

Part 1

How to Use dForce: Creating a Blanket, Draping Clothes on Furniture and Much More

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(*RGcincy on Daz Forums*)

This is a summation of learnings made while trying out Daz Studio's new dForce. These do not involve draping clothes on figures but rather on other ways you can use dForce (such as draping blankets and towels or draping clothing on furniture and other clothing). Because of their simplicity, some of the elements made from primitives are helpful in illustrating what the various dForce global and surface parameters will do.

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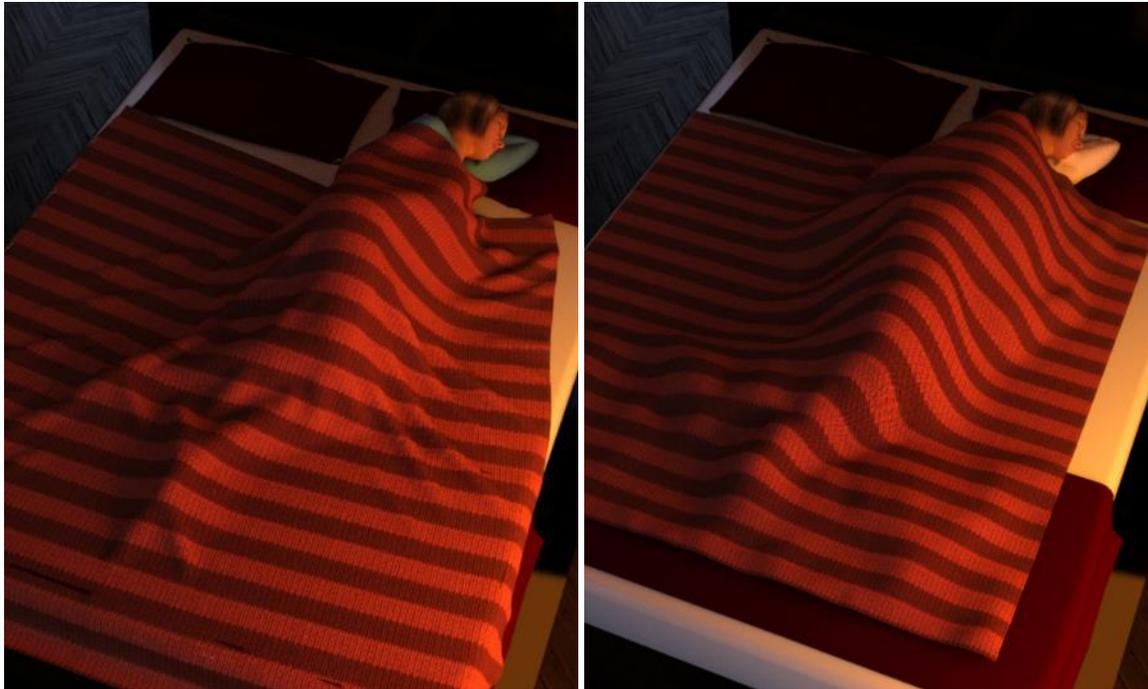
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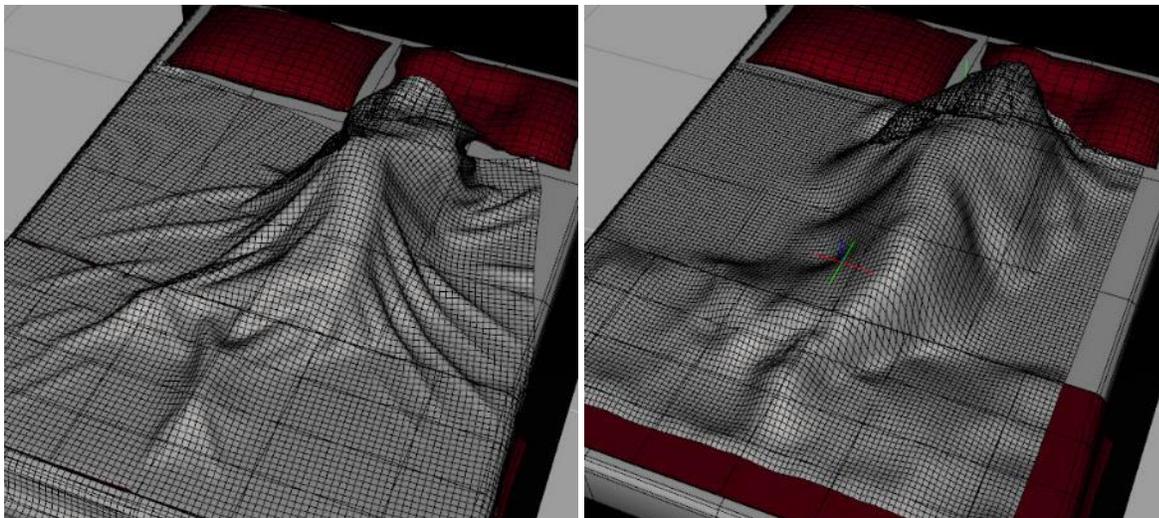
1. **Creating and Draping a Blanket Over a Figure.** Back in June I posted a tutorial on using a push modifier to create a blanket to cover a reclining figure (see [How to Use a Push Modifier: Creating a Blanket](#)). Although it works, the push modifier approach has a number of issues: (1) it's fairly labor intensive, (2) the results rely on the skill of the artist, (3) the artist has to interpret how gravity and cloth properties affect the draping, and (4) it grows the polygons of the mesh so that the edges of the blanket do not pull in as they naturally would.

With the new dForce simulator available, I decided to revisit the idea of a simple blanket. The default settings of dForce didn't give a good result but a few simple parameter changes make it work well.

Below Left: Here's a render of the final dForce result. *Below Right:* The result from using a push modifier. You can see that the physics of dForce give a more realistic result.



Below Left: dForce gives more natural draping of the blanket. Instead of the mesh polygons growing, the edges of the blankets pull in and all of the polygons remain square. *Below Right:* Using a Push Modifier, the polygons above the figure have stretched to become rectangular and the edges of the blanket remain extended and do not pull in as a real blanket would do:

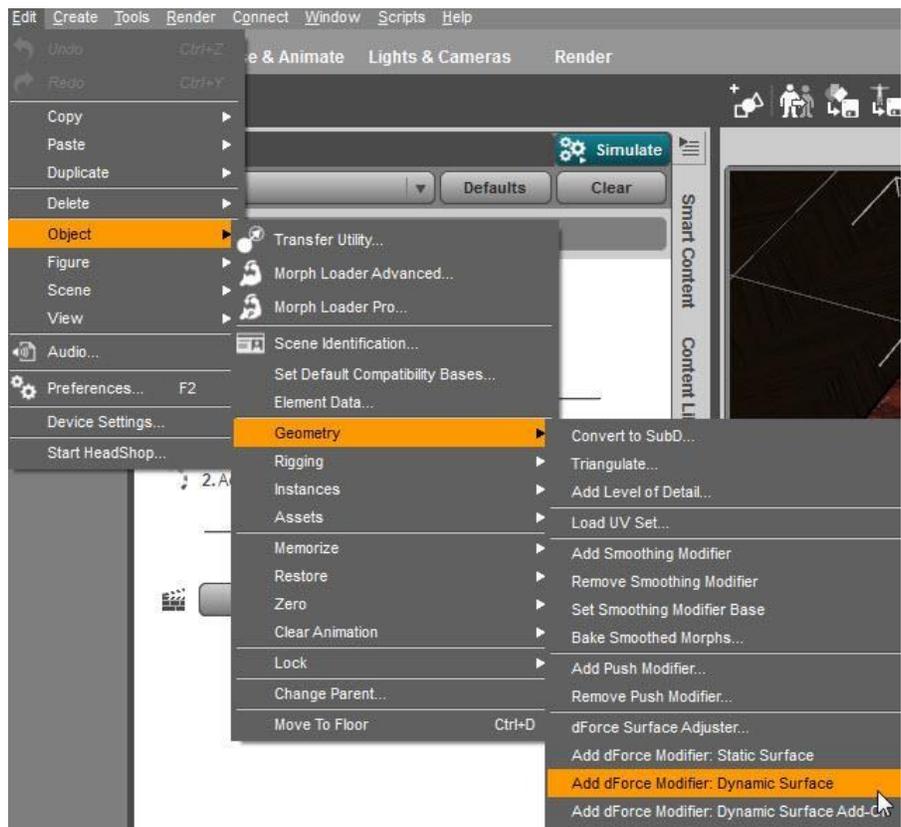


- a. I used the bed from [Modern Room Bedroom](#). It comes with a blanket at the foot of the bed and two pillows (combined as one prop) at the head of the bed. The actor is G3F in a sleeping pose on her side with her left arm tucked behind her head.
- b. Create a flat plane by going to the main menu and selecting Create/New Primitive... and set the primary axis to Y-positive, size to 5 feet, and divisions to 100.
- c. Resize the plane to a Scale of 120%, X-Scale of 110% and Y-Scale of 105%. Position it above the sleeping figure (I used a Y-translate value of 97.3) and move it down the bed so the upper end is over the shoulders and not the face of the reclining figure. Add whatever material or fabric shader you'd like to the plane.

Right: flat plane hovering over figure and bed



- d. Add a dForce modifier to the plane. Select the plane in the Scene Tab, then from the main menu select Edit/Object/Geometry/Add dForce Modifier: Dynamic Surface. This will allow the plane to be modified during the simulation.



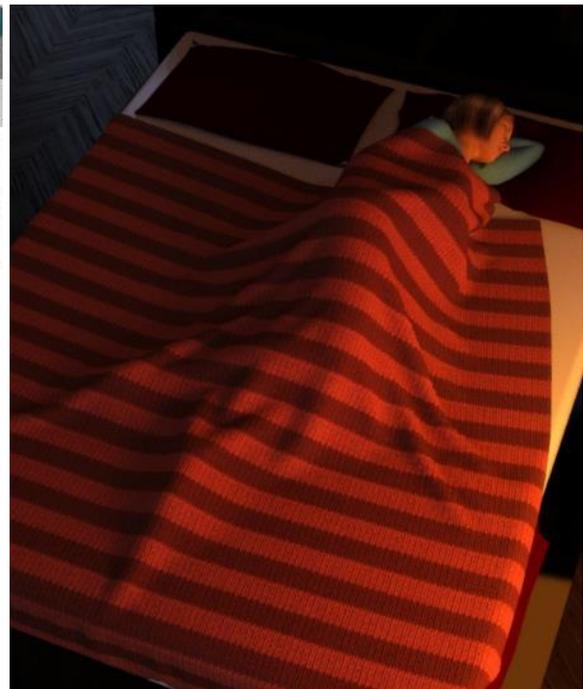
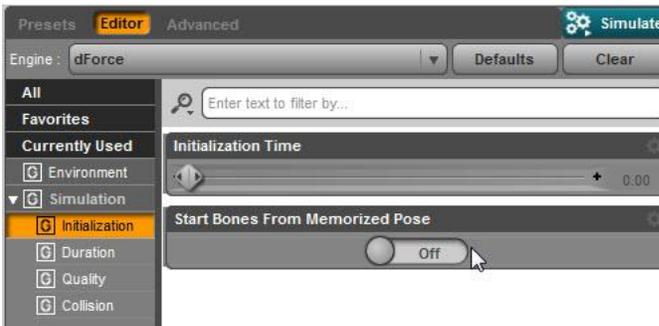
- e. To start a simulation, click on the Simulate button at the upper right of the Simulation Settings pane. If the dForce pane is not already open, go to Window/Panes (tabs) and select Simulation Settings.



- f. Using the default settings, the simulation will start by moving the figure to the vertical T pose with the head projecting through the blanket. As the simulation progresses and the figure's pose is transformed to the reclining pose, it will wrap the blanket around the figure, not drape it over the top as desired.



- g. In the Simulation Settings pane, click on the Editor tab at the top then click on Simulation/Initialization. Set Start Bones From Memorized Pose to **Off**. This skips the step of starting from the T-pose and lets the blanket drape over the figure.



Right: a render of the final result from just this one change. If you wanted, you could stop here.

2. **dForce Global Environment and Duration Settings.** Notice that the blanket in the image in 1.g drapes nicely over the figure but lays very flat on the mattress around her. Changing some other dForce parameters can add character to those flat regions. The following shows how changing Gravity, Air Resistance, and Stabilization Time affect draping.

a. **Gravity.** The default setting is 1. Here are the results at 0.5, 1.0, and 1.5. Air Resistance and Stabilization Time are set to the default settings of 0.15 and 1.0 respectively. *Top Left Image Below:* With 0.5 gravity and a Stabilization Time of 1, the far left edge of the blanket does not drop down and wrap around the mattress as it should. This means there was not enough time for it to settle.

0.5 Gravity



1.0 Gravity



1.5 Gravity



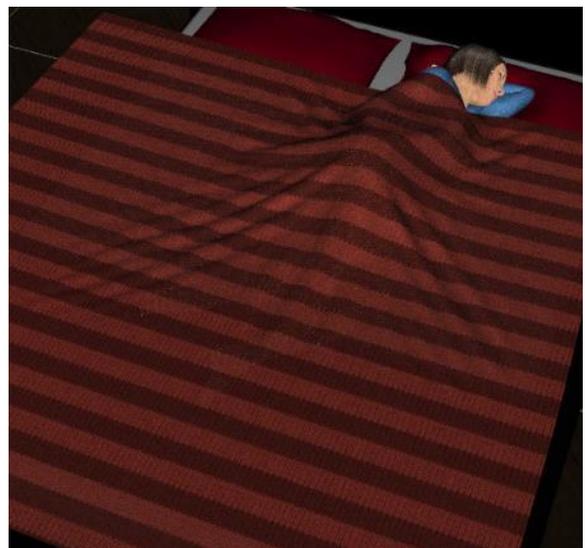
- b. **Stabilization Time.** The default setting is 1. If set lower, the simulation will not last as long and you will get a looser draping. In the image, the time is set to 0.5 with Gravity at its default value of 1. Because there is less time, the parts of the blanket extending past the mattress remain suspended unrealistically in mid-air.



By raising gravity to 1.5 and leaving Stabilization Time at 0.5, the edges of the blanket will drape over the mattress edge but note that the higher gravity causes the blanket to drape closer to the figure than at the default Stabilization Time of 1.0.



- c. **Air Resistance.** The default setting is 0.15. When set higher, there is an upward force countering the downward force of gravity. With Air Resistance set to 0.6 and Gravity at the default value of 1, the blanket will hover in mid-air as seen in the image at the right.



At the same air resistance of 0.6, increase Stabilization Time to 2 and the blanket will drape onto the figure as seen in the image at the right.



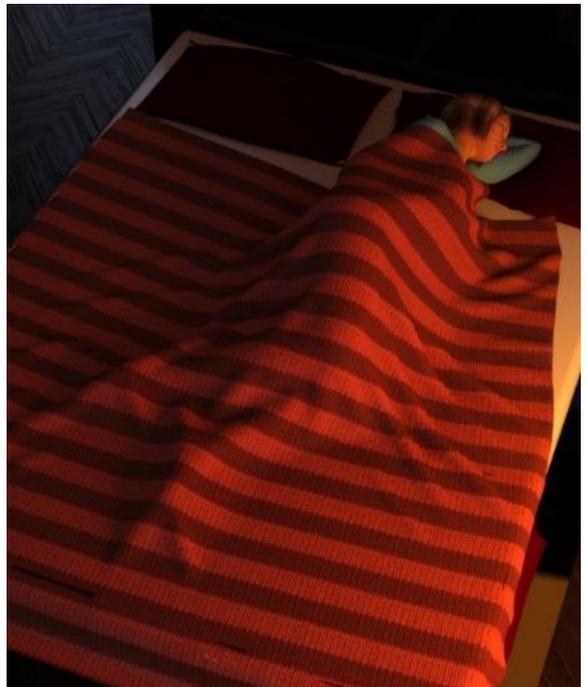
Two things to notice in the image at the right. First, compared to the default settings, there are more ridges in the blanket in the areas that were flat against the blanket before (desired). Second, the left edge of the blanket is not fully laid down (undesired).

To correct, increase Gravity slightly to 1.1 and you get this result:



The settings for the final render shown at right are:

- Start Bones From Memorized Pose set to Off
- Gravity set to 1.1
- Air Resistance set to 0.6
- Stabilization Time set to 2

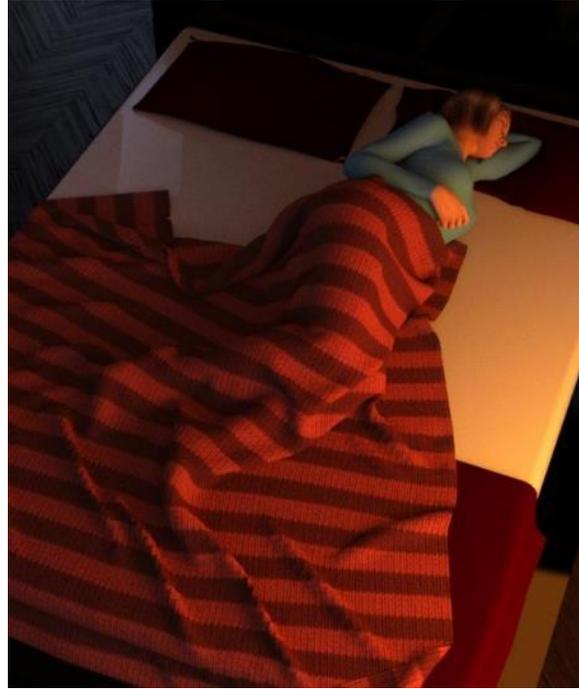


- d. **Negative Air Resistance.** Decreasing Air Resistance below zero has an interesting effect. It causes a billowing during the simulation which results in the blanket being pulled in more tightly to the front of the figure (as if it was cold and someone grabbed the blanket to snuggle in tight). Increase Gravity to 2 to counter the lower air resistance and set Stabilization Time to 2 to give it enough time to settle.

Air -0.10



Air -0.25:



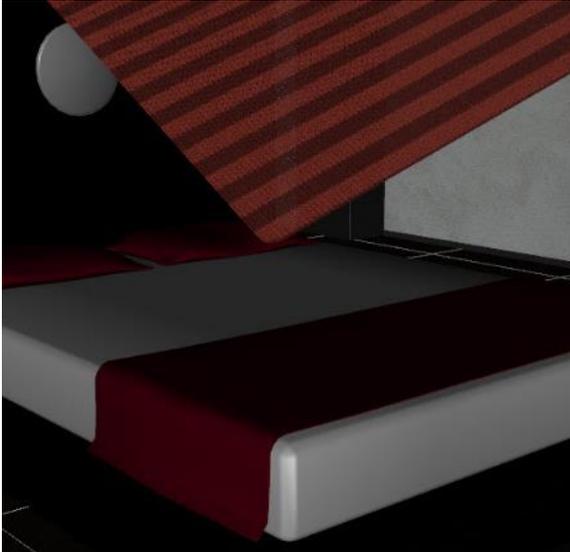
I did not change the starting Z-Translate at first so the result is that the blanket gets pulled off the shoulders. By moving the blanket further over the head, it wraps around the shoulders and keeps them covered as shown below.

Air -0.25 +Z-Translate:



3. **Cast Off Blanket.** In this section, removing the figure and setting the blanket at an angle allows it to fall as if someone cast it off when getting out of bed.
 - a. Rotate the plane around the X and Y axis so a point is aimed at the lower left part of the mattress. Use trial and error to move it around, as if too close to the corner the blanket slides mostly off the bed. I used default Gravity and Air Resistance and a Stabilization Time of 2 so there was enough time to settle.

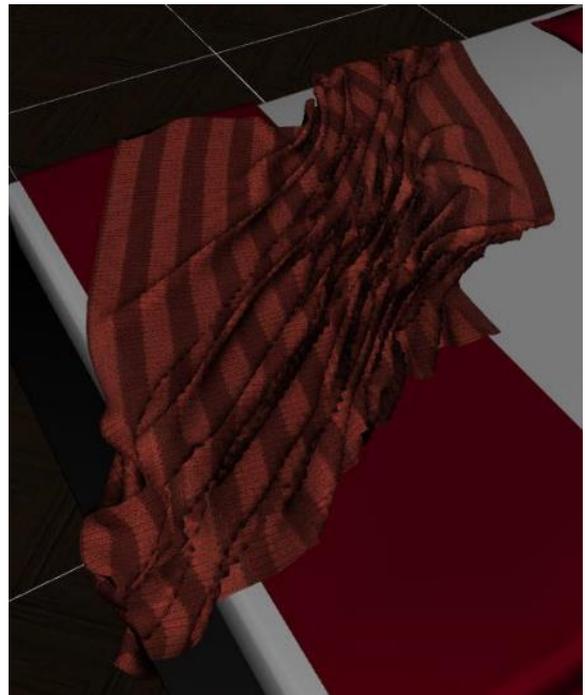
Side View:



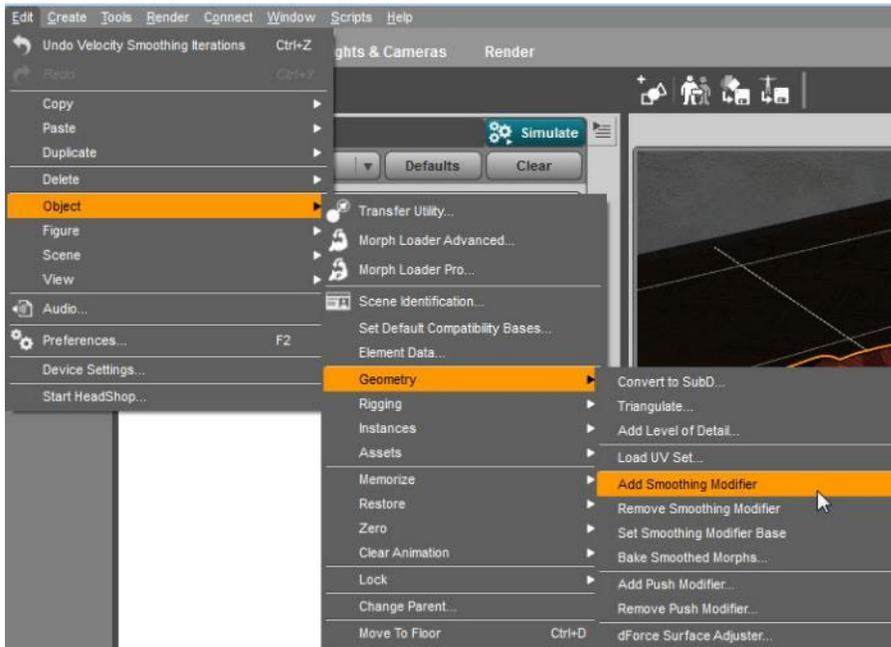
Top View:



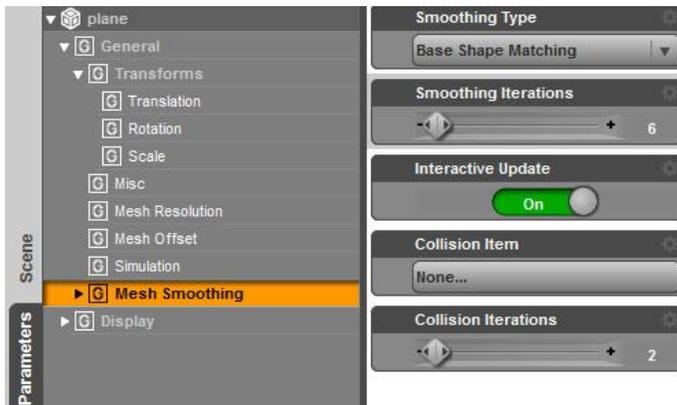
- b. Using default Gravity and Air Resistance with a Stabilization Time of 2 so there is enough time to settle, after simulation you get:



4. **Adding a Smoothing Modifier.** You'll note that there's some jaggedness to the ridges in the image above. To remove, add a Smoothing Modifier. Select the blanket in the Scene pane, then go to the main menu and select Edit/Object/Geometry/Add Smoothing Modifier.



Go to the Parameters pane and set Smoothing Iterations to 6 and Collision Iterations to 2.



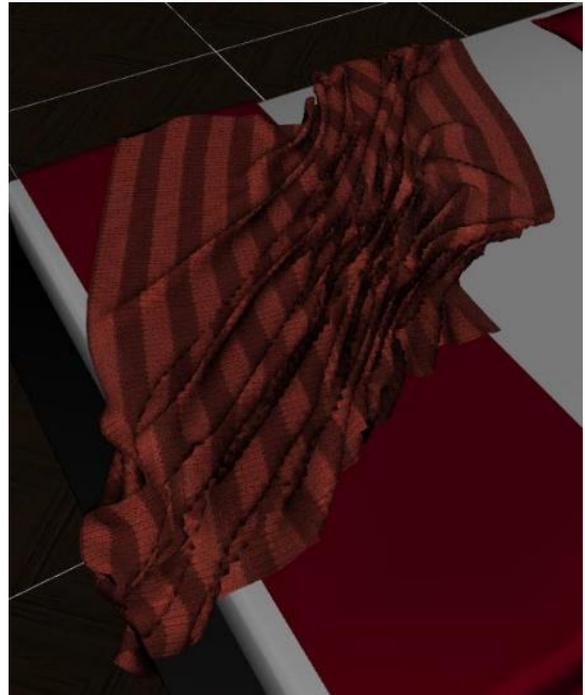
A finished render of the smoothed and tossed aside blanket:



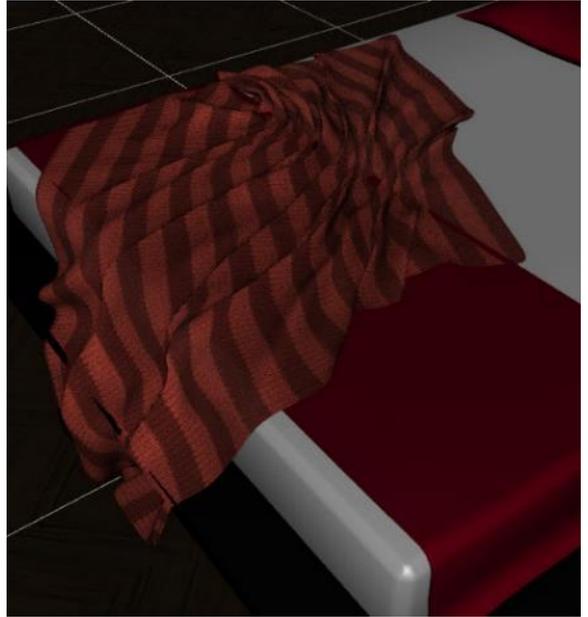
5. **Using dForce Surface Smoothing Settings.** In step 3.c I added a smoothing modifier after the simulation to remove jaggedness along some of the ridges in the blanket. The Simulation Surfaces tab offers a smoothing option as well. It differs from the smoothing modifier in that it is applied as the simulation occurs, so it affects the simulation results.
- a. Select the surface of the blanket and go to the Surfaces pane. Then select the Simulation Tab. For now, we are only changing the Velocity Smoothing and Velocity Smoothing Iterations parameters. Gravity and Air Resistance are at default values and Stabilization Time is 2.



- b. The result using the default values for **Velocity Smoothing** (a value of 0). You can see the jaggedness in the texture in the lower middle.



The result after setting Velocity Smoothing to 0.1 and Velocity Smoothing Iterations to 1. Notice that there is no jaggedness but the blanket is not as gathered.



Increasing Velocity Smoothing to 0.25 spreads it out even more:



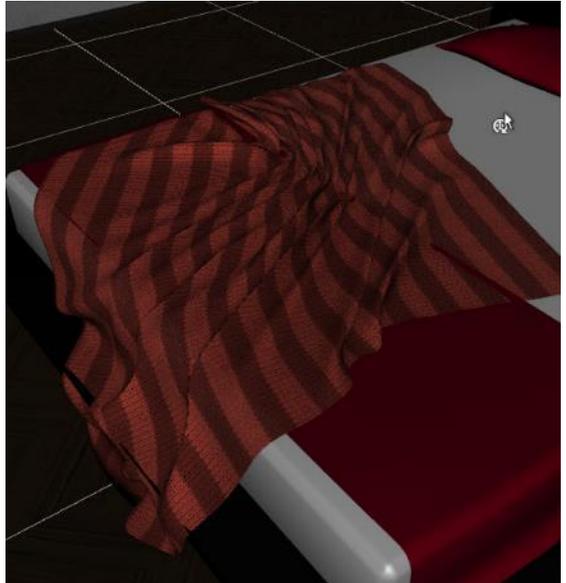
And at 0.5 even more:



At a value of 1, the blanket is hardly gathered:



- c. To test changes to **Velocity Smoothing Iterations**, here's the image again for Velocity Smoothing of 0.25 and Iterations 1:



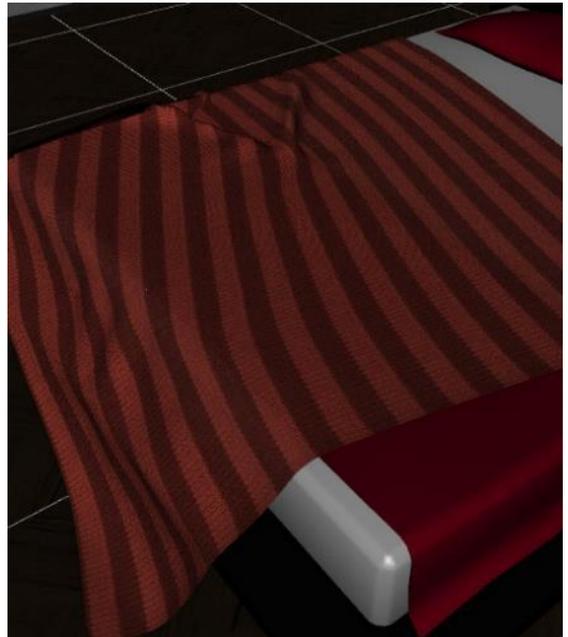
At iterations 2:



At iterations 3:



As you can see from this image series, increasing the Velocity Smoothing value **or** increasing the number of Velocity Smoothing Iterations will spread the blanket out. You can get it almost flat with just a bit of folding by setting Velocity Smoothing to 0.5 and Velocity Smoothing Iterations to 3:



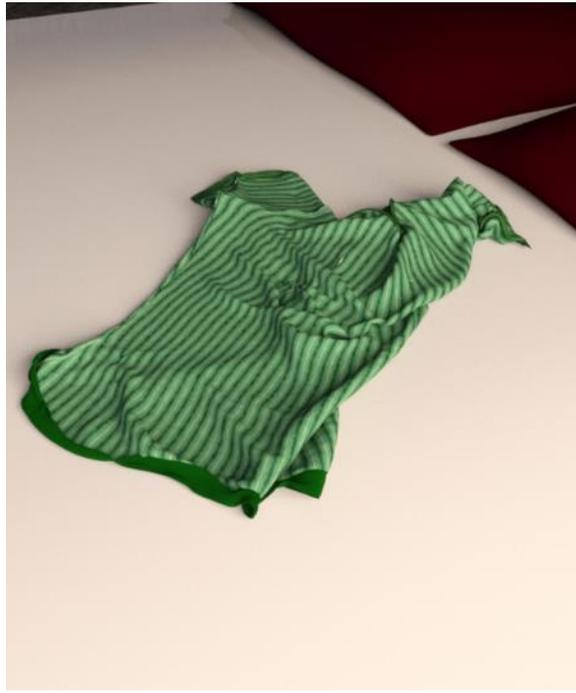
6. **Draping Clothes on Furniture.** There's only occasional use for a cast off blanket like in step 3, but the same idea can be applied to clothing items which are frequently found thrown about on beds, chairs, floors and other spots in a scene.
 - a. Load the shirt from [70's Gym Uniform for Genesis 3 Females](#) and add a striped shader to better show the folding of the item. Position it at an angle over the bed and run the simulation using the default dForce parameters except turn off Start Bones from Memorized Pose.

(Note that the left image is from the viewport and the right is a render. Same shader but for some reason two looks.)

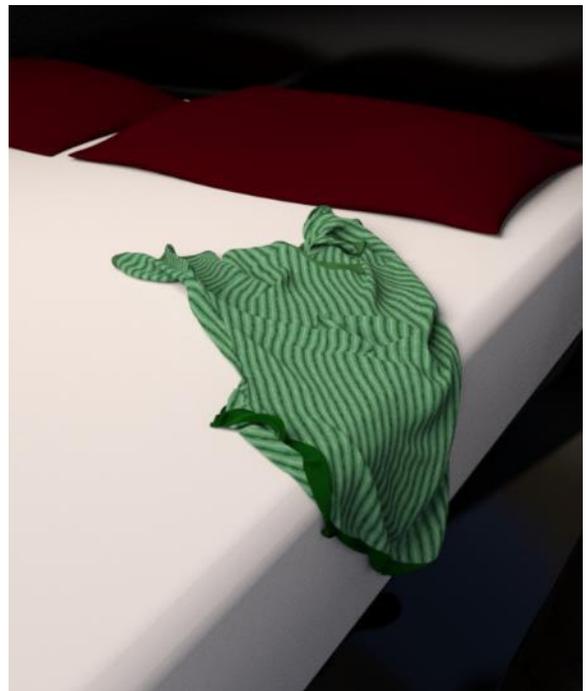
Starting position:



After Simulation:



- b. Move the starting position so part of the shirt extends beyond the mattress. It will now fold over the mattress (*right*):



- c. Replace the bed with a chair from [The Chair Collection](#) so the shirt drapes over the corner (*below*).



- d. Using a different chair from Simple Living - Living Room:



- e. A lot of clothing causes crashes – the screen goes black and Daz Studio closes. The shirt used above did not cause a crash when over the bed. It had one crash when using the first chair and several when using the second chair. At this time, it's not always clear what it is about a clothing item or it's interaction with other props that causes a crash. Switch to another item or reposition it slightly and try again. Be sure to make lots of saves before running a simulation on a new setup.

- f. You'll find that using various clothing items is hit or miss. Some work, others don't. One shirt even flew up into the sky. I did try an experiment with a shirt ([Everyday Casual Outfit for Genesis 3 Males](#)) that caused a crash every time. I exported it as an object then reimported it. I was then able to drape the shirt over a chair without a crash. To get the arms to hang straight, increase Stabilization Time to 1.5 otherwise they remain curved in space. See the result at the right.



Exporting as an object doesn't work for every clothing item that causes crashing but it can help on some.

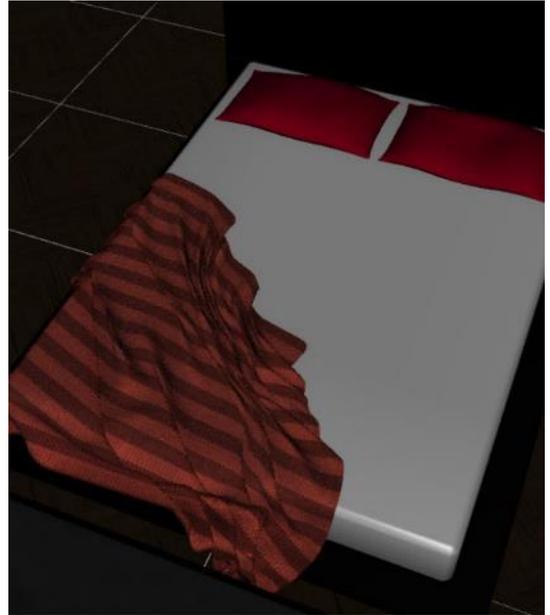
- g. Below is another example of clothing draping on a chair. This uses the t-shirt, pants, and boots from [Air Defender for Genesis 2 Males](#). This clothing simulates without crashing.



7. **Friction.** Friction is an obvious parameter to test as some fabric have low values (silk) while others have high values (coarse wool). When two objects interact, there are two frictions to consider: that of the item being simulated (which has a dynamic surface) and that of the item being collided with (which has a static surface).
- a. The static surface will use default values unless you add a static modifier. Select the item in the Scene pane and then go to the main menu and choose Edit/Object/Geometry/Add dForce Modifier: Static Surface. Friction is one of the few values you can adjust on a static surface. In the following series of images, the amount of friction for the blanket and the mattress is varied to show how it affects the result.
 - b. The starting point for the blanket was the same as used in section 3. At the right is the result when using the default friction values of 0.4 for blanket and mattress:



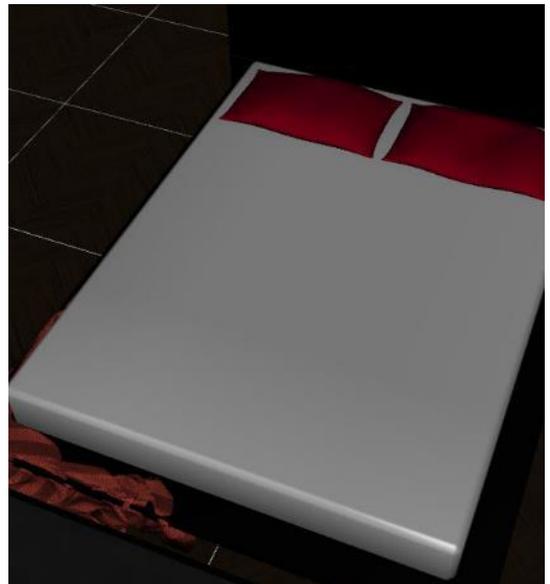
- c. Blanket friction of 0.4 (default) and mattress friction of 0.1 (silk or satin sheet). More of the blanket has slid off the bed:



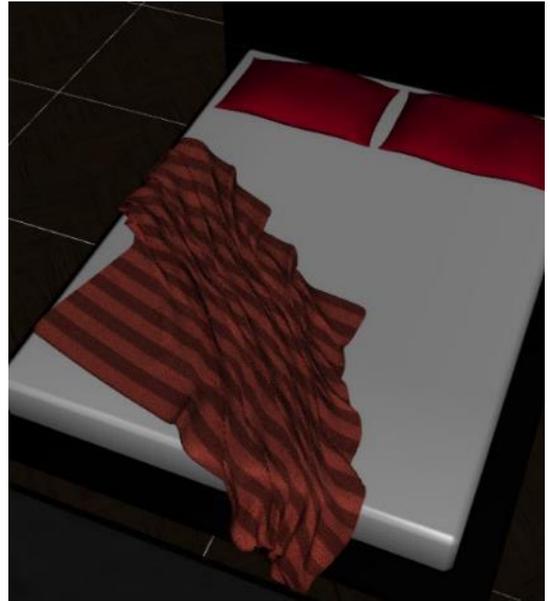
- d. Blanket friction of 0.1 and mattress friction of 0.1. The blanket has slid further off the mattress:



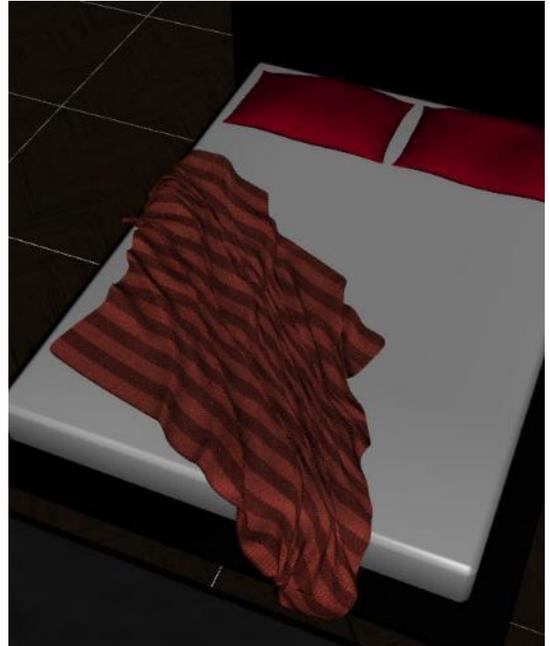
- e. Blanket friction of 0.01 and mattress friction of 0.01. Whoops! The blanket slides all the way off:



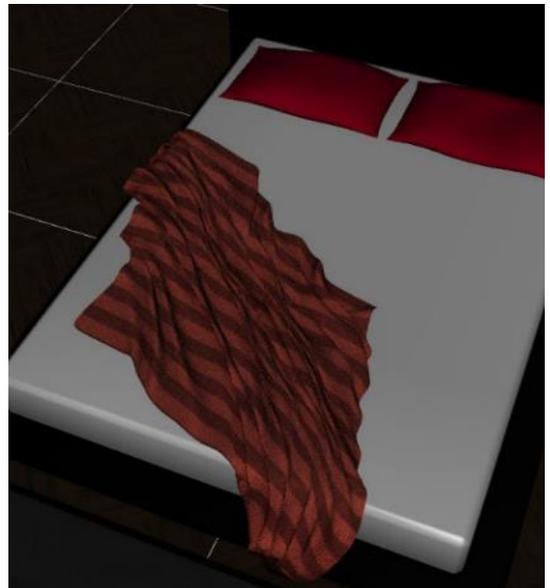
- f. Blanket friction of 0.6 (higher than default) and mattress friction 0.4 (default). There's little change from the result using the default values shown in 7.b above:



- g. Blanket friction of 0.8 and mattress friction of 0.4. Only a slight change:



- h. Blanket friction of 1.0 and mattress friction of 1.0 has little additional effect. The lower left corner of the blanket stays about where it landed instead of sliding along the blanket:



- i. Based on these results, lowering friction below the default of 0.4 had a large effect whereas higher values did not change much at all.

8. **Creating a Clothes Pile.** Section 6 showed clothes being draped over furniture. The items of clothing interacted with either the bed or the chair but not with any other clothing item. In this section we'll discuss stacking clothing on top of other clothing.

a. Since many clothes can cause a crash, make sure to save your last working simulation so you can quickly get back to it. This is not as important if you already know that each clothing item will simulate successfully.

b. In this section, Start Bones from Memorized Pose is turned **Off**.

c. I started with the Air Defender shirt, pants and boots shown in step 6.g above. The shirt was positioned horizontally halfway over the chair's back. The pants were positioned horizontally halfway over the chair's seat. The boots were just set on the floor AFTER the pants were simulated (otherwise the pants leg would catch on the boots). See image at *Right*.



d. After running the simulation, select the pants and shirts in the Scene pane. Go to the Parameters pane, select Simulation, and turn Freeze Simulation to **On**. Now when you run the Simulation, these two items will be frozen in their simulated state and will not participate in future simulations, so a new clothing item can be draped over the already simulated forms.

Be sure to save your scene so you can go back to it if any added clothing item causes a crash.



e. Next simulate the shirt from 70's Gym Uniform that was used in 6.a. Position this to overlap the pants on the chair and one of the boots so it will hang on the boot top. After simulation, turn Freeze Simulation to On for this item.

- f. Next use the [Leotard for Genesis 3 Females](#) to overlay the pants, the gym shirt, and the corner of the chair. After simulation, turn Freeze Simulation to On for this item.



The result after doing steps c-f is shown at the right.

- g. After doing the above, I thought it would look nice to render some socks stuffed into the boots. This takes some rework as the gym shirt is covering one of the boot holes. The socks are from [Uniform Dress for Genesis 3 Females](#).
- h. Hide the gym shirt by clicking on the eye in the Scenes pane. This keeps it from participating in the simulations and interfering with the socks. If the socks don't fully line up with the boots, move the leg bone of the one of the socks side-to-side so both socks are over an opening. Also, bend the ankle of the socks so the toes point down, otherwise they'll end up just laying over or sliding off the boots.



After simulation, turn Freeze Simulation to On for the socks.

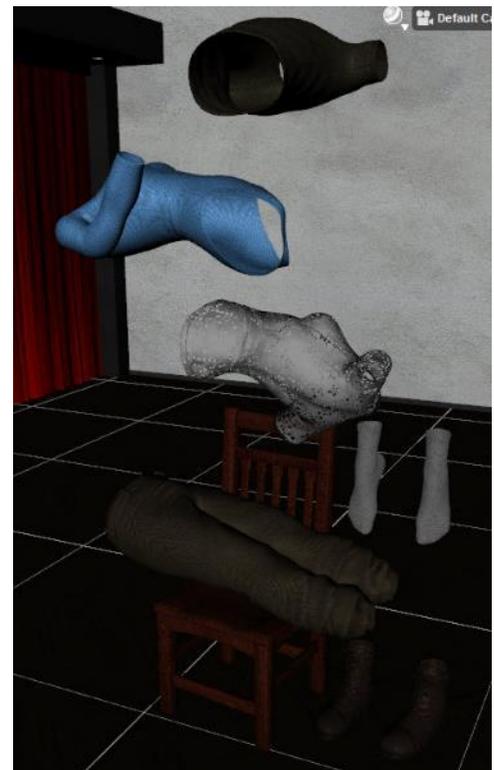
- i. Since the gym shirt covered the boots, and now the socks do as well, the gym shirt needs to be re-simulated. Hide the leotard since it overlays the gym shirt. Then turn Freeze Simulation to Off for the gym shirt and re-run the Simulation. Afterwards, turn Freeze Simulation back to On.
- j. Repeat step i for the leotard since it overlays the gym shirt.
- k. Steps g-j would not have been needed if I had done everything in order at the start, but since I decided to insert the socks, it turned into a good demonstration of how you can place an item in between already simulated items.

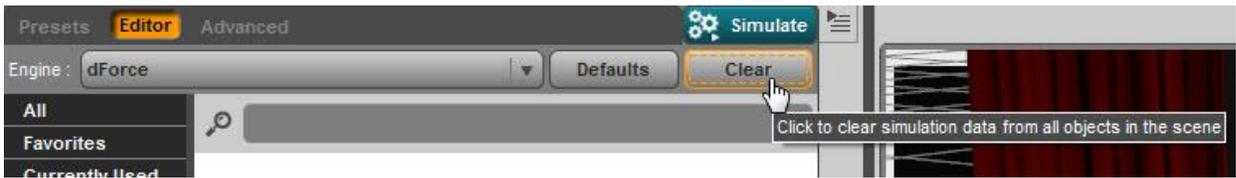
At the right is a render of the final stack of clothing:



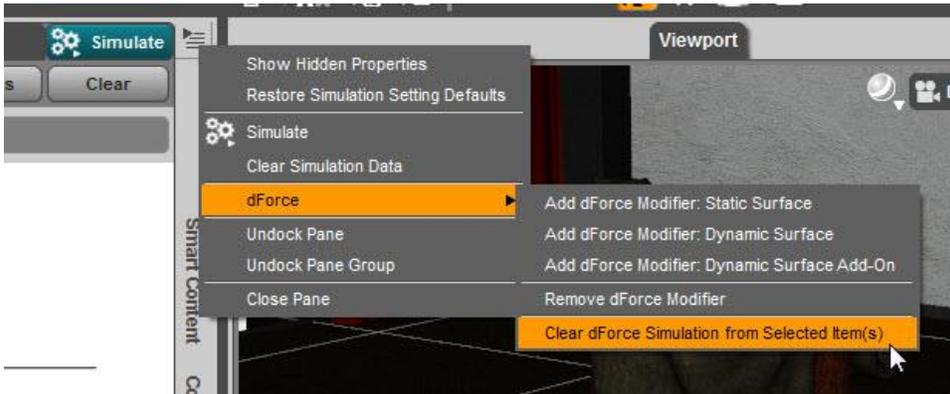
- l. The image at the right shows the starting position of the various clothing items. You could simulate them all at once but the boots would catch the pants legs and the pants legs would block one of the socks from going into the boots. I find it easier to do each item one by one, freezing the simulation for each item as I go. This way I can also make adjustments if they don't drape quite the way I like them.

- m. When simulating multiple items, you may be tempted to click on the Clear button on the Simulation Settings pane. **Don't!!** This clears ALL objects and you'll end up with what is shown at the right.





If you want to clear just a single item to change its positions, select the item(s) in the Scene pane, then left-click on the Simulation Settings sub-menu (the stacked lines icon in an upper corner) and choose dForce and then Clear dForce Simulation from Selected Item(s).



9. **Various Methods to Correct Poke Through.** One thing I've noticed with the clothes draping on furniture is there can be poke through of the furniture (in the image series below, it's the red color of the chair showing through the green shirt). There are several ways to remove or minimize poke through.
 - a. Make SMALL changes in X, Y, and Z translate. Small means 0.1 to 0.3 units. For this image, the t-shirt was raised by +0.3 on the Y axis and -0.1 on the X axis. This typically does not remove all the poke through but will take care of much of it. Sometimes you can hide most of it on the side opposite from the camera. You don't need or want to make big changes as it can make the draping look off.

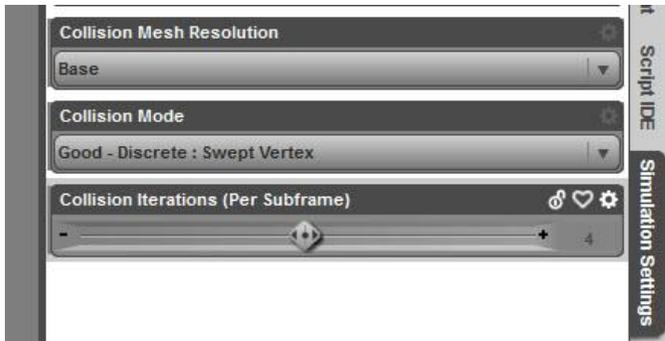
Before with poke through:



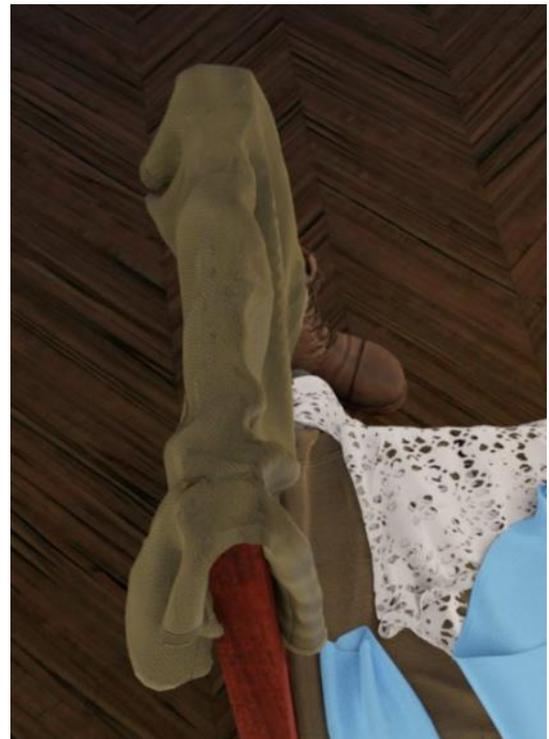
After X and Y changes:



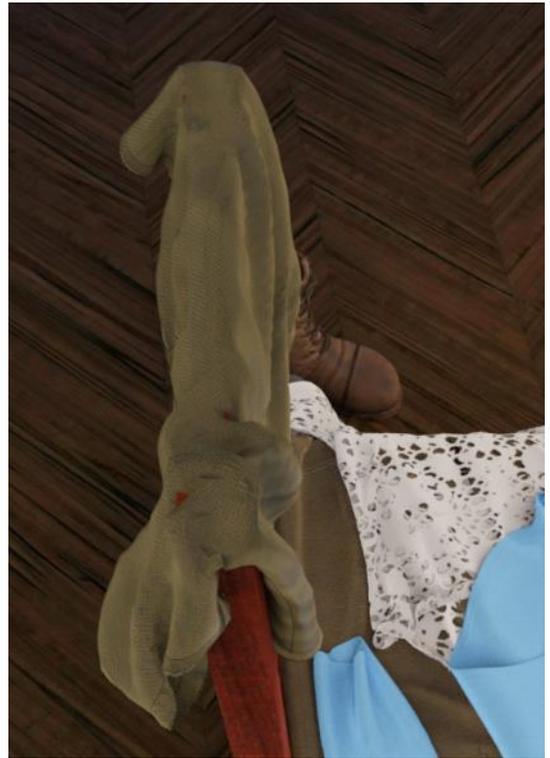
- b. Change the pose, again by small increments. The clothes have bones that you can bend, twist, or move side-by-side. This is harder than changing XYZ position as its trial and error and you may not find the right combination that helps.
- c. Counter-intuitively, use Good instead of Best or Better Collision Mode. (I don't know how often this helps, but with Best you see a sharper crease in the clothing against the chair edges and that's where poke through most often occurs).



- d. Change the Collision Iterations to 10 (using Best Collision Mode). This parameter affects self-collision but also helped with the chair collision, possibly by changing how the shirt interacts with itself.



- e. Change the Collision Offset. The default value is 0.2 which gives the poke through shown in the first image of step 9.a. The image at the right shows Collision Offset set to 0.5 which causes less poke through.



At Collision Offset of 0.75 there is very little poke through but now the t-shirt does not fully hang down. Longer Stabilization Times do not get it to lie flat. See image at right.



At Collision Offset of 1.0, the shirt falls completely off the top of the chair (not shown).

- f. If you can't hide the poke through by doing any of the above, you can add a push modifier. I won't go into details here as they are covered in another of my tutorials (How to Use a Push Modifier) but push modifiers can be added to an object after it's been simulated. I used a value of 0.5 to minimize how much offset was being added. I also painted the least amount of push I could get away with.

Push Modifier weight map I used:



Top View with Push Modifier applied:



Front View **without** Push Modifier:



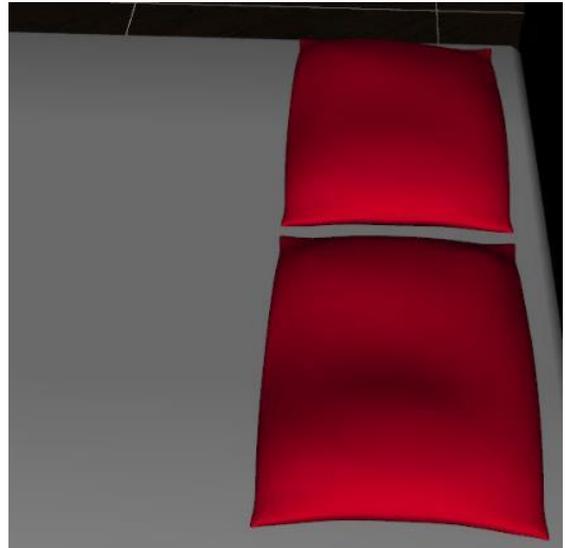
Front View **with** Push Modifier:



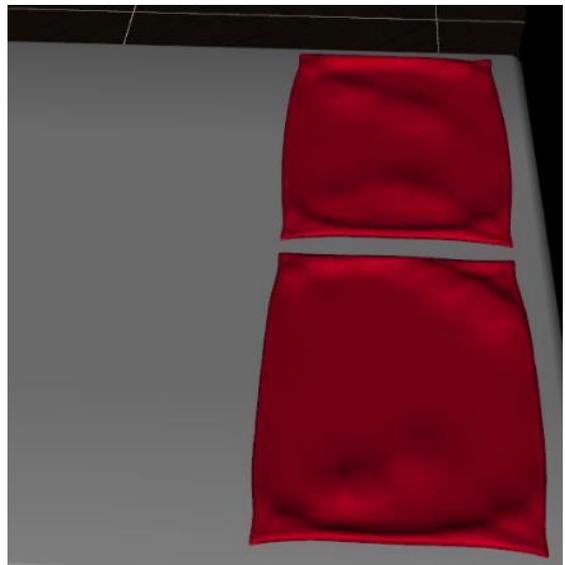
As you can see, the poke through on the upper left chair corner is gone and there is little difference in the overall draping.

10. **Getting a Figure's Head to Sink into a Pillow.** When I did the blanket at the beginning, I did not bother with the pillows. The pillows with the Modern Room Bedroom already have a slight depression built in. I also had added a Push Modifier in a previous tutorial and that was still in effect in all the bed images I've shown. In this section I discuss how to simulate these pillows so the figure sinks into them.

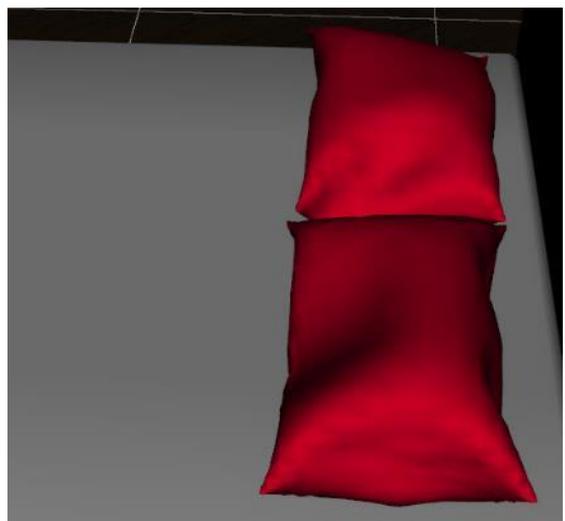
a. Here's what the pillows look like as loaded into Daz Studio:



b. If you simulate with default gravity (+1.0), the pillows flatten out as they collapse like a burst balloon:

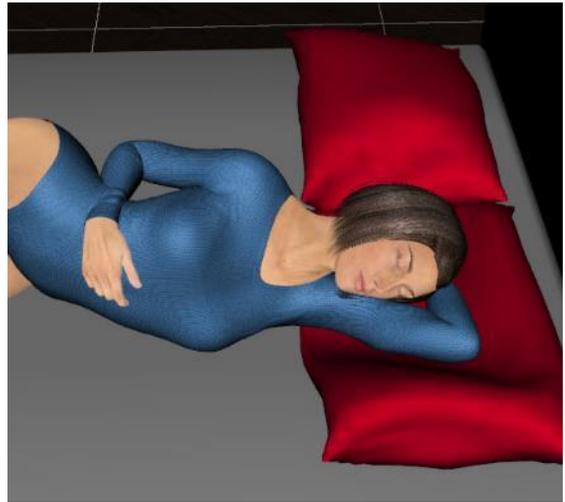


c. If you simulate with negative gravity (-1.0), the pillows plump up:

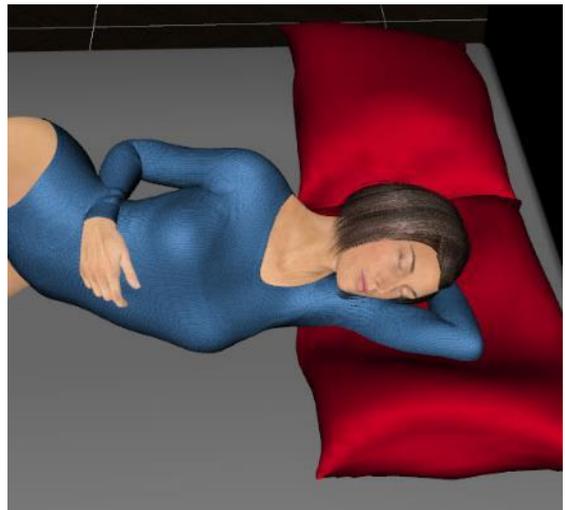


- d. To get the pillows to plump when the figure collides with them, use a negative value like -0.5:

Be sure to have the figure's upper chest, arm and head slightly raised from the mattress, otherwise the simulation will drive the pillow down into the mattress.



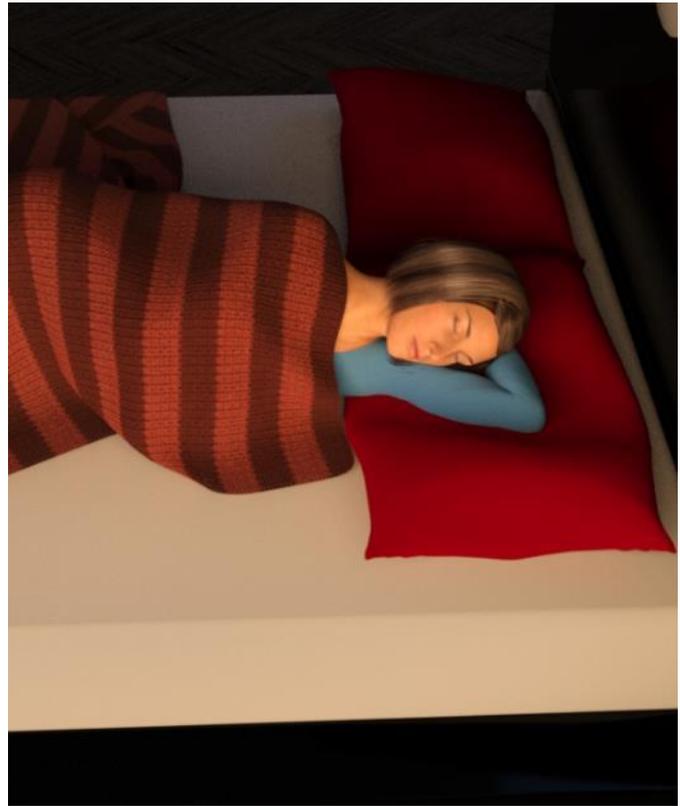
- e. I thought the pillow didn't plump up enough just under the figure's arm pit and arm. You can puff up the pillow a bit more by setting the surface parameter Contraction-Expansion Ratio to 105% (default is 100%). I found at 110% the mesh blew up.



- f. You can also add sub-division. It helps give a bit more complexity to the pillow but adds significantly to the simulation time (you can export the pillow with subD on and reimport as an obj to speed things up). Here is the result and you can see there's not much difference:

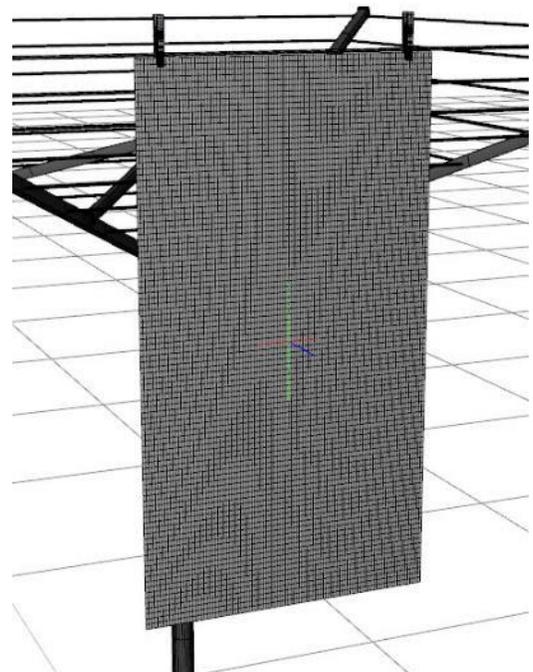
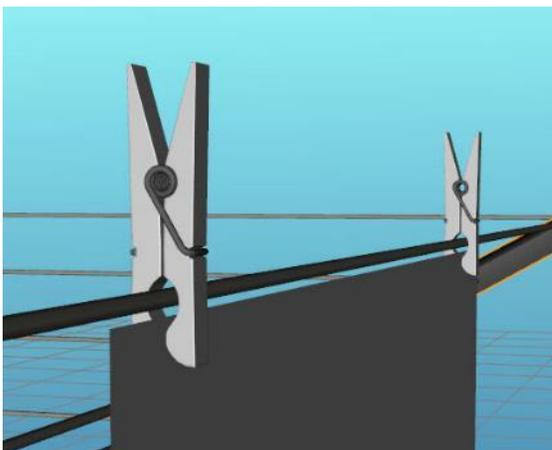


- g. Using the 105% setting for Contraction-Expansion Ratio and adding back the blanket, here is the finished blanket and pillow combo. If I were to do anything else, I'd add a Push Modifier and paint some slight puffing around the arm.

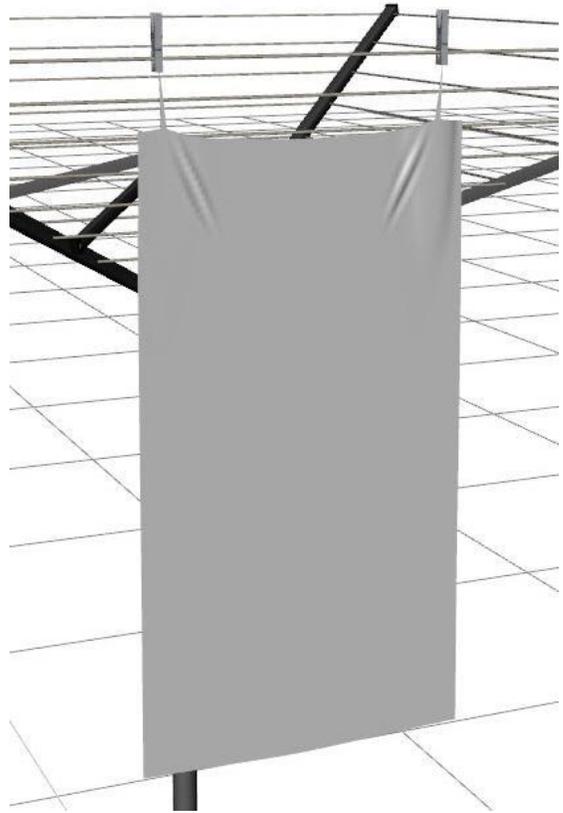
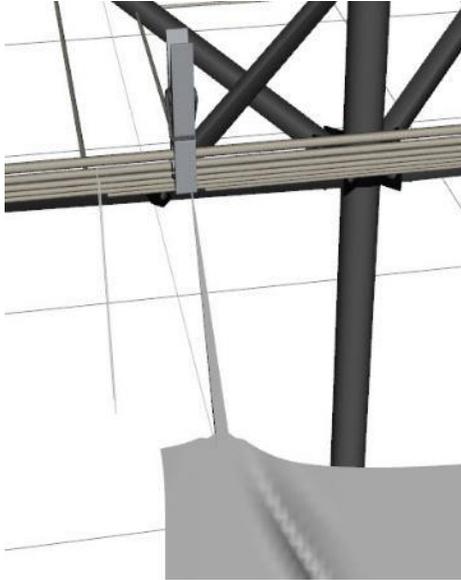


11. **Hanging Towel.** In this section we'll create a towel and drape it from a clothes line with clothes pins. This section introduces the concept of weight maps. In the next section we'll add wind.

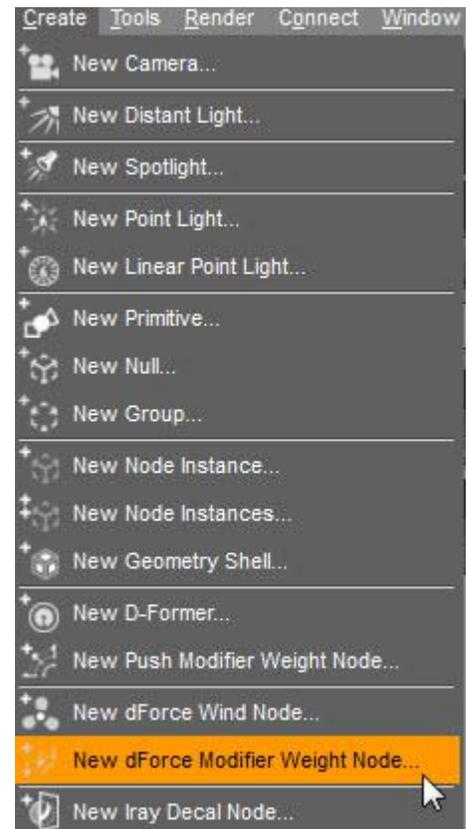
- a. I used a laundry dryer and clothes pins from [Laundry Day Mega Set](#). Place two pins on one of the upper lines. If you don't have this set, you can use a long, narrow primitive cylinder and some cubes instead.
- b. Create a flat plane by going to the main menu and selecting Create/New Primitive... Set the primary axis to Z-positive, size to 3 feet, and divisions to 100. Scale X-axis to 55% so it's a rectangle.
- c. Position the towel so the upper edge is inside the two clothes pins. The towel needs to touch the pins inner surface, otherwise it will fall to the ground.



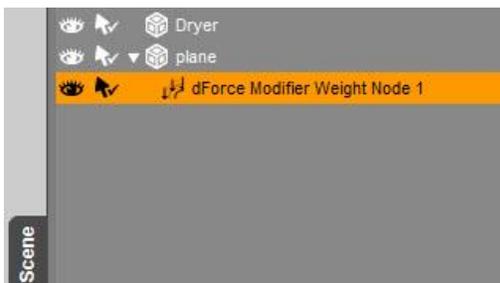
- d. If you simulate now, you will see most of the towel falling with just a few polygons attached to the pins and stretching way out. Sometimes the polygons will hold and the towel will be held by tiny strands as shown below. Other times the strands will break and the towel will fall to the ground.



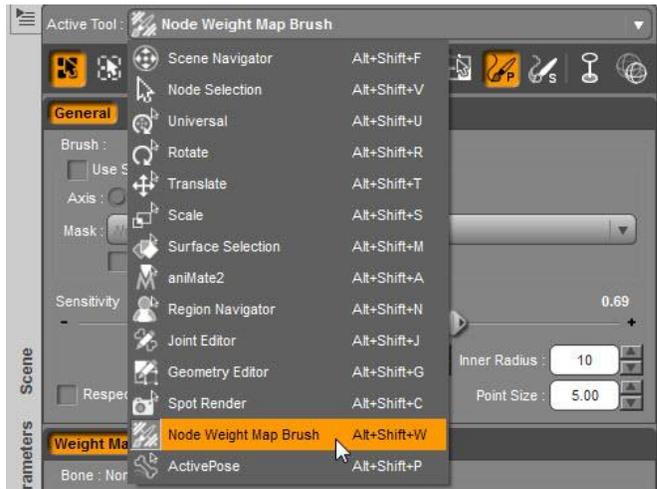
- e. To keep the towel in place under the pins, you need to add a dForce weight node and weight map. Select the towel in the Scene pane, then from the main menu select Create/New dForce Modifier Weight Node:



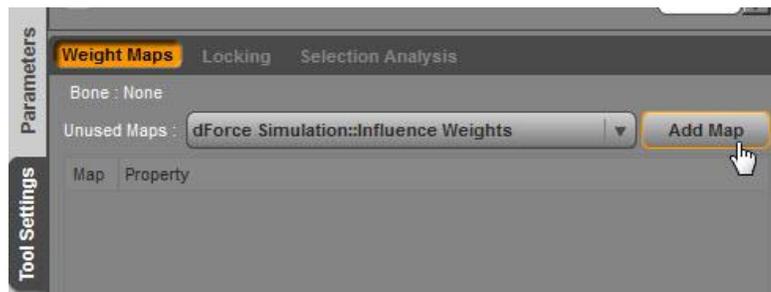
Afterwards you will see it parented to the plane in the Scene pane:



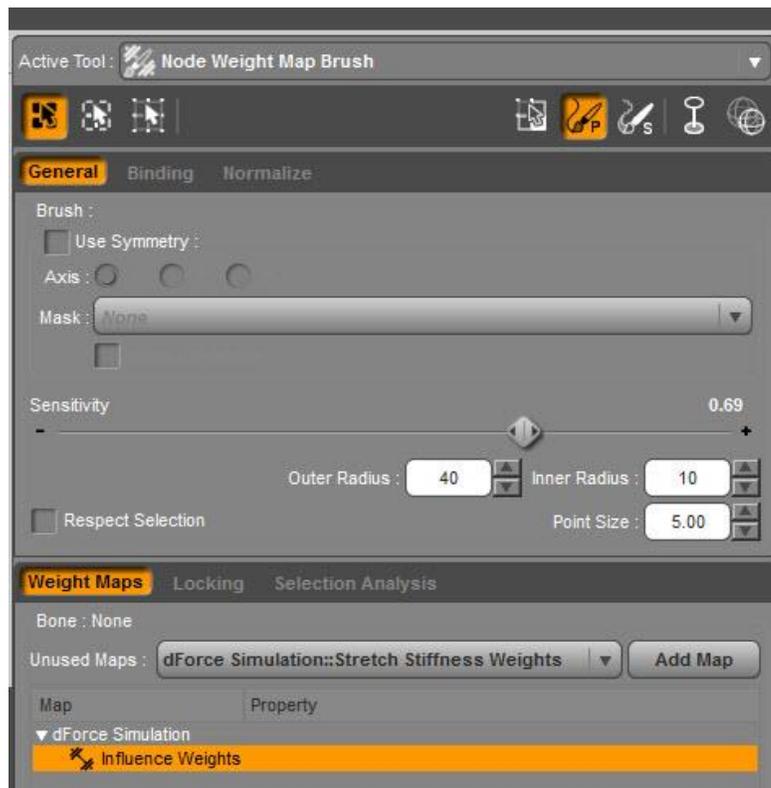
- f. With the weight node selected in the Scene pane, go to the Tool Settings pane and from the drop down menu at the top select Node Weight Map Brush.



- g. Next you need to add the weight map. On the Tool Settings pane, in the middle of the pane, check that dForce Simulation::Influence Weights is showing and click on Add Map.

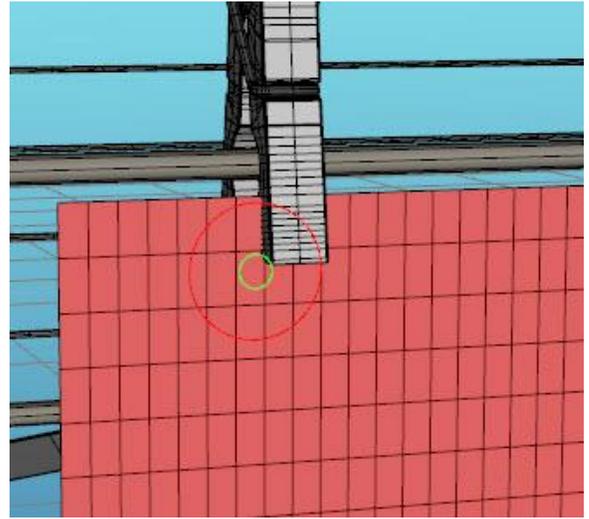


You will now see a map listed (Influence Weights):

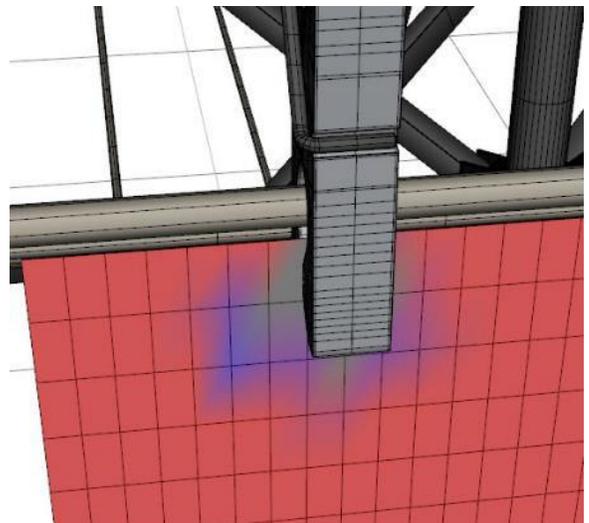


In the viewport, the plane (towel) will turn solid red. A red color means that area of the map has a value of 1 and that area will participate fully in the simulation.

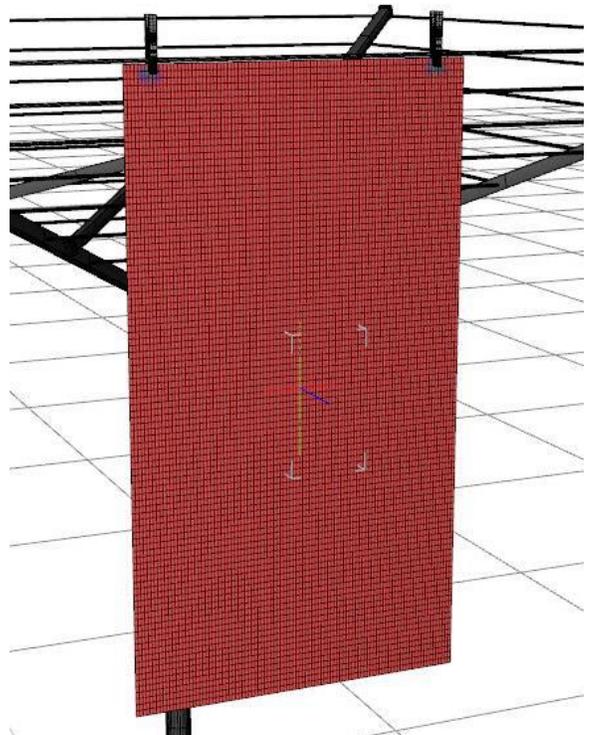
- h. When the Weight Map tool is in use, you will see a paint brush with two concentric circles. Move it around and it will add weight (add color) to the map. In this case, you won't see any added color because it already fully red.



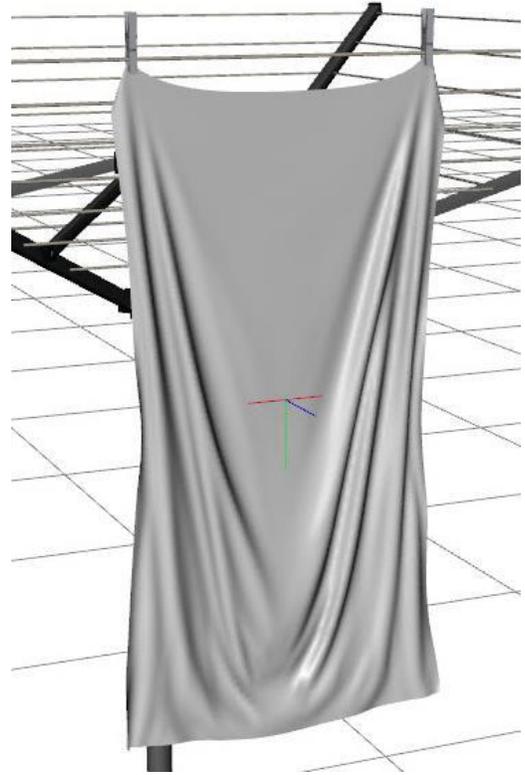
Hold down the Alt key and the brush removes weight (color). How much it removes depends upon the size of the circles and the Sensitivity slider setting. A blue color means those areas will still participate in the simulation but at a much lesser or slower rate. A gray value means it won't be affected at all. The map below shows the small area that has been modified: gray right around the clothes pin with a little blue surrounding it. The influence is on the vertices, so if you have too few polygons, you have to paint over a larger area.



In the image at the right, you will see two small areas of blue at the top of the plane just around the clothes pins. Those are areas where red was removed so they are either not involved (no color) or less involved (blues and yellows) in the simulation.



- i. Now when you simulate, the area of the towel under the clothes pins will be held in place and the rest will drape under the influence of gravity.

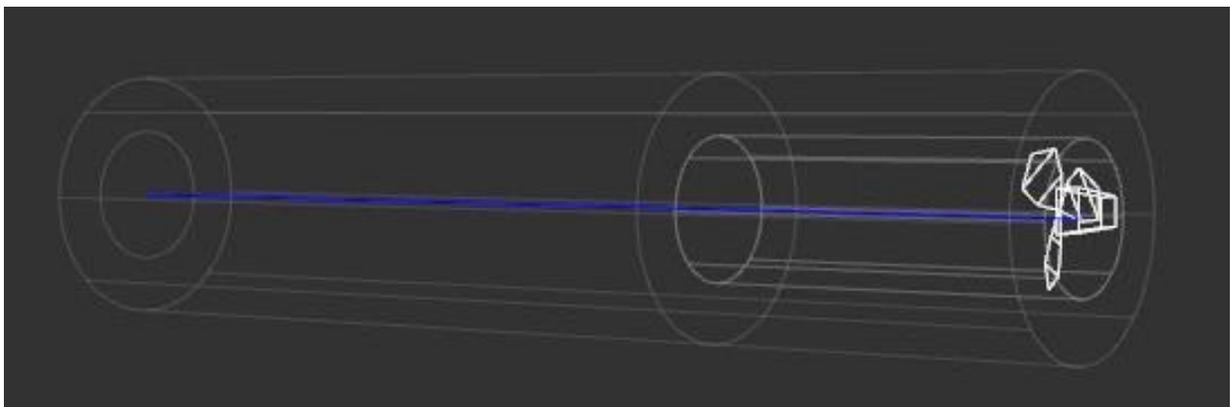
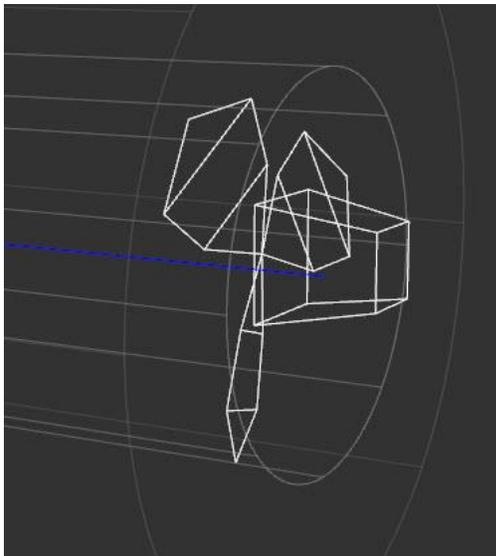
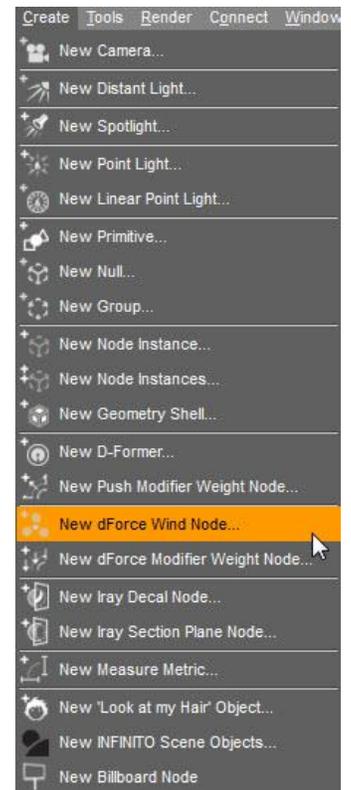


A finished render of the towel:

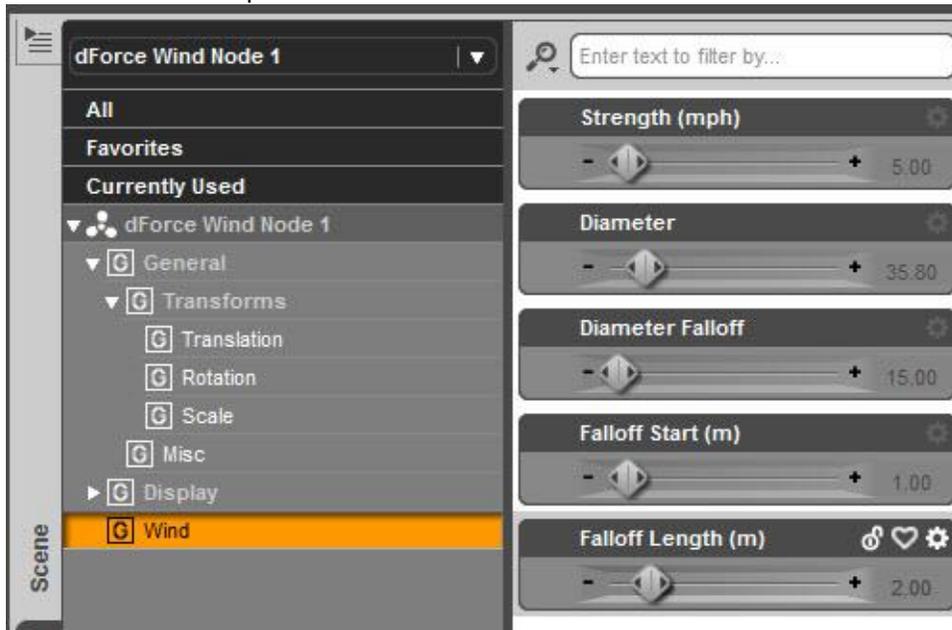


12. **Wind!** You can add a wind node to give a slight nudge or a heavy blast to your items. To start, I'll describe the basics of the wind node.

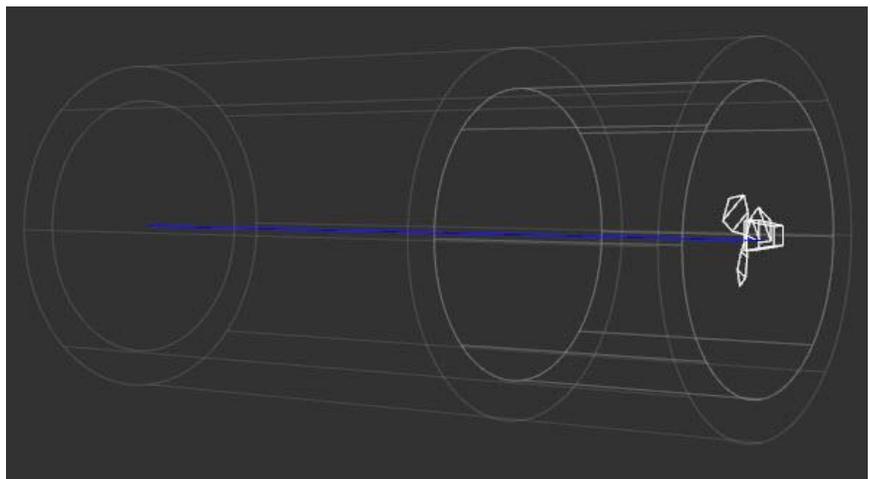
- a. To add the node, go to the main menu and select Create/New dForce Wind Node...
- b. The wind node is not parented to anything and loads at world center on the ground. When selected, it can be hard to see against a white background, so I set the background to a dark gray.
- c. You'll see that the node looks just like a fan blowing down a tube. It has a long cylinder surrounded by three perpendicular circle pairs:



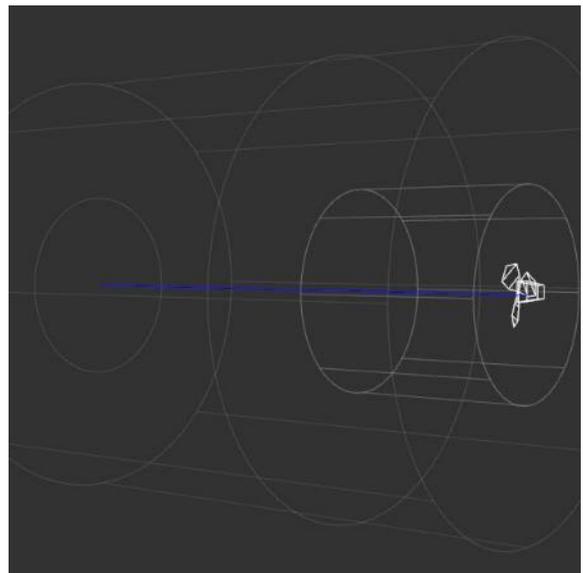
d. This shows the wind parameters:



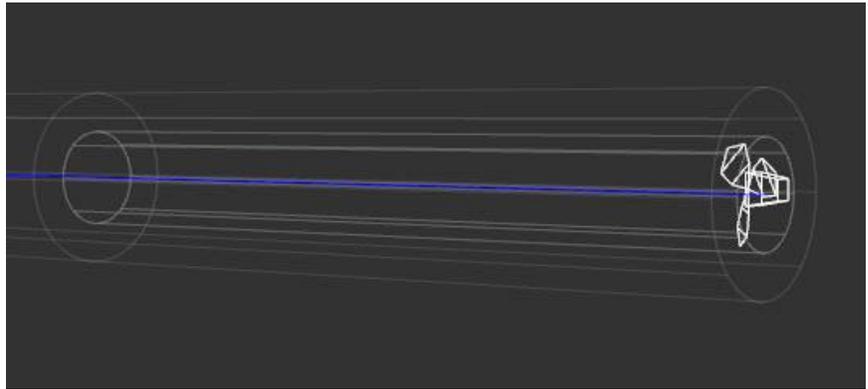
e. The inner circles represent Diameter. This image shows a larger diameter than in the default view.



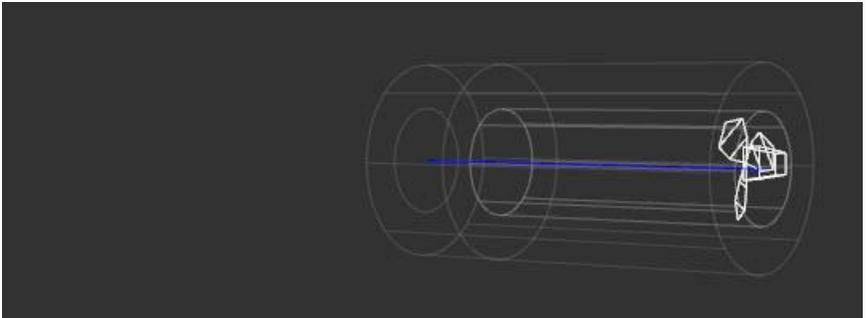
f. The outer circles represent Diameter Falloff. What this means is the wind is at constant and full strength across the area of the inner circle. It then falls to zero as it reaches the outer circle. In this image you can see a much large distance between the inner and outer circles than in the default view.



- g. The first circle pair near the fan is where the wind starts. It remains at full strength until you reach the middle circle pair. It then falls off to zero at the circle pair opposite the fan. This image shows a longer Falloff Start than the default view, which means a longer full strength wind region.

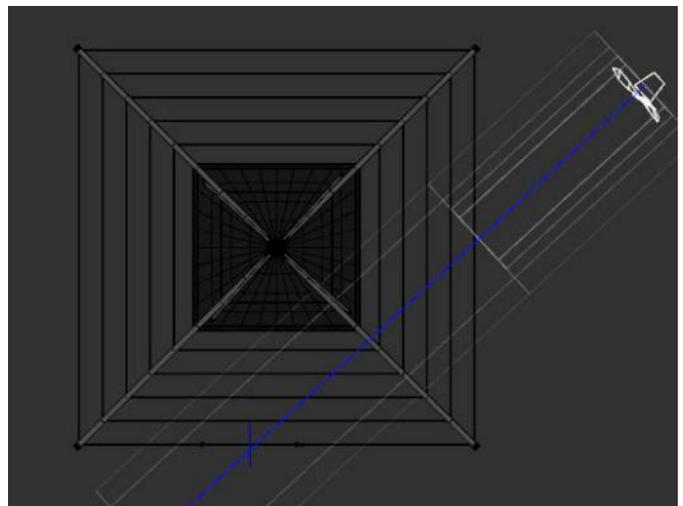


- h. This shows a shorter Falloff length which means the winds die off more rapidly:

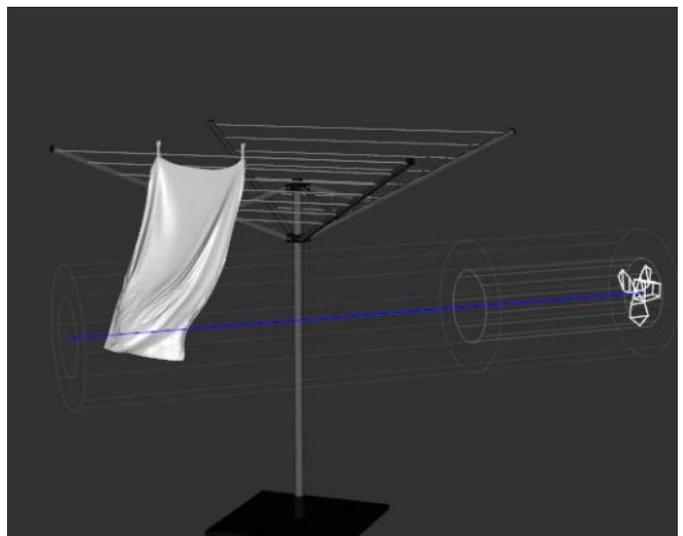


- i. To use the fan, position it to blow on the towel. A watch out is if you blow the towel towards these clothes lines, the mesh blows up or Daz Studio crashes because of interaction between the towel and the prop. To avoid, I set it to blow the towel away from the dryer rack.

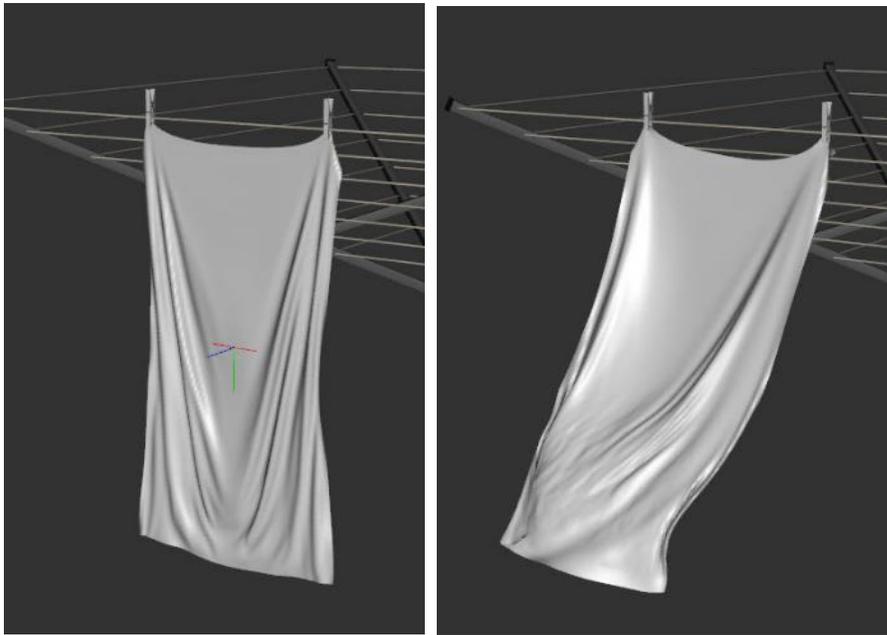
In the top view at the right, note that I have the towel (located at the bottom of the image) in the falloff zone. The fan blows hard even though set to the default 5 mph and the towel will whip around and crash Daz Studio if it's in the full-strength region.



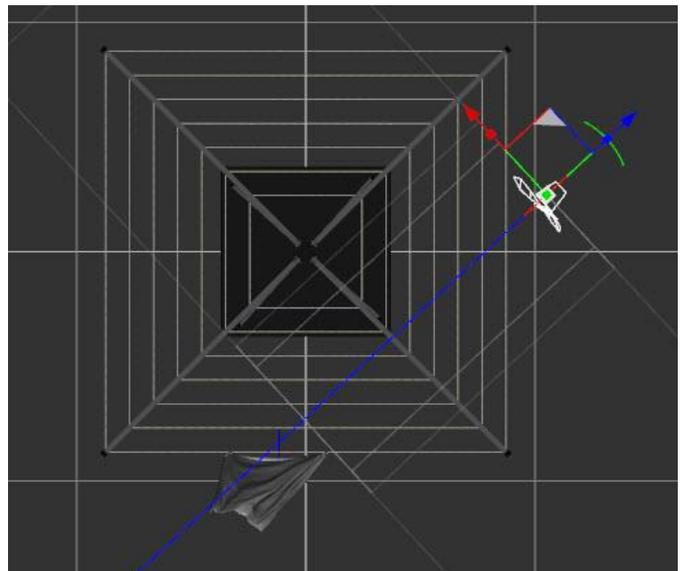
- j. This image shows a front view so you can see how the wind node is positioned. Note that I only have the lower portion of the towel being impacted by wind.



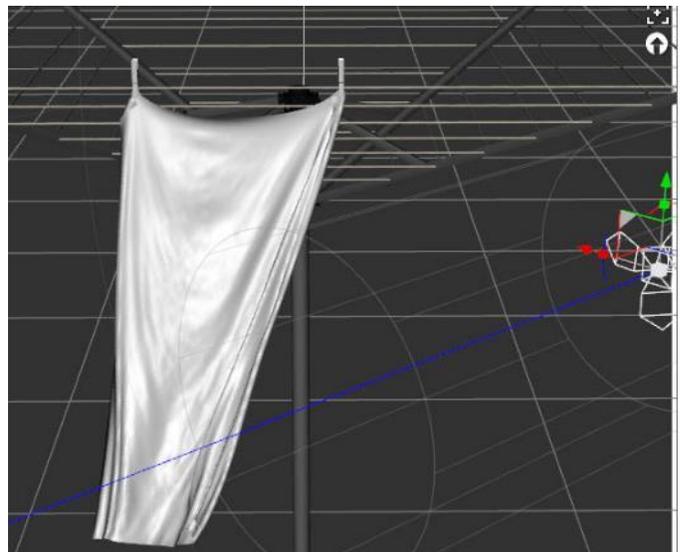
- k. A comparison of the simulated towel without wind (*left*) and with wind (*right*):



- l. For this next case, I increased the wind Diameter and moved the node closer to the towel. I also decreased Strength to 0.2 mph (as 5 is just too intense).



Here you can see the wind caused the towel to pull in on itself more than the previous settings:

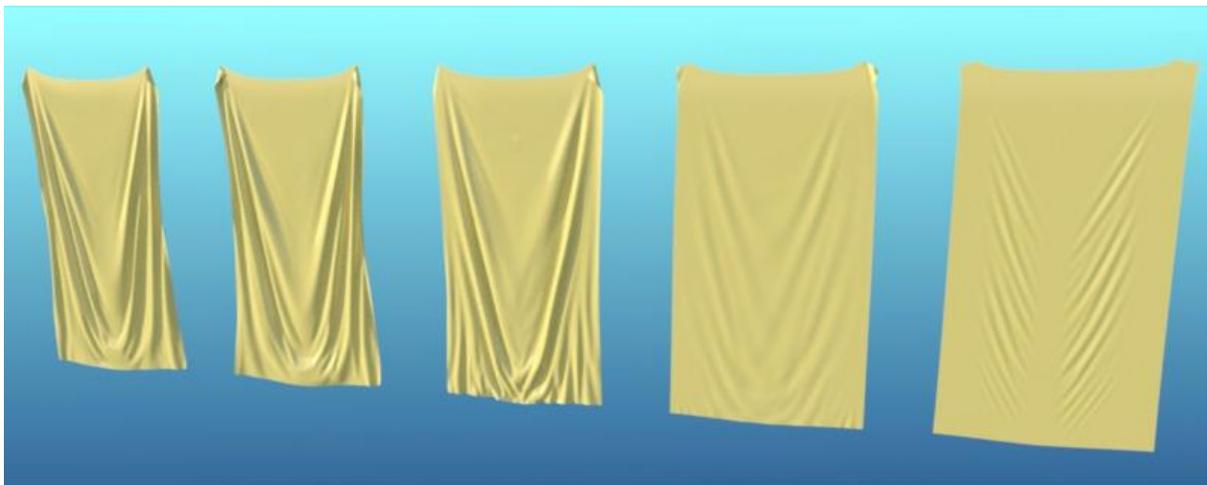


13. **dForce Surface Parameter Tests.** To test out the influence of various surface parameters, I've created a test rig of five towels having the same influence weight map as I used in 11 and 12 above. This map has two small areas where the clothes pin hold the towel. Note that once you have the influence weight map, you no longer actually need any pins or clothesline, the towel will be held in mid-space as these upcoming images show. Default values are used *unless* noted in the description.

a. Dynamic Strength. After Friction, this is the next surface parameter in the Simulation tab on the Surfaces pane. This parameter is meant to be applied to accessories like belts, buckles, buttons, etc. to keep them from distorting. A value of 1 allows the vertices to move freely and a value of 0 stops all movement. Intermediate values suppress movement but I have found it acts quickly. The image below shows 5 towels. From left to right:

1. 1.0 (default)
2. 0.96
3. 0.92
4. 0.88
5. 0.84

As you can see, by 0.88, most of the draping has been suppressed. At 0.8 (not shown) it all is.



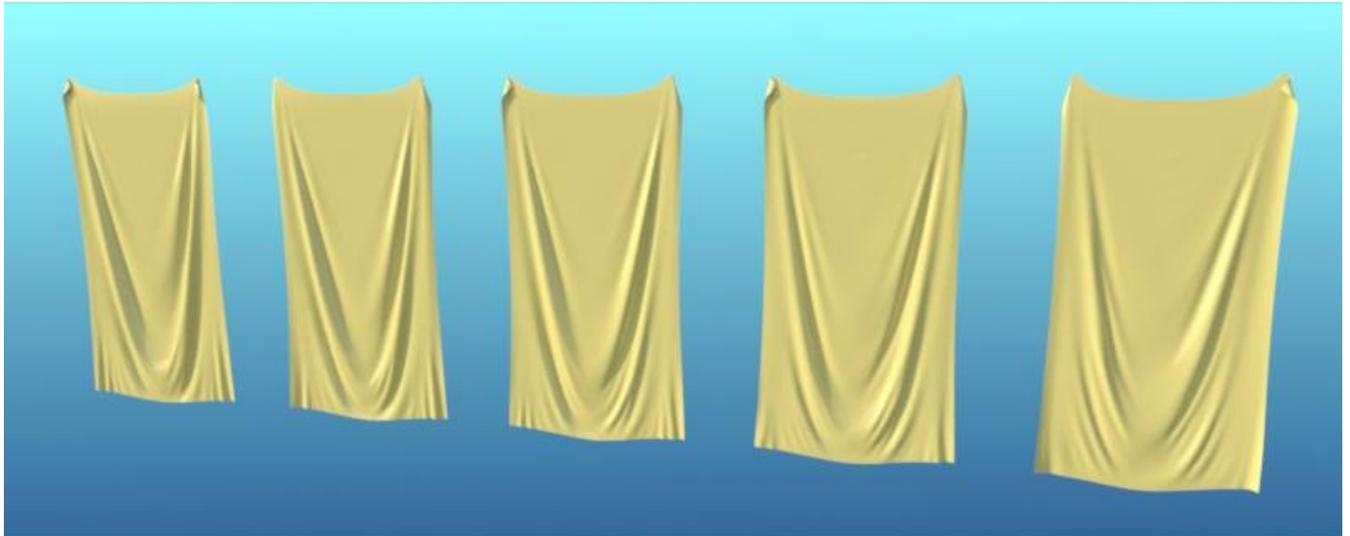
The above image doesn't show much since it was draped vertically with gravity alone. The next image has wind applied. As you can see, there's a lot more variation on towels 4 and 5 than what shows with the vertical draping. Since the folds that form in towel 1-3 are mostly suppressed, you wouldn't want to use these levels of dynamic strength for a towel, but you may want to for a piece of paper that was crumpled and then unfolded. If you take the Dynamic Strength down to 0.25 (not shown), the towel ends up flat and smooth.



b. **Stretch Stiffness.** The higher the value, the less a mesh will stretch. In the following image, from left to right, values are:

- | | |
|------------------|--------------|
| 1. 1.0 | less stretch |
| 2. 0.8 (default) | |
| 3. 0.6 | |
| 4. 0.4 | |
| 5. 0.2 | more stretch |

Without wind, the biggest changes are found in the lower corners, where there are fewer vertical folds, and along the lower center where there are more but less deep folds.



With wind, most differences are gone although a little less wavy in the lower corners.

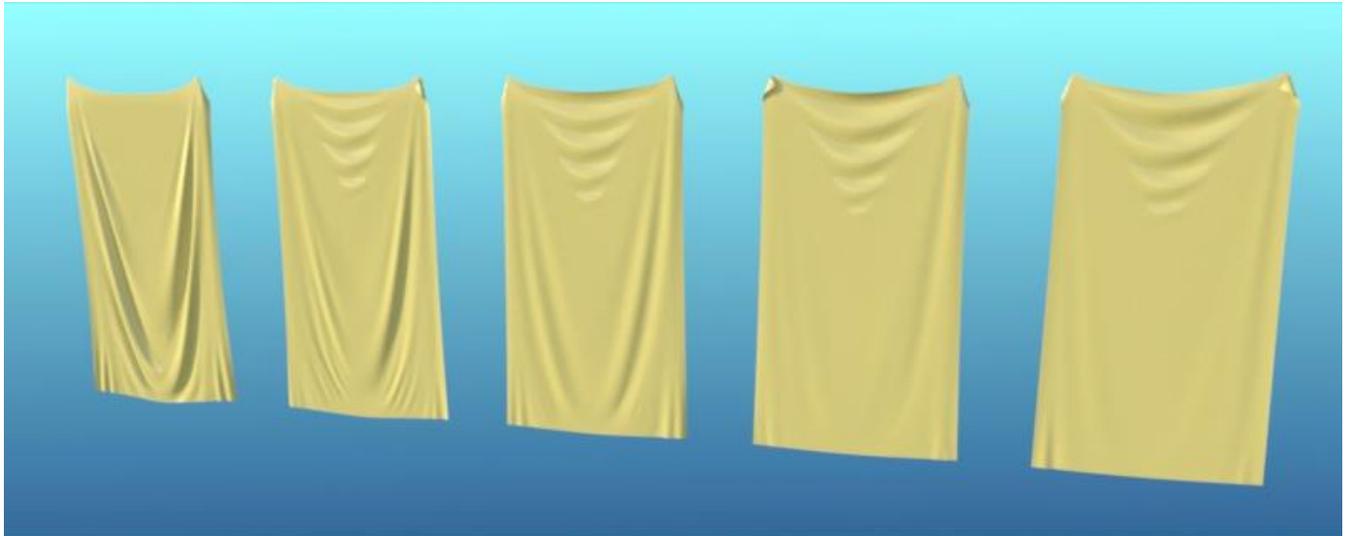


The changes are subtle which is true for a number of these comparisons.

c. **Shear Stiffness.** Controls the amount of resistance to lateral shifting and twisting. The higher the value, the less a mesh will stretch. In the following image, from left to right, values are:

1. 0.2 (default)
2. 0.4
3. 0.6
4. 0.8
5. 1.0

Without wind, you can see how the center drapes dramatically at the default value (left towel) and disappears as you go to the top value of 1.0 (right).



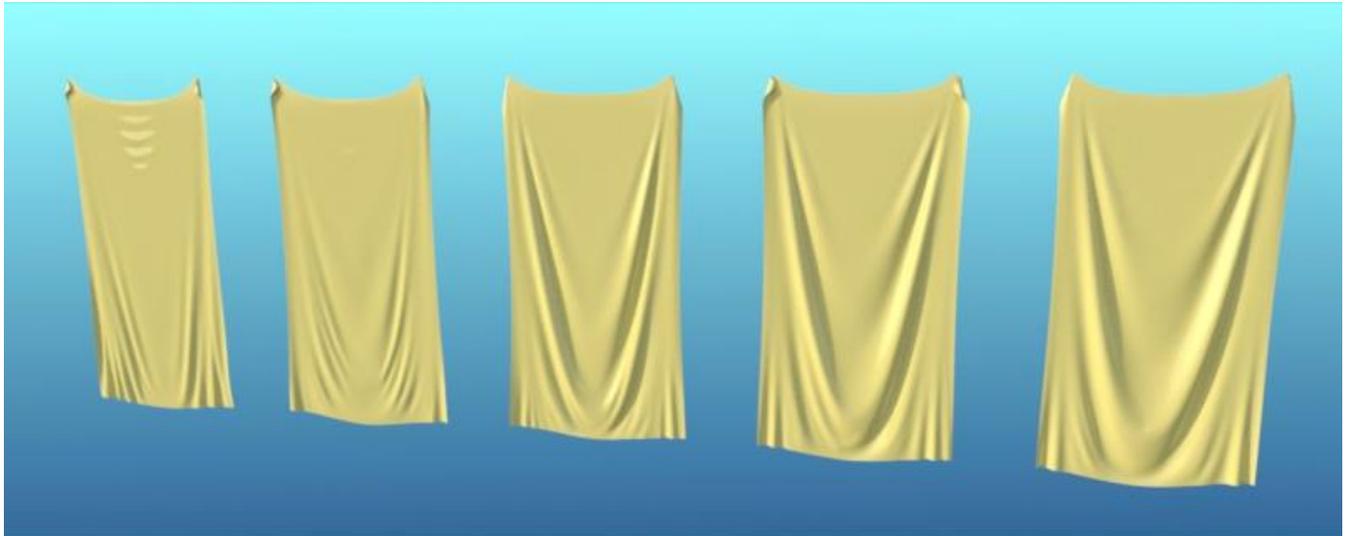
With wind, you see a similar pattern.



d. **Bend Stiffness.** Higher values will result in broader folds and shapes and lower values approximate thin and flexible materials. In the following image, from left to right, values are:

1. 0.1 thin material, fewer folds
2. 0.3
3. 0.5 (default)
4. 0.7
5. 0.9 thicker material, more folds

Without wind, you can see the enhanced folding at higher values (right). At lower values, the center section becomes smooth and seems to be draping more.



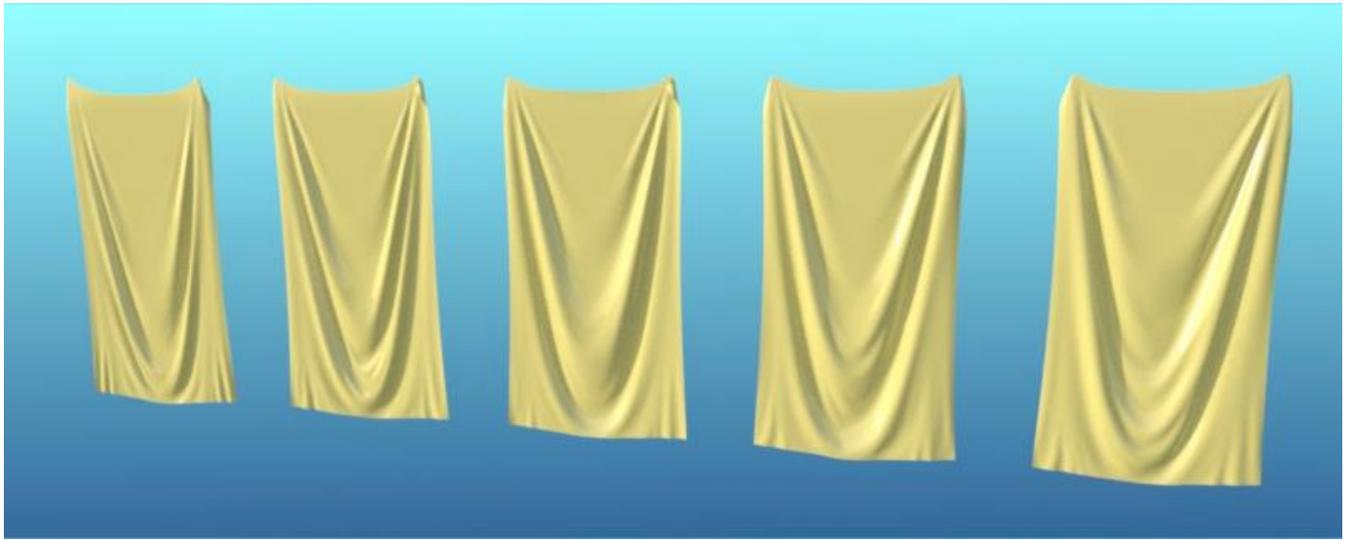
With wind, there's a surface disturbance that develops and some of the folding is reduced.



e. **Buckling Stiffness.** Controls the amount of resistance to compression. In the following image, from left to right, values are:

1. 5% (default)
2. 25%
3. 50%
4. 75%
5. 95%

Without wind, it's subtle but you'll see the centers of the towels have somewhat more draping at higher values.



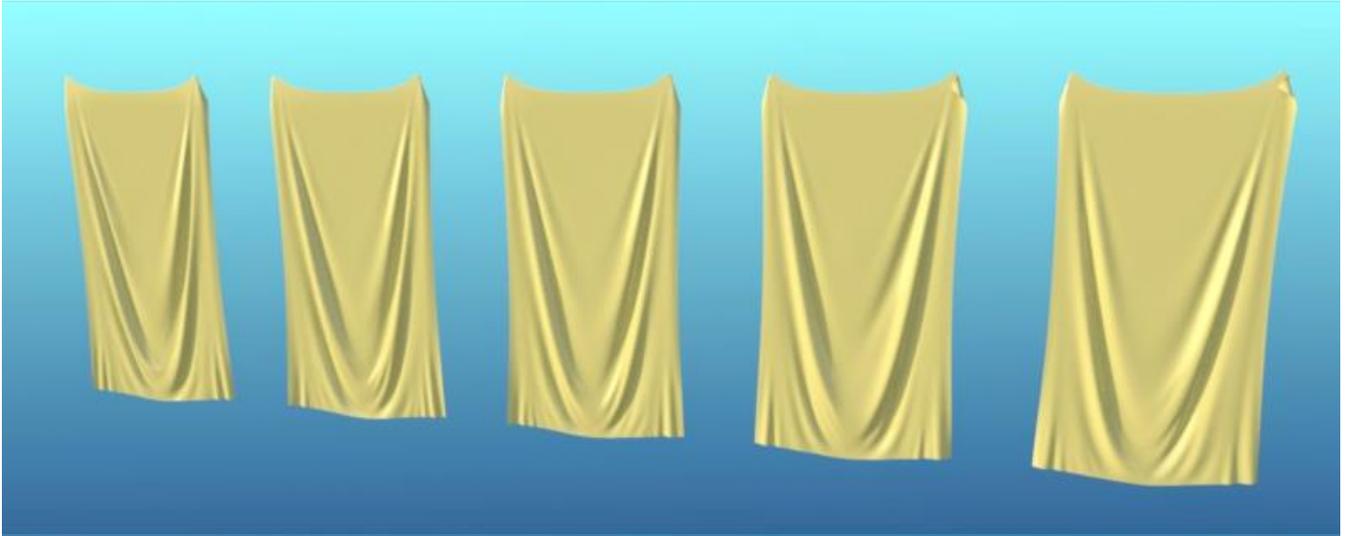
With wind, it's again subtle but you'll see draping starts higher up the towel as the value increases.



f. **Buckling Ratio**. Higher values should behave more like flexible silk while lower values behave more like denim. In the following image, from left to right, values are:

- 1. 10% denim
- 2. 30%
- 3. 50%
- 4. 70% (default)
- 5. 90% silk

Without wind, not a lot of variation...



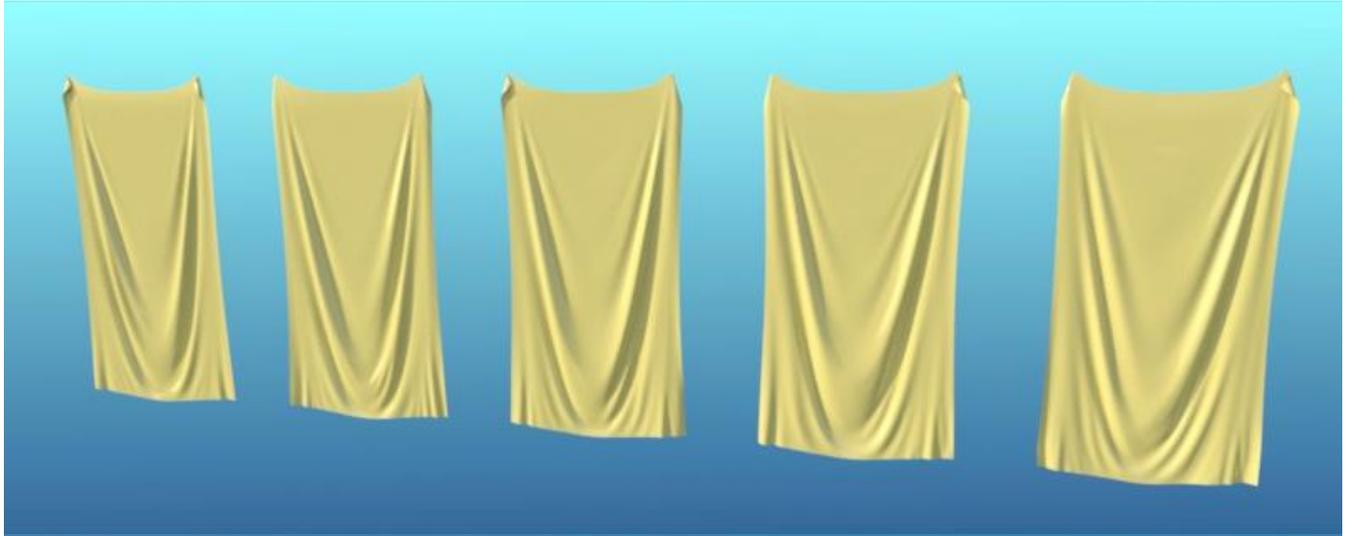
...nor is there with wind.



g. **Density (GSM)**. Lower values represent lighter fabrics while higher values represent heavy fabrics. In the following image, from left to right, values are:

- 1. 90 lace
- 2. 180 (default)
- 3. 270
- 4. 360
- 5. 450 canvas

As with Buckling Ratio, without wind there's not much variation.



With wind, you see folds forming somewhat closer to the center.



h. **Contraction-Expansion Ratio.** Values below 1 will cause the mesh to contract/shrink while values above 1.0 will cause the mesh to expand/grow. If it grows too much, it can interact with itself or other objects and crash. In the following image, from left to right, values are:

- 1. 80% shrink
- 2. 90%
- 3. 100% (default)
- 4. 110%
- 5. 120% expand

I used more extreme values to show the effect. Without wind, you can see how the left towel shrinks in on itself while the right towel has expanded. The middle towel is the default size.

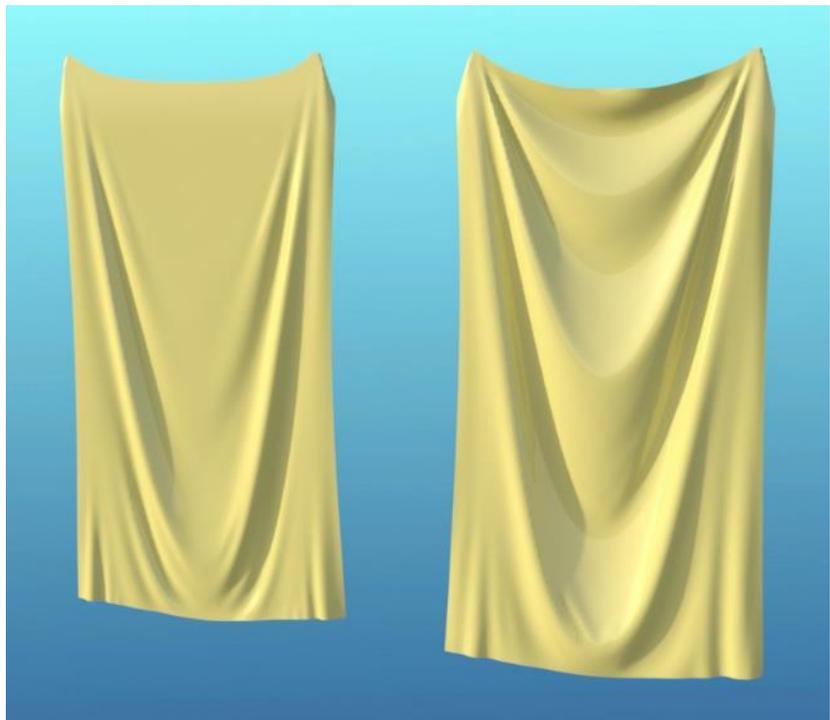


With wind, some of the folds are being blown smooth.



- i. **Combined Effects.** The above image series were single-variable tests. Obviously you can combine these parameters in many, many different ways. I went through and chose settings that tended to cause more folds in the towel. The image on the left shows the default dForce surface values while the one on the right shows the combination. You can see that the settings I chose did indeed enhance the amount of folding. The settings used are:

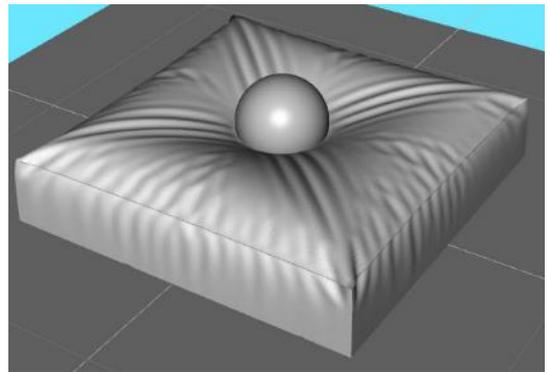
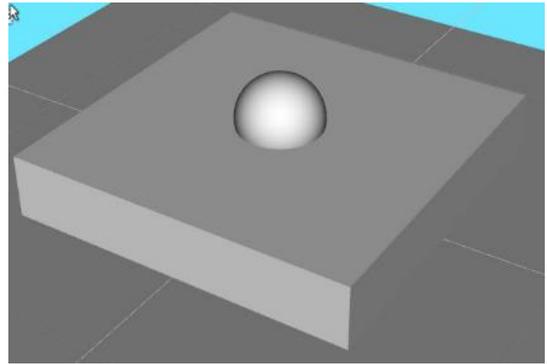
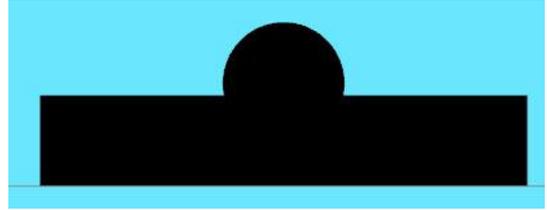
	<u>Left Towel</u>	<u>Right Towel</u>
Dynamic Strength	1.0	1.0
Stretch Stiffness	0.5	0.2
Shear Stiffness	0.2	0.2
Bend Stiffness	0.5	0.9
Buckling Stiffness	5%	95%
Buckling Ratio	70%	50%
Density	180	180
Contraction-Expansion Ratio	100%	105%



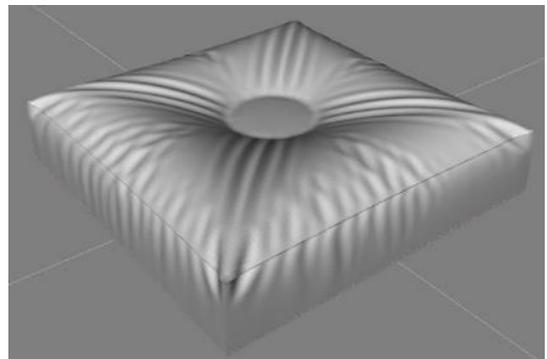
- j. **Note regarding these tests:** The towel images above are static figures after simulation is complete. If you watch the objects while they are undergoing simulation, you can see more variation for some surface properties than in the finished results. As these are also free-hanging towels that are not interacting with other portions of clothing or other objects, they may not reflect the results you get while draping clothes on a figure.

14. **Creating a Foot Stool.** This is an example showing how you can use a primitive cube and negative gravity to create a foot stool which will react to objects and figures sitting on it.

- a. Create a primitive cube and scale it to be squat. You need enough polygons in the cube so it can distort, so set Divisions to 100 when creating the cube (Create/New Primitive). Select the cube in the Scene pane and then from the main menu select Edit/Object/Geometry/Add dForce Modifier: Dynamic Surface.
- b. Create a smaller primitive sphere and position it partially embedded in the middle of the cube.
- c. Go to the Simulation Settings pane and set Environment/Gravity to -0.1. During simulation, this will cause the cube to expand instead of collapsing in on itself.
- d. Run the simulation and you will get something similar to this image. The negative gravity causes the fabric to push up and around the ball. It also causes wrinkling along the edges of the cube and pulls the material in from the corners. This gives the appearance of a plush foot stool being pushed down on by the ball.



Without the ball, it looks like this:



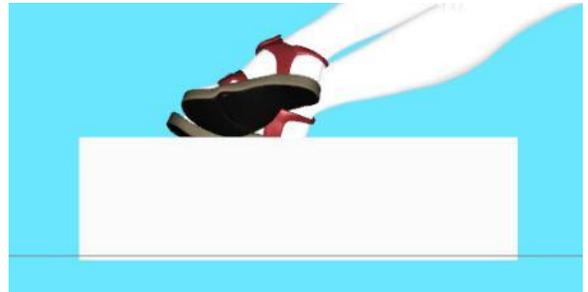
After rendering:



This is a render without the ball. You can see that it's partially puffed but without all the surface disturbance caused by the ball.



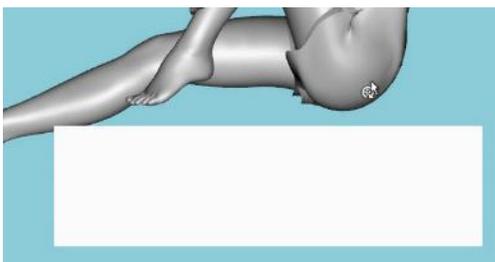
- e. Replace the ball with a pair of feet partially embedded into the top of the stool.



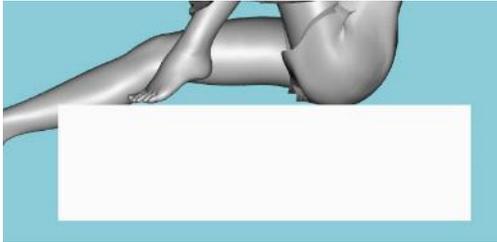
Here's the finished render showing a comfortable foot stool for tired feet!



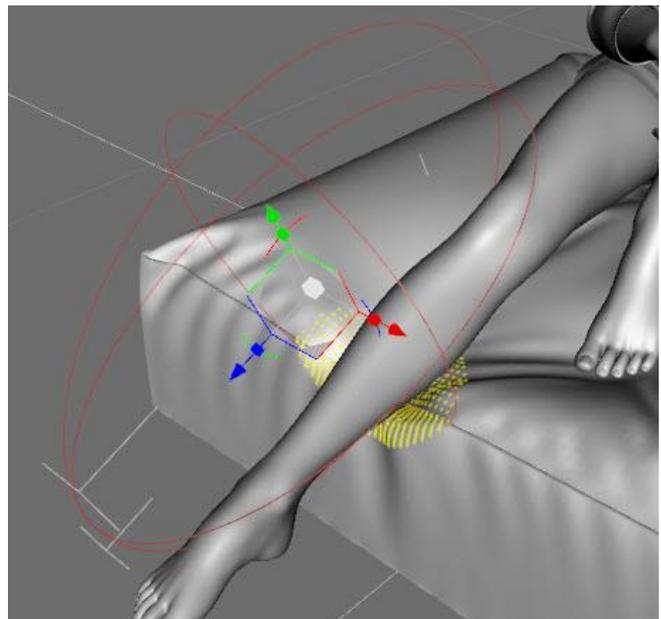
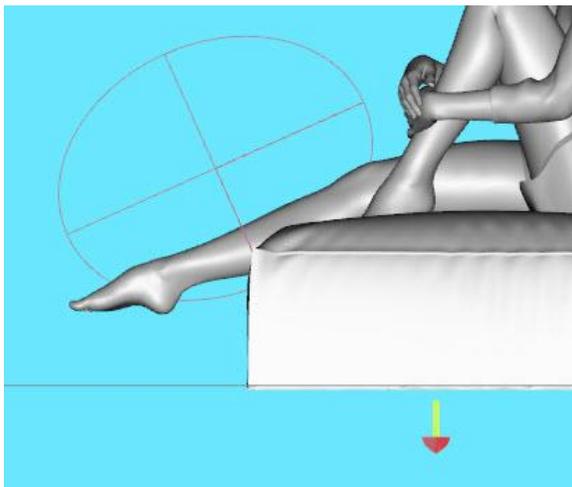
- f. Replace the feet with a young girl sitting on the stool. In this case, the figure is hovering over the stool before simulation, but the growth of the cube with negative gravity will push up into the figure.



- g. In this example, we move the girl further into the stool. Now you see more surface interaction than above, but you also see that the extended leg does not depress the edge of the stool as you might expect; instead, it's like the leg cuts into the edge.



- h. I didn't find a way to use dForce to solve the problem but I could use a D-Former to push the edge down. I used a very small weak field as you can see in the right image.



Here's the resulting render:



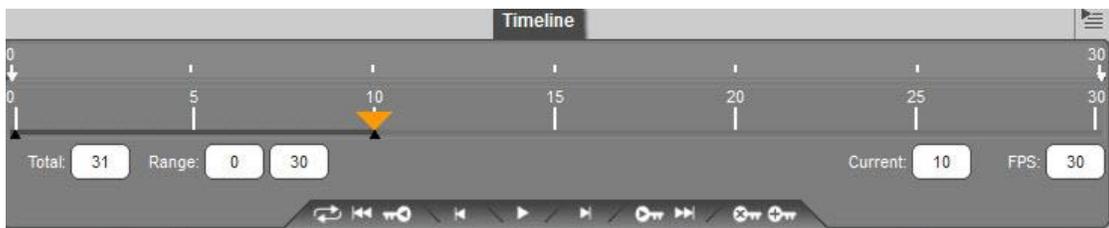
You now see some space between the leg and the fabric which looks more like you would expect in the real world.

When you use a D-Former or Push Modifier to modify a simulation, remember that you are moving *away* from a physics-based outcome. So use judiciously, more to nudge things rather than make dramatic changes.



15. **Animated Posing for the Foot Stool.** An astute question by Richard Haseltine led me to try a better way to bend the edge of the cushion: animate the extended leg so it comes down onto the cushion rather than starting within the cushion.

- a. Set everything up the same as in section 14. Be sure Start Bones From Memorized Pose is turned OFF in the Simulations Settings.
- b. If not already open, go to Windows/Panes (Tabs) and select Timeline.

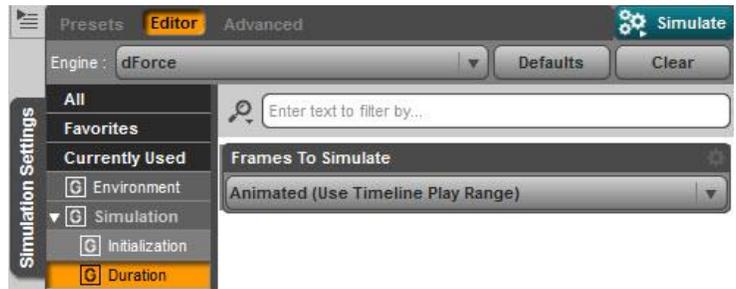


- c. Set the total number of frames to 31.

- d. On the timeline, click on frame 10 then click on the + Key icon in the lower right of the pane. This sets the pose we've been using as the final pose.
- e. On the timeline, click on frame 0 then click on the + Key icon again. Next select the figure's shin and bend the leg so it just clears the edge of the cushion.



- f. In the Simulation pane, under the Duration tab, select Animated (Use Timeline Play Range) from the drop down box.



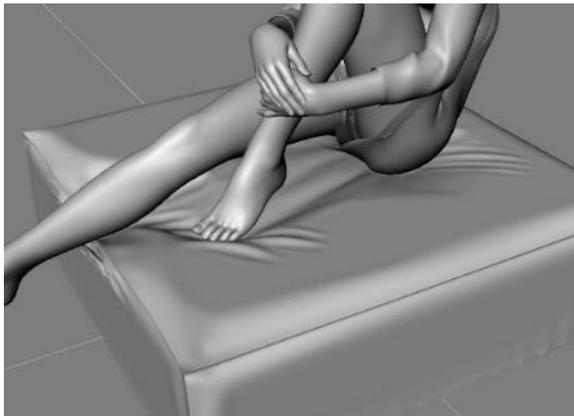
- g. I found that 10 seconds was enough time for the leg to move down and depress the edge of the cushion in a natural fashion. However, if you only have 10 frames in the timeline, that was not enough time for the cushion to fully expand so the figure did not look like it was sitting into the cushion.

The final render:



- h. This was the first time I've used an animated figure pose. Besides the advantage of removing interference between the extended leg and the edge of the cube, you can use the timeline to see how the simulation is progressing and choose an intermediate time for a render.

Here is the 10th frame:



15th frame:



20th frame:



30th (final) frame:



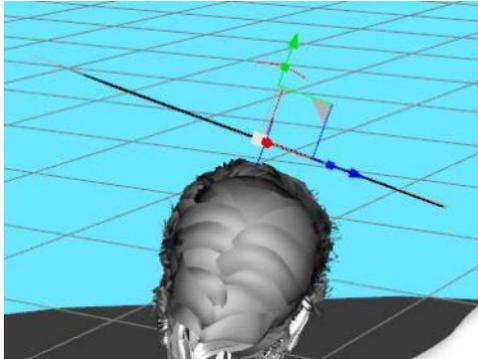
- i. There's another way to do an animated pose (set Start Bones From Memorized Pose to ON) but in this situation it will just cause a crash. The figure will start from the T-pose, dive down into the cube as it moves into the desired pose, and wrap the cube around its feet in the process. As it wraps, all goes haywire and Daz Studio will shut down.

You can change the Memorized Pose to one that will work. In this case, move the extended leg as in step e. so it clears the edge of the cushion. From the main menu, select Edit/Figure/Memorize/Memorize Figure Pose. Now move the extended leg back down into the cushion where it was before. In the Simulation Settings pane set Start Bones From Memorized Pose to ON and run your simulation. I found this to be slower than setting up the animated scene but others may find this a better approach. Here's a render, which is only slightly different from the animated result:



16. **Head Scarf and Telephone Wires.** This shows two other objects you can make with primitives and dForce. These are pretty straightforward if you've performed the steps in the previous sections: position the object, apply the dForce modifier, run the simulation.

- a. The scarf in this image is a square plane positioned over the head to match the rotation angles of the head. The center point of the plane is vertically above the center point of the head so it's centered when gravity pulls it down.

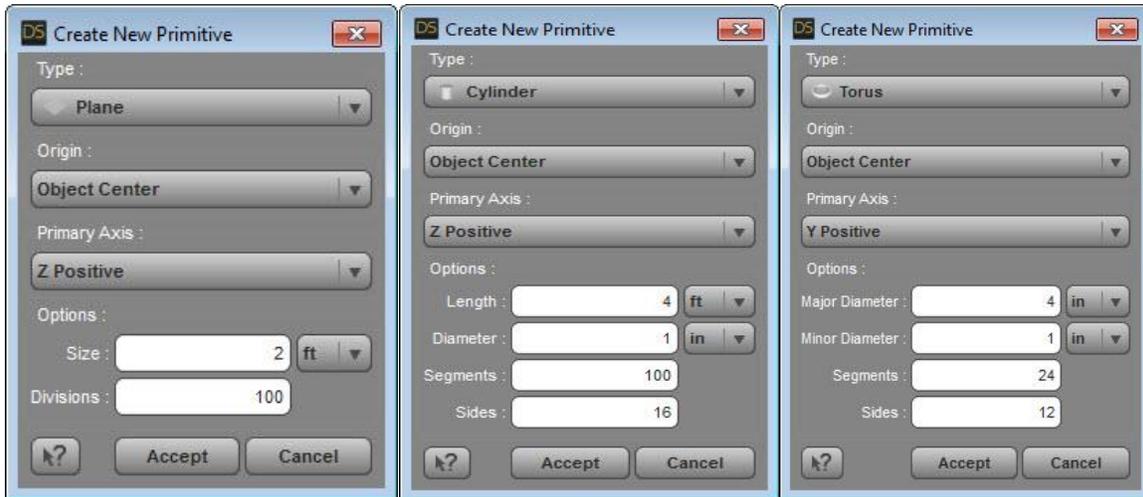


- b. The wires in the next image were made from primitive cylinders. After applying the dForce modifier, I then added a dForce weight node and removed the influence from just the tips (paint while holding down the Alt key to remove weighting, see section 11 for details). I found a Gravity of 2.0 and a Stabilization Time of 0.3 allowed the wires to sag without the tube going flat.

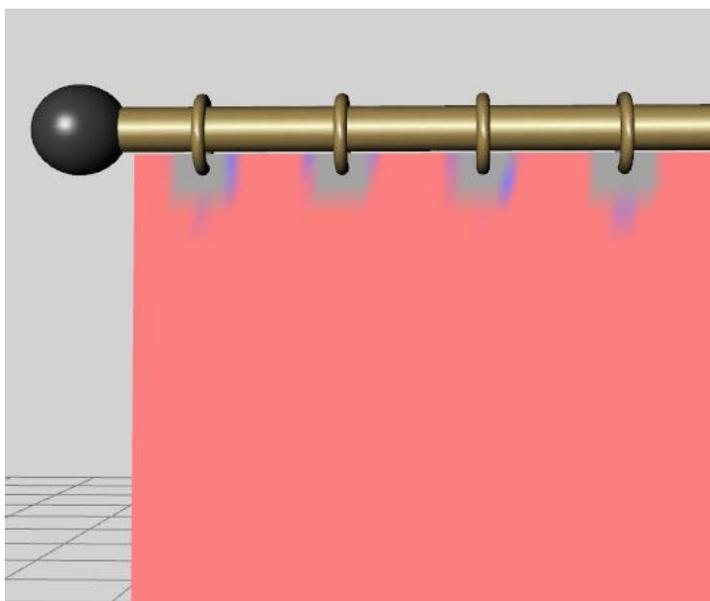
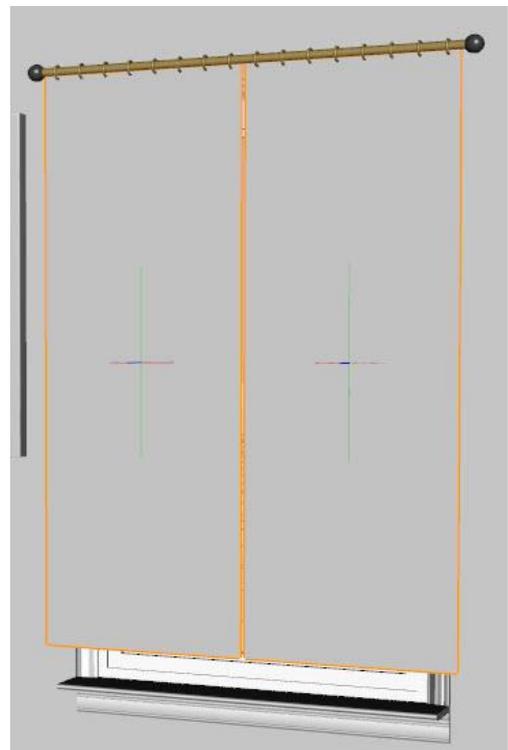


17. **Creating Blowing Curtains.** This shows another use of Daz Studio primitives to create a pair of curtains. I used [Collective3d Portrait Vignettes Contemporary 4](#) as the setting. It comes with blinds which I hid.

- a. I created a curtain using a plane primitive. I created a curtain rod from a cylinder and a curtain ring from a torus. I then made 15 instances of the torus and used the Align pane to line them up with even spacing. Two spheres were added at each end of the rod. Here are the settings for the primitives.

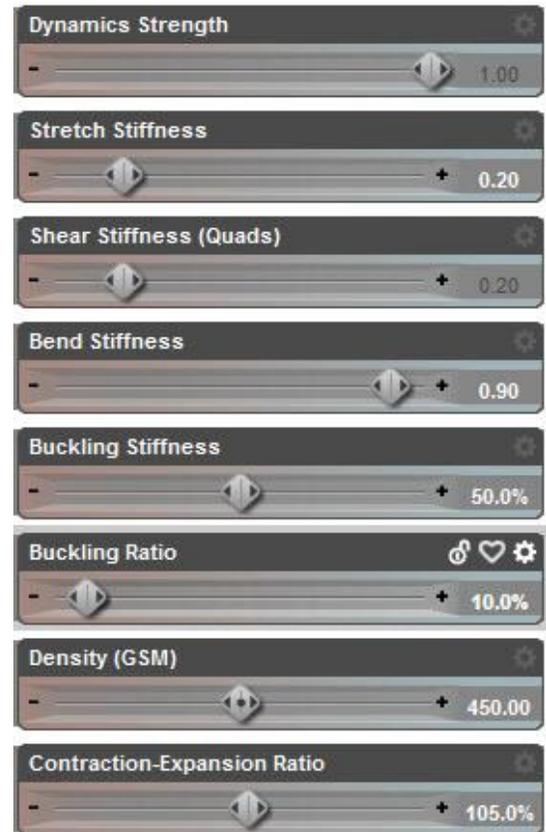


- b. I next selected the curtain and added the dForce modifier and a dForce weight node and painted the edges of the curtain that are directly under the rings. Afterwards, go to the main menu and select Edit/Duplicate/Duplicate Node Hierarchies to create a copy of the first curtain along with its attached weight map. Position everything as shown in the image at the right. Note that the curtains are a little short. That's on purpose as they will grow with the surface settings I chose (discussed in the next step). The top edge of the weight map is shown below.

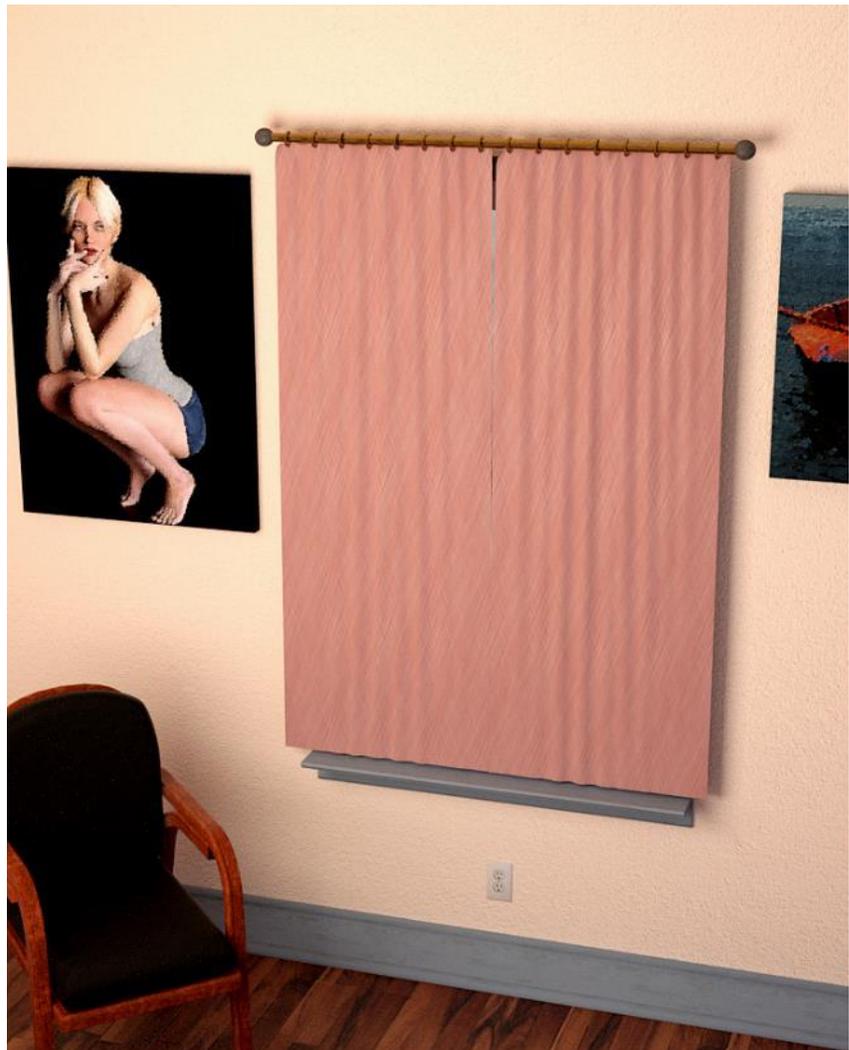


- c. Here are the Surface-Simulation-Structure settings I used. These were chosen to give more folds in the hanging curtains, otherwise they look relatively flat. Note that every value shown in white text is a change from the default value (the default values have black text).

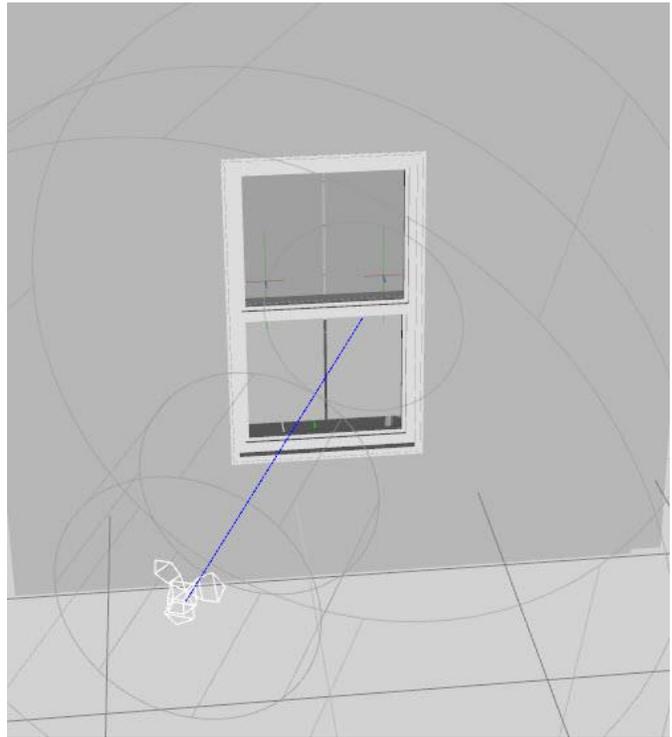
I also had air resistance set to 0.47 on the Simulation Settings pane. That wasn't intentional, it was a left-over from a prior simulation I ran but I kept it throughout. Its biggest effect was to dampen the effect of wind in a later step.



- d. The two curtains have a slight gap between them. Even with the gap, they will interact with each other during the simulation, acting as if they were pinned together. To manage this, I hid curtain 2, simulated curtain 1, then hid it. Unhide curtain 2, simulate it, then unhide curtain 1. You will end up with something like this:

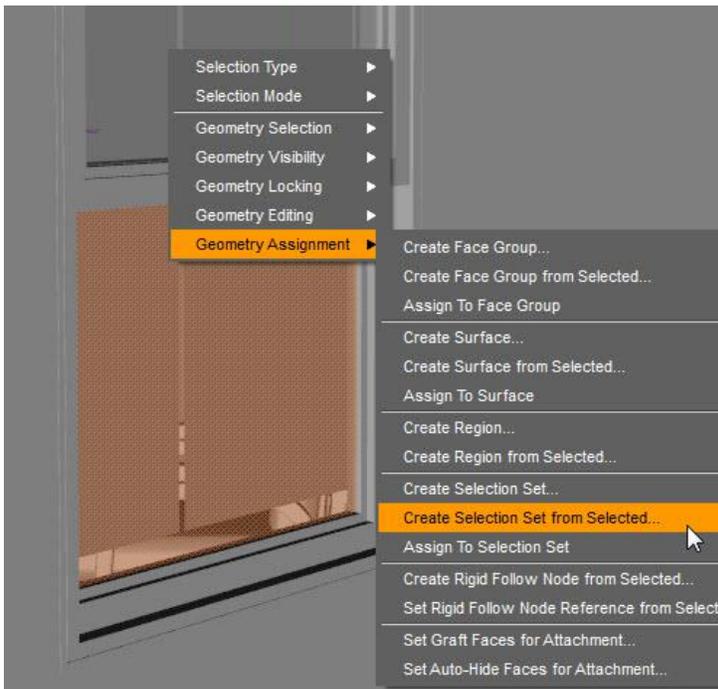
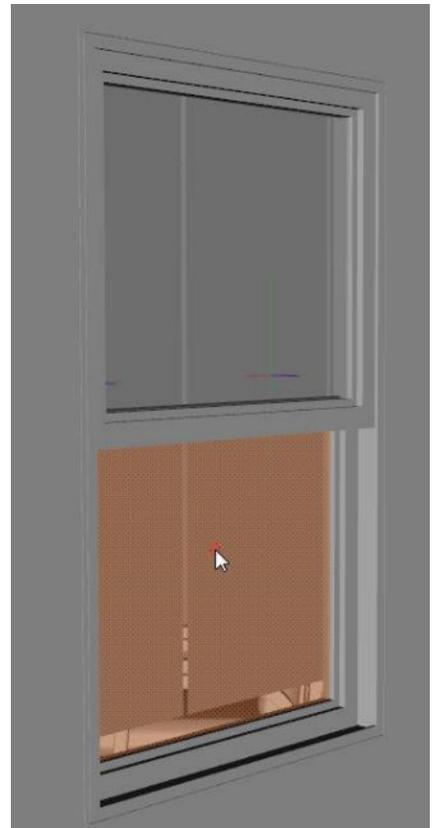


- e. Next we want to add a wind node and position it outside the window as shown at the right. Note that I have the window positioned within the falloff length of the wind node.



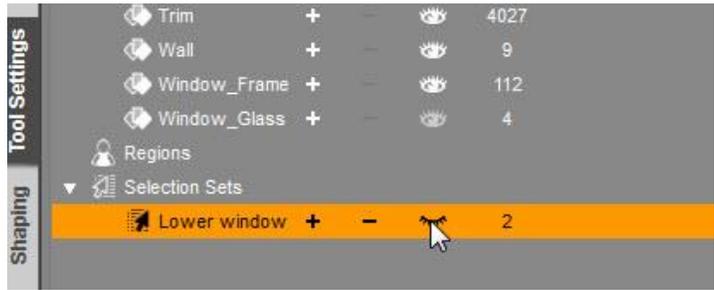
- f. If you run the simulation now, the curtains will simulate just as they did in step d, as the window glass is blocking the wind (just like in a real house). There are two ways to proceed. If you want the full window open (top and bottom), select Wall and Floor in the Scene pane, then go to the Tool Settings pane, choose Geometry Editor from the drop-down box at the top, and under the Surfaces listing, close the eye under the surface Window_Glass.

If you want just the lower window open as I did, after going to the Geometry Editor, click on the lower window pane in the viewport. It will change color to show it is selected (see image to right).



Next, right click in the viewport and choose Geometry Assignment/Create Selection Set from Selected... and give the set a name like lower window.

There will be a new listing in the Geometry Editor pane under Selection Sets. Close the eye by lower window.



- g. Set wind to 2 mph on the wind node. Run the simulation. You'll get something similar to this, as if a gentle breeze is coming in the window.

With this gentle breeze, I was able to simulate the two curtains at the same time as they did not latch on to one another as they did in the static simulation of step d.

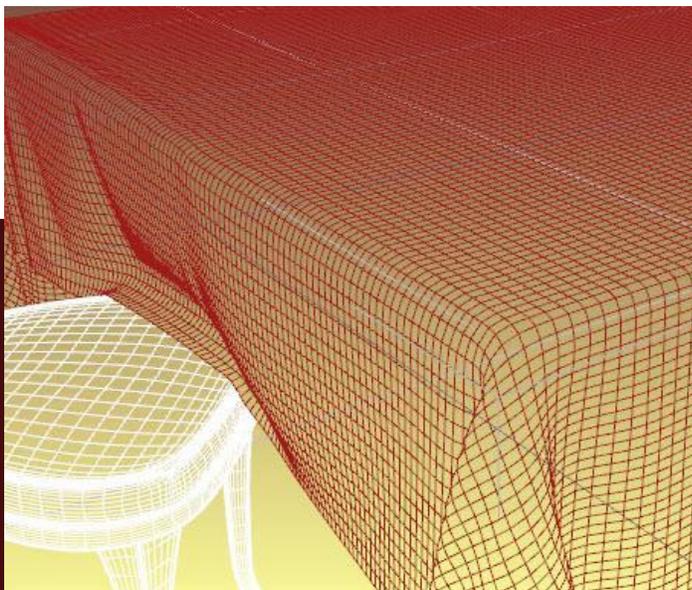
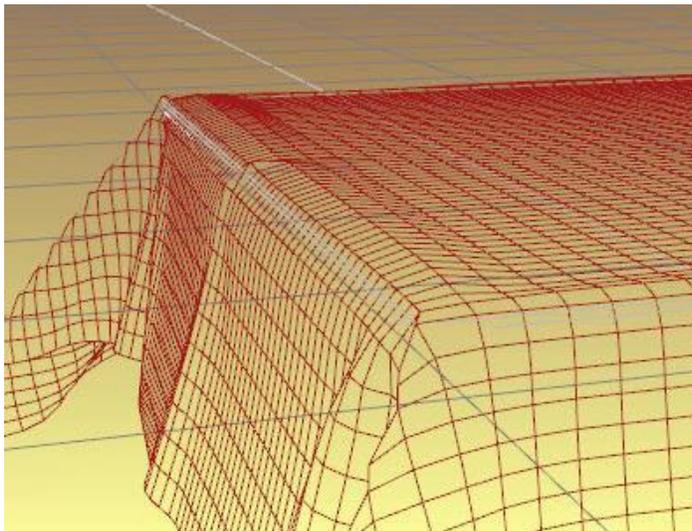


I bumped the wind up to 5 mph (remember that the wind in dForce seems much stronger than real life) and the curtains are really blowing out. In this case, they did latch on to one another so I simulated each curtain separately as I did in step d.

18. **Creating a Tablecloth and Napkin.** In this example, a primitive plane is used to make a tablecloth and napkin. The furniture and other props are from [Divine Dining Room](#). The scene portrays the time just after a diner has completed a meal and left their chair.

Since we've covered in detail the making of a primitive, adding a dForce modifier, and simulating the draping, those items will not be covered again. Instead, I'll focus on any new or unusual aspects.

- a. My first attempt at the tablecloth was to make a 100 division plane. This is the same number of divisions used for the blanket and towels. In this case, I noticed after simulation that there was a ridge at the edge of the table. Looking at the mesh, you can see the left edge lifts up before turning down.

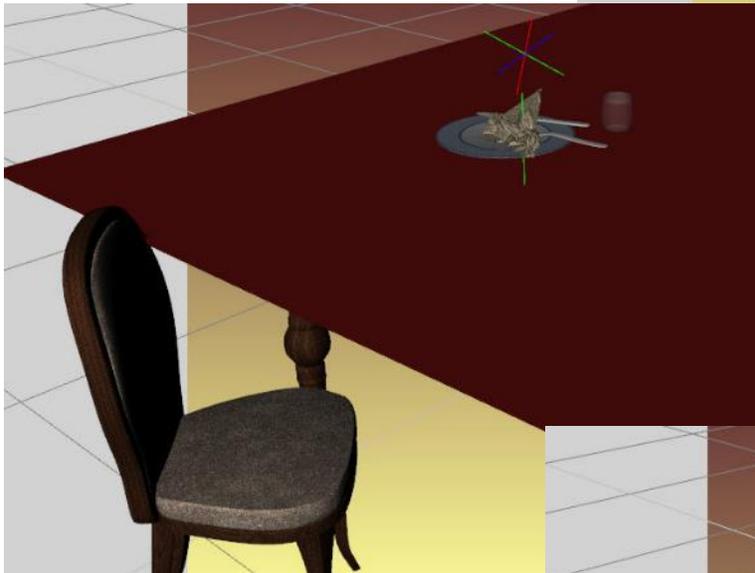


I made a 200 division plane. With smaller polygons, it makes the turn with less of a ridge.

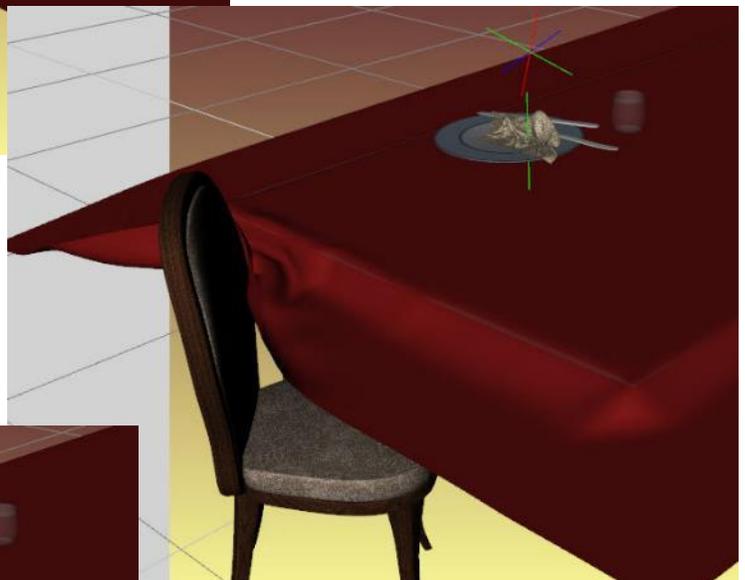
- b. If you position the chair in its final location and then simulate the table cloth, it will catch on the chair as shown to the right. To avoid this, create an animation timeline. Have the chair start to the left and slide into this position on frame 12. I found I needed a total of 45 frames for the table cloth to end up hanging vertically; if I only had 30, the parts of the cloth hanging over the table top were partially floating in space.



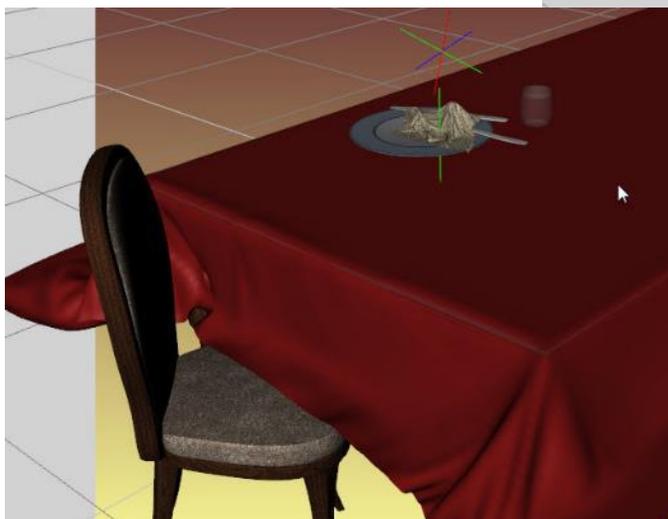
Frame 7: chair sliding towards table



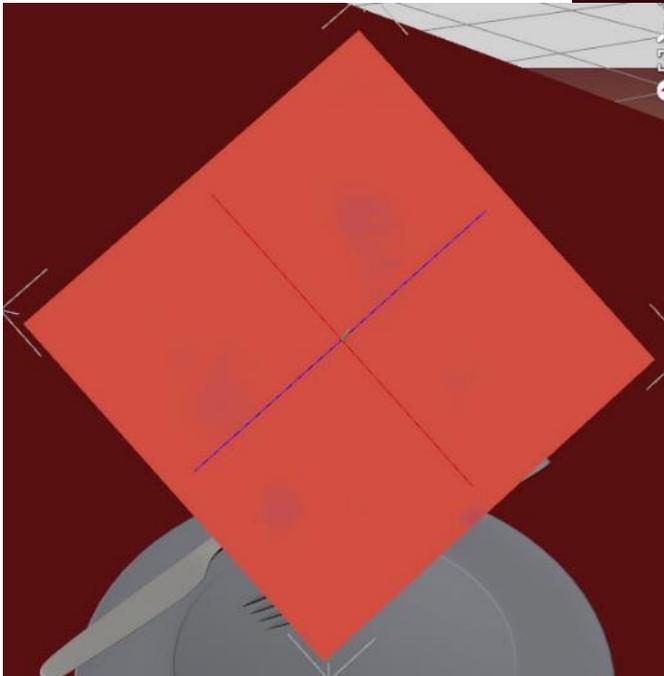
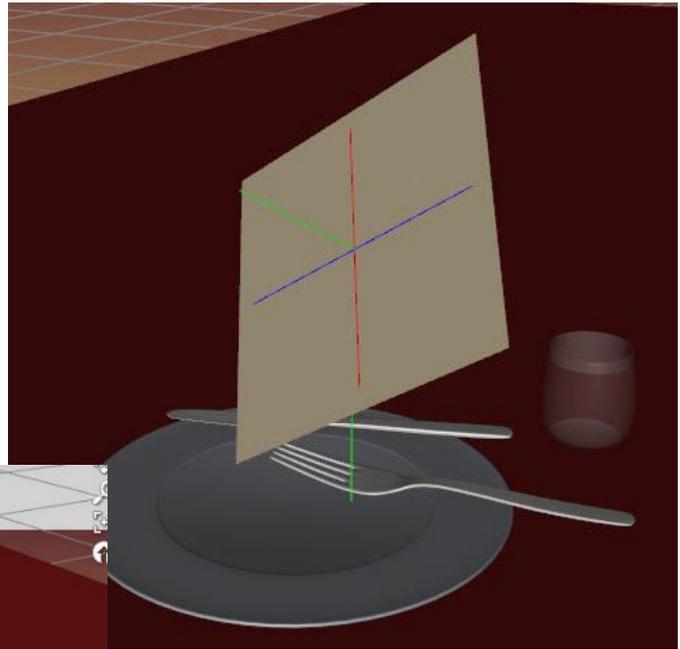
Frame 12: chair in place



Frame 17: cloth wrapping down onto chair

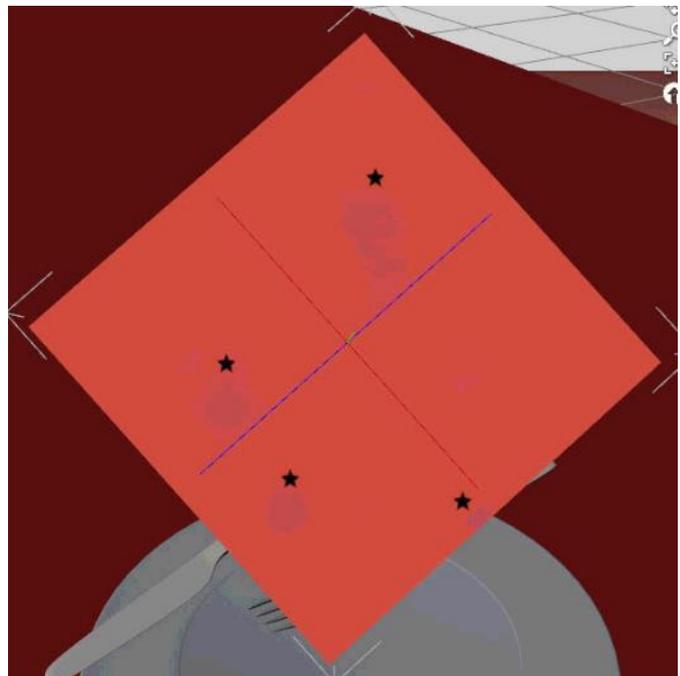


- c. The napkin was another 100 division plane. It was rotated so it fell like a diamond, with one tip hitting the plate first.

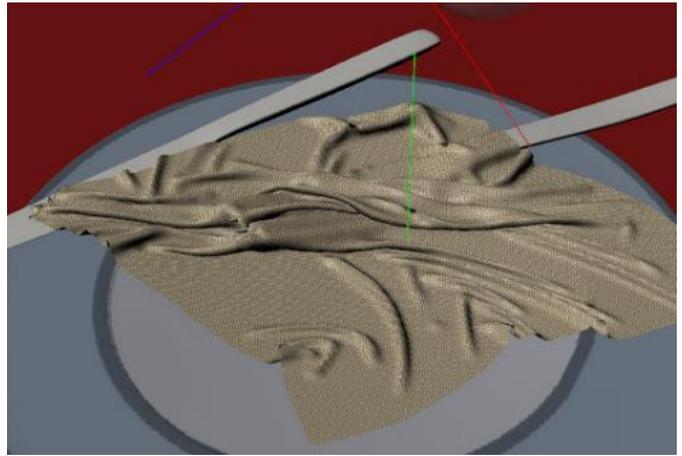


To give the napkin some structure, I added a dForce weight node (see section 11. e) and painted *very faintly* a few spots with lower influence weight. You can barely see these bluish spots in the image to the left.

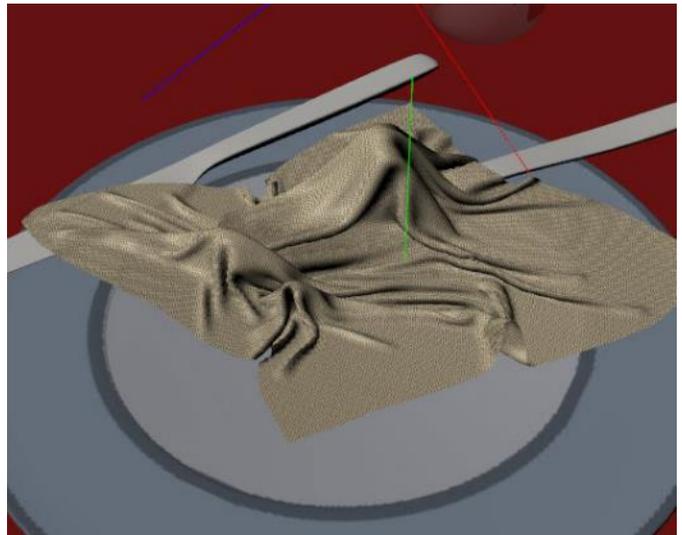
I posterized the image and marked the spots with a star to make them more obvious. These need to be faint to allow the napkin to completely fall yet slow some areas to build structure.



Here's what the napkin looks without the weight map. It lays quite flat.



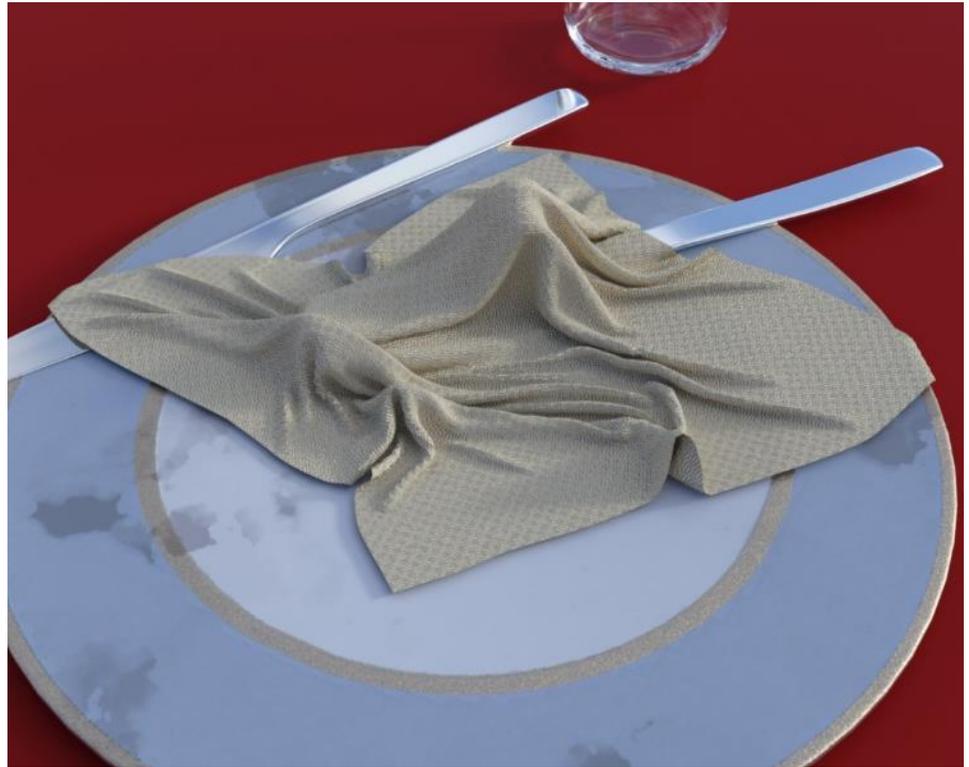
With the map, several parts stay upright, as if the napkin has some rigidity, made from stiffer cloth.



- d. Here's a finished render of the tablecloth. I added a smoothing modifier to remove some jaggedness along the corners (see [section 4](#)).

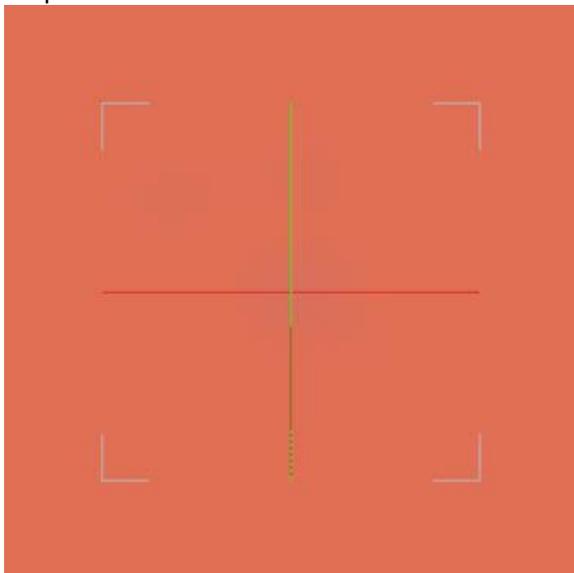


A close-up render of the napkin:

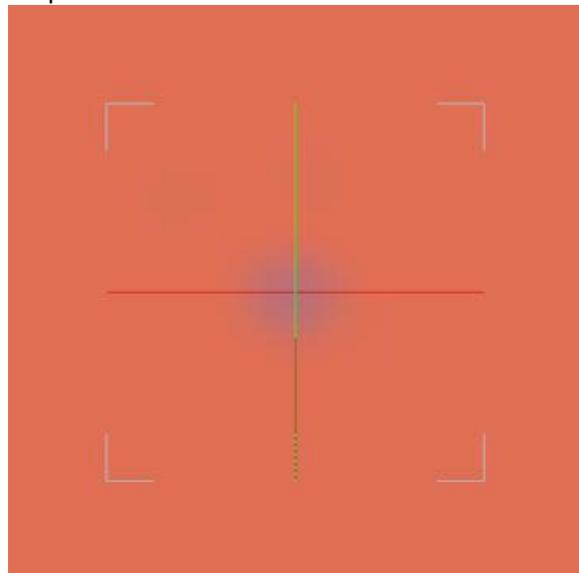


19. **Exploring Influence Weight Maps.** While working on the napkin, I noticed that the weight map seems very sensitive (in the amount of change it causes) when compared to weight maps for D-Formers and push modifiers. I decided to run a test with 5 small planes, each with a different degree of influence weight in the center of the plane. The first plane had no weight map, so 100% influence everywhere. The 2nd map had barely a hint of influence removed, so little that you can hardly see the bluish color in the center of the map. The 3rd had enough removed so blue is clearly seen.

Map 2:

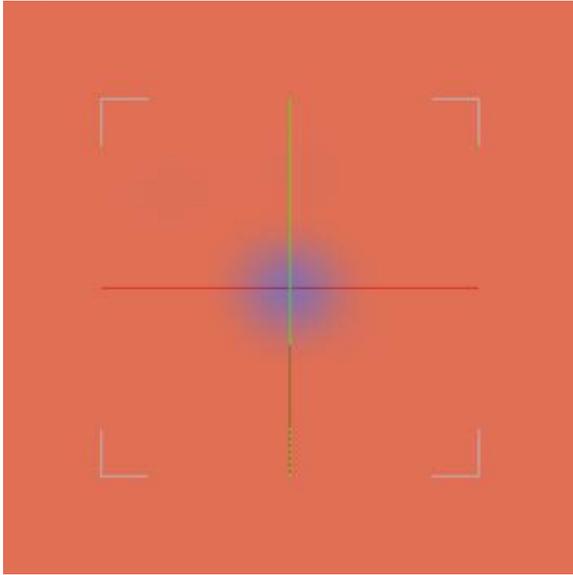


Map 3:

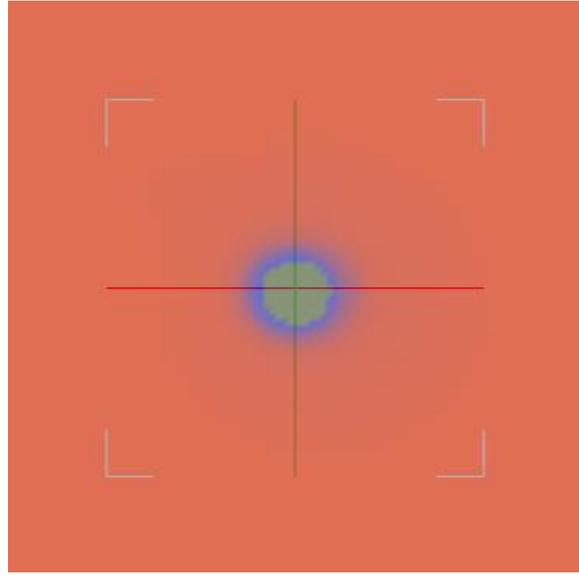


The 4th had as much as I could take off without any areas dropping to zero, while the 5th clearly has areas of zero (the gray zone in the center).

Map 4:



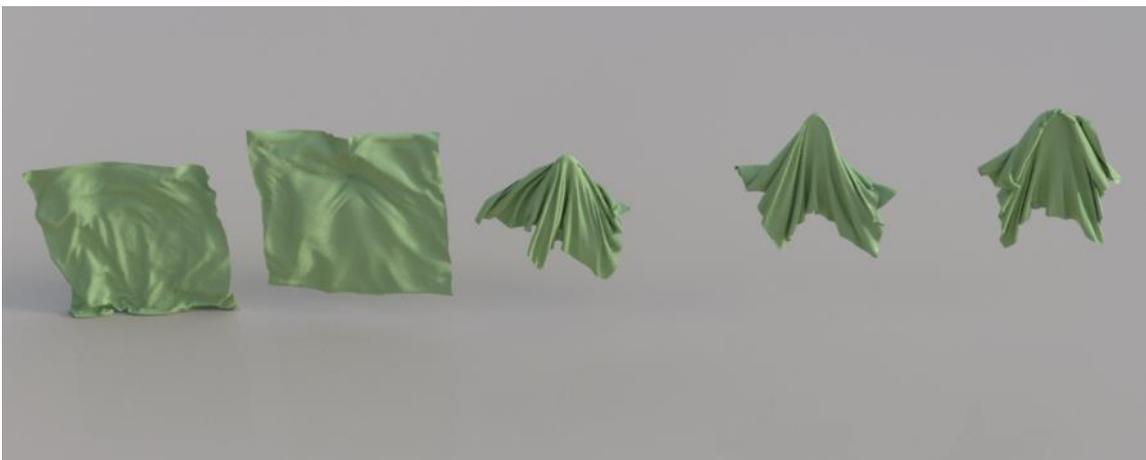
Map 5:



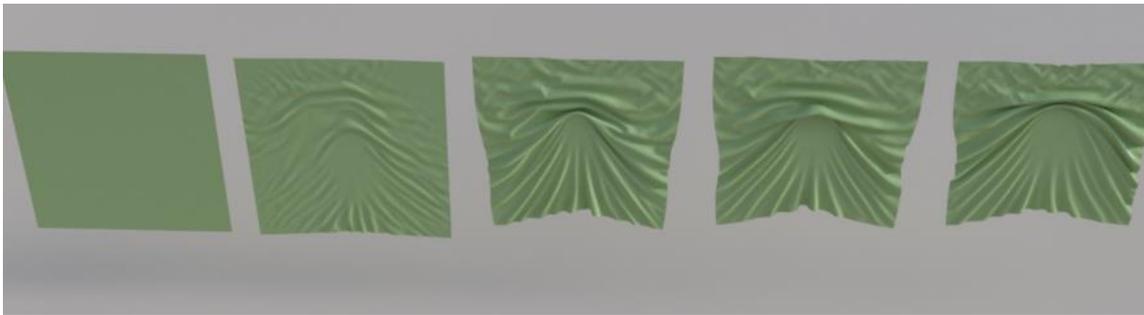
- a. I first ran a simulation using default surface settings. The first plane drops right to the floor, flat and crumpled. The second also drops completely but a small amount is gathered in the center. The third drops to the floor as well but it's more tightly gathered and the center is sticking up. 4 and 5 hover in space, and twist and turn during the simulation.



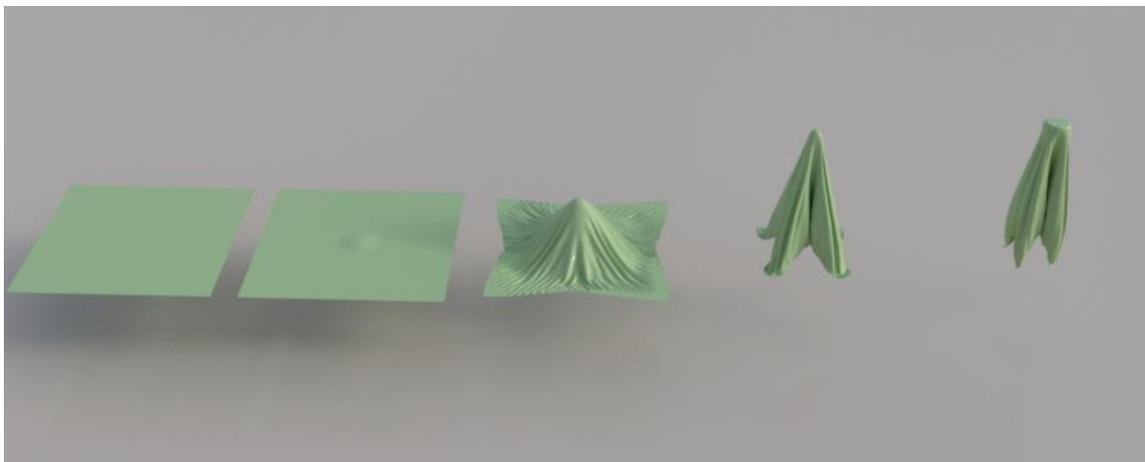
- b. I next reduced Dynamic Strength on each of the surfaces to 0.9...



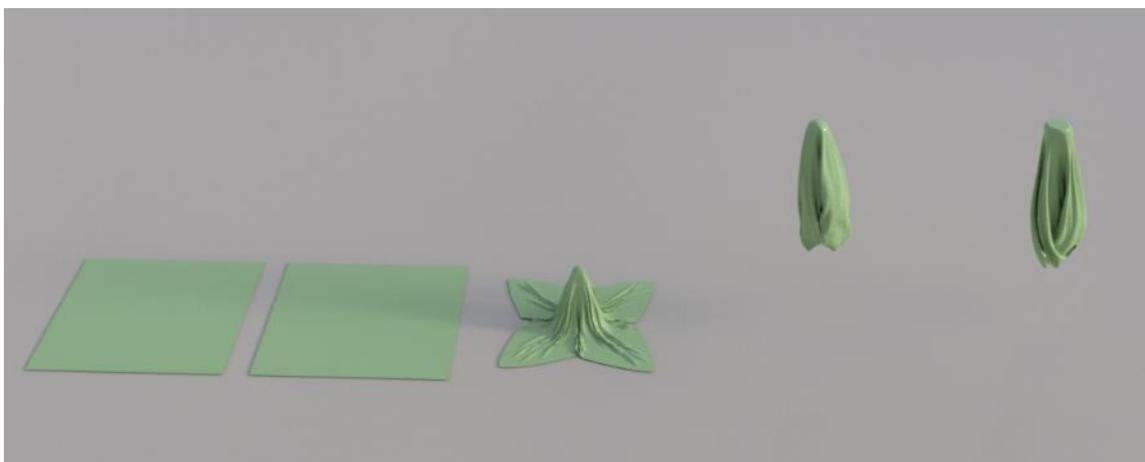
- c. ...and then reduced Dynamic Strength again to 0.85. This highlights how the small amount of missing influence in the center of the map is affecting the results. Even the faint hint of blue color on map 2 is enough to make a difference.



- d. I next returned Dynamic Strength to the default value of 1.0 but made the planes horizontal. I also shortened the simulation time so you can see how the maps are influencing results. You can see the little bump made by map 2.



- e. I increased the density from the default of 180 to 300 which is supposed to mimic a heavier fabric and be less affected by air resistance. As a result, the planes drop further to the ground. The right two (maps 4 and 5) also have collapsed in on themselves more.



- f. I exported the 4th napkin in step e as an .obj and reimported it into Daz Studio. I added a new dForce modifier, positioned the napkin horizontally, and used a short (0.10) Stabilization Time to keep the tip of the napkin from flattening. That gave a different look from what I showed before in section 18. Remember that map 4 has only a small reduction in influence in the center of the napkin which causes it to droop around that point. By exporting the horizontally draped plane from step e, I preserve this look and can then change its orientation and drape it again.

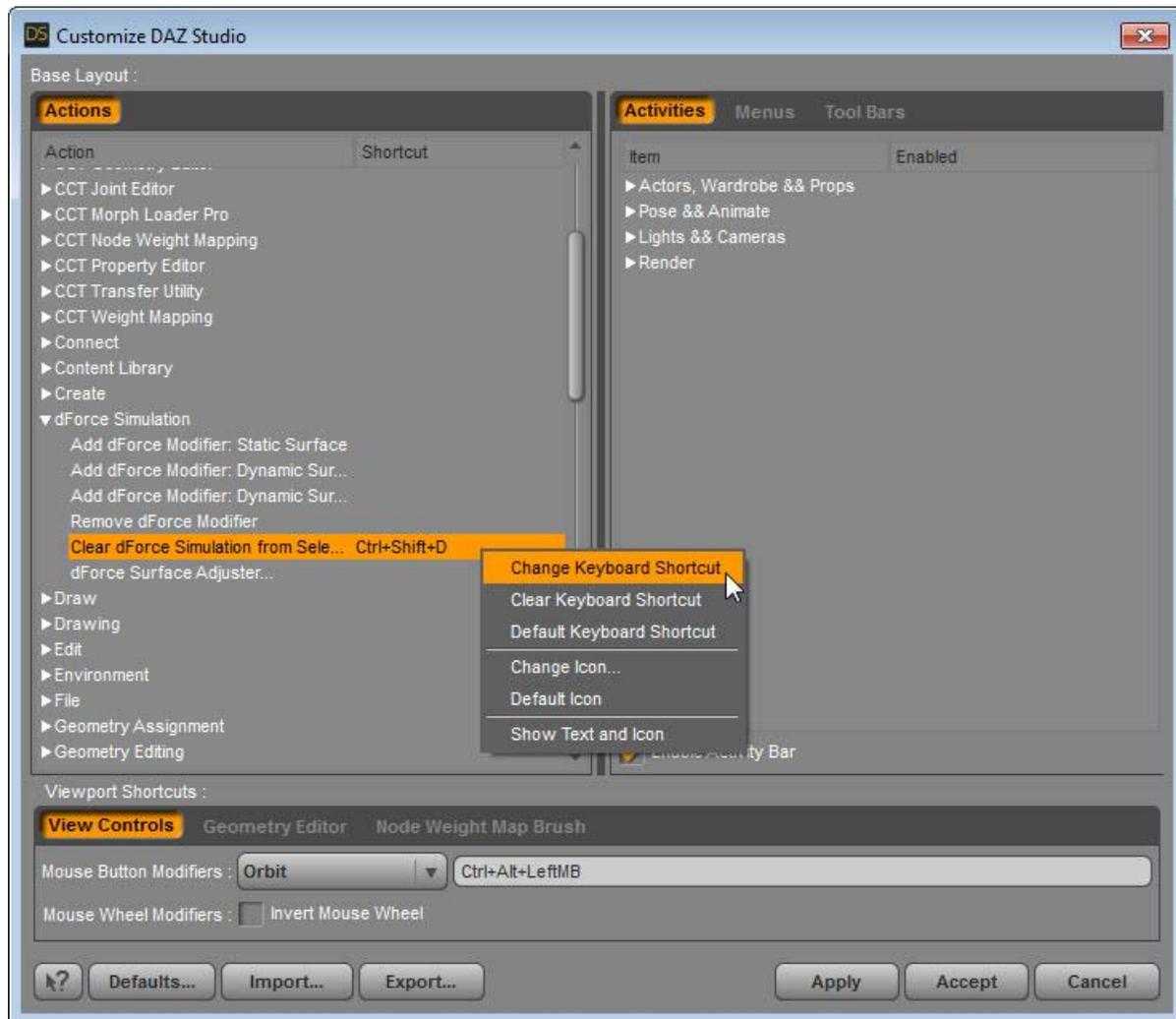


- g. My suggestion if you are painting influence maps is to be aware that a little goes a long way in terms of effect. It is easy to remove too much influence and get flat areas. It's also easy to leave a faint, almost invisible area where you've removed influence that will impact your results. If you ever are in doubt, you can right click in the viewport (while using the node weight map tool) and choose Geometry Selection/Select All, then right click again and choose Weight Editing/Fill Selected... and use a value of 100% to completely fill the influence weight map again.

20. **Short-cut Key to Clear Simulation on Selected Item(s).** Oftentimes I want to remove the dForce simulation from one item. You can't use the Clear key on the Simulation Settings pane as it clears all simulations, even those that are frozen. So to clear a simulation, you have to select the item and then do a multiple-step menu selection from either the main menu or the Simulation Settings pane menu. Not all that hard but it gets old to keep scrolling, clicking, and scanning down menu lists to get to this one command.

You can add a keyboard shortcut to make this a quick process. Click on the F3 key to bring up the Customize menu. Scroll down the Action column and left-click on dForce Simulation. Then right-click on the item Clear dForce Simulation from Selected Item(s) and choose Change Keyboard Shortcut. Type in a key combination (I used Ctrl+Shift+D). Now when you want to clear the simulation on an item, choose it in the viewport and type your shortcut key and you're done. Much faster!

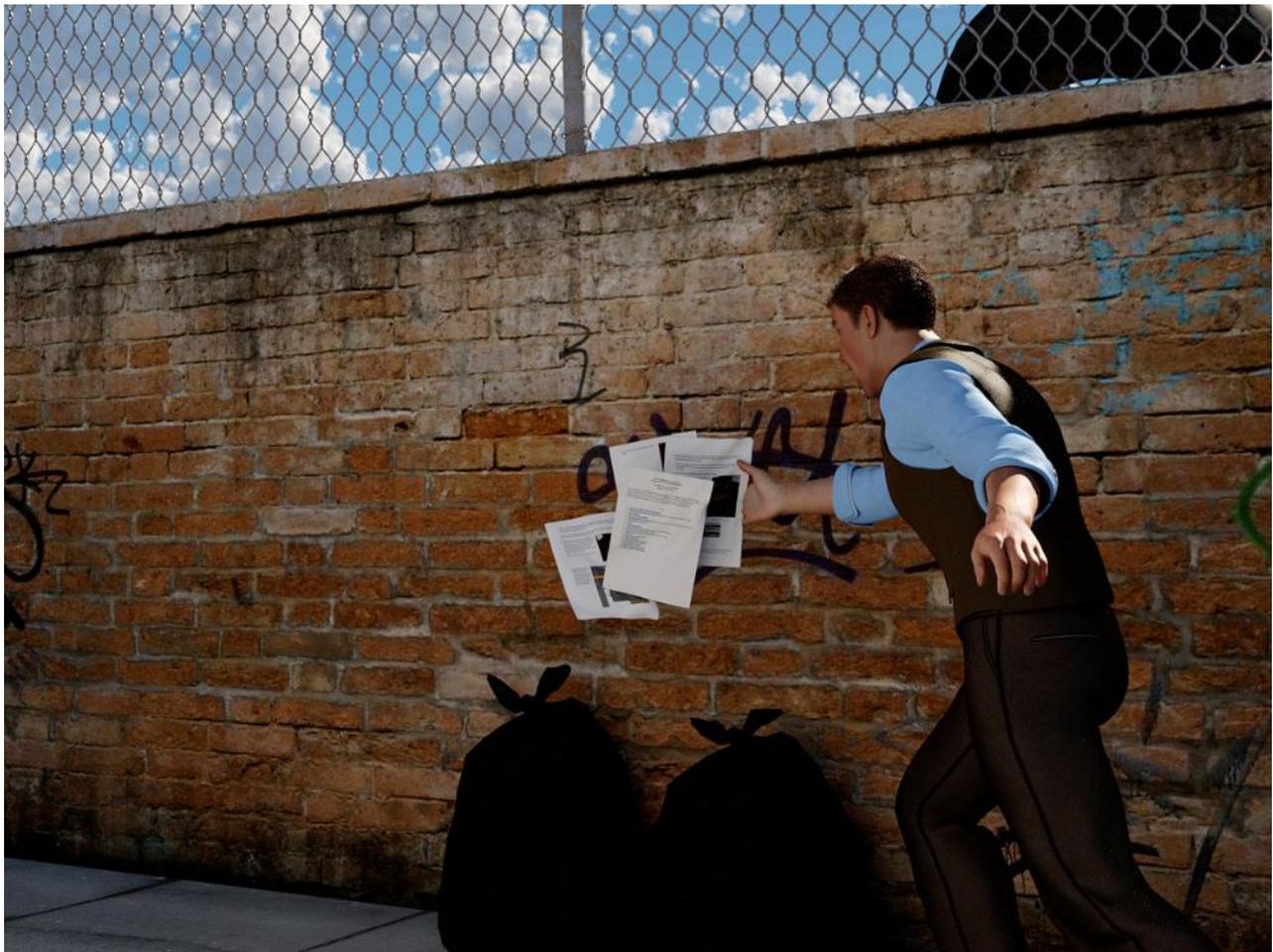
Hint: after setting the shortcut key, close down Daz Studio and reopen it so the new shortcut key is remembered. Otherwise a crash (which dForce is prone to do) will lose the new setting.



21. **Dropped Papers.** As I think of ways I might use dForce, I get caught thinking dForce is a physics engine which it's not (at least in its current implementation). So something I think would be easy to setup takes more time and relies more on me than the simulator.

A case in point is a set of dropped papers. The scenario is that of a man carrying a stack of papers in his hands. The wind catches them and blows them away with the man giving chase. Ideally, I could create a stack of say five planes, pose them in space in front of a wind node, and run the simulation. The papers would start to fall, the wind would grab them, and they would simultaneously separate from each other, warp and rotate in the wind, and fall downward as well as move forward. Sounds simple but it doesn't work. Rather, the papers either collapse into a heap of limp cloth or they stick to each other. I can get something that looks like I want but it's by me "faking" the wind and gravity motion, meaning I'm using imagination not physics.

Here's the result I achieved:



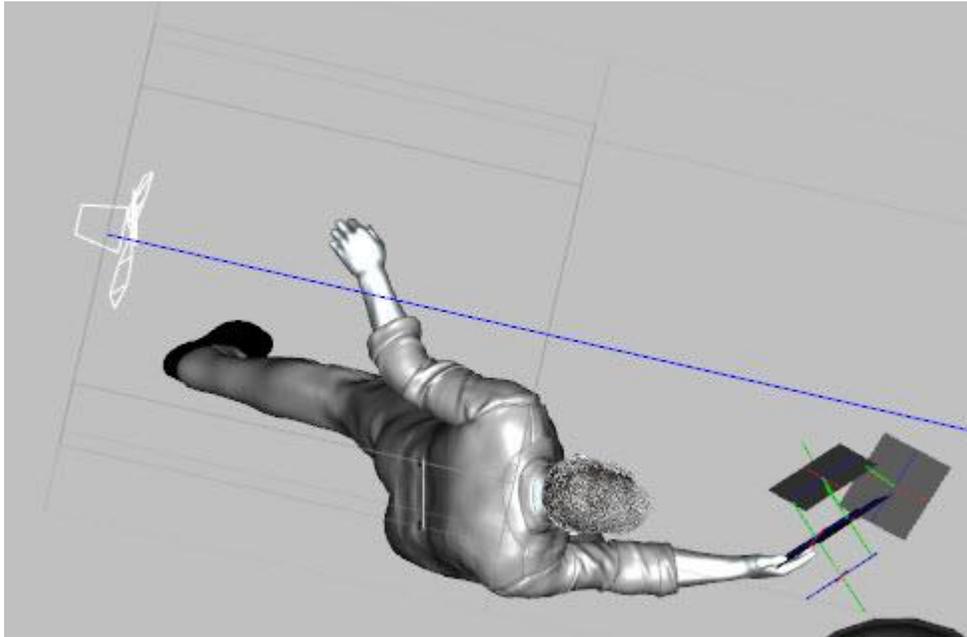
I made 5 primitive planes for the papers. I scaled them in one direction so they were rectangular. I took screen-shots of this write-up and used them for the diffuse texture map. The papers dissolve into limp cloth if you run at full dynamic strength so I turned it down to 0.85:



I found the papers fell too fast at full gravity, so I set it to 0.6:



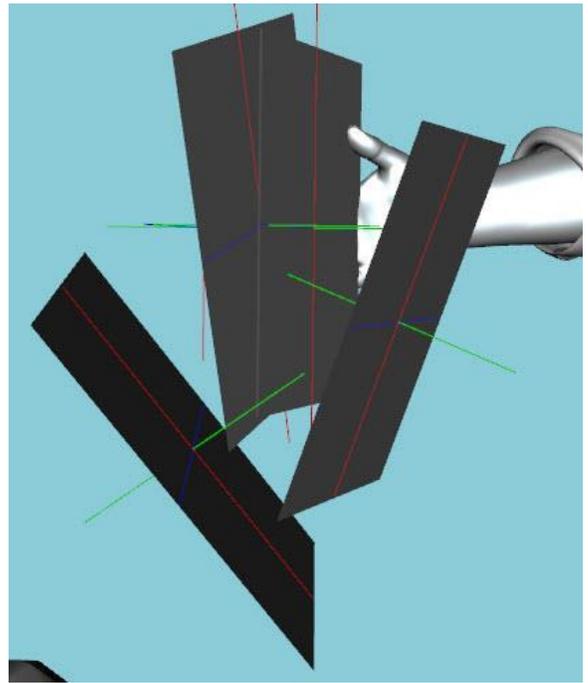
Here's the wind node position:



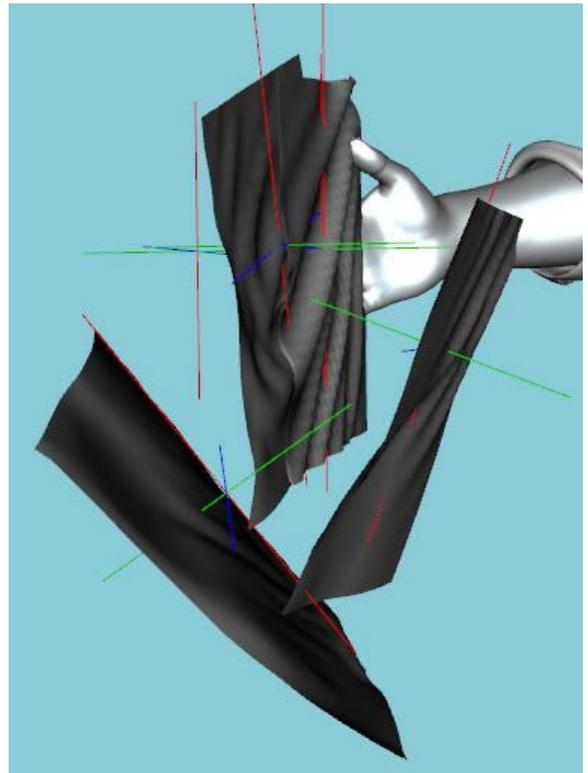
And the wind node parameters:



Here's the starting position of the papers. As you can see, I had to move and rotate them myself as dForce will not:

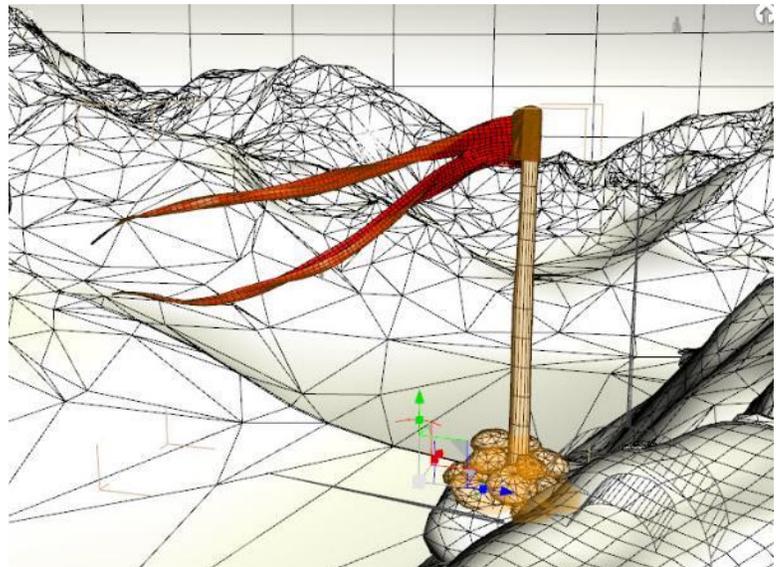


A close-up of the papers after simulation:



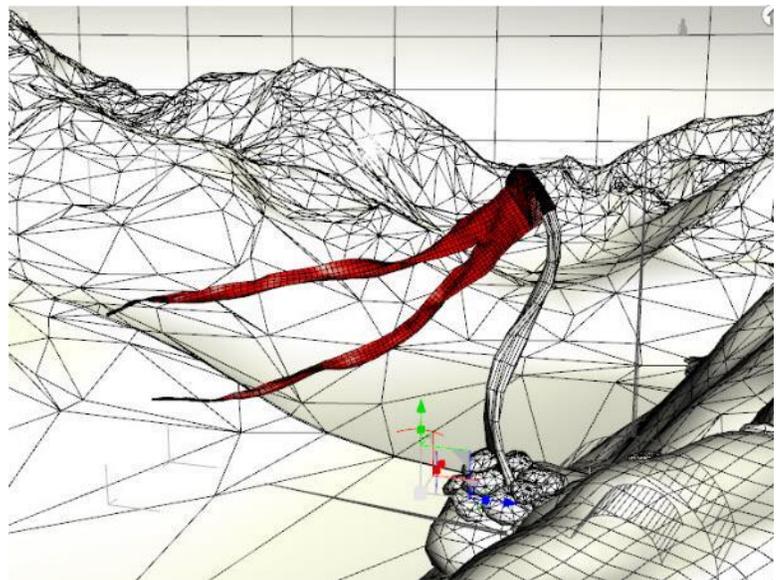
22. **Banner Flag.** Flags are a natural for dForce. Since there's a test scene of conventional flags in dForce Starter Essentials (which comes with Daz Studio 4.10), I decided to test a longer banner flag that is found in FirstBastion's [Ridge Walk Mountains](#). That flag is already configured by the PA to look like it's blowing in the wind but you can also transform it with dForce. After running a few tests with his flag, I replaced it with a primitive plane of similar size to see how that looks. Here are the results.

a. This is what the flag prop looks like. It has the flag, a pole, and a set of rocks.

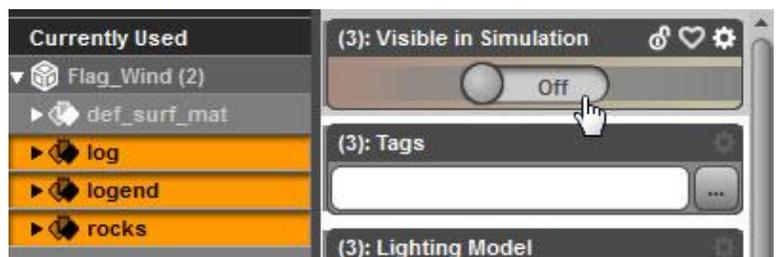


b. Select the flag prop and from the main menu select Edit/Object/Geometry/Add dForce Modifier: Dynamic Surface.

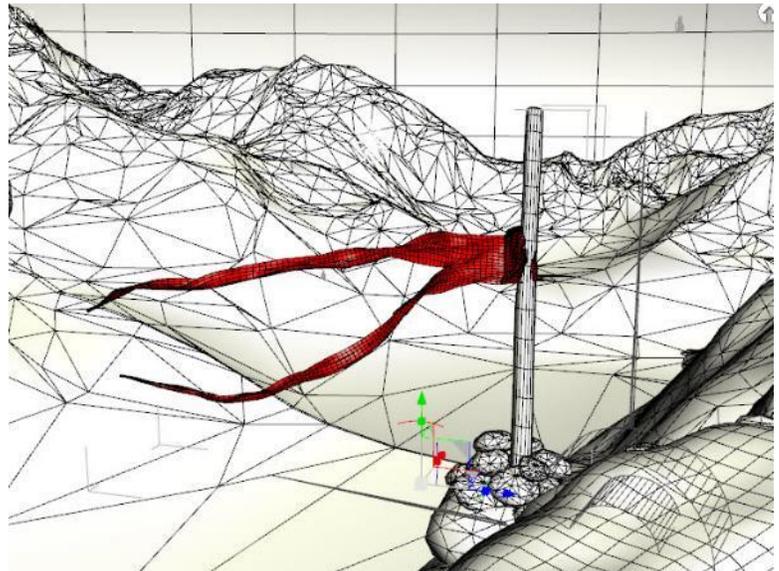
c. Run the dForce simulation. What you will see is the whole prop begins to sag:



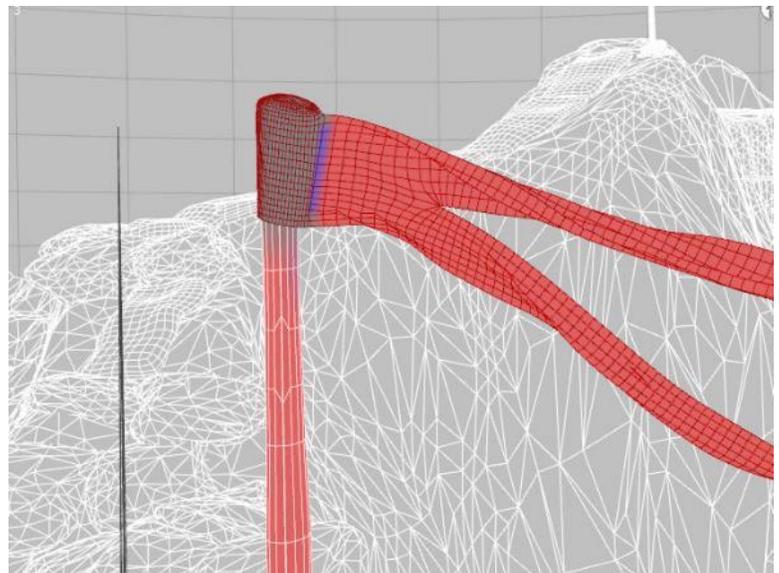
d. Since the pole and rocks have separate surfaces, you can quickly turn them off by going to the Surfaces pane and set Visible in Simulation to off.



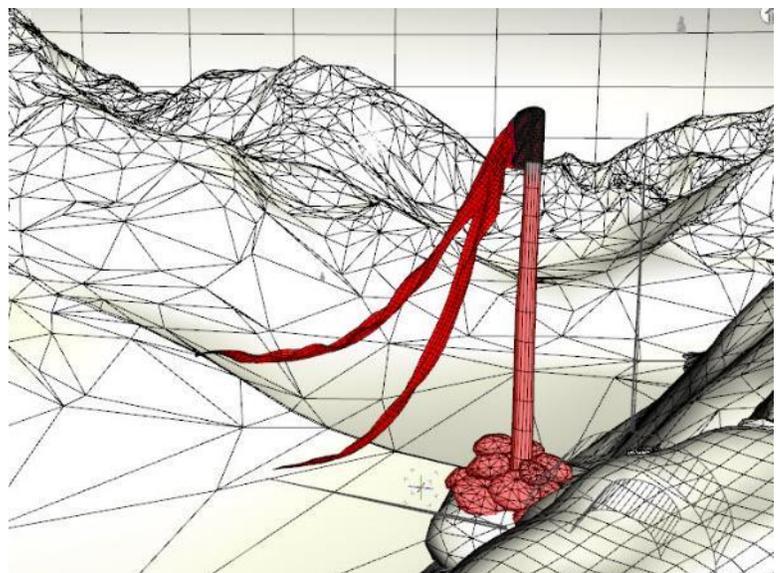
- e. Now you'll find that the flag slips down the pole. To correct, you need to add a weight map to keep the portion wrapped around the pole in place.



- f. Add a weight map as normal by having the flag prop selected then go to the main menu and choosing Create/New dForce Modifier Weight Node. Select the new node in the Scene pane, go to the Tool Settings pane and select Node Weight Map Brush, then click the Add Map button. Using the brush and holding down the Alt key, remove color from the area around the pole as shown at right (area in gray).

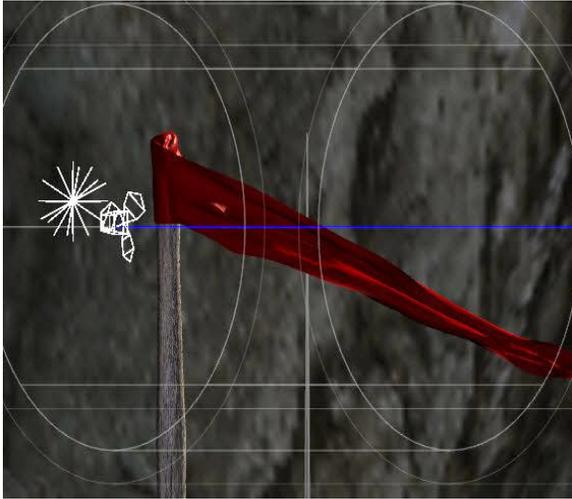


- g. Now when you run the simulation, the flag stays at the top of the pole while the flaps hang down.

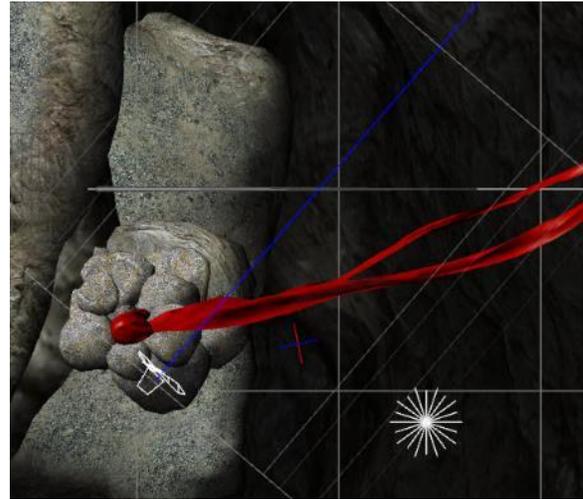


- h. Add a wind node and set it to blow at an angle to the flag (since the prop was built to have the look of wind blowing, blowing it in a different direction lets you see the effect wind is having). I set Wind Speed to 5 mph which will make the flag stream horizontally.

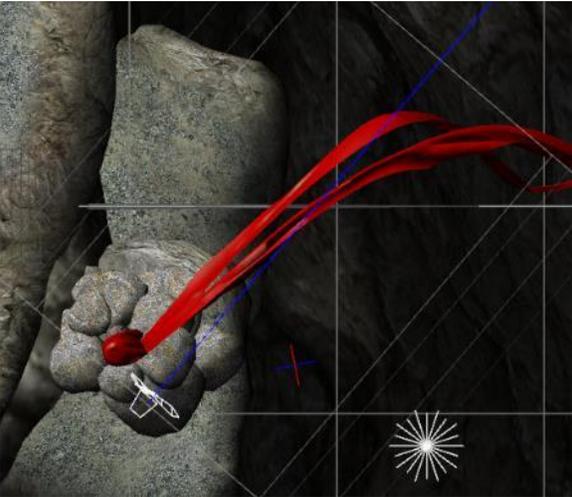
Side View:



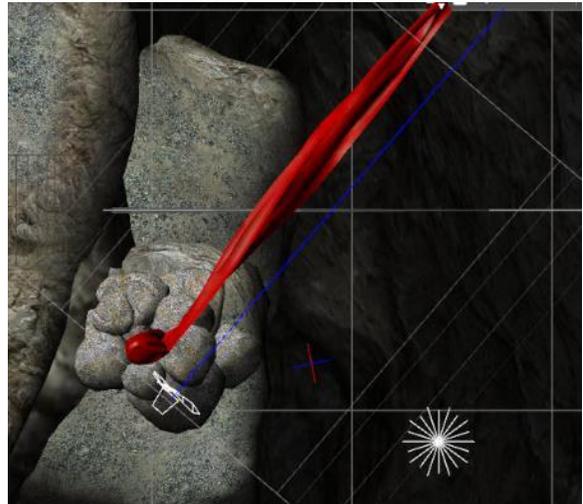
Top View at Start:



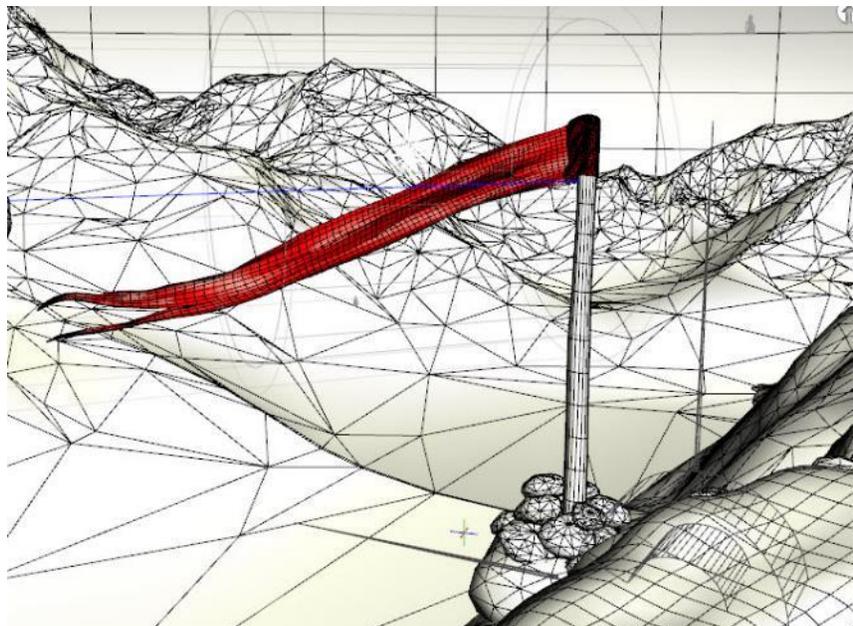
Top View midway:



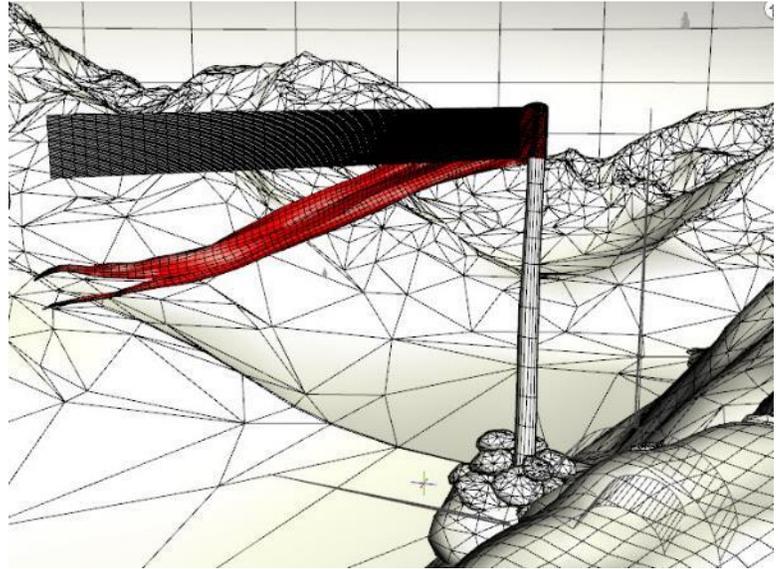
Top View at end:



The flag after the simulation is complete:



- i. Next I added a primitive plane with 50 divisions and sized and positioned it to match the previous banner.



- j. The primitive plane won't wrap around the pole, so I kept that part of the original banner. To do this, select the flag prop, go to the Tool Settings pane and select the Geometry Editor, then using the tool, select all the polygons of the flag that project from the pole and assign them to a new surface. Next go to the Surfaces pane and set that surface to an opacity of 0 and it will be hidden from view.

- k. Here is the new flag at 3 wind speeds.

0.1 mph:



5 mph:



10 mph:



At the higher speed, the end of the flag gets compressed into a tiny strand:

i. Depending upon the look you desire, there are some surface parameters you can change. These all use the higher wind speed of 10 mph.

a. *Influence* is the quickest way to cut back on flag movement:

1.0 (default)



0.88



b. *Stretch Stiffness* has slight effect, mostly changing how the end of the flag wraps in the wind. Note that as with some other dForce surface parameters, small changes can make a difference:

0.8 (default)



0.9



0.98



1.0



- m. Mesh resolution has a big effect, but this is harder to achieve as you have to make a new plane (I tested using sub-D on a low resolution mesh but it wrapped the same as the original low mesh).

50 by 50 mesh (used in images above):



20 by 20 mesh:

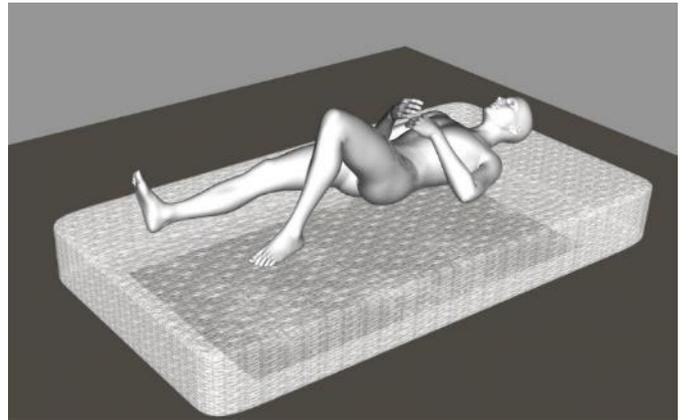
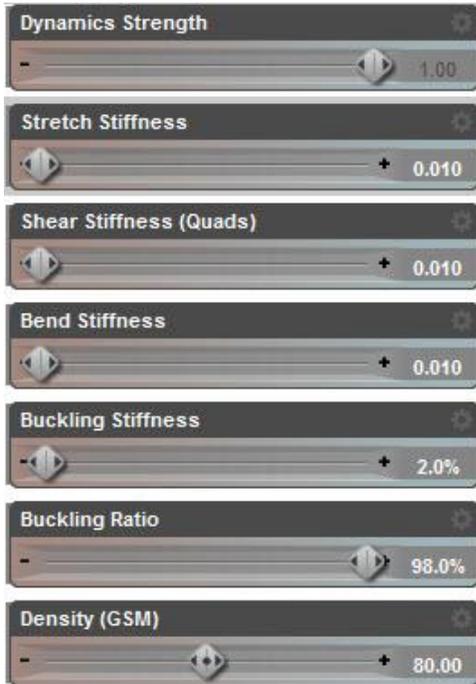


10 by 10 mesh:

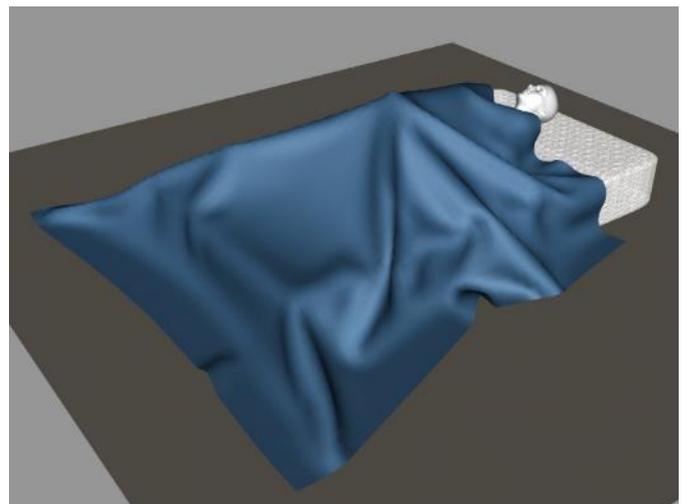
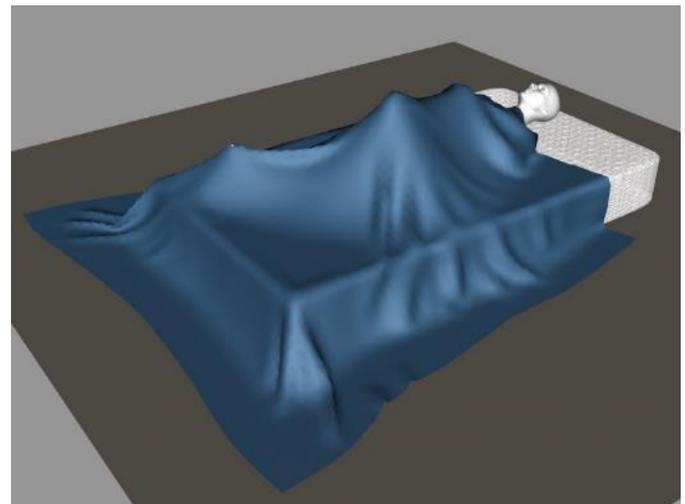


23. **Effect of Surface Properties Using Simple Sheet Drop – Part 1.** The simple sheet drop is a scene in the dForce Starter Essentials, which comes with Daz Studio 4.10. The sheet has a number of simulation surface parameters that are different than the dForce defaults. In this section, I'll compare the original scene settings to the default surface properties, then show what happens when you change an original setting back to the defaults one by one. The only changes to the scene I made was to move the sheet so it doesn't cover the figure's head and use different shaders.

- a. Original scene settings and figure's pose. With the knee up, there's more room for draping than what I had in my original blanket tests.

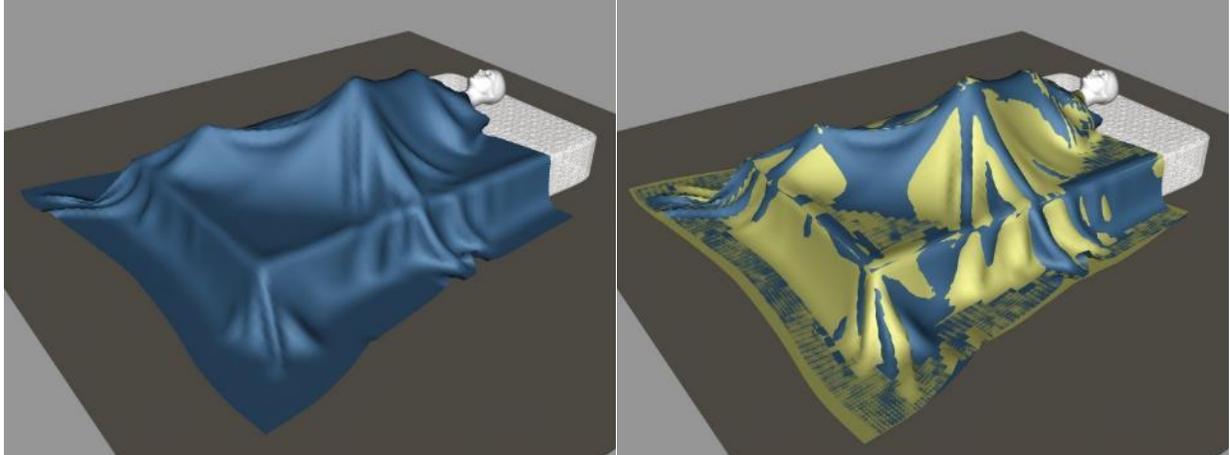


- b. Original scene settings (top right) vs. dForce defaults (bottom right). The scene settings result in a less stiff draping that more closely hugs the figure and bed. The fabric is more rounded over the knees and foot and there is more dipping between high points. The defaults might be better for a stiffer blanket while the scene settings would be better for a sheet.

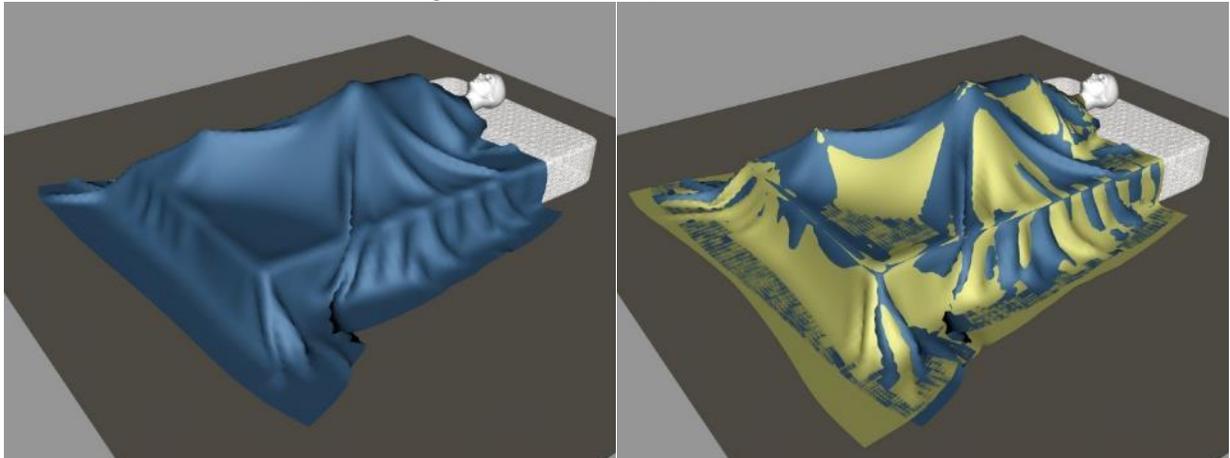


c. **One by one replacements.** Because the scene settings result in a drape much different from the original, keeping 5 of the 6 scene settings lets you see how one set back to default is affecting the drape. For each parameter change, I show an image of the resulting sheet (blue) plus a second image with the original sheet (yellow) also visible. Whichever color is visible indicates a higher elevation. Zoom in for a better view.

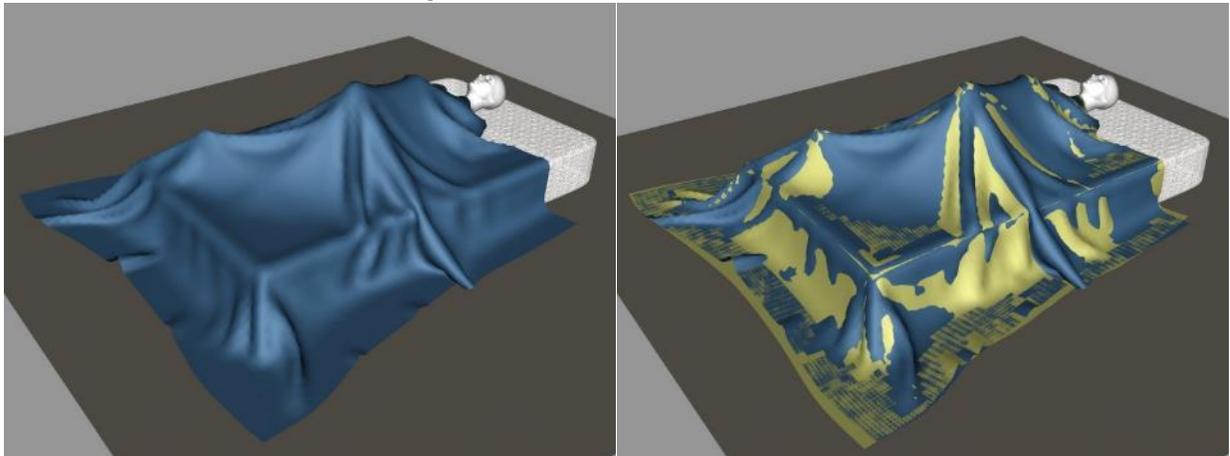
d. Stretch Stiffness at default (0.8 vs. original scene at 0.01)



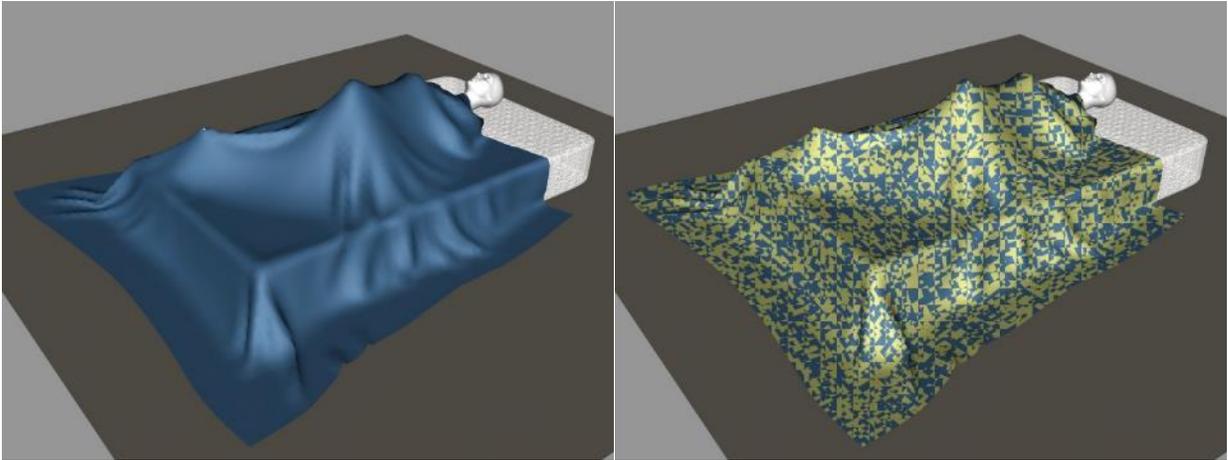
e. Shear Stiffness at default (0.2 vs. original scene at 0.01)



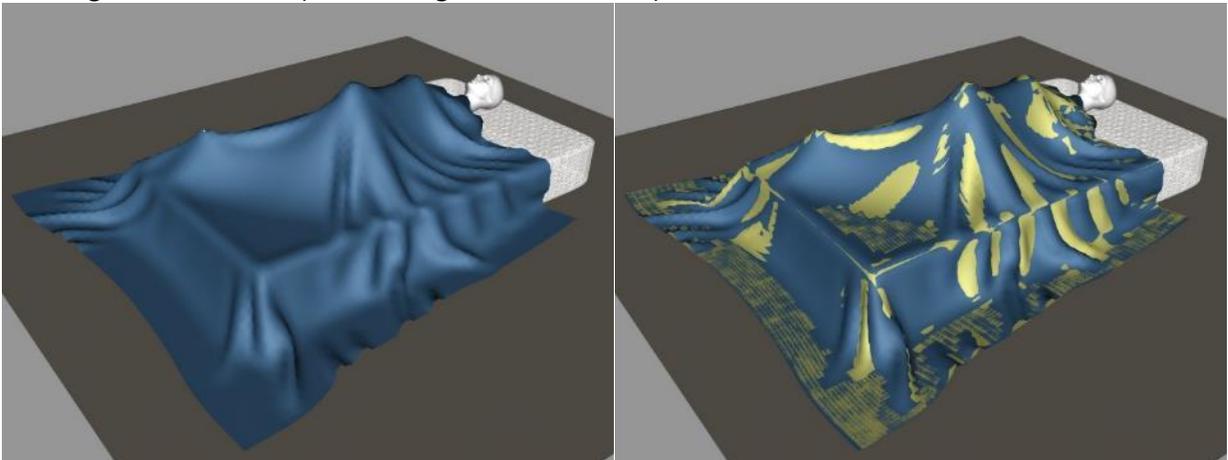
f. Bend Stiffness at default (0.5 vs. original scene at 0.01)



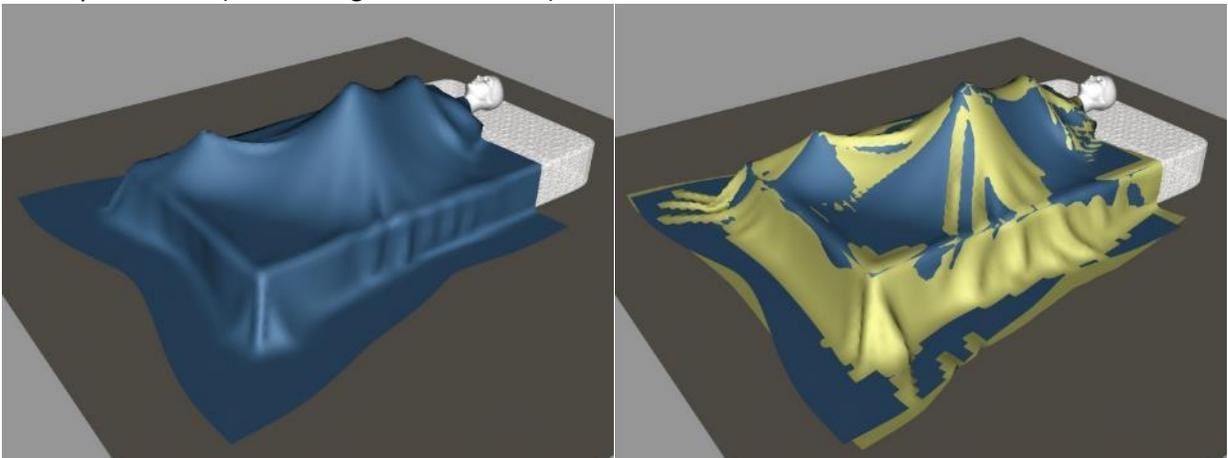
- g. Buckling Stiffness at default (5% vs. original scene at 2%). The intermingled colors on the overlay image shows buckling stiffness had little effect.



- h. Buckling Ratio at default (70% vs. original scene at 98%)



- i. Density at default (180 vs. original scene at 80)

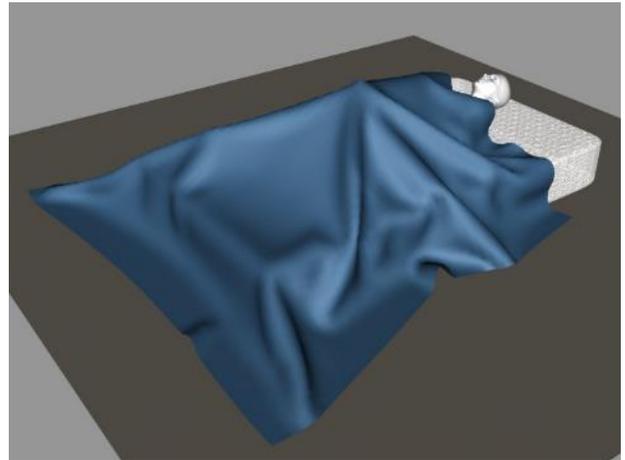


j. **Conclusions.** It's easiest to see differences if you go to the discussion thread on Daz Forums and open each image in a separate browser window. You can then flip through them to see what is happening.

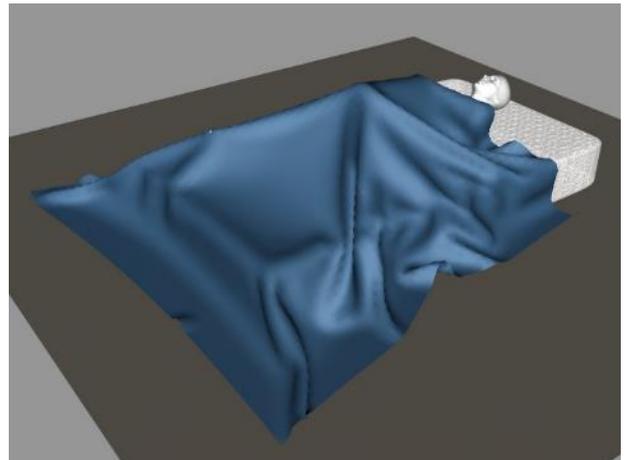
- Resetting Stretch Stiffness to default gave more and longer folds.
- Setting Shear Stiffness to default pulled the fabric in closer to the figure and bed and had sharper folds.
- Resetting Bend Stiffness to default gave steeper valleys than the original combination or stretch stiffness at default.
- Resetting Buckling Stiffness to default had no discernable effect.
- Resetting Buckling Ratio to default gave more folds than the original. It also gave more rounded folds than when shear or bend stiffness were at defaults.
- Resetting Density to default suppressed almost all the folds. It also caused the sheet to hang vertically down the side of the bed. It pulled the fabric closer to figure and bed than when shear stiffness was at default. **Without the lower density, the folding effect of the other parameters is largely missing.**
- dForce default settings give a shape most similar to bend stiffness at default but with very stiff folds and little droop between the high points. Looks more like a stiff rather than silky fabric. Interesting that although the density was high, it did not suppress folds (see previous bullet).

24. **Effect of Surface Properties Using Simple Sheet Drop – Part 2.** This continues the above discussion. Instead of resetting the 6 scene surface properties to default one at a time, one default surface property is set to the original scene's properties. This is another way to see how surface properties affect the draping. After looking at parameters one by one, several are combined at once to show interactive effects.

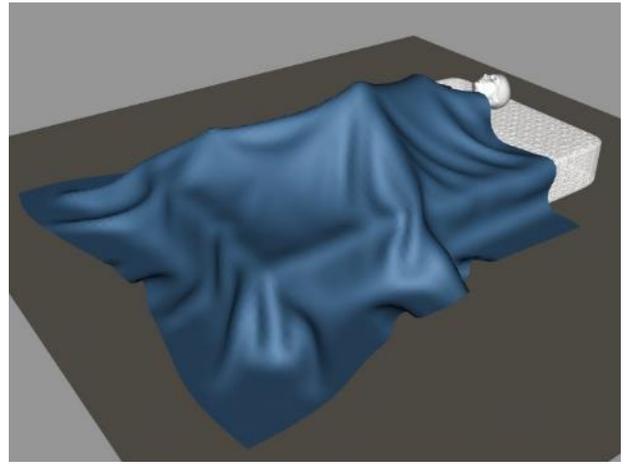
a. Default values



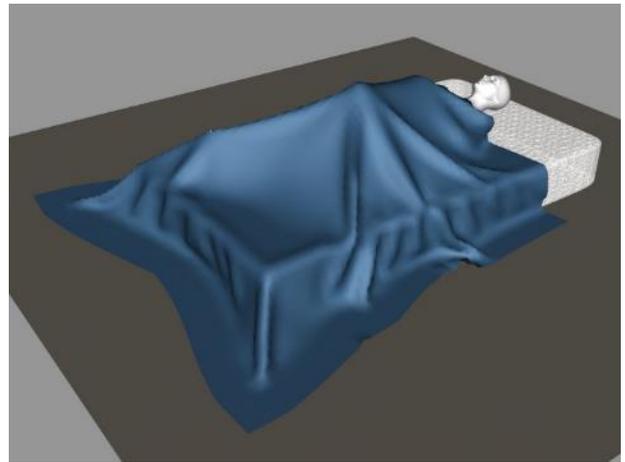
b. Stretch Stiffness (0.01 vs. default of 0.8)



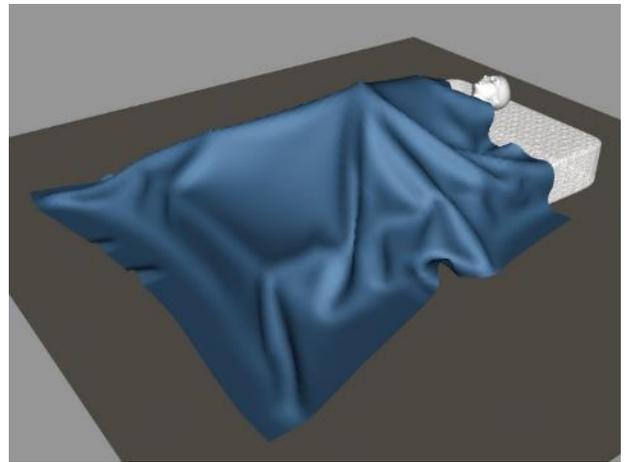
c. Shear Stiffness (0.01 vs. default of 0.2)



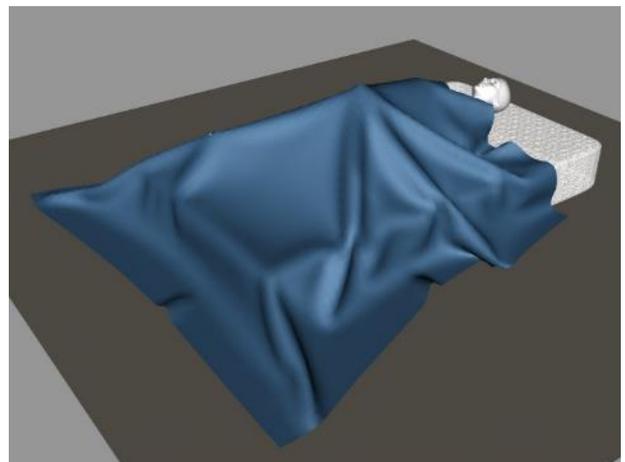
d. Bend Stiffness (0.01 vs. default of 0.5)



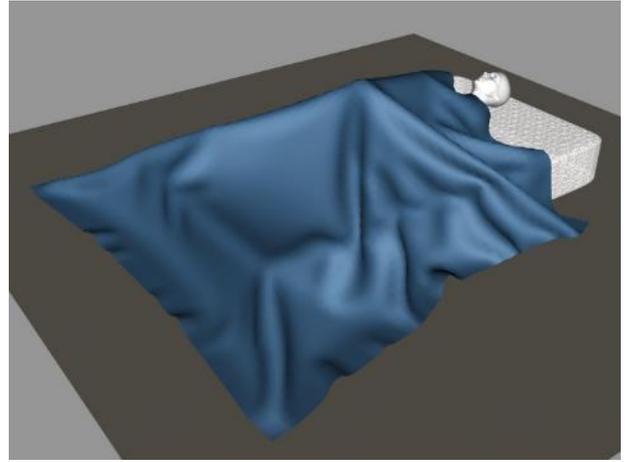
e. Buckling Stiffness (2% vs. default of 5%)



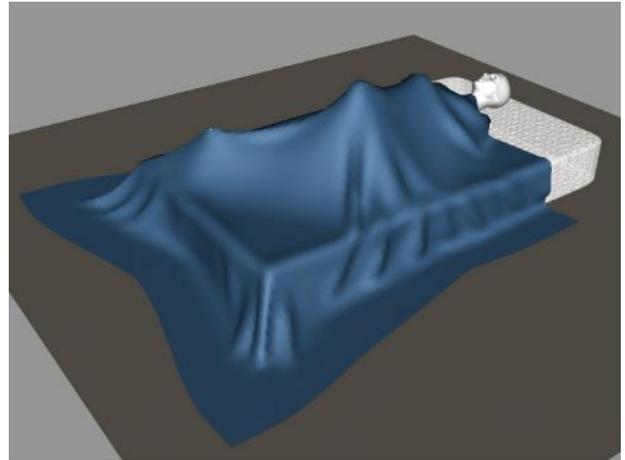
f. Buckling Ratio (98% vs. default of 70%)



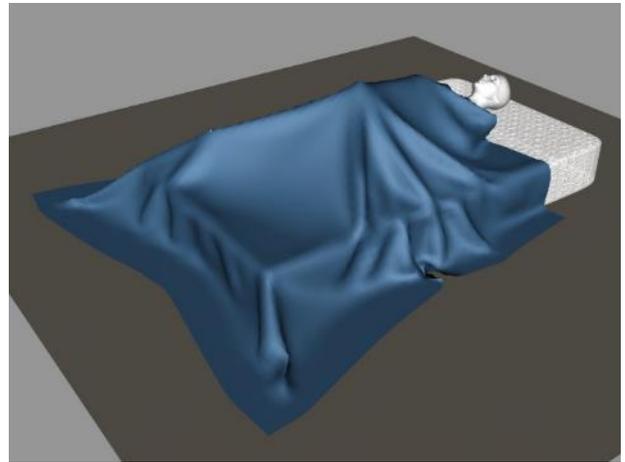
g. Density (80 vs. default of 180)



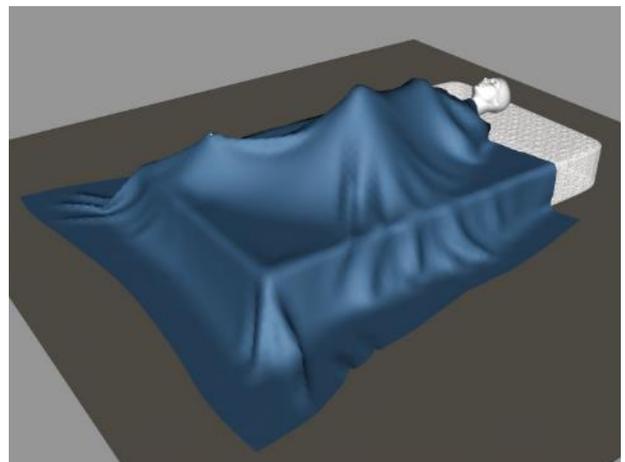
h. Stretch, Shear, and Bend Stiffness at 0.01



i. Buckling Stiffness at 2% and Buckling Ratio at 98%



j. All 6 original scene parameters



k. **Conclusions.** It's easiest to see differences if you go to the discussion thread on Daz Forums and open each image in a separate browser window. You can then flip through them to see what is happening.

- Changing Stretch Stiffness to 0.01 retained basic shape of defaults but gave sharper peaks on folds.
- Changing Shear Stiffness to 0.01 gave more drooping of the fabric and broader peaks on folds.
- Changing Bend Stiffness to 0.01 had a similar effect as Stretch Stiffness except more drooping of the fabric.
- Changing Buckling Stiffness to 2% retained basic shape of defaults and gave a result similar to Bend Stiffness with more drooping of the fabric.
- Changing Buckling Ratio to 98% retained basic shape of defaults and appeared similar to buckling stiffness except laid flatter against floor and mattress.
- Changing Density to 80 meant the fabric did not pull in as tightly and fold peaks were longer.
- Changing both buckling parameters together gave similar shape but fabric was pulled tighter to bed and body and flat areas were hugged tightly.
- Changing Stretch, Shear, and Bend Stiffness together gave much more drooping of the fabric with most folds smoothed and reduced in size.
- The final shape using all 6 settings is most similar to the results of changing stretch, shear, and bend Stiffness together. The buckling parameters then softened the shape.

25. **Effect of Surface Properties Using dForce Primitive Flag Test.** The primitive flag test is a scene in the dForce Starter Essentials, which comes with Daz Studio 4.10. It uses color-coded flags to explain the effect of mesh resolution and a number of surface properties. After you run the simulation, you need to interpret the results yourself using the brief explanation provided in the [dForce – Start Here](#) forum thread. Since it's not easy to see what's going on, I took the liberty of running the simulation and then pulling out various combinations of flags so it's easier to see what's going on.

a. The first thing to look at is the effect of mesh resolution which is the number of polygons in the mesh. The more polygons the more opportunity for the plane to drape in a more complex manner. From the forum post, the flags are color coded to show different mesh resolutions:

- Red = 128 divisions (128 by 128 grid = 16,384 polygons)
- Yellow = 96 divisions (9,216 polygons)
- Cyan = 64 divisions (4,096 polygons)
- Blue = 48 divisions (2,304 polygons)
- Purple = 32 divisions (1,024 polygons)
- Magenta = 16 divisions (256 polygons)

Below are the simulation results at 3 different timeline positions. Frame 120 is just after the flags have become vertical, frame 150 is halfway to the final draping, and frame 180 is at the end of the timeline. I show it this way as it helps see how the various parameters affect draping.

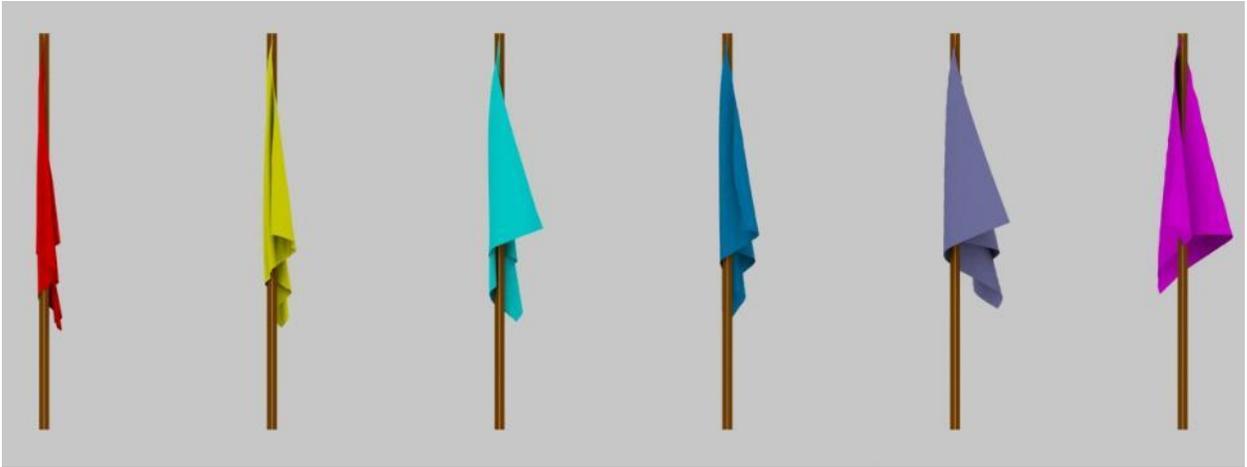
Frame 120:



Frame 150:



Frame 180:



As you can see, the high polygon meshes will drape nearly vertical while the lower resolution meshes look stiffer and have a less compact shape. The former would better represent a silky fabric while the latter might best represent a stiff fabric. Of course, resolution only helps if you are creating a primitive or your own model where you have control over how many polygons are present. If you are using a commercial mesh, you will be stuck unless you have a decimator to reduce the number of polygons. Sub-division adds virtual polygons but they do not have an effect in the dForce simulation; however, they can soften sharp edges that occur during a simulation.

The flags above all have the same dForce surface properties:

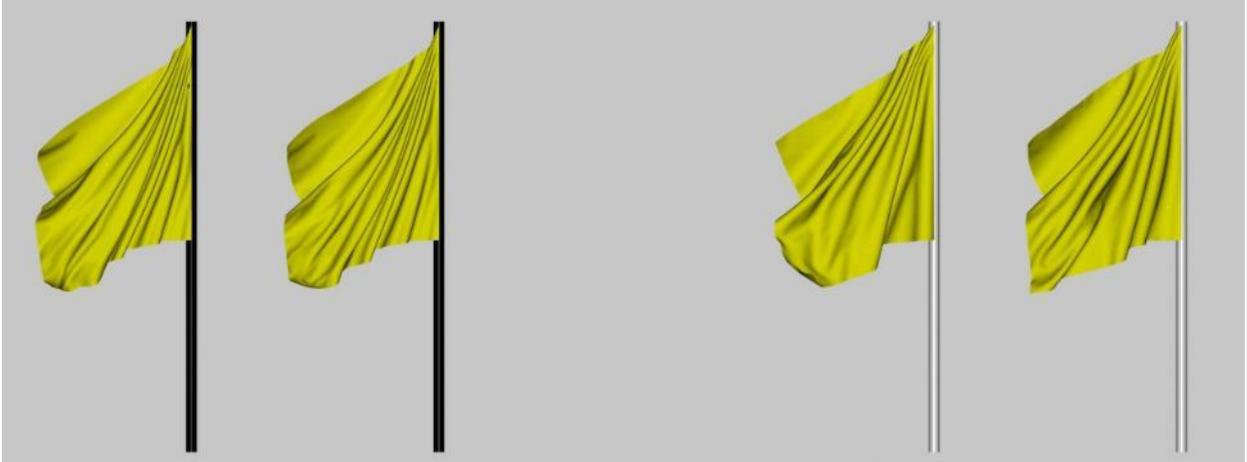
- Bend Stiffness = 1.0 (default = 0.5)
 - Buckling Stiffness = 0.0 (default = 0.05)
 - Buckling Ratio = 0.4 (default = 0.7)
- b. The flag test scene expands upon the 4 resolutions in the middle (yellow, cyan, blue, purple) by testing combinations of Buckling Stiffness and Buckling Ratio. In this next series of photos
- Bend Stiffness is kept constant at 1.0
 - Buckling Stiffness is either 0.02 for the two flags on the left or 1.0 for the two flags on the right
 - Buckling Ratio is 0.95 for the two flags on the outside and 0.05 for the two inner flags

In the images on the following pages, BuS = Buckling Stiffness and BuR = Buckling Ratio

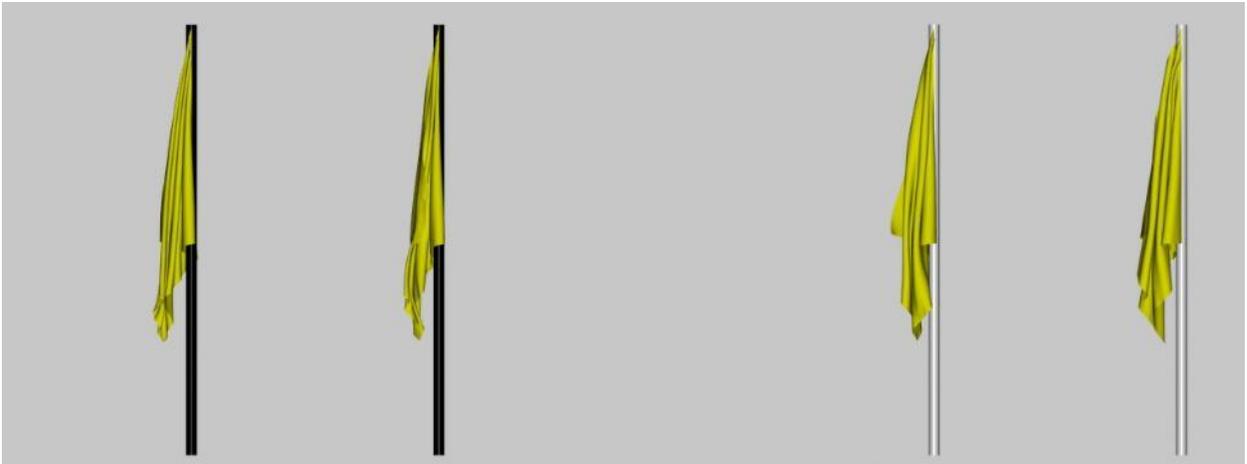
Note: for the next section, I inserted this page break to keep flags of similar resolution on the same page

- c. We'll start with the higher resolution yellow flags (96 divisions).

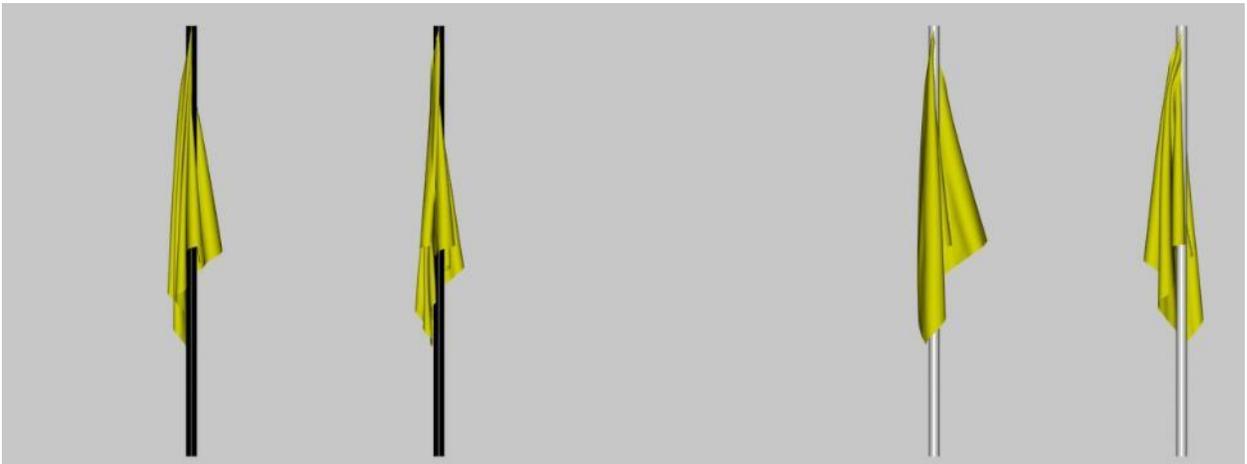
Frame 120:



Frame 150:



Frame 180:



BuS:

0.02

1.0

BuR:

0.95

0.05

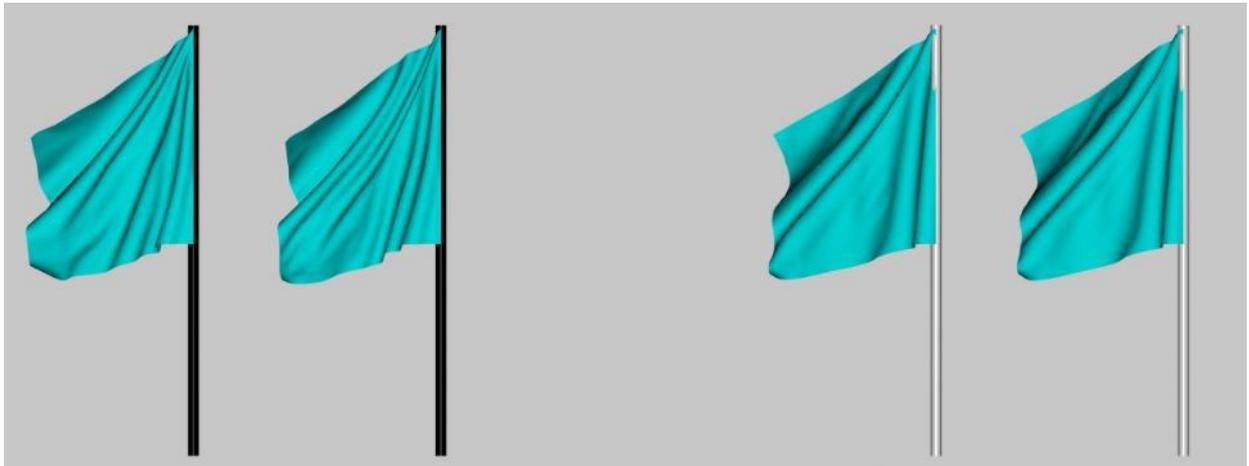
0.05

0.95

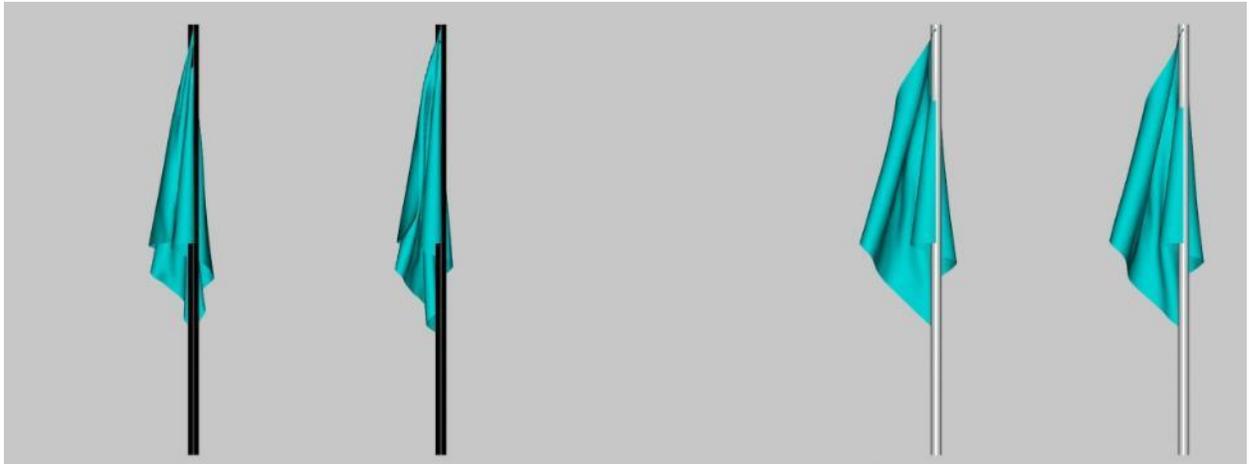
Buckling Stiffness appears to have the bigger effect (left flags vs right flags in frame 150 and 180) with lower values causing draping closer to the pole. Buckling Ratio had a lesser effect.

d. The Cyan flags have 64 divisions.

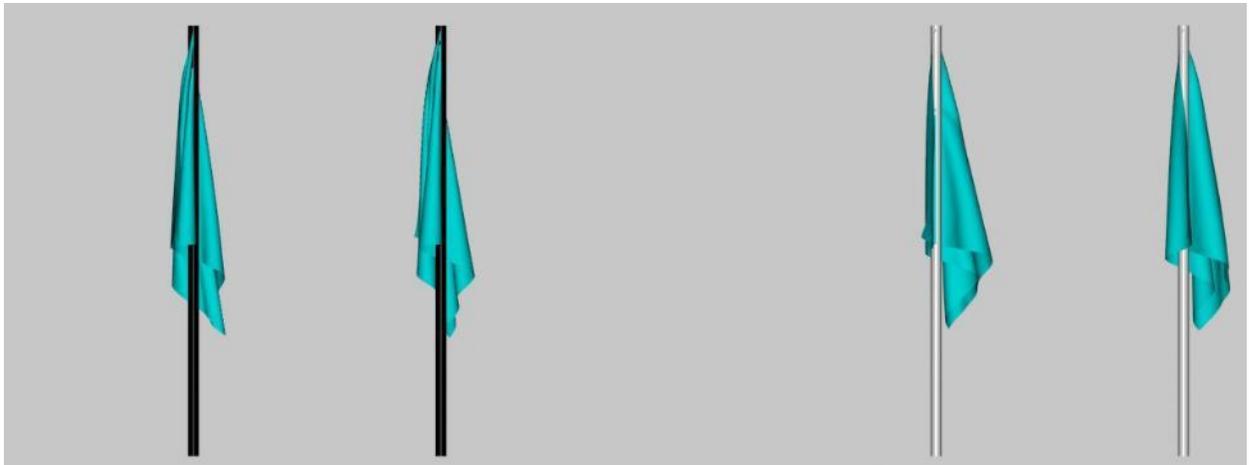
Frame 120:



Frame 150:



Frame 180:



BuS:

0.02

1.0

BuR: 0.95

0.05

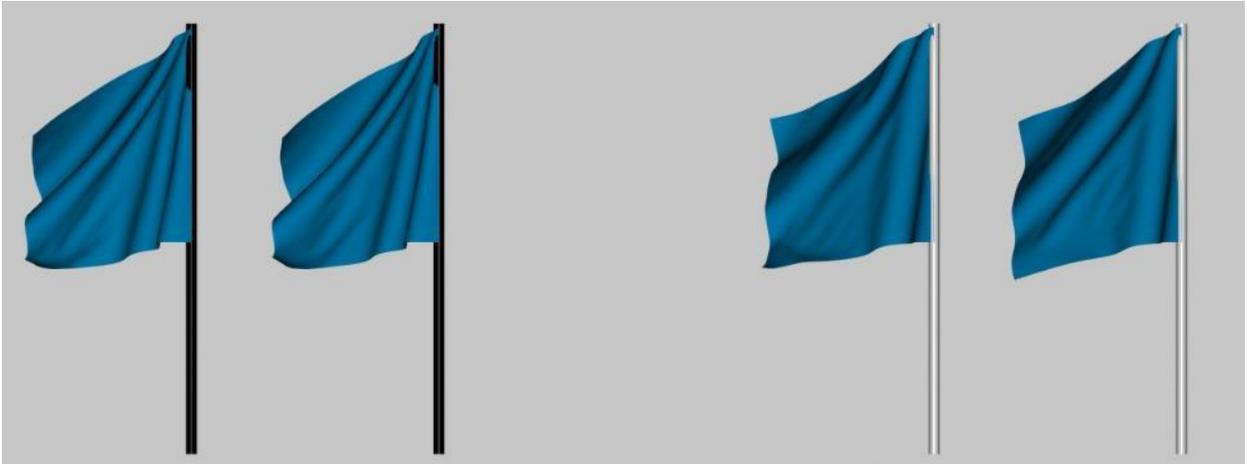
0.05

0.95

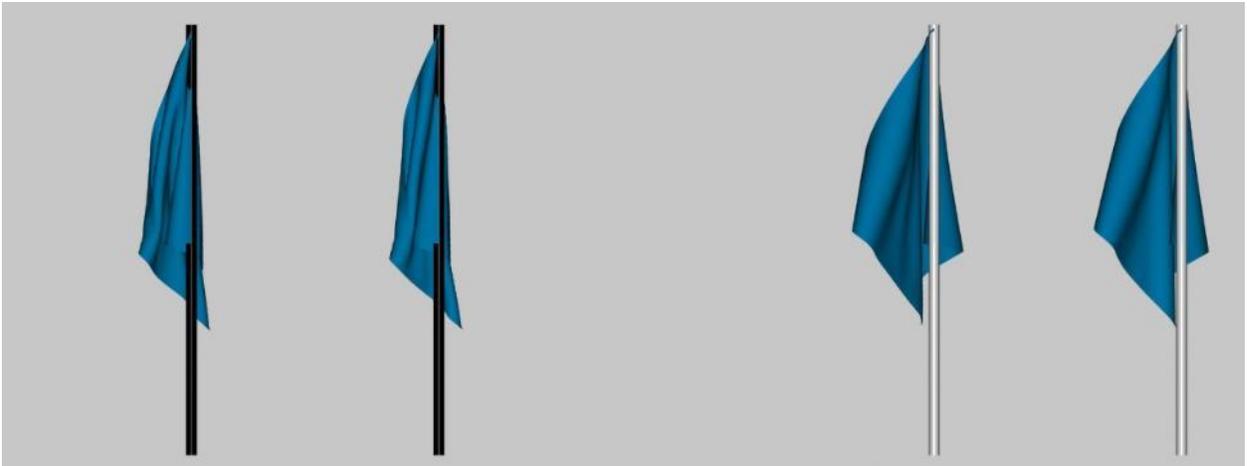
Again, Buckling Stiffness appears to have the bigger effect (left flags vs right flags) and more of an effect than on the higher resolution yellow flags. The higher Buckling Ratio (outside flags) seem to drape better to my eye.

e. Blue flags have 48 divisions (similar to what I used for the banner flag in section 22).

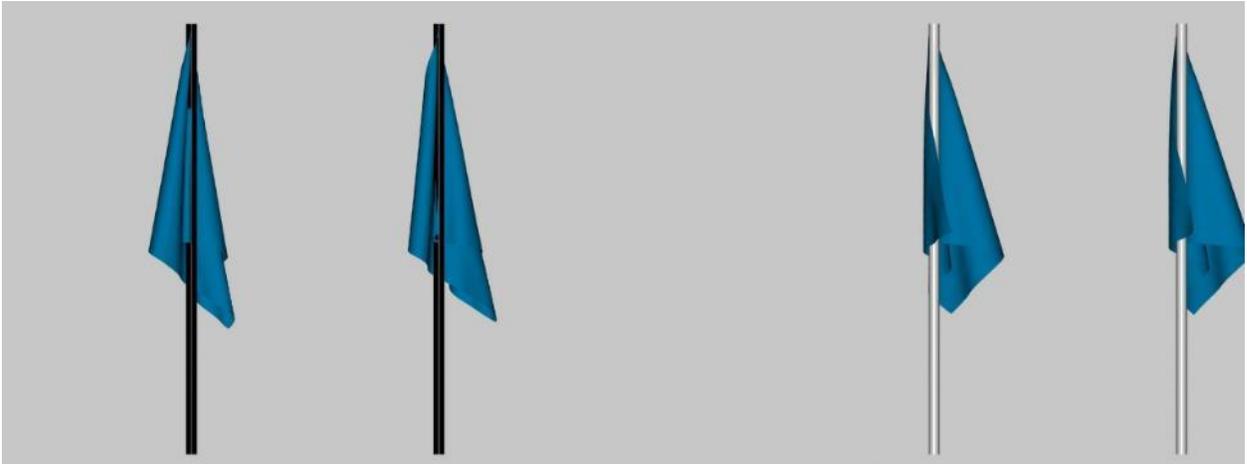
Frame 120:



Frame 150:



Frame 180:



BuS:

0.02

1.0

BuR:

0.95

0.05

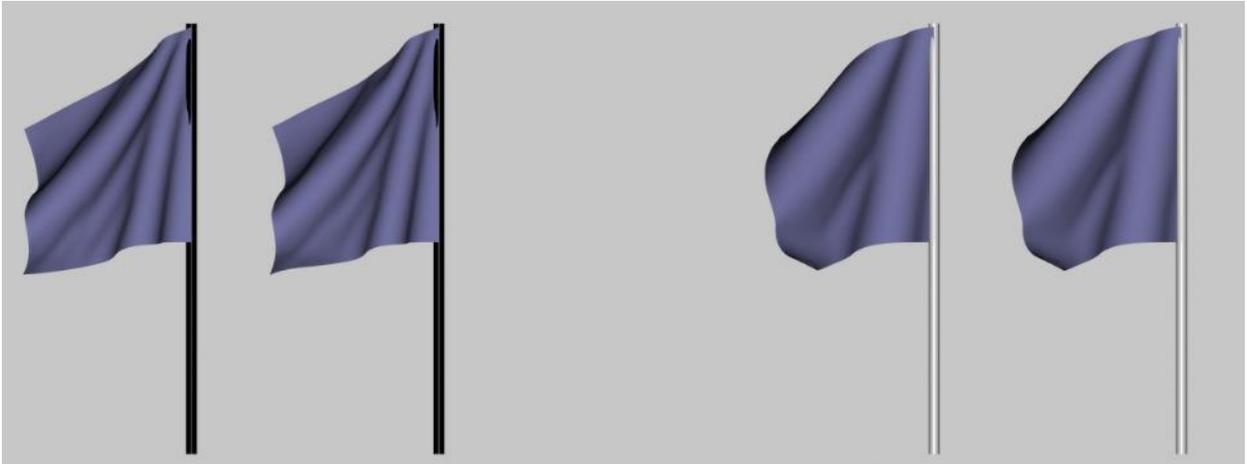
0.05

0.95

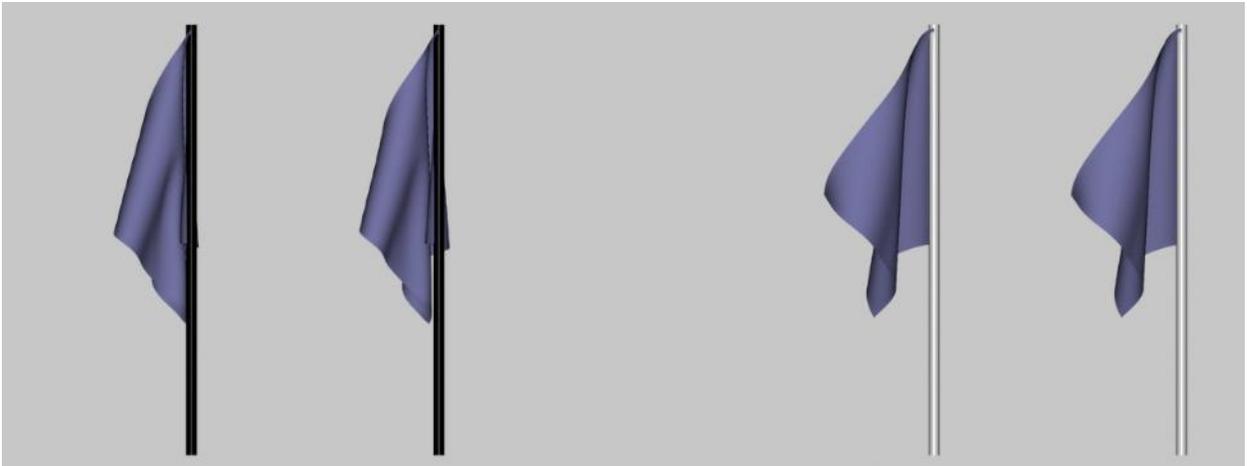
Again, Buckling Stiffness appears to have a bigger effect (left flags vs right flags) than Buckling Ratio.

f. The last series is the purple flags with 32 divisions.

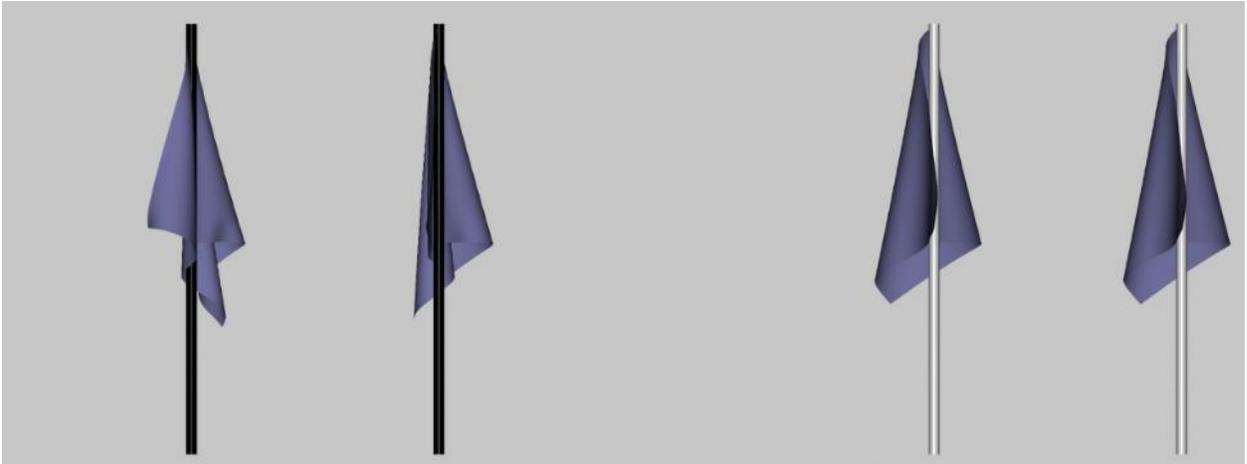
Frame 120:



Frame 150:



Frame 180:



BuS:

0.02

1.0

BuR:

0.95

0.05

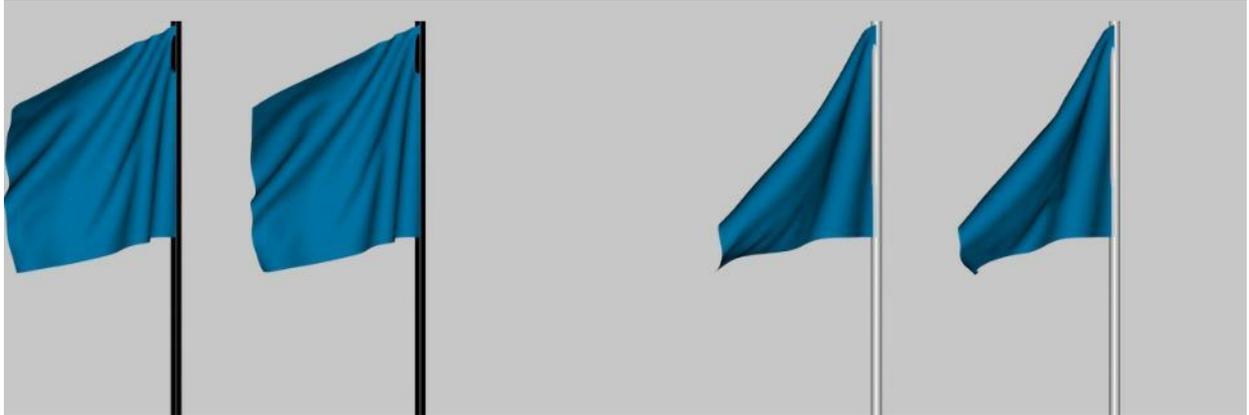
0.05

0.95

High Buckling Stiffness makes for a stiff draping (left vs right in frame 150 and 180). Buckling Ratio had little effect.

- g. There's four extra blue flags that are supposed to show the effect of Density. It actually is multi-variable because low density is combined with low Buckling Strength and vice versa.
- Bend Stiffness is kept constant at 1.0
 - Buckling Stiffness is either 0.02 for the two flags on the left or 1.0 for the two flags on the right
 - Buckling Ratio is 0.95 for the two flags on the outside and 0.05 for the two inner flags
 - Density is 100 for the left flags and 650 for the right flags. As mentioned, Density and Buckling Stiffness vary together (100/0.02 vs. 650/1.0)

Frame 120:



Frame 150:



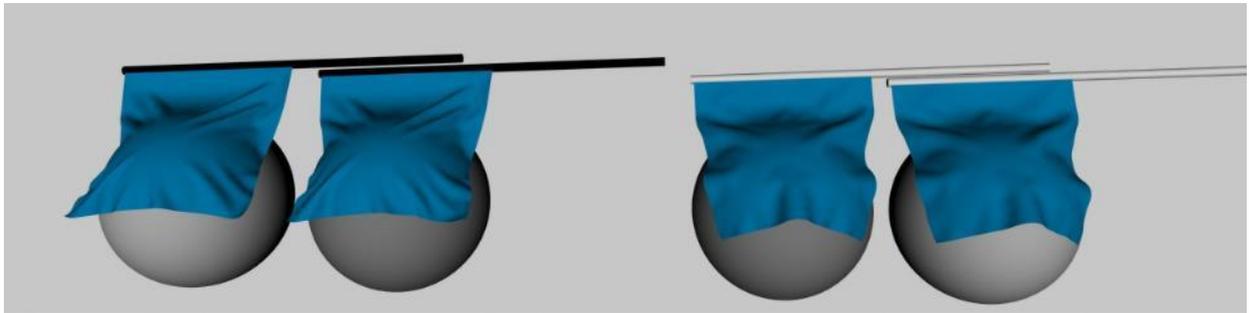
Frame 180:



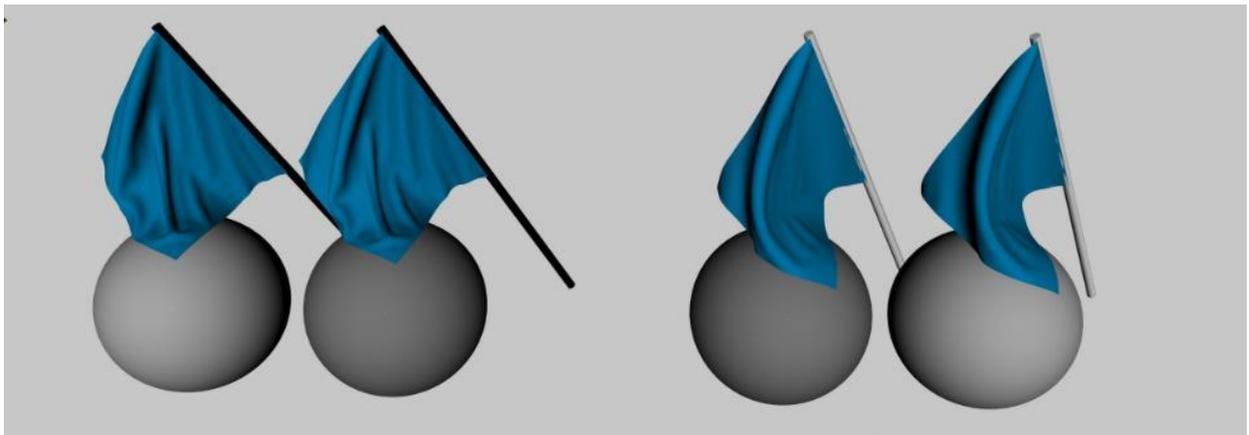
<i>BuS:</i>		<i>0.02</i>			<i>1.0</i>	
<i>BuR:</i>	<i>0.95</i>		<i>0.05</i>		<i>0.05</i>	<i>0.95</i>
<i>Den:</i>		<i>100</i>			<i>650</i>	

The higher density/buckling stiffness flags have stiffer folds and less draping. They also rotated to the left from the right as they finished simulating.

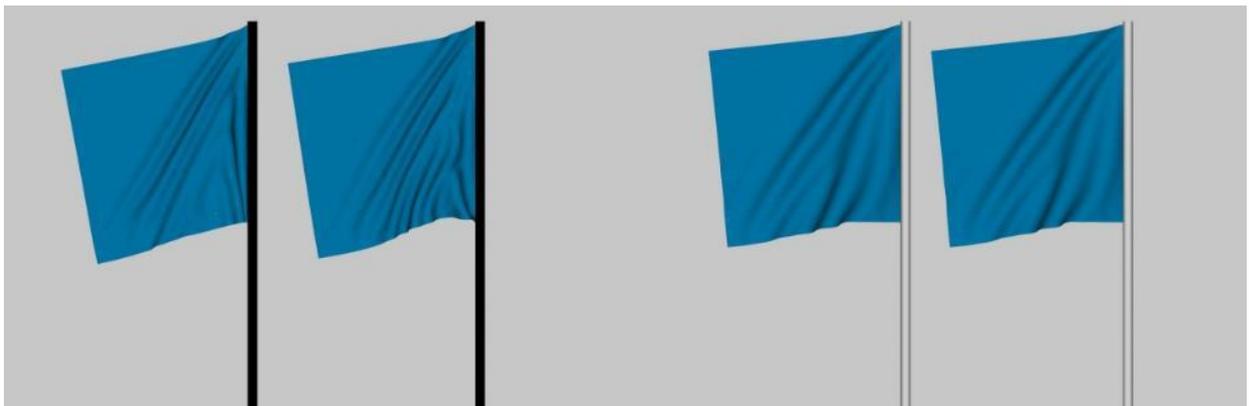
- h. If you load this scene yourself, you'll note that there's a large sphere next to each flag and the flags start in a horizontal position. The flag first drapes over the sphere, then when the flag has mostly wrapped over the sphere...



...the flag pole begins to tip to the vertical. Once the pole is vertical, the animation runs until the flags drape completely vertical as shown in step g, frame 180.



The use of a sphere does make for a good looking flag drape but it's not intuitively obvious why you would simulate something in this fashion. I hid the spheres and ran the simulation and without the spheres, adjacent flags can catch each other and their mesh explodes. I then started with the poles vertical and the end drape is similar to that from using the spheres (frame 180). The biggest differences are in the intermediate stage, where the flags without the sphere have folds in the lower-right half but the fabric is flat in the upper-left half.



You never get a drape that looks like step g, frame 120. By the time the folds appear in the upper-left half, the lower-right has mostly collapsed towards the pole like step g, frame 150.

Is it important if you miss that intermediate stage? Maybe, maybe not. It depends upon what look you are trying to achieve. If you don't get the results you expect with dForce, you may need to get creative and do it as multi-step process (a good example of that is what [Areyana did](#) to simulate a dress on a horse rider, starting with the dress and horse upside down and flipping them over during the simulation).

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