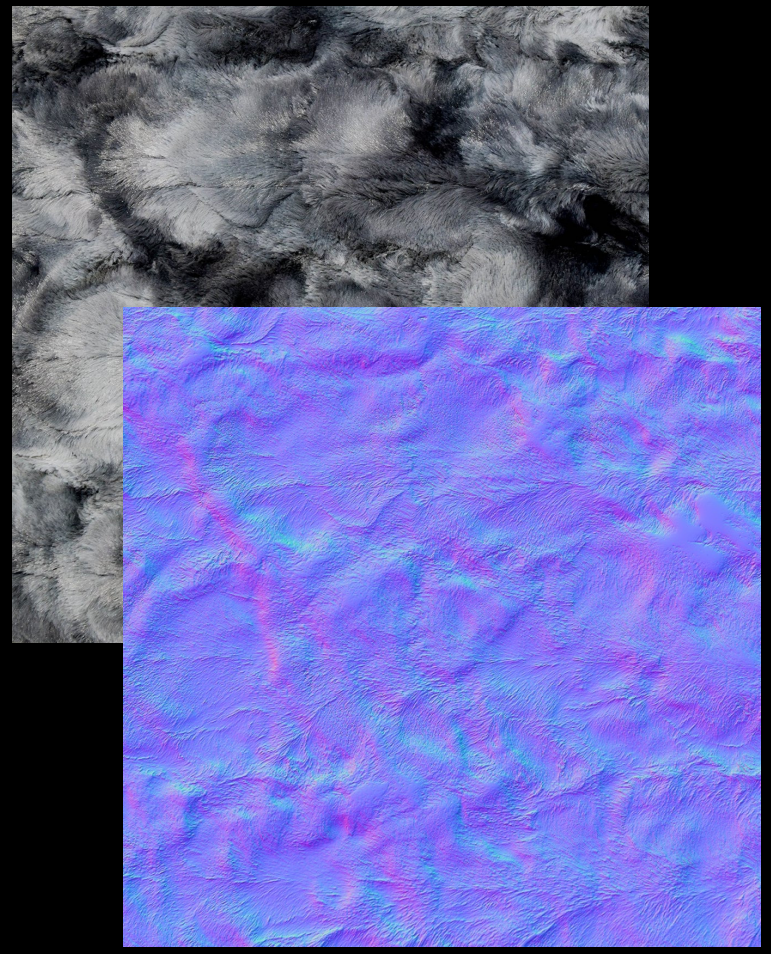


Step 4: Select the layer

Step 5: Go to Filter > 3D > Generate Normal Map
(Note that you need Photoshop Extended to access this menu. You find that by going to Help>System Info.)

Photoshop will then think for a moment or so and then it will turn your texture into a beautiful multicolor painting.

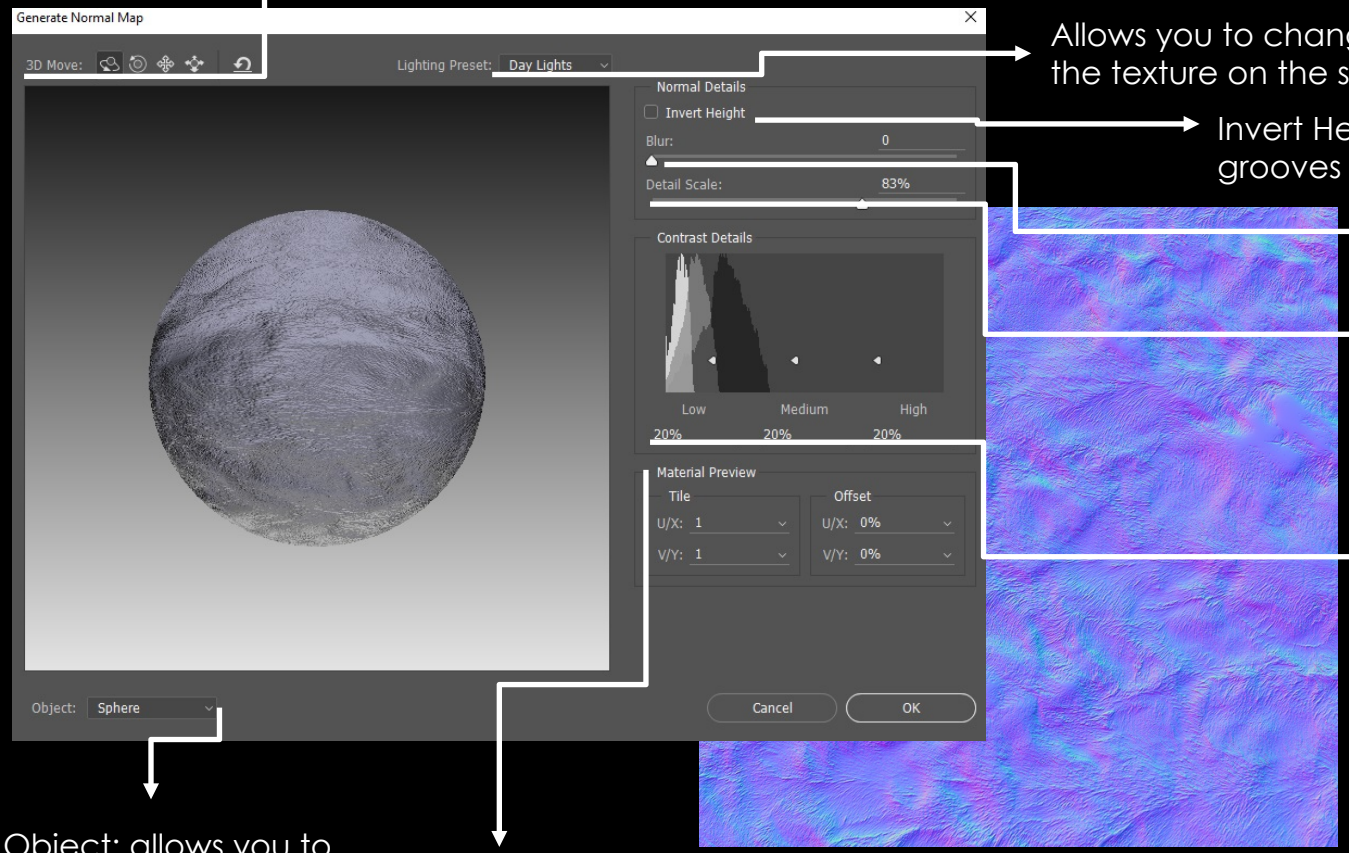
As you can see, the normal map follows the texture in RGB.



TWEAKING A NORMAL MAP

As you might have noticed, along with the normal map appearing, a pop-up box appears with it.

This box allows you to tweak the normal map in a way that benefits YOUR PROJECT.



3D Move: allows you to interactively view the texture on the sphere.

Allows you to change the light you view the texture on the sphere with.

Invert Height: inverts the raised grooves on your normal map

Blur: blurs your normal map

Detail Scale: allows you to add or remove detail from your normal map

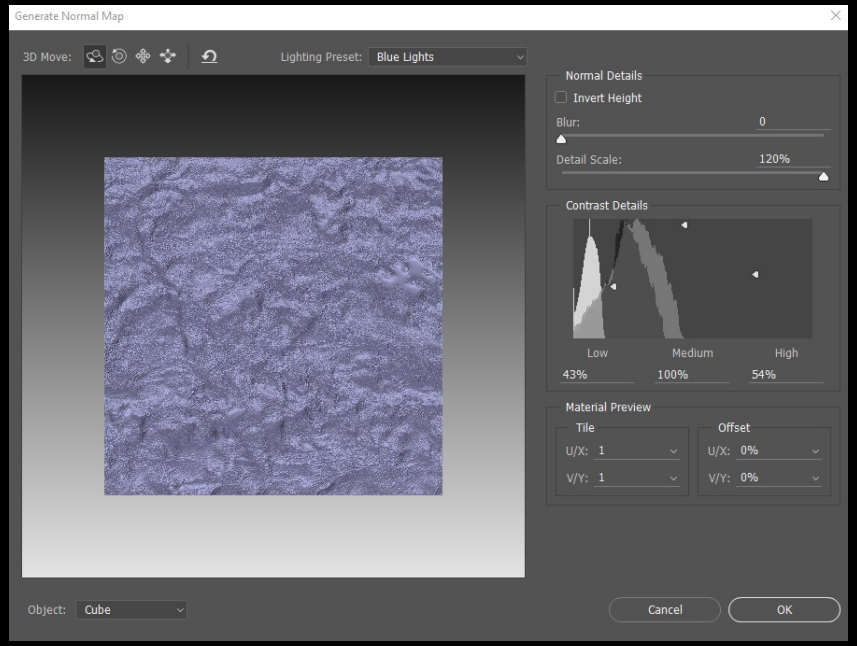
Contrast Details: This deals with contrast of the texture. You can either grab the arrows and raise and lower them to subtract or add contrast, or plug in a percentage.

Object: allows you to display your texture on different primitive objects

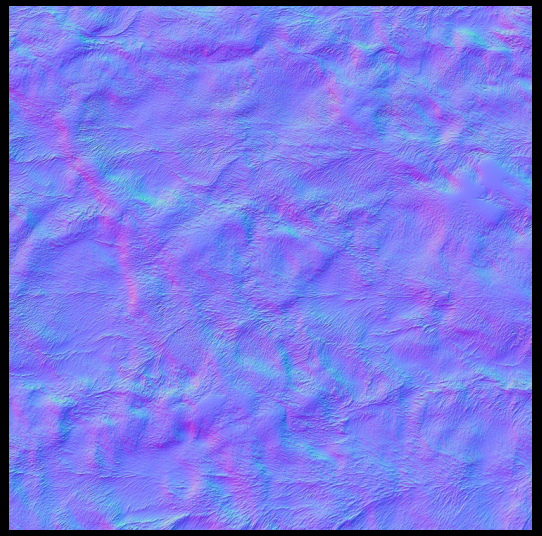
Material Preview: allows you to tile as well as offset the u/v and x/y preview, etc.

TWEAKING A NORMAL MAP

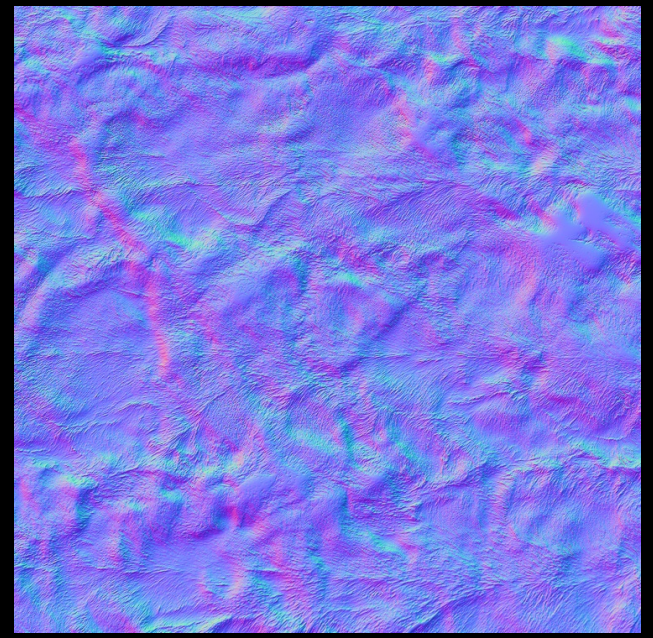
When you are done, hit OK, and the texture updates in Photoshop.



This is what my viewport looked like when I hit OK.



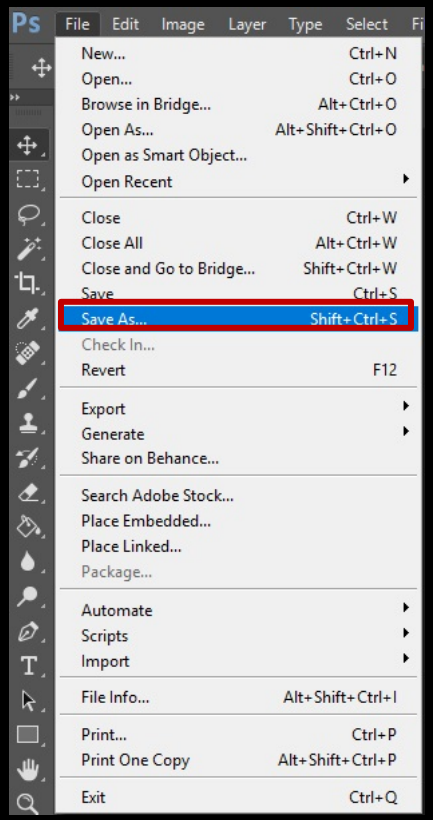
The original Normal Map

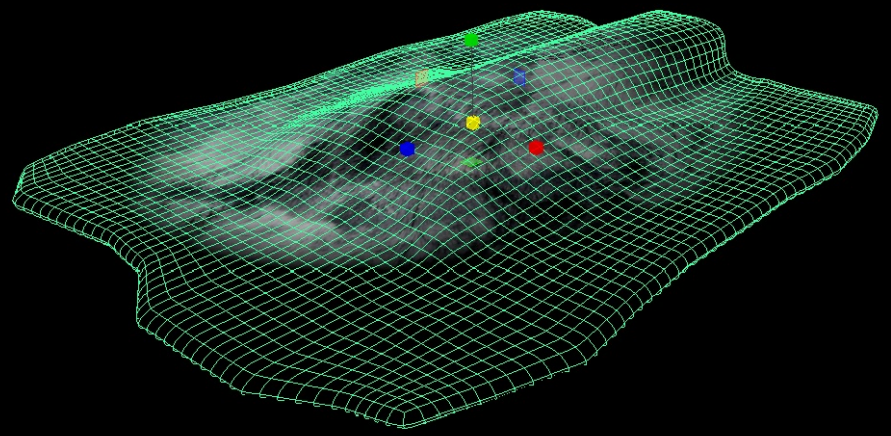


The new normal map after my tweaks

EXPORTING A NORMAL MAP

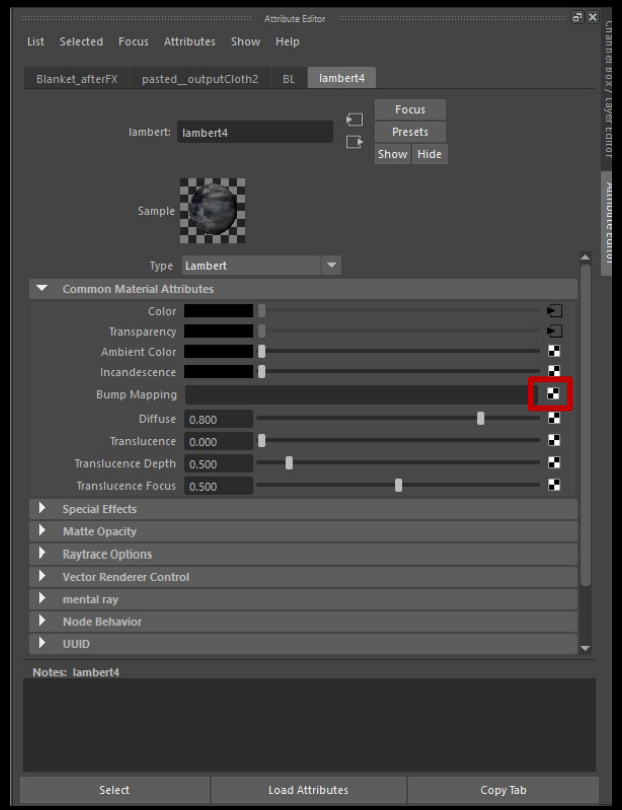
When completed, go to File > Save As and make sure to RENAME the file (don't save over your original texture) and click "Save."





Back in Maya, select the object

ASSIGNING THE NORMAL MAP

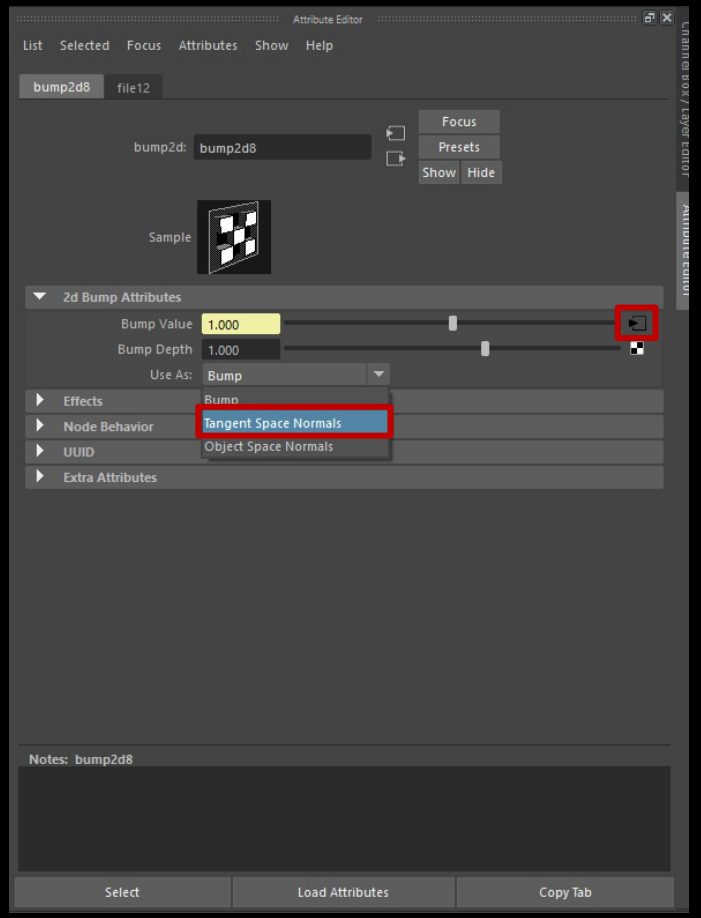


In the shader node (Lambert), find "Bump Mapping" and select the checkerboard box to the right of it. In the pop-up window, choose "File" again.

This will switch on the "Bump Map" node.

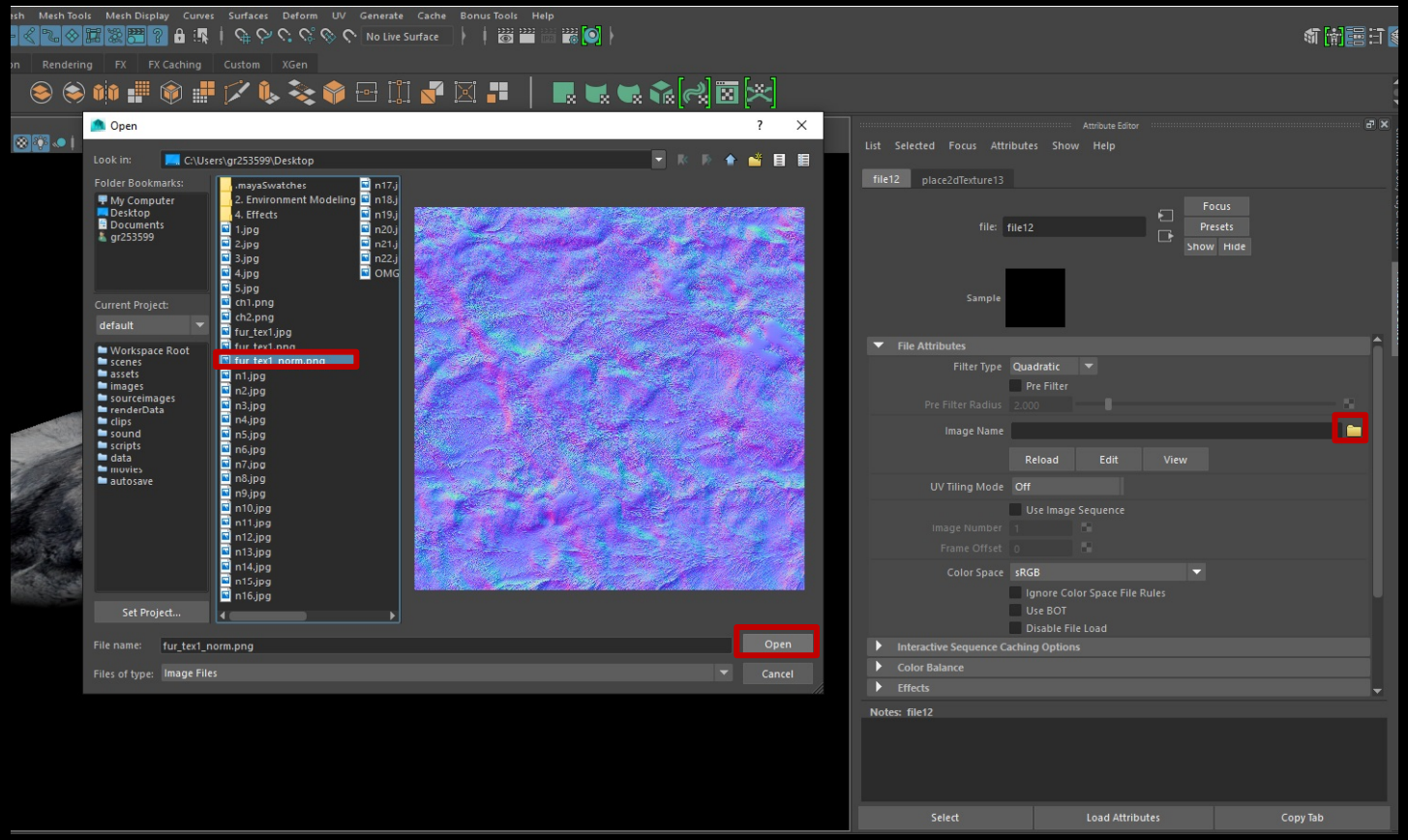
In the "2D Bump Attributes," click the "Use As: Bump" box and change it to "Tangent Space Normals."

Lastly, click the arrow next to "Bump Map Value"



NOTE Remember that a Normal Map is just a three bump maps in the x, y, and z direction.

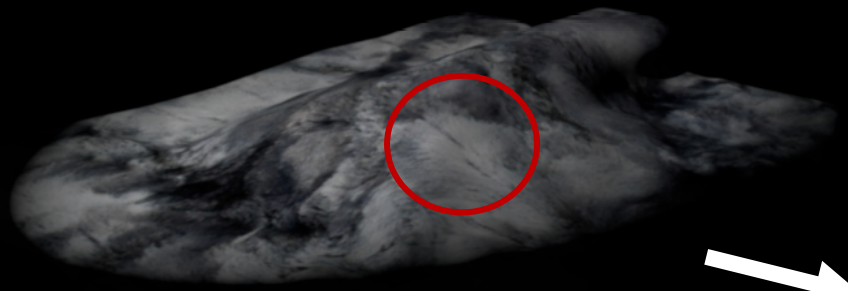
ASSIGNING THE NORMAL MAP



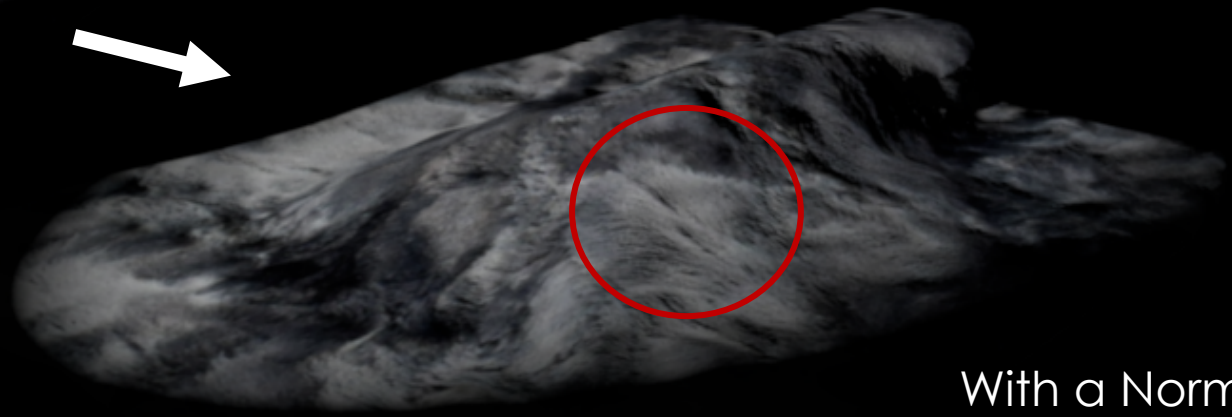
Inside of the Normal Map node, select the folder image to the right of "Image Name" and select your normal map file and click open.

WITH VS WITHOUT

Without a Normal Map



Now when you render it with the normal map on it, this is what you get! Now, it may be hard to tell, but the detail in this image does make the fur appear more raised.



With a Normal Map

NOTE

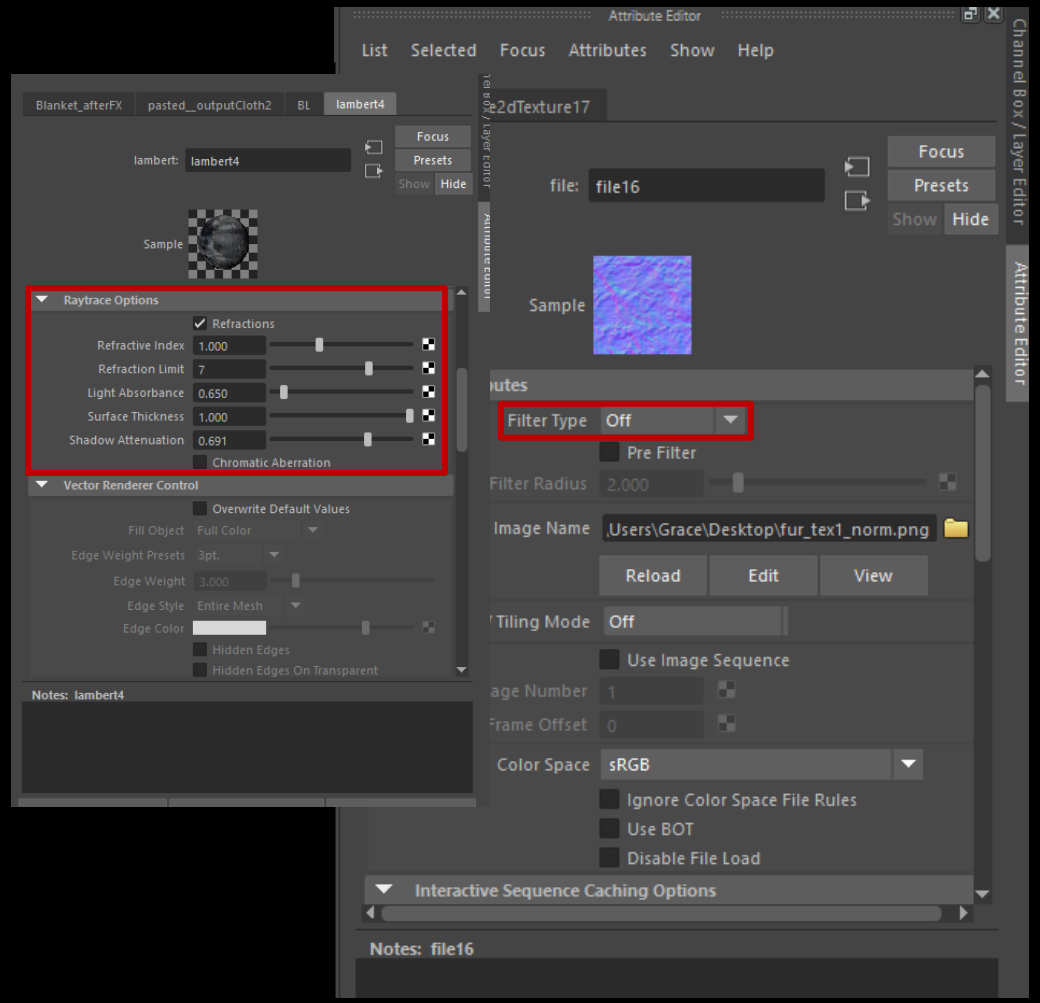
For example, you can see on this piece of fur I circled in red, that the one with the normal map has more detail on it, and looks more raised than the previous version without it.

MAKING ADJUSTMENTS

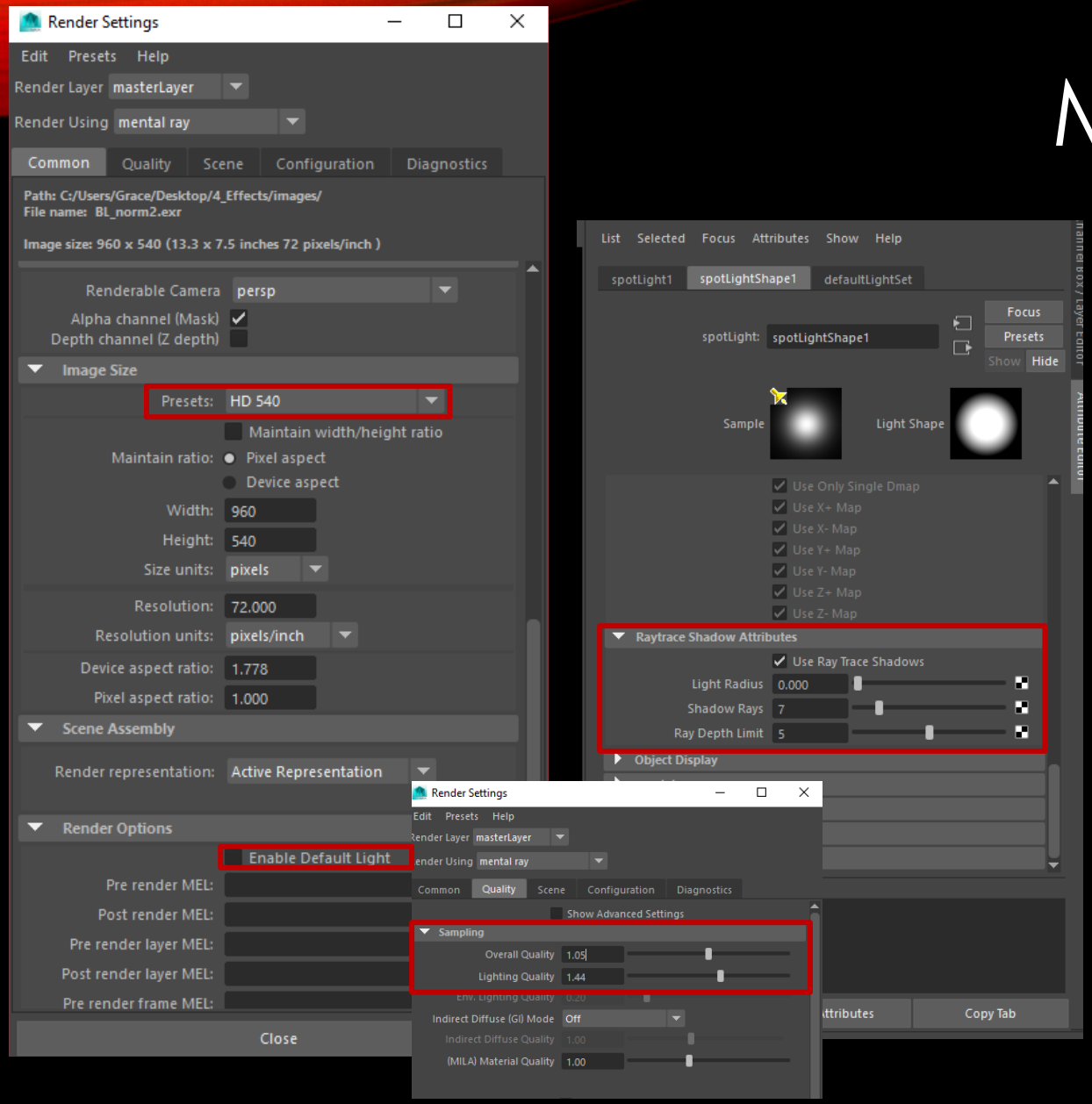
Now, I decided to go back into some settings and move some attribute bars around and such to make the lighting a little different and bring out more quality in the normal map:

I turned the filter type to off inside of the normal map as the "Quadratic" setting tends to add a blur.

I also jumped into the fur texture itself and played with some raytrace options having to do with surface thickness, etc.



MAKING ADJUSTMENTS

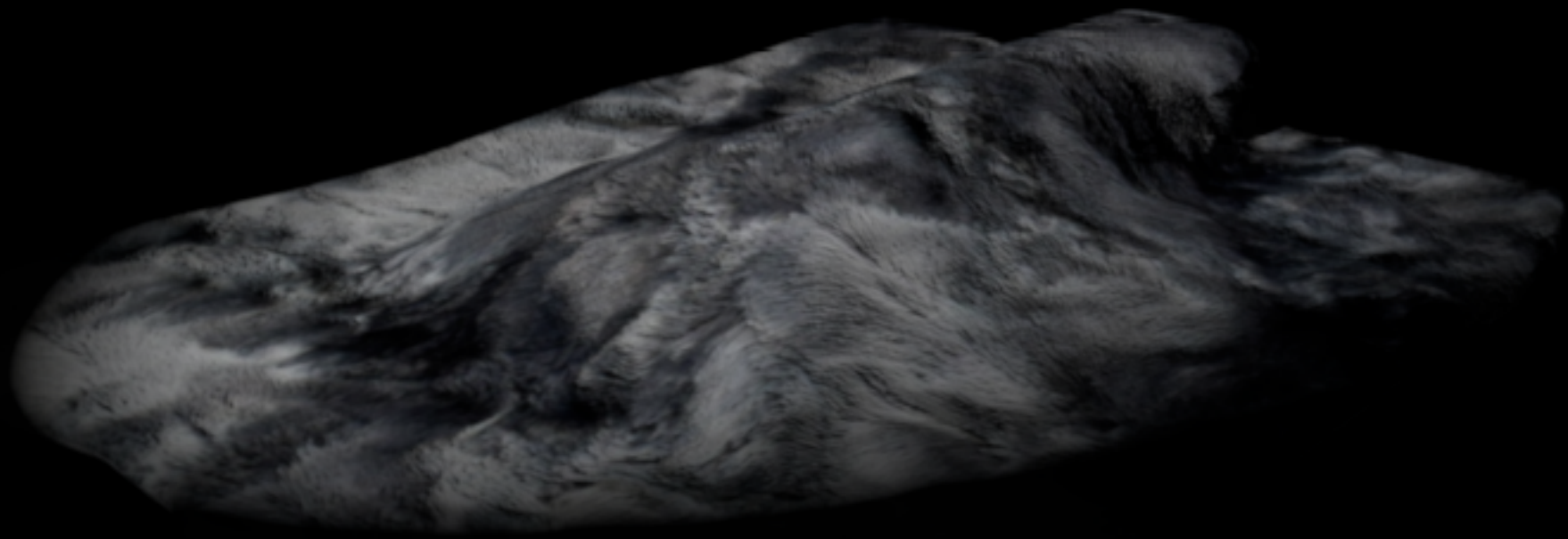


I also jumped into my Render Settings, make my render image itself HD 540 to get more info on the pixels, etc, and turned off "Enable Default Light."

I also improved the overall quality and lighting quality in Render Settings.

Lastly, I jumped into the spotlights Attributes and turned on Raytrace Shadows (as your image will display none if you don't turn this on), and added more shadow rays, depth limits.

THE END RESULT



SUMMARY OF PAPER

And that's it! Again, just to summarize, we walked through how to:

1) Create a three dimensional nCloth with an actual thickness and allow it to be animated like an nCloth

AS WELL AS

2) how to add a normal map to create the illusion of depth on a high-poly model to give it added complexity

That's the end of the technical paper, hope you enjoyed!

RESOURCES/SPECIAL THANKS

Part 1: nCloth/Wrap Deformer Effect

CGTalk

- http://forums.cgsociety.org/archive/index.php?t-1088087.html

  Specifically the user DrYo for giving an amazing idea to actually animating a blanket that is high-poly without it inner-penetration of vertices

Maya ToolBelt Video

- https://www.youtube.com/watch?v=pIEtpW1fZTc

  Specifically for teaching how to apply the Wrap Deformer

Autodesk Maya: Knowledge Network

- https://knowledge.autodesk.com/support/maya/learn-explore/caas/CloudHelp/cloudhelp/2016/ENU/Maya/files/GUID-B98E74F5-6965-41B1-BBF8-471FB2FAD7EC-htm.html

  Definition of the Wrap Deformer

RESOURCES/SPECIAL THANKS

Part 1: nCloth/Wrap Deformer Effect

3D Tutorial Zone

- http://www.3dtutorialzone.com/tutorial?id=20

  How to remove nCloth Node

Cheryl Cabrera

For helping me with nCloths

RESOURCES/SPECIAL THANKS

Part 2: Creating a Normal Map

Brain Poof (Youtube)

- https://www.youtube.com/watch?v=PaixnxO-zhM

  Fixing Normal Map Intensity inside of Photoshop (Without using the 3D menu set)

LinkedIn Learning (Youtube)

- https://www.youtube.com/watch?v=rtL_ZUH3dY4

  How to assign normal maps inside of Maya

Ryan Gatts (Youtube)

- https://www.youtube.com/watch?v=Wopbib6iNlw

  Creating your own normal map using a texture you hand painting digitally

RESOURCES/SPECIAL THANKS

Part 2: Creating a Normal Map

Brigid Costello (Youtube)

- https://www.youtube.com/watch?v=P1MmtI4ZlnU
  Making a quick normal map using Photoshop's 3D Menu

Pluralsight

- http://blog.digitaltutors.com/bump-normal-and-displacement-maps/
  Information on what specifically a normal map is and how to use it.

Adobe

- https://forums.adobe.com/thread/1089932
  Figuring out if your Photoshop has the 3D Menu