

Wine Carafe and Glasses

In this tutorial, you will use Raytrace materials, Raytrace maps, and Thin Wall Refraction maps, combined with Opacity maps, to create a decorative wine carafe and glasses on a living room table.

Raytracing is a technique for generating highlights, reflections, and shadows by tracing the path of rays sampled from a light source. Raytraced renderings are more accurate and look more photorealistic than other rendering methods, but generally prolong rendering times. The Raytrace Material and Map features in 3DS MAX R2 permit selective raytracing. For example, you can limit the raytrace to specific objects, sub-objects, or sub-object selections. Furthermore, you can control which objects are reflected and refracted, and how they are reflected and refracted.

This tutorial file is large because it is part of a case study on creating a complex scene from start to finish. You should set your swap file to at least 200 MB.

Please note that the combined raytraced transparency maps and materials on glass objects in this scene can result in substantial render times. To reduce this time, you will prepare and selectively render objects or groups of objects, and make use of the Local Include choices on the Raytrace material Raytracer Parameters rollout.



Setup

Reset 3DS MAX and open \Scenes\ol_ca01.max.

Lessons

Lesson 1: Setting Up the Scene

Lesson 2: Applying Raytrace Materials to the Wine Carafe

Lesson 3: Applying Materials to the Carafe Plate

Lesson 4: Applying Materials to the Wine Glasses

Lesson 5: Viewing your Results

Lesson 1: Setting Up the Scene

In this lesson, you will change the background for the scene. Then you will create and modify a material for the rug.

Lesson Tasks

Assign a New Background

Create a Material for the Rug

Tone Down the Color of the Rug

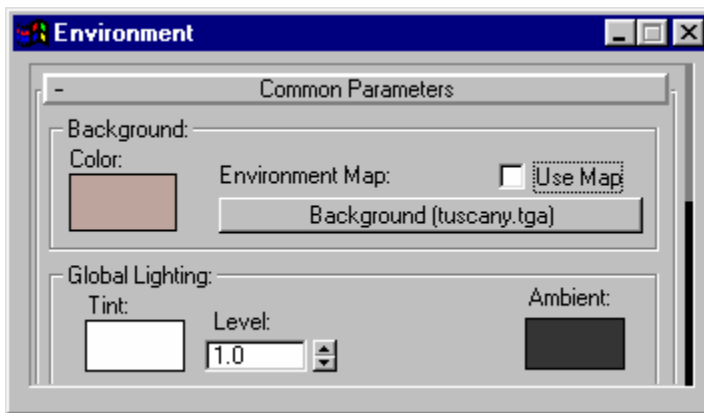
Assign a New Background

The current background graphic (Environment map) for the scene is **tuscany.tga**, an outdoor scene that is viewable only by looking out the window or the open door. However from our current camera angle, the only visible background is the room, which is made up mostly of painted walls.

The Raytrace Material/Map settings use the background settings when calculating the raytrace reflections. This would result in **tuscany.tga** being reflected off the carafe, even though the predominant visible background sources are the painted walls.

In the following steps, you will assign a color for the background, instead of the bitmap graphic.

- 1 On the Rendering menu, choose Environment and clear Use Map.
- 2 Open the Material Editor and select the Walls material (slot four).
- 3 On the Basic Parameters rollout, drag the Diffuse color swatch to the Background Color swatch on the Environment dialog. Select Copy on the dialog.



Create a Material for the Rug

In this task, you will create and assign a material for the rug.

- 1 On the toolbar, click Select by Name and select the Rug object. Open the Material Editor, select an empty sample slot, and label it **Rug**. Then open the Maps rollout.

Note: As a shortcut, you can press H to open the Select Object dialog. For the remainder of this tutorial when you are asked to “select” an object in the scene, you can use any of the 3DS MAX selection methods unless otherwise instructed.

- 2 On the Utilities panel, click Asset Manager.

The Asset Manager utility lets you view thumbnail displays of bitmap files on your hard disk, and then view them or drag and drop them to valid Map buttons or sample slots on the Material Editor. Also, you can double-click the thumbnail to render an image.

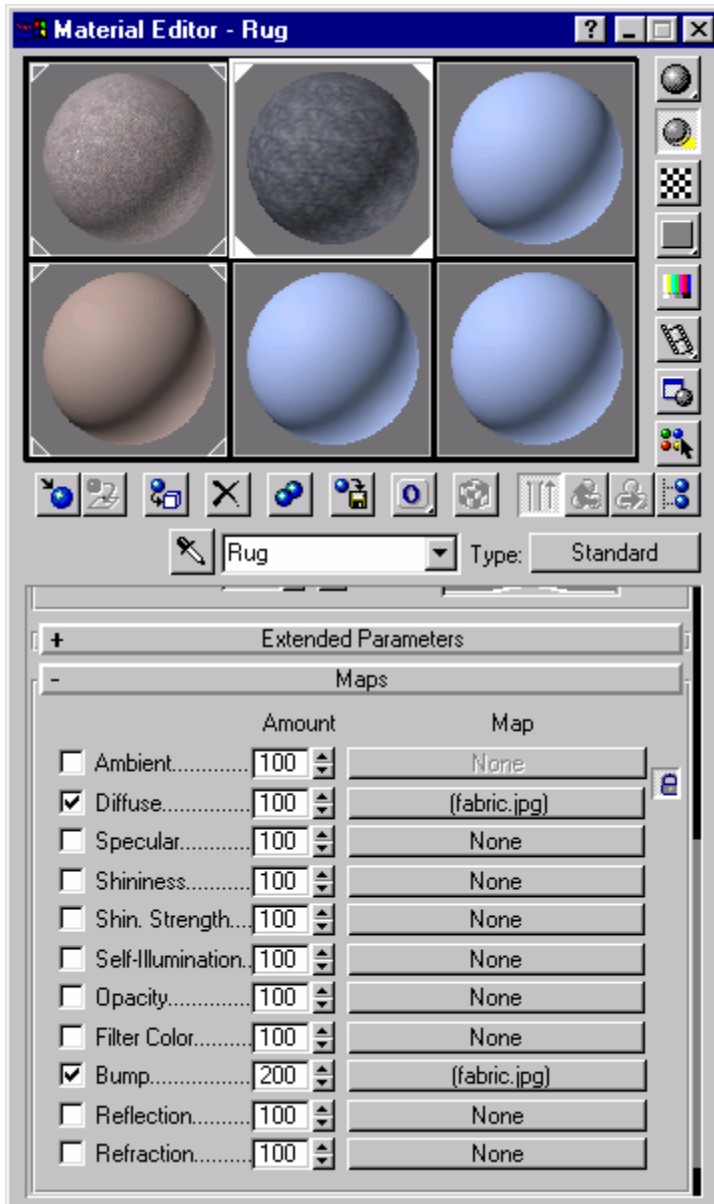
- 3 Drag **frabic.jpg** from the Asset Manager to the Diffuse Map button on the Maps rollout, and then click the button.

Frabic.jpg is an all-purpose texture map that might be used for drapery, upholstery, clothing, etc. However, it requires some modification, such as adjustments to tiling, adding noise, and adjusting color levels, to make it uniquely appear to be an area rug.

- 4 On the Coordinates rollout, set U Tiling = **8.0** and V Tiling = **8.0**. Set Blur Offset = **0.1**.
- 5 Open the Noise rollout and select On, set Amount = **15.0**, set Levels = **6**, and set Size = **3.0**.
- 6 Open the Output rollout and set RGB Level = **0.9** and Bump Amount = **2.0**.
- 7 On the Material Editor toolbar, click Go to Parent.

Note: In the remainder of this tutorial, when you are asked to return to a specific material level, for example “Return to the Raytrace material level,” this instruction implies clicking Go to Parent until you reach that material level.

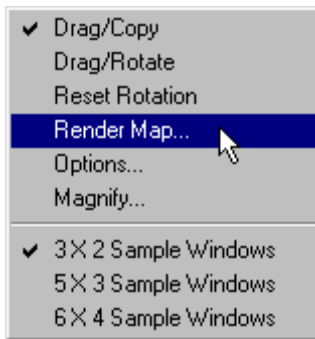
- 8 Drag the Diffuse Map to the Bump Map button and select Instance on the dialog. Set Bump Amount = **200**.
- 9 With the Rug object still selected, click Assign Material to Selection.



Tone Down the Color of the Rug

The rug pattern is too powerful for the delicate glass objects, which are the subject of the scene. In this task you will tone down the color of the rug. One way to do this might be to lower the Diffuse Amount setting to 50. However if you do this, the blue rug colors will mix with the default Diffuse color (gray), changing the rug color. A better way is to use a color from the bitmap material itself and assign it as the Diffuse color.

- 1 Click the Diffuse Map button for the rug. Right-click the Rug material slot and choose Render Map, and then click Render.



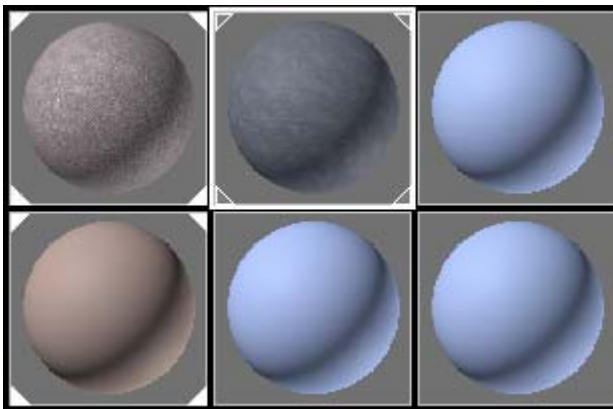
Note: The Render Map command is only available when you are at the Map level of a material.

- 2 CTRL+Click (about five times) in the rendering window to magnify the result until individual color pixels are clearly visible.
- 3 Find a light color, and then right-click on it.

An eyedropper appears and the selected color displays in the color swatch at the top-right of the rendering window. Notice that you can drag the dropper around the image and see the changes in color values.

- 4 Return to the Standard material level. Drag the color swatch from the rendering window to the Diffuse color swatch on the Basic Parameters rollout. Select Copy on the dialog.
- 5 On the Maps rollout, set Diffuse Amount = **50**.

The material is now a blend of the color taken from the bitmap. Even though you assigned the material to the scene earlier, any changes you make using the Material Editor are immediately reflected in the scene.



Lesson 2: Applying Raytrace Materials to the Wine Carafe

A Raytrace material is an advanced surface shading material. It supports the same kind of diffuse surface shading that Standard material do, and offers the added benefit of full raytrace reflections and refractions. Furthermore, Raytrace materials support fog, color density, translucency, and fluorescence, as well as other special effects.

A Thin Wall Refraction map lets you simulate the "jog," or offset effect, you find when you view part of an image through a plate of glass. For objects that model glass, such as the wine carafe in this scene, this map is faster, uses less memory, and provides a much better visual effect than a Reflect/Refract map.

In this lesson, you will use both of these new materials and assign them to various parts of the wine carafe.

Lesson Tasks

Create Materials for the Carafe Center and Top

Create Materials for the Carafe Body

Create Materials for the Carafe Center and Top

The wine carafe has 3 glass objects: a center, top, and body. The center and top objects have no cut glass. The body object has a grapevine pattern. In this task, you will create a Standard material for the top and center objects to speed rendering.

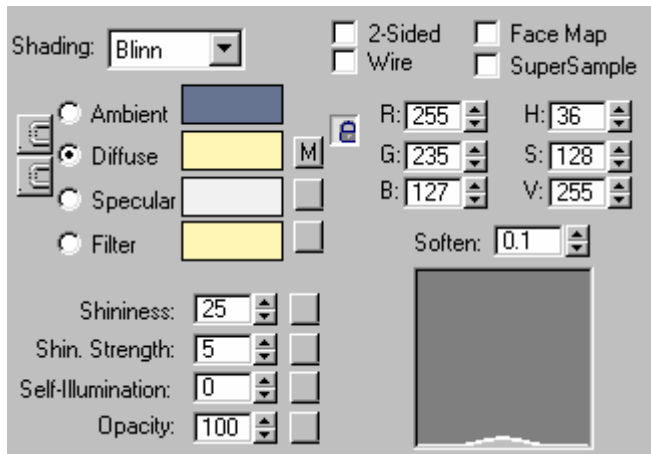
- 1 Open the [Wine Carafe] group.

The wine carafe is a Group and must be opened before you can access the wine carafe parts. Grouping is a way of aggregating objects, and can best be described as a feature somewhere between linkage and geometric attachment. Groups have the advantage of allowing many objects to be manipulated as a unit, while keeping individual parts readily accessible for editing, mapping, and assigning materials. Groups are listed as [group name] in the Select Objects dialogue. You open a group using the Open command on the Group menu, after which both the group and its parts may be selected by name in the Select Objects dialogue.

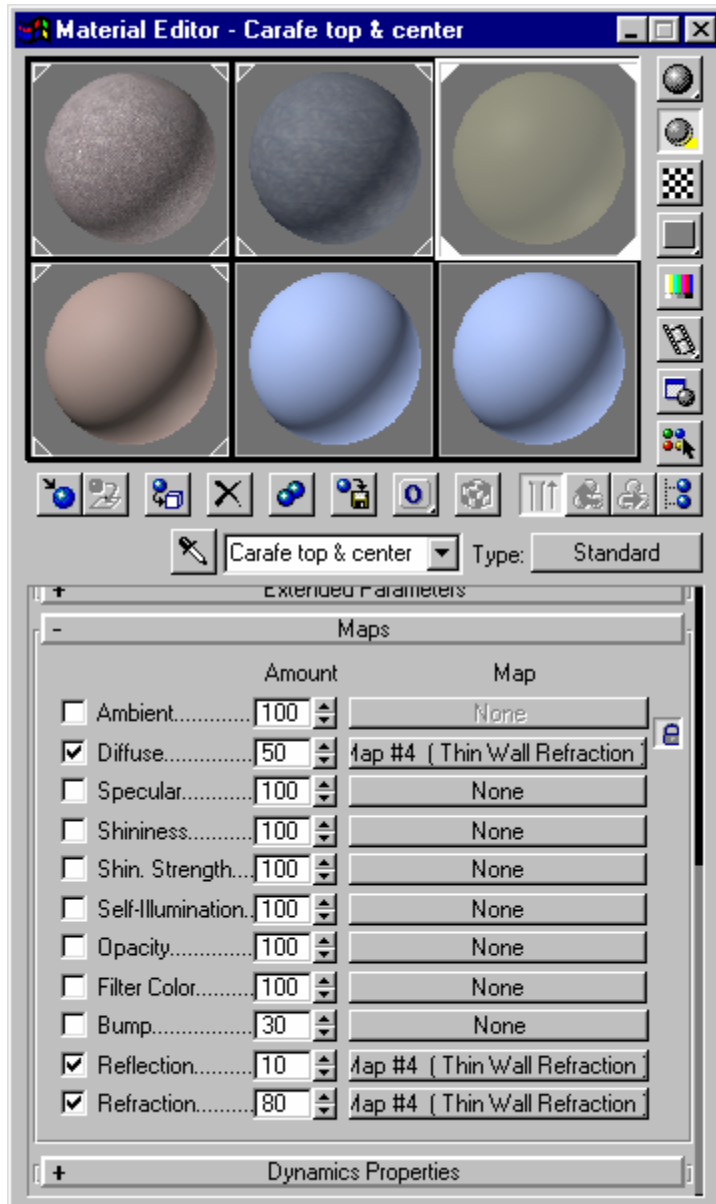
- 2 Select the carafe top and carafe center objects.
- 3 Select an available slot on the Material Editor and label it **Carafe top & center**.

Because the carafe center is visible only through the carafe body, and there is no internal lighting, the goal is to keep the body transparent, refractive and visible, and also to minimize the rendering time attributable to the top and center objects.

- 4 Create a pale yellow color in the Diffuse color swatch (H = **36**, S = **128**, V = **255**). Then drag the Diffuse color to the Filter color swatch, and select Copy on the dialog.



- 5 Click the Diffuse Map button and select Thin Wall Refraction. Select Instance on the dialog. Then drag the Diffuse map to the Reflection and Refraction Map buttons, and select Instance both times. Finally, set Diffuse Amount = **50**, Reflection Amount = **10**, and Refraction Amount = **80**.
- 6 With the carafe top and carafe center objects selected, click Assign Material to Selection.

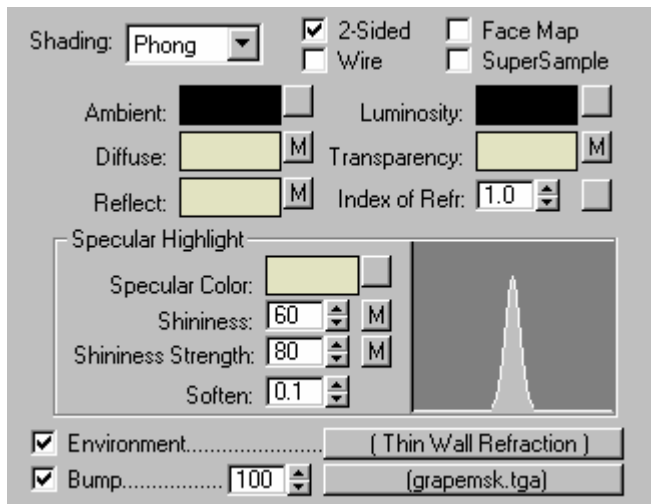


Create Materials for the Carafe Body

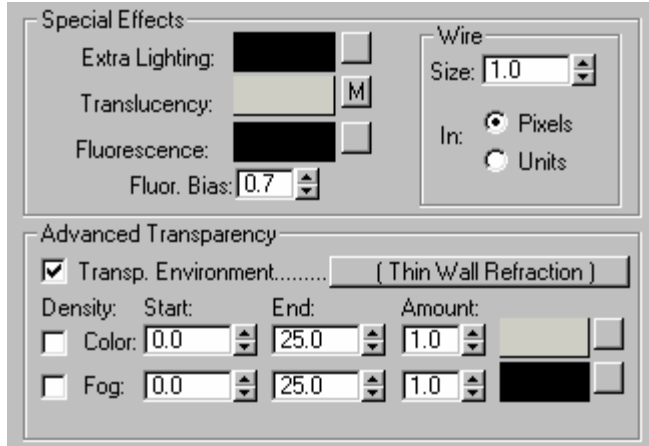
- 1 Select the carafe body object.
- 2 Select an available sample slot in the Material Editor, label it **Carafe body**, and assign a Raytrace material type.
- 3 On the Basic Parameters rollout, select 2-Sided.
- 4 Set the Diffuse color swatch to H = **43**, S = **69**, V = **203**. Drag the Diffuse color to the Transparency, Reflect, and Specular Color swatches, and select Copy on the dialog each time.

The Diffuse color is what the object reflects without specular reflection. Reflection and Transparency effects are layered on top of the Diffuse color. The Reflect color is the specular reflection color, i.e. the color that the rest of the scene is filtered through. The Default is Black, having no reflection. Luminosity is similar to the standard material's self-illumination component, except it allows the color to be other than the diffuse color. The Transparency color is similar to the Standard material's combined filter color and opacity controls, with black being opaque, white fully transparent, and any other color filtering the color of any object behind the raytraced object.

- 5 Set Shininess = **60**, and Shin Strength = **80**.
- 6 Select Environment and assign a Thin Wall Refraction map. Return to the Raytrace material level.
- 7 Set Bump = **100**, and drag **grapemsk.tga** from the Asset Manager to the Bump button.



- 8 Open the Extended Parameters rollout, click the Translucency color swatch, and then choose a neutral tint (H = **43**, S = **24**, V = **168**).
- 9 Drag the Translucency color to the Transp Environment/Density/Color swatch under Advanced Transparency.
- 10 Select Transp Environment, click the button to the right, and assign a Thin Wall Refraction type map. Return to the parent level.



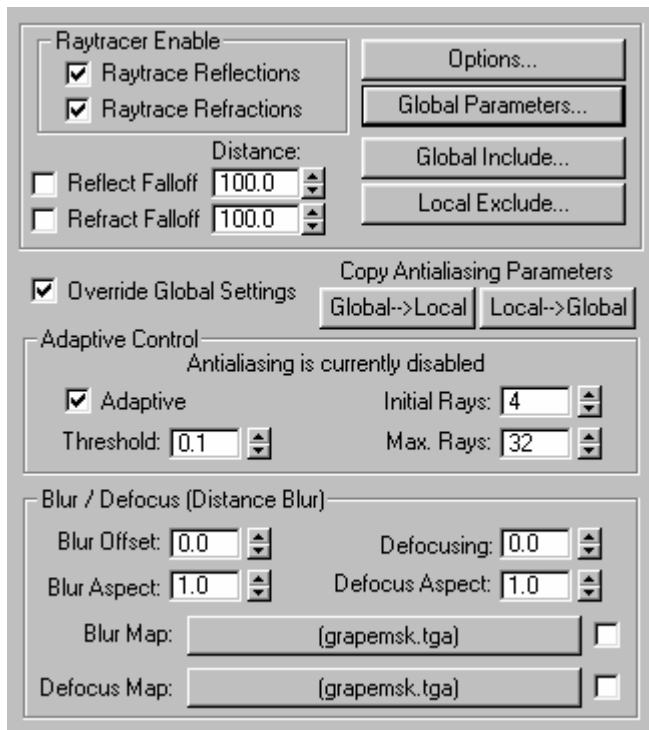
11 Open the Raytracer Controls rollout, click Options, and then clear Global Antialiasing and Global Color Density/Fog.

12 Click Global Parameters and select Adaptive. Leave Manual Acceleration cleared.

The Raytracer uses two acceleration techniques, a single pipe for typical scenes (less than 300 objects) and a dual pipe for complex scenes. By default, acceleration is automatic; the Raytracer switches between single pipe and dual pipe as the scene requires. When you select Manual Acceleration, you override automatic acceleration and can specify the acceleration method to use. Manual acceleration is useful to optimize the process where the scene has many objects of disparate sizes.

13 Select Override Global Settings and select Adaptive.

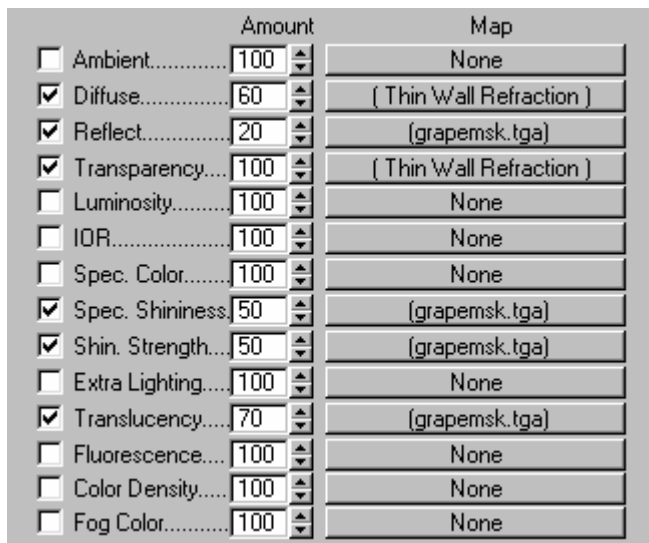
14 Drag **grapemsk.tga** from the Asset Manager to the Blur Map and Defocus Map buttons.



15 Open the Maps rollout and set Diffuse Amount = **60** and assign a Thin Wall Refraction map. Return to the Raytrace material level.

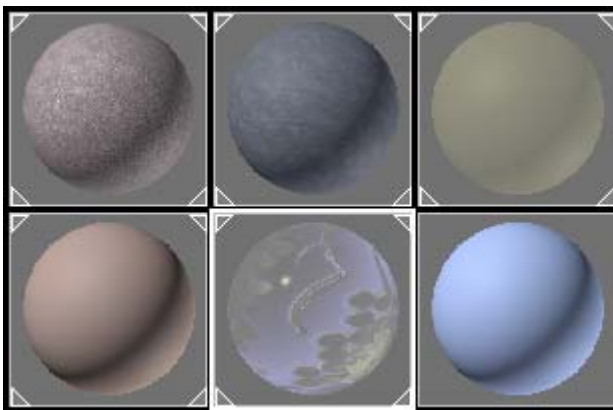
- 16 Drag the Diffuse Map to the Transparency Map button, and select Instance on the dialog.
- 17 Set Reflect Amount = **20**, and drag **grapemsk.tga** from the Asset Manager to the Reflect Map button.
- 18 Drag the Reflect Map to the Spec Shininess (= **50**), Shin Strength (= **50**), and Translucency (= **70**) Map buttons.

The Raytrace material Maps rollout differs that in the Standard material Maps section by adding Transparency, Luminosity, Extra Lighting, Translucency, Florescence, Color Density, and Fog Map buttons. The material for the carafe body has only 3 components: a Thin Wall Refraction Map to refract the image of the object behind the carafe, the grape vine mask bitmap to create a patterned bump and highlight, and a color tint to prevent the transparent areas of the body from disappearing against the background. The Thin Wall Refraction map is blended with the glass color. The grape mask is used to pick up reflections and highlights, and to vary the translucency of the object. The result is a combination and variations will effect the prominence of the grape pattern and the transparent quality of the carafe.



For additional practice, save this tutorial file with a different name. Then turn off/on combinations of these maps, vary their amount settings, and observe the results in the Material Editor.

- 19 Click Assign Material to Selection.



Note: Applying Raytrace Materials or Maps is independent of setting Raytrace shadows in the scene. Raytrace shadow parameters are set for individual scene lights under

Modify/Shadow Parameters. This scene has two Spot and two Omni lights, each set to cast shadows using global shadow maps, and with Ray-Traced Shadows turned on.

Lesson 3: Applying Materials to the Carafe Plate

The plate material consists of two bitmaps that were composited using two separate UVW maps. The capability to use multiple UVW maps lets you scale, align, adjust, and composite multiple maps directly on objects without having to create final composites in a third-party image editor. Also, you don't have to create final composites with the Material Editor using a Composite map, or rendering the image in layers and compositing them in Video Post. A multi-layered 2D graphic may look good in a 2D display, or even in a Material Editor sample slot, but they can appear artificial when assigned to the object. By using multiple mapping coordinates you can adjust for these artifacts.

Lesson Tasks

Apply Multiple UVW Map Modifiers

Create the Back Material

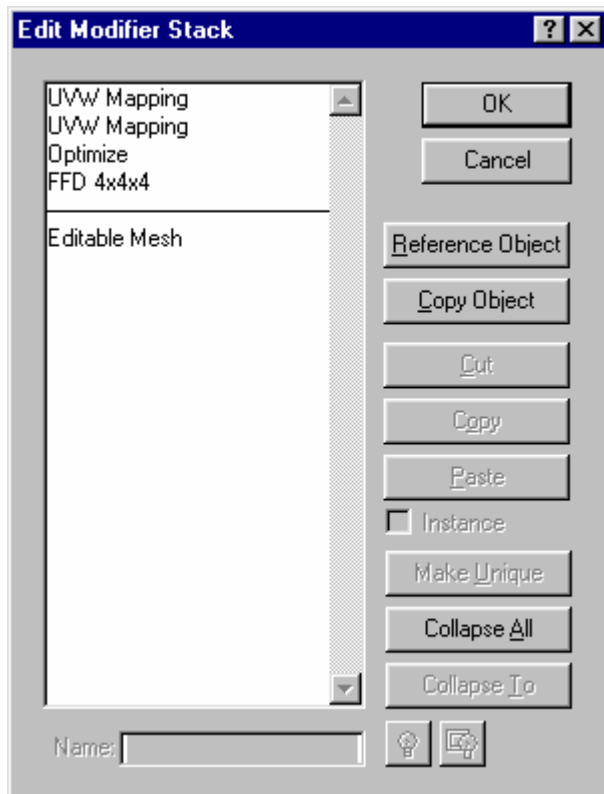
Create the Facing Material

Apply Multiple UVW Map Modifiers

UVW Map modifiers let you apply and edit mapping coordinates. One reason to apply a UVW Map modifier is to gain greater control over how the mapping coordinates relate to the object. If you apply a UVW Map modifier to an object with built-in mapping coordinates, the applied coordinates take precedence. If you try to render a mapped object that has neither mapping coordinates nor a UVW Map modifier, you see a Missing Texture Coordinates alert.

Each object can have two UVW mapping coordinate channels. In this task, you will apply two UVW Map modifiers to the plate, one for channel 1 and one for channel 2.

- 1 Select the Plate object. Choose an available sample slot in the Material Editor and label it **Plate**.
- 2 On the Modify panel, click Edit Stack to open the modifier stack. Notice that the Editable Mesh, FFD 4X4X4, and Optimize modifiers are already applied. Close the dialog.
- 3 On the Modifiers rollout, click UVW Map. On the Parameters rollout, select Planar, Channel 1, and Z.
- 4 Apply a second UVW Map modifier and select Planar, U Tile Flip, Channel 2, and Z.
- 5 Open the modifier stack again and notice that the two UVW Map modifiers have been added. Close the dialog.

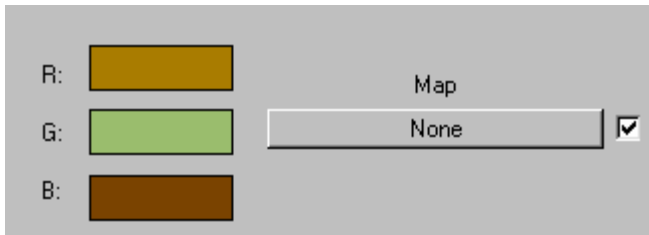


Create the Back Material

The Double Sided material lets you assign two different materials to the front and back faces of an object. In this task, you will assign a Double Sided material to the plate and create the Back (inner) material.

Note: If you run short of available sample slots in the Material Editor, right-click in any sample slot and choose a higher configuration matrix, such as 6 X 4. Also, you can place the cursor on any intersection between sample slots (the panning hand appears) and drag diagonally toward the upper left to reveal more slots.

- 1 On the Material Editor, assign a Double Sided material type to the Plate sample slot, and select Discard old material on the dialog.
- 2 Click the Back Material button and label this level **Background**. Open the Maps rollout.
- 3 Open the Asset Manager and drag **crackmud.jpg** to the Specular Map button.
- 4 Click the Diffuse Map button and assign a Mix material. On the Asset Manager, drag **crackmud.jpg** to the Color #1 Maps button.
- 6 Click Color #2 Maps, assign an RGB Tint Map, and set the colors as follows:
 - R (H = **22**, S = **255**, V = **106**)
 - G (H = **64**, S = **176**, V = **135**)
 - B (H = **12**, S = **255**, V = **53**)

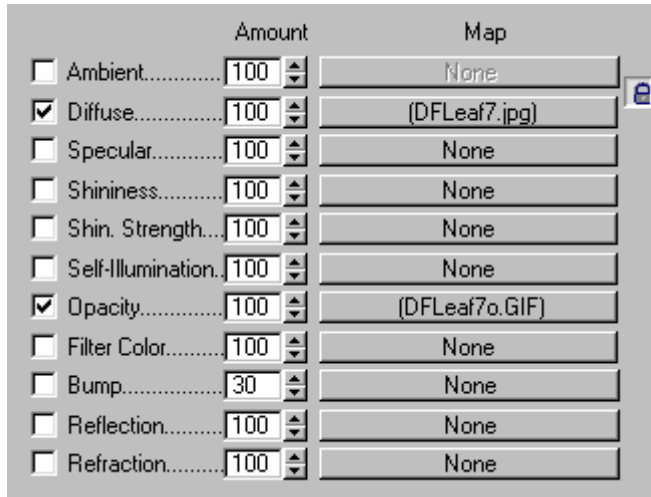


- 7 Return to the Mix material level and set Mix Amount = **0.5**.
- 8 Return to the Double Sided material level

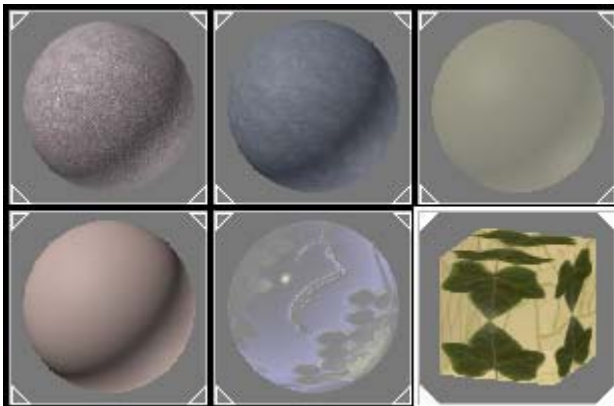
Create the Facing Material

In this task, you will create the Facing (outer) material for the plate.

- 1 Click the Facing Material button and label this level **Leaf**. Open the Maps rollout.
- 2 On the Asset Manager, drag **DFLeaf7.jpg** to the Diffuse Map button.
- 3 Click the Diffuse Map button and set Mapping = Explicit UVW2. Clear Tile for U, and select Mirror for V.
- 4 Return to the Standard material level and drag **DFLeaf7o.GIF** to the Opacity Map button.
- 5 Click the Opacity Map button and set Mapping = Explicit UVW2. Clear Mirror and Tile for U, and select Mirror for V.



- 6 Return to the Double Sided material level.
- 7 To better visualize the material as it will appear on the plate, click the Sample Type flyout on the Material Editor vertical toolbar and choose the cube. Then double-click the material slot to render an image of the material. You can drag the border of the rendering window to increase the size of the image.
- 8 With the Plate object still selected, click Apply Material to Selection.



Lesson 4: Applying Materials to the Wine Glasses

The Wine Glass object has overlapping cut glass patterns and materials, with tinting in some areas. For this lesson, the geometry is supplied with the modifier stack complete.

Reviewing the modifiers from the bottom up:

- The first Edit Mesh modifier divides the goblet into tinted and clear faces.
- The second Edit Mesh modifier selects vertices for the goblet without the stem.
- The XForm modifier is used to non-uniform scale the goblet portion.
- The first UVW Mapping modifier is applied to goblet selection, with Cylindrical Mapping, Cap cleared, Channel = 1, and Alignment = X.
- The third Edit Mesh modifier is used to exit the Sub-Object level
- An Optimize modifier is applied to the entire mesh.
- Finally, a second UVW Mapping modifier is applied to the entire glass, with Mapping = Cylindrical, Cap = cleared, Channel = 1, and Alignment = X.

Lesson Tasks

Create a Clear Glass Material

Create a Red Cut Glass Material

Create a Clear Cut Glass Material

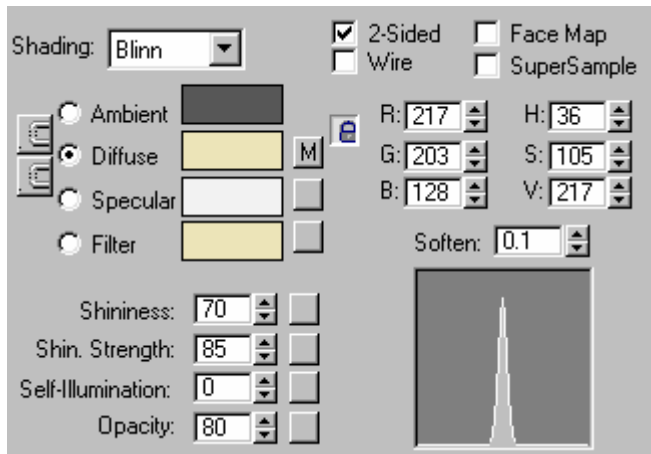
Create a Clear Glass Material

- 1 If you haven't already done so, on the Material Editor right-click in any material sample slot and choose 6 X 4 Sample Windows.
- 2 Select an available sample slot, assign a Multi/Sub-Object material type and label it **Wine Glasses**. Set Number of Materials = **3**. Label the first material **Clear**, the second material **Red Cut**, and the third material **Clear Cut**.
- 3 Click the Clear material button and label it **Clear Glass**.
- 4 On Basic Parameters rollout, select 2-Sided.
- 5 Click the Diffuse color swatch and set H = **36**, S = **105**, V = **217**. Then drag the Diffuse color to the Filter color swatch, and select Copy on the dialog.
- 6 On the Utilities panel, click Color Clipboard, and then click New Floater. Drag the Diffuse color swatch to the first slot on the clipboard, and select Copy on the dialog. Save the clipboard as **Glasses**. Leave the clipboard open in the lower right corner of your screen for now.



The Color Clipboard is useful in situations where you expect to reuse, match, or edit colors in the current scene, or a different one. You can have multiple floaters.

- 7 Set Shininess = **70**, Shin Strength = **85**, and Opacity = **80**.



- 8 Open the Extended Parameters rollout and set Falloff Amount (Amt) = **80**.
- 9 Open the Maps rollout, click the Diffuse Map button, and select Raytrace Map.

Note that the Raytrace Map is similar to the Raytrace Material that you applied to the carafe body. For the Raytrace Map there are no Basic, Extended Parameters, or Maps rollouts. Also, Antialiasing, Attenuation, Basic Material Extensions, and Refractive Material Extensions have their own rollouts.

- 10 On the Raytracer Parameters rollout, click Options and clear Global Antialiasing and Global Color Density/Fog, if they are not already cleared.
- 11 Click Global Parameters and make sure Background and Adaptive and still selected from a previous task. Then select Manual Acceleration, Dual Pipe, and Object Voxel Trees.
- 12 Click Local Exclude and select Include. Choose wine glass and wine nipple. Click the right arrow to add these items to the list.
- 13 Open the Antialiasing rollout and select Override Global Settings and select Adaptive.
- 14 Open the Attenuation rollout and set Falloff Type = Linear and make sure Background is selected.
- 15 Open the Basic Material Extensions rollout and assign a Thin Wall Refraction map to the Reflectivity/Opacity Map button. Select First Frame Only and make sure Apply Blur is selected.
- 16 Return to the Raytrace map level. Under Basic Tinting, select Enable, and then drag from the Glasses Color Clipboard the color you created in Step 6 to the Basic Tinting color swatch.
- 17 Open the Refractive Material Extensions rollout and make sure Color Density and Fog are cleared.

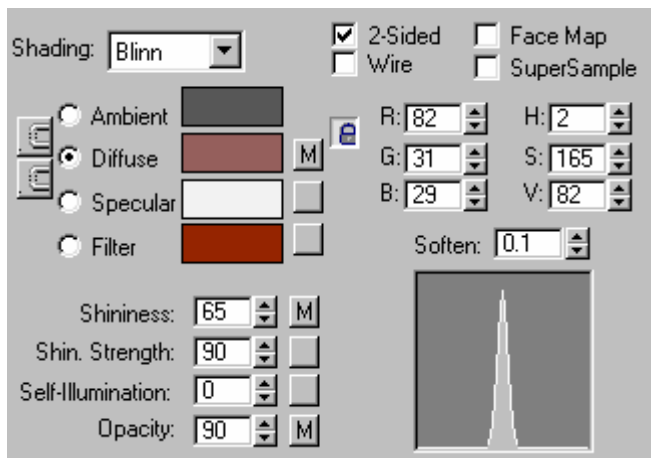
Note: Enabling these features and including more objects to reflect increases the rendering time.

Create a Red Cut Glass Material

- 1 Return to the Multi/Sub-Object level, click the Red Cut material button, and label this material **Red Cut Glass**.
- 2 On the Basic Parameters rollout, select 2-Sided.
- 3 Create a rose Diffuse color (H = 2, S = 165, V = 82). Drag the Diffuse color to the Filter color swatch, and select Copy on the dialog. Finally, drag the Diffuse color to the second slot on the Glasses Color Clipboard and select Copy on the dialog.

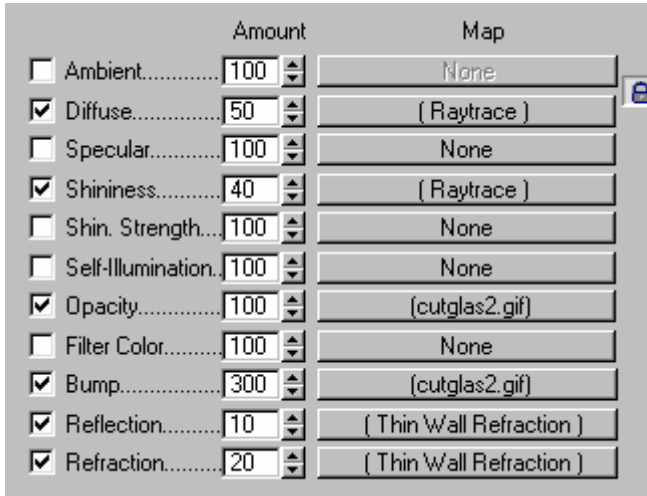


- 4 Click the Filter color swatch and increase the saturation (S = 255).
- 5 Set Shininess = 65, Shin Strength = 90, and Opacity = 90.



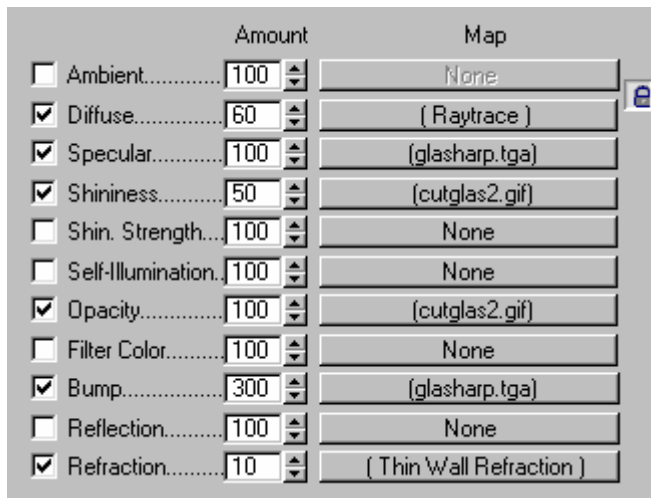
- 6 Open the Extended Parameters. Under Opacity Falloff, make sure In is selected, and set Amount = 80.
- 7 Open the Maps rollout and drag **cutglas2.gif** from the Asset Manager to the Opacity Map button.
- 8 Drag the Opacity map to the Bump Map button and select Instance on the dialog. Set Bump Amount = 300.
- 9 Click the Reflection Map button and assign a Thin Wall Refraction material. Select First Frame Only. Return to the Standard material level and set Reflection Amount = 10.
- 10 Drag the Reflection map to the Refraction Map button and select Instance on the dialog Set Refraction Amount = 20.
- 11 Click the Diffuse Map button and assign a Raytrace map. Instead of repeating the steps you used to create a Raytrace material in the previous task, return to the Standard material level, open the Material/Map Navigator, and drag (click and hold down) the Raytrace map from the Clear material to the Diffuse Map button for the Red Cut material. Select Instance on the dialog. Set Diffuse Amount = 50.

- 12 Drag the Diffuse map to the Shininess Map button, and select Instance on the dialog. Set Shininess Amount = **40**.



Create a Clear Cut Glass Material

- 1 Return to the Multi/Sub-Object material level, click the Clear Cut material, and label it **Cut Glass Clear**.
- 2 On the Basic Parameters rollout, select 2-Sided.
- 3 Drag the amber material from second slot on the Glasses Color Clipboard to the Diffuse and Filter color swatches. Select Copy on the dialog.
- 4 Set Shininess = **70**, Shin Strength = **85**, and Opacity = **80**.
- 5 Open the Extended Parameters rollout and set Falloff Amount (Amt) = **80**.
- 6 Open the Maps rollout, and drag **glasharp.tga** from the Asset Manager to the Specular Map button, and then click the button. Set Mapping = Explicit UVW2, set U Tiling = **2.0**, set V Tiling = **1.0**, and set Blur Offset = **0.01**.
- 7 Return to the Standard material level. Drag the Specular map to the Bump Map button, and select Instance on the dialog. Set Bump Amount = **300**.
- 8 Drag **cutglas2.gif** to the Shininess Map button and set Amount = **50**. Click the Shininess Map button and set U and V tiling = **2.0**.
- 9 Return to the Standard material level and drag the Shininess map to the Opacity Map button. Select Instance on the dialog.
- 10 Click the Refraction Map button and assign a Thin Wall Refraction map, and select First Frame Only. Return to the Standard material level and set Refraction Amount = **10**.
- 11 Drag the Raytrace Map from the Material/Map Navigator to the Diffuse Map button. Set Amount = **60**.



- 12 With the wine glass object selected, click Assign Material to Selection.

Lesson 5: Viewing your Results

To save rendering time, until you arrive at optimal settings use enlarged material examples as rendered from each material slot by double-clicking on the material sample slot. Drag out the VFB to 1" or 1.5". If you find the material acceptable, test render only selected scene objects one at a time. After making any final adjustments to the material settings, render the final scene.

