Creating A Flowing Water Effect With A Displacement Map

Written by Shawn Felski

All textures painted by Clara Kopitnik

In this paper, we will be going through the process of attaching an ocean-shader scrolling textures to your objects to give the illusion of rushing water, without utilizing Houdini simulations or high-poly to low-poly baking. This method is particularly useful when trying to save resources on background elements and those that will not be up close to the camera. Followed by how to add a particle effect for added panache.

PREPARATION

Before anything else you should have your object and any other geometry modeled, UV'd, and placed. Once you've done that, it's time to start adding textures.(Your mesh may differ from mine.)



The next step is to prepare your textures, or have a talented texture artist take care of that. They need to be seamlessly scrollable so make sure to line things up properly.



APPLYING THE TEXTURES

Duplicate your geometry twice. You should now have three separate objects of the same shape. You'll want to manipulate their scale and position on the **Y** axis so that they all rest one on top of the other without interpenetrating. Subdivide the lowest one once.



We'll start with the bottom object, so hide the other two for now with CTRL + H

Start by holding down the **right mouse button** and Going down to the option to **Assign New Material**. We're going to use a **blinn** for this example just because it's simple.



In the **Attribute Editor** we're going to click the icon to the right of the **color** attribute, then click the option for **File**.

				- · · ·
List Selected Focus A	ttributes Display Show	Help	Options Help	
blinn7SG blinn7				
blinn7SG blinn7 blinn Sample ▼ Common Material Att Colo Transparenc	: blinn7 e Blinn ¥ tributes	Focus Presets* Show Hide	✓ Favorites Maya Maya Surface Volumetric Displacement 2D Textures Ghy Textures Ghy Grid Ghy Grid Ghy Ghy	
Ambient Colo Incandescence Bump Mappin	e I	÷	Rendering Arnold Shader Texture Cocan Cocan Cocan Cocan Cocan Cocan Cocan Cocan Cocan Cocan Cocan Cocan	
Diffus Translucence	e 0.800 e 0.000	- : :	Light Utility Ramp Simplex Noise	
Translucence Dept	h 0.500	×	Water	
Translucence Focu	s 0.500		Brownian	
 Specular Shading 			Cloud	
Eccentricit	y 0.300		Crater	
Specular Roll Of	ff 0.700		Fluid Texture 3D	
Specular Colo	er 📃 👘		i i i i i i i i i i i i i i i i i i i	
Reflectivit	y 0.500		Leather	
Reflected Colo	r 📕		Mandelbrot 3D	
Special Effects			Marble	
Matte Opacity			Rock	
Raytrace Options			As Snow	
Notes: blinn7			Solid Fractal	
			Stucco	
			🚺 Volume Noise	
			Wood	
			Calenv Ball	
Select	Load Attributes	Copy Tab	Close	

Next, select the texture you want to be applied to your base layer.

From there you're going to select the attribute labeled **Place2dTexture** and type the expression **=time** into the box indicated below.



The next step is to repeat with all of the other layers with their respective textures until they're all scrolling along.



You can then add an effect to the base like an ocean deformer. First, go to the material attributes for the base layer, and select the box next to the attribute labeled **Displacement Map** and select the option labeled **Ocean**.



Next, mess with the attribute for **Scale** until you reach your desired level of distortion, and type the expression **=time** into the box next to the attribute labeled **Time**. Then hit play, sit back, and watch your water flow!



CREATING A WATERY MIST/FOAM EFFECT USING PARTICLE EMITTER

Written by Clara Kopitnik

To create the effect of mist at the bottom of the waterfall and maintain the stylized painterly effect, use a particle emitter with sprites.

PREPARATION

For the sprites, we used several brush strokes with slight variance of t variance on hue and saturation. For this, 2k PNG textures were used. In this case, 9 varieties at different lengths and angles. Find some of the examples below. We'll be saving these out as **transparent PNG files** and placing them into our **sourceimages** folder in our project. We will name these **waterfallFoam.1**, waterfallFoam.2, waterfallFoam.3, etc.



BUILDING THE EMITTER

To add the emitter, open your scene in Maya. We'll be placing the emitter at the base of the waterfall.



Open the **FX** menu set. Click **nParticles > Create Emitter (option box)**. Reset the settings. We'll be changing a few things here.

Under Basic Emitter Attributes, change Emitter Type from Omni to Volume.

Basic Emitter Attributes	
Emitter type:	Volume 🔻
Rate (particles/sec):	100.000
Scale rate by object size: Need parent UV (NURBS):	
Cycle emission:	

Make sure that under Volume Emitter Attributes, the Volume shape is set to Cube.



Click Create.

We'll need to resize the emitter to cover the entirety of the bottom of the waterfall. With **emitter1** in the outliner selected, resize the emitter and move it into place.



ADDING THE SPRITES

Next, we'll be adding the images to our sprites.

In the outliner, select **nParticle1** and open the **Hypershade editor**. Create a new Lambert material in the node menu. With nParticle1 still selected, **right click** the new Lambert node and select **Assign Material to Viewport Selection**.



In the **Hypershade editor**, with the new Lambert material selected, **click the checkerboard option next to Color**. Select **File**. Click on the folder next to Image Name and navigate to your first file for the mist/foam. In the Attribute Editor, check the box labeled Use Image Sequence. Under Interactive Sequence Caching Options, check the box labeled Use Interactive Sequence Caching. Change Sequence Start to 1, and Sequence End to the number of your last image, in this case, 9.



Next, **right click** over **Image Number** and click **Delete Expression. MAKE SURE YOU ARE ON FRAME 1 IN YOUR TIMELINE.** For frame 1, set image number to 1. **Right click** and select **Set Key.** Move forward to frame 2, **right click** and select **Set Key** again. Do this for all images.

File Attributes		
Filter Type	Quadratic 🔻	
	2.000	
Image Name	sourceimages\waterTexture.1.png	ing To
	Reload Edit View	
UV Tiling Mode	Off	>
	✓ Use Image Sequence	ttrib
Image Number	file7_frameExtension.output	ute I
Frame Offset	O Set Key	Edito
Color Space	sF Break Connection	
	Lock Attribute	
	Ignore when Rendering	
 Interactive Sequence C 	aching Options	
	Use Interactive Sequence Caching	
C		

With **nParticle1** selected in the outliner, select **nParticleShape1** in the Attribute Editor. Scroll down to **Shading**. For **Particle Render Type**, change the option from **Particles** to **Sprites**.

Shading		
Particle Render Type	Sprites Depth Sort	
	0.100 Color Accum	
	2 Use Lighting	
Opacity	1.000	

Open the menus labeled **Per Particle (Array) Attributes** and **Add Dynamic Attributes**.

 Per Particle (Array) 	Attributes		
Positi			
Ramp Positi			
Ramp Velo			
Ramp Accelerati			
Lifespan			
World Velo			
Add Dynamic Attri	butes		
General	Opacity	Color	

Select **General** under **Add Dynamic Attributes**. Open the tab that says **Particle**. We're going to add some of these attributes. Add the following Attributes:

spriteNumPP	spriteScaleXPP	spriteScaleYPP
spriteTwistPP		

If done correctly, these attributes will appear under **Per Particle (Array) Attributes**.

Madd Attribute: nPar	ticleShape1	×
Help		
New Particle Cont parentU parentU pointFieldScalePP pointSize radius0 radius1 radius1 radius1 rotaiunPP rotationDampPP rotationFiritionPP seletedOnly		Â
spriteNum		
spriteScaleX spriteScaleYP spriteScaleYPP spriteScaleYPP spriteTwistP strickinessScalePP surfaceShading surfaceEnsionScalePP tailFade tailSize threshold traceDepthPP useEighting useEiScalar1PP userScalar2PP userScalar3PP userScalar4PP		
ОК	Add	Close

In Per Particle (Array) Attributes, **right click Sprite Num PP.** The following menu will appear.

M Expression Ed	itor			_		×
Select Filter Object F	ilter Attribute Filter	Insert Functions H	elp			
Expression Name						
 Selection 						
Objects		Attribut	es 			
nParticleShape1		spriteN	umPP		_	
		spriteSi spriteTi	aleYPP vistPP			Į.
Selected Object	and Attribute: nParticle	Shape1.spriteNumPP				
D						
			None		Angul	ar only
	Particle: 🔵 Runt		Runtime after o		• Creatio	on
E						
Expression:						
Ī						
Create						

Under **Expression**, type the following:

nParticleShape1.spriteNumPP = rand(1,9);

M Expression Editor					_	E]	Х
select Filter Object Filter Attri	bute Filter	Insert Fur	nctions H	lelp				
		Creating Pa						
Objects				es				
nParticle1			lifespar	ъPP				
nParticleShape1			spriteN	umPP raleXPP				
			spriteSo	aleYPP				
			spriteTy	wistPP				
Selected Object and Attribu	te: nParti	rleShane1 cr	riteNumPD					
	co marci	ciconape nop	incertainin					
				None				
Partic	ile: 🔍 Ru	ntime before	dynamics	Runtii	ne after dynamics	•		
Expression:								

This will cause the emitter to randomly cycle through each of the 9 images. If you do not have 9 images, replace 9 with the number of images you want the emitter to cycle through. Click **Create.**

By this point, playing the sequence should allow your images to appear as sprites.



ADJUSTING THE SPRITE BEHAVIOR

Now, we're going to adjust how our sprites behave. A lot of this section is up to your preference, but this document will go through the adjustments made to achieve the effect shown here.

With **nParticle1** selected, open the tab **nParticleShape1** in the **Attribute Editor**. Open the tab labeled **Lifespan**. Change the **Lifespan Mode** option from **Lives Forever** to **Random Range**. Change the **Lifespan** to **0.800**.

 Lifespan 		
Lifespan Mode	Random range	
Lifespan	0.800	
Lifespan Random	0.000	
General Seed	0	

Open the tab labeled **Dynamic Properties.** Make sure that **Forces In World** is checked. Change **Local Force** to **3.00**, **6.00**, **3.00**. Change **Dynamics Weight** to **0.800**.

 Dynamic Properties 				
	Forces la lgnore S			
Local Force	3.000	6.000	0.000	
Local Wind	0.000	0.000	0.000	
Dynamics Weight	0.800	I		
Conserve	1.000	<u> </u>		
Drag	0.010			
Damp	0.000	8		
Mass	1.000			

Open the tab labeled **Shading.** Change the **Opacity** to **0.600**.

 Shading 		
Particle Render Type	Sprites Depth Sort	
Threshold	0.100	
	2	
	2	
	Use Lighting	-
Opacity	0.600	

Open the tab labeled Sprite Attributes. Change Sprite Scale X and Sprite Scale Y to 5.00.

If all the steps above have been followed, your effect should appear like this:



Finished Example:

https://drive.google.com/file/d/1DQnK_GDHJNGhQTCMWAPz08OoM0Q3uwTR/view?usp=shar ing

Resources

https://learn.foundry.com/modo/902/content/help/pages/shading_lighting/blob.html

https://download.autodesk.com/global/docs/maya2014/en_us/index.html?url=files/Surface_Relie f__Displacement_maps.htm,topicNumber=d30e632545

https://download.autodesk.com/global/docs/maya2014/en_us/index.html?url=files/Surface_Relie f__Connect_a_texture_as_a_displacement_map.htm.topicNumber=d30e632762

http://forums.cgsociety.org/t/instanced-particles-with-displacement-maps/1258821/4

https://forums.autodesk.com/t5/maya-shading-lighting-and/need-help-with-displacement-maps-o n-instanced-particle-objects/td-p/8534264

https://www.youtube.com/watch?v=iD5keuS9BZU

https://www.youtube.com/watch?v=Vrk8pOK02II

https://www.youtube.com/watch?v=BBBaWGfaEQQ

https://www.youtube.com/watch?v=bPoHHRSN61U

https://www.youtube.com/watch?v=UJo9bghTcWk

https://www.youtube.com/watch?v=ZuyA44hfGak

https://www.youtube.com/watch?v=1TdSFBhxxqo

https://knowledge.autodesk.com/support/maya/learn-explore/caas/CloudHelp/cloudhelp/2020/E NU/Maya-LightingShading/files/GUID-E7A03E4E-8C9A-4B62-8218-28FC063A82AB-htm.html#: <u>~:text=Displacement%20maps%20are%20grayscale%20textures,on%20an%20otherwise%20flat%20object.&text=By%20default%2C%20Maya%20uses%20Feature,add%20more%20triangles%20where%20required.</u>

https://www.youtube.com/watch?v=mogrqZ_DfAw

https://www.youtube.com/watch?v=FM-XUP_4WAE

https://www.youtube.com/watch?v=Yx23PPxEQmM

https://knowledge.autodesk.com/support/maya/learn-explore/caas/CloudHelp/cloudhelp/2019/E NU/Maya-Rendering/files/GUID-45376A98-6E91-4AE0-92E7-B83FDA9BC1E3-htm.html

https://www.youtube.com/watch?v=C3Xuap8r5JE

https://answers.arnoldrenderer.com/questions/822/is-there-a-way-to-baked-selected-geometry-f or-mult.html