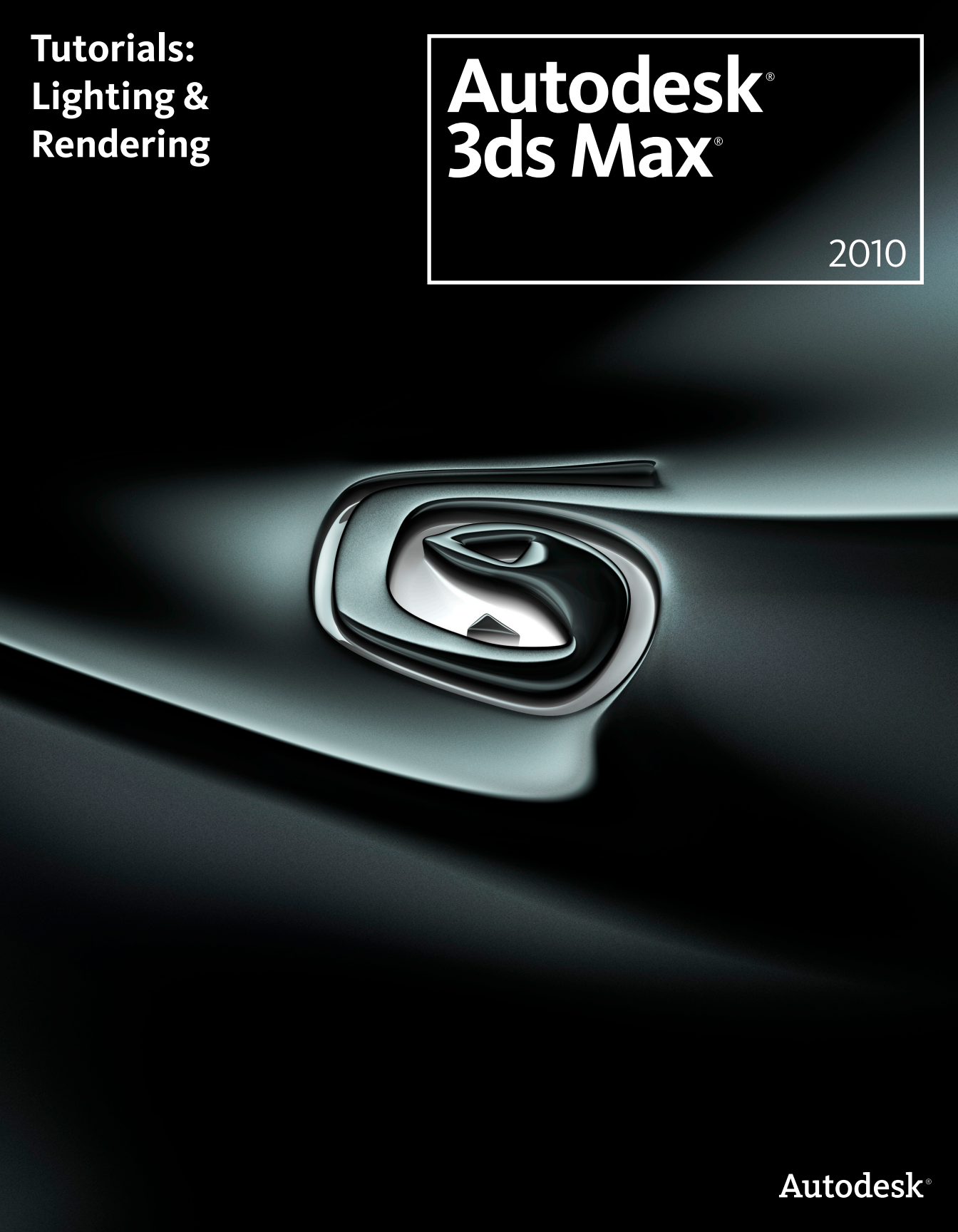
Tutorials: Lighting & Rendering

Autodesk® 3ds Max®

2010



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Lighting and Rendering

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The tutorials in this section show you how to create outstanding images and animations with 3ds Max. You will learn how to use a variety of lighting methods, as well as how to render still images and animation. You will also be introduced to three powerful features in mental ray that let you achieve convincing global illumination in your scene.

Features Covered in This Section

- Photometric illumination.
- Using daylight systems together with Sky Portal to illuminate a scene.
- Shadow creation and definition.
- Using particle systems to reduce scene complexity.
- Rendering single images and animation over a computer network.

Lighting and Rendering a Daylight Scene

In this tutorial, you have a scene of an army compound that requires lighting conditions for early, mid-day and late-day illumination. To accomplish this, you will create a daylight system and customize it to match a specific scene location and time. Then, you'll set scene exposure and combine the daylight system with a Sky Portal object that will cast light into building interiors. You will fine-tune the late-day illumination by adjusting the aperture setting.

After completing these lessons, you will see how easy it is to use mental ray rendering options to create realistic daylight conditions.

Morning illumination

Mid-day illumination

Late-day illumination

In this tutorial, you will learn how to:

- Use daylight systems to illuminate scenes set in the daytime.
- Set up illumination based on the scene's geographic location, orientation, and time of day.
- Use the Sky Portal object to gather skylight and apply it to the interior of buildings.
- Adjust scene exposure.

Skill level: Intermediate

Time to complete: 1 hour

Adding Daylight Illumination

Start by switching from the default 3ds Max renderer to the mental ray renderer.

Set up the lesson:

1.  On the Quick Access toolbar, click the Open File button and from the *\lighting_and_rendering\army compound* folder, open the scene file *army_compound-lighting_start.max*.

2.  On the main toolbar, click Render Setup to open the Render Setup dialog.

3.  On the Common tab > Assign Renderer rollout, click the browse button for the Production renderer (at present the label says "Default Scanline Renderer").

A Choose Renderer dialog opens.

4. In the Choose Renderer dialog, choose mental ray Renderer, then click OK.

5. Close the Render Setup dialog.

6.  On the main toolbar, click Render Production.

Rendered scene with no daylight system present

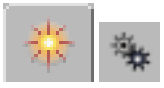
7 Close the rendered frame window.

Default lights provide basic illumination in the scene, with textures and materials applied, but the rendered image appears flat and not very realistic. You need to add daylight to the scene. This will be generated by a daylight system comprising two mental ray photometric light sources:

- mr Sun, which simulates direct light from the sun.
- mr Sky, which simulates indirect light created by the scattering of sunlight in the atmosphere.

These two light sources will be accompanied by the mr Physical Sky environment shader, which establishes the physical representation of the sun and sky.

Create the daylight system:

1  On the Create panel, turn on Systems.

2 On the Object Type rollout, click Daylight to turn it on.

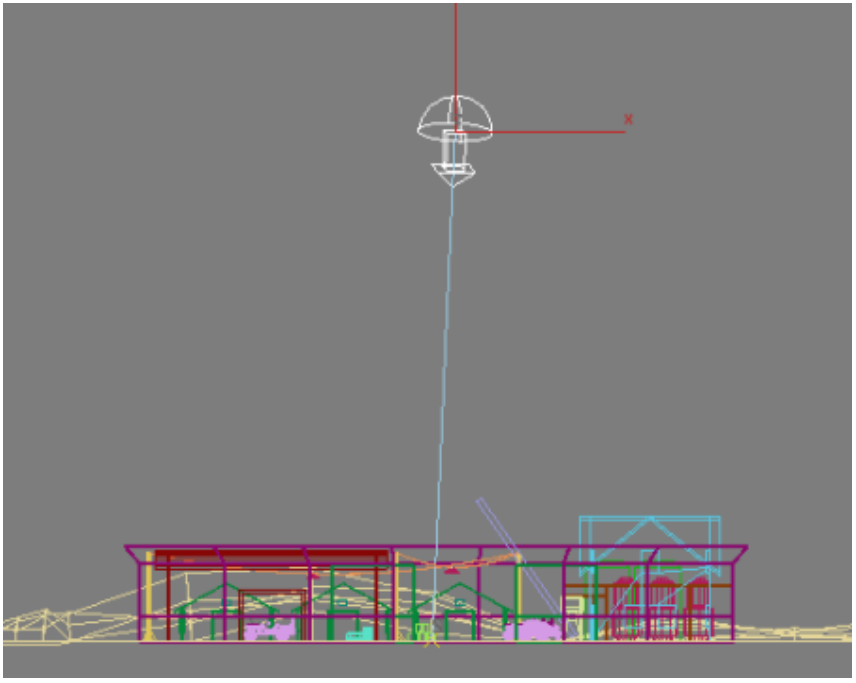
3 On the Daylight System Creation dialog, click Yes to accept the recommended mental ray photographic exposure control value of 15.

4 In the Top viewport, click anywhere over the compound and drag slightly in any direction to create a compass rose.

5 Release the mouse button.

As soon as the mouse button is released, a Daylight object, or "sun," is created.

6 Move the mouse upward to position the daylight object in the sky. You can track the object's position in the Front viewport. The exact height of the daylight object in the sky is not important.



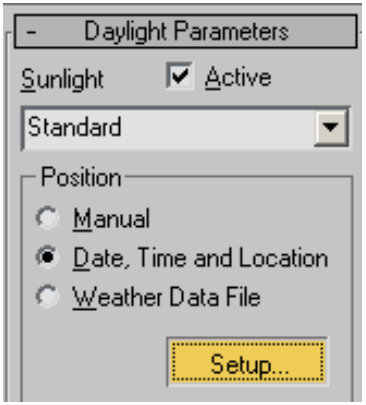
7 Click once to set the Daylight object position, then right-click to end Daylight creation.

Set the time and location of the light source:

Now you will reposition the Daylight object, or "sun," so its position in the sky corresponds to the geographic location of the scene.

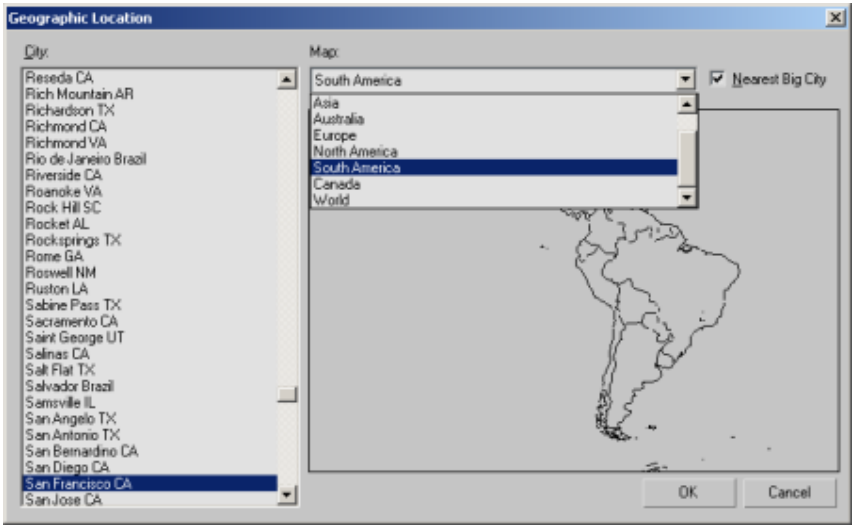
1  With the Daylight object selected, on the Modify panel > Daylight Parameters rollout, click Setup.

3ds Max displays the Motion panel.



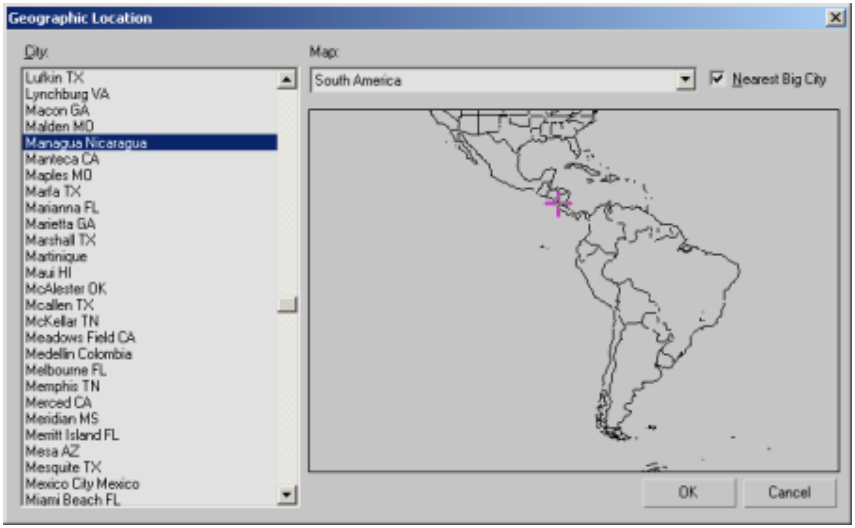
2 On the Motion panel > Control Parameters rollout > Location group, click Get Location.

3 On the Geographic Location dialog, Map list box, choose South America.



You will now choose Managua, the capital of Nicaragua, as the physical location of the scene.

4 On the map, click on Nicaragua, or choose Managua Nicaragua from the City list displayed to the left.

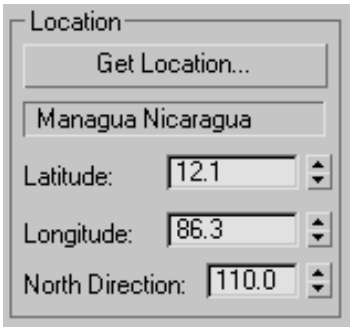


After you click OK, the compass rose and Daylight object are repositioned to scene coordinates that simulate the real-world latitude and longitude of Managua.

The Control Parameters > Time group displays controls that let you modify the date and time of day, which also affects the sun position. The first scene you will illuminate and render is morning at 9 AM.

5 In the Time group > Hours spinner box, set the time to **9**.

6 In the Location group, set North Direction to **110** degrees.



This adjustment will reorient the north-south position of the scene so when you render the late-day version of the scene, the sun disc will appear over the barracks as it prepares to set in the west.

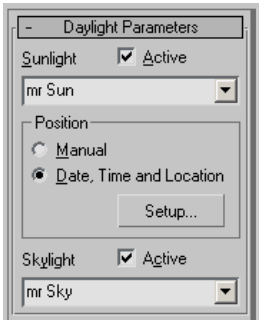
7 Right-click the Camera01 viewport and press F9 to render the scene.

Rendered scene with Daylight object positioned at 9am

The scene looks good, but can be improved.

8  With the Daylight object selected, go to the Modify panel.

9 On the Daylight Parameters rollout > Sunlight drop-down list, choose mr Sun, and from the Skylight drop-down list, choose mr Sky.



10 A dialog appears, asking if you want to use the mental ray Physical Sky shader. Click Yes to apply the mr Physical Sky shader to the scene.

Rendered scene with mr Physical Sky shader added

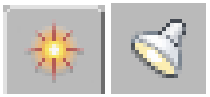
Note how the regions behind the barracks doorways remain unnaturally dark. You could solve this problem by increasing the number of ray bounces next to the Indirect Lighting control. Alternatively, you could add a Sky Portal. This method is described in the next lesson.

Using Sky Portal and Photographic Exposure Control

Sky Portal is a light object that gathers the sky light (as opposed to direct sunlight) generated by the daylight system. It then directs the light flow to the interior of selected scene objects.

NOTE The Sky Portal generally requires less rendering time than the Global Illumination option. It is an effective alternative to quickly visualize a scene.

Add the Sky Portal:

1. Continue working on your own scene file, or from the *\lighting_and_rendering* folder, open the scene file *army_compound-lighting_daylight.max*.
2.  On the Create panel, click Lights. Photometric should be chosen on the drop-downlist.
3. On the Object Type rollout, click mr Sky Portal, then turn on Autogrid.
4. In the Camera01 view, create the Sky Portal by dragging diagonally from the upper-left corner of the far right barracks entrance to the lower-right corner, until the entire opening is covered.

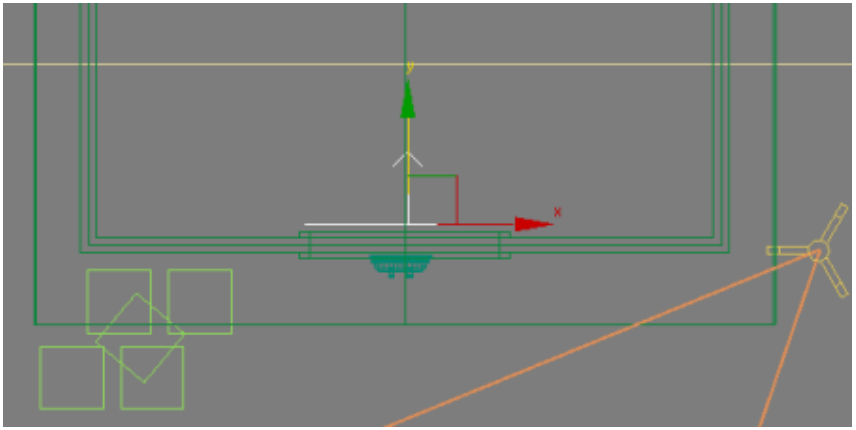
Sky Portal object in front of the barracks door

The Sky Portal should not be much larger than the door.

5 Right-click to complete creating the Sky Portal.

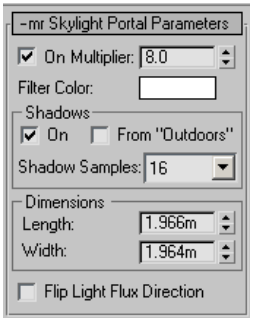
6 Right-click the Top viewport and zoom into the scene until you can clearly see the barracks entrance nearest to the Sky Portal object.

7  Reposition the Sky Portal so it lies just inside the barracks entrance.



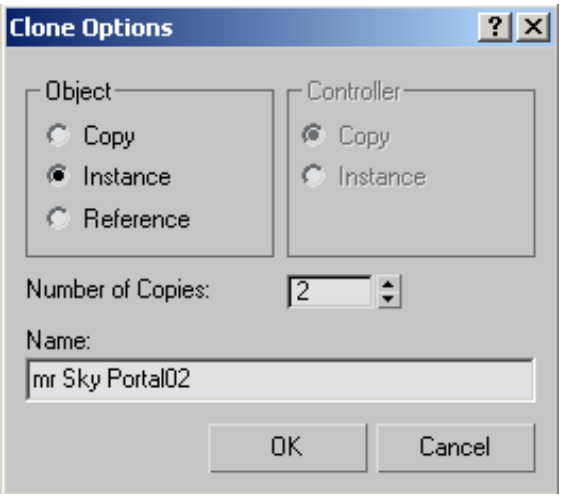
If the Sky Portal was placed outside the entrance, the sides of the door frame would attract unneeded illumination.

8  With the Sky Portal object still selected, go to the Modify panel. On the mr Skylight Portal Parameters rollout, turn on On Multiplier and specify a value of **8**.



You would typically specify a lower multiplier value if Sky Portal objects were added to other doors and windows in the barracks.

9 Shift+drag the Sky Portal to the left and create two instances of the Sky Portal for each of the two remaining barracks in the scene. Position the portals at their respective entrances.



10 Activate the Camera01 viewport, press F9 to render the scene, and compare the result with the cloned copy of the previous rendering.

Rendered scene with light channeled into the barracks interior

The result is much improved. The Sky Portal is now channeling sky light into the barracks.

11  Make a clone of the rendered frame and minimize it.

Set illumination for mid and late afternoon:

1  Select the Daylight system (select the sun object, not the compass rose). On the Motion panel > Time group > Hour spinner box, set the time to **14** (2pm).

2 Make sure you have camera view active and render the scene.

Rendered scene with Daylight object positioned at 2pm

The shadow of the suspended light next to the jeep indicates that the sun is almost directly overhead. One problem exists however: the Sky Portal is transferring too much light into the barracks.

3  Select any Sky Portal object, go to the Modify panel, and on the mr Skylight Portal Parameters rollout > On Multiplier field specify a value of **5.0**.

Because you instanced all copies of the Sky Portal, any change you make to one object will be passed on to the others.

4  Render the scene and make a clone of the rendered frame.

Rendered scene with Sky Portal multiplier reduced

Compare the latest rendered frame with the one you cloned earlier. The entrance illumination is subtle but more realistic.

You will now generate a third rendered version of the scene, this one showing late-day illumination.

5 Select the Daylight system and in the Motion panel > Time group > Hour spinner box, set the time to **17** (5pm).

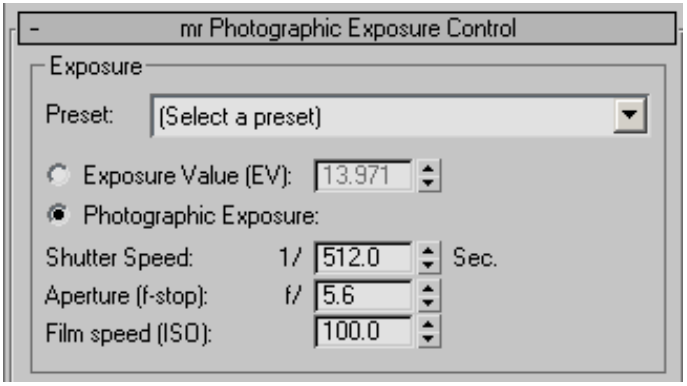
6 Render the scene.

Rendered scene showing late day illumination before Exposure Control adjustment

The army compound is too dark for this time of day. You will use exposure control to adjust scene illumination.

7 On the Rendering menu, choose Exposure Control to open the Environment And Effects dialog.

8 On the Exposure Control rollout, make sure Photographic Exposure is turned on and set Aperture (f-stop) to **5.6**.



9 Render the scene.

Rendered scene after adjustment to exposure

The lighting conditions better reflect the time of day. Compare the rendered frame with the other cloned frames to see how you have created three distinct moods based on mental ray lighting techniques.

Summary

You can create a daylight system to simulate real-world outdoor lighting conditions at any time of day, at any location on the planet. mental ray offers a range of presets that define proper exposure settings, which you can adjust manually as needed. A Sky Portal object can be added to channel daylight into doorways and windows of structures, to enhance their interior illumination.

Lighting and Rendering a Nighttime Scene

In this tutorial, you will illuminate a night scene of an army compound. You will create photometric lights that replicate real-world lighting systems, then add a touch of realism using the mental ray Glare effect.

In this tutorial, you will learn how to:

- Place photometric lights in a scene and adjust light color.
- Set shadow parameters so lights cast shadows properly.
- Use render presets to quickly set night scene exposure.
- Use a bitmap image as the scene background and adjust the bitmap exposure, brightness and contrast to compensate for night lighting conditions.

Skill level: Intermediate

Time to complete: 1 hour

Adding Photometric Lights

You will start by switching from the default renderer to the mental ray renderer, if you have not already done so. You'll then add photometric lights that provide illumination to the night scene.

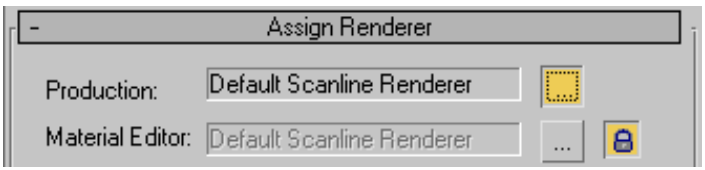
Set up the lesson:

1  From the Application menu, choose Reset, and accept the prompt dialogs to reset 3ds Max.

2  On the Quick Access toolbar, click the Open File button and from the *\lighting_and_rendering\army compound* folder, open the scene file *army_compound-lighting_start.max*.

3  On the main toolbar, click Render Setup to open the Render Setup dialog.

4  On the Common tab > Assign Renderer rollout, click the browse button for the Production renderer (at present the label says "Default Scanline Renderer").



A Choose Renderer dialog opens.

5 Choose mental ray Renderer and click OK.

6 Close the Render Setup dialog.

7  Activate the Camera01 viewport, and on the main toolbar, click Render Production.

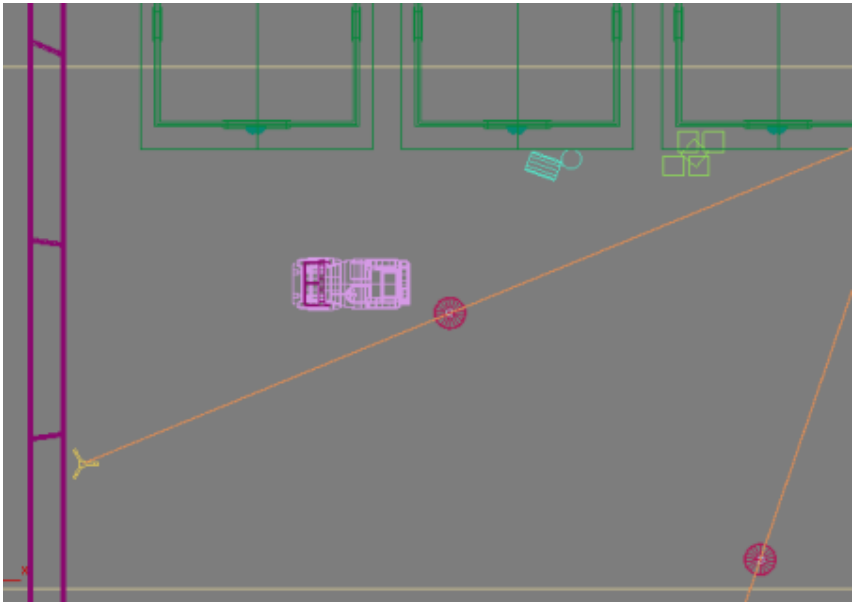
Rendered scene with default lighting

This is the same starting point as the previous tutorial, with default lights providing basic illumination. You will now add photometric light objects to illuminate the scene.

8 Close the Rendered Frame Window.

Set up the photometric lights:

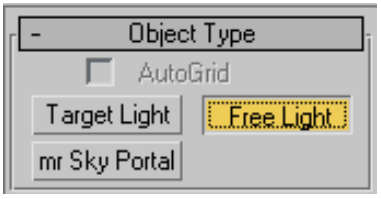
1 Activate the Top viewport and zoom in to the overhead lamp next to the *jeep01* object.



2  On the Create panel, choose Lights.

3 If AutoGrid is on, turn it off.

4 On the Object Type rollout, click Free Light to turn it on.

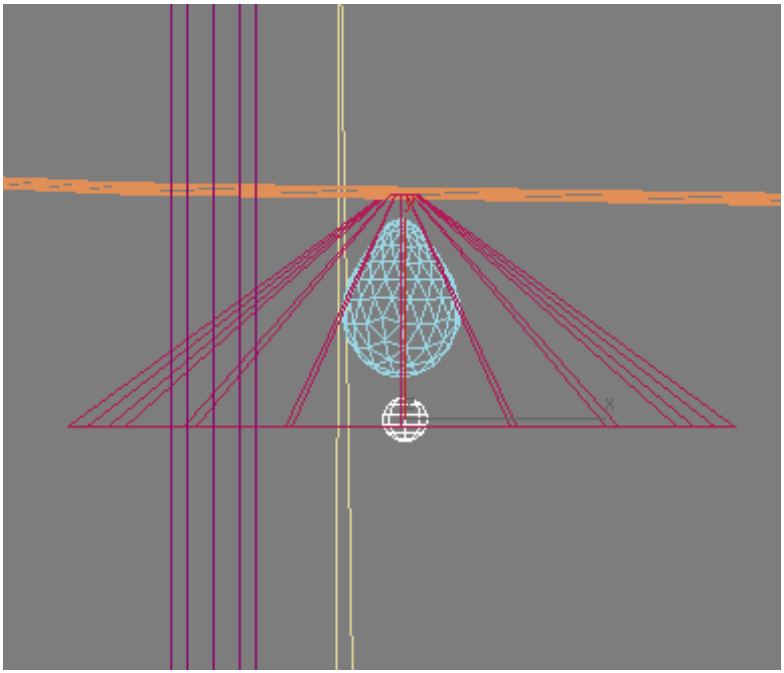


5 On the Photometric Light Creation dialog, click Yes to apply the mr Photographic Exposure Control settings to your scene.

6 Click once on the center of the lamp shade to create the light object.

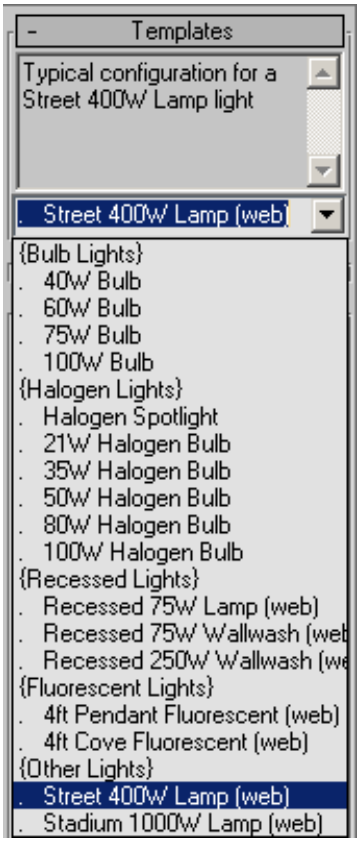
By default, the light object is created on surface plane of the scene.

7  Activate the Front viewport and use the Select And Move tool to move the light object on its Y axis until it is just below the lamp light bulb.



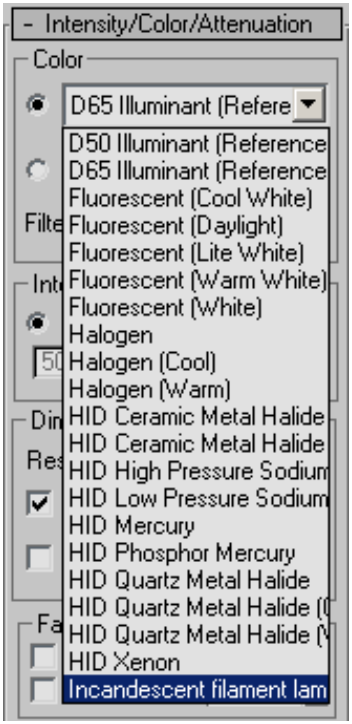
Do not position the light object inside the bulb itself. Otherwise, it will cast unwanted shadows.

8 Go to the Modify panel > Templates rollout and choose Street 400W Lamp (Web).



Next, you will choose the color of the light to be cast. You have two ways to do this: you can specify color by the type of object that emits the light, such as an incandescent bulb or a fluorescent tube. Or you can specify light color by its temperature, in degrees Kelvin.

9 On the Intensity/Color/Attenuation rollout > Color group list box, choose Incandescent Filament Lamp.



The adjacent color chip updates to match the color temperature of your light selection and displays its corresponding value in degrees Kelvin.

10 Activate the camera viewport and press F9 to render the scene.

Scene exposure set too high for the lighting system

The image is too bright because you have not set the proper exposure for this type of lighting environment.

Set scene exposure:

1. On the Rendering menu, choose Exposure Control to open the Environment And Effects dialog.
2. On the mr Photographic Exposure Control rollout > Exposure group, make sure Photographic Exposure is turned on, then specify a Shutter Speed of 1/**2.0** second, then render the scene.

Rendered scene after adjustment to exposure

The scene is much improved, but light is only falling on the central part of the compound. You need to add another overhead light.

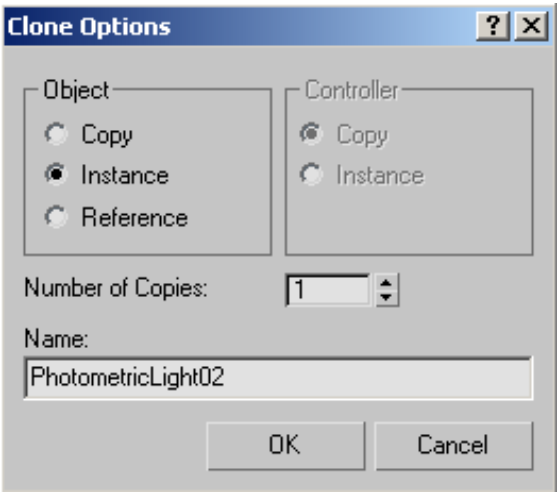
3 Close the Environment And Effects dialog.

Add more lights and introduce shadows:

1 Activate the Top viewport and zoom out until you can see the other light fixture, to the lower right.

2 Shift+move the light object until it is just below the other light fixture.

A Clone Options dialog displays.



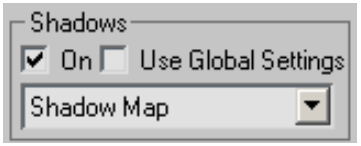
3 In the Object group, turn on Instance to create an instance of the light object then click OK.

4 Activate the Camera01 viewport and render the scene again.

Scene illumination after second light added

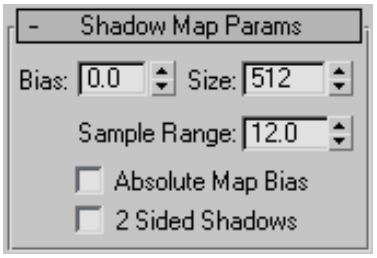
The rear area of the compound is now illuminated, but objects in the scene cast no shadows.

5 With either light selected, go to the Modify panel > General Parameters rollout > Shadows group and turn shadows on.



6 On the Shadow Map Params rollout, reduce Bias to **0** (to set shadows closer to shadow-casting object) and set Sample Range to **12.0**.

Setting Sample Range to a value of greater than 0 generates soft-edged shadows.



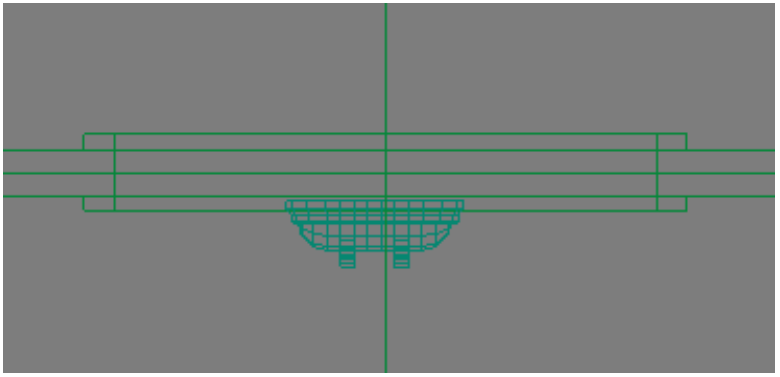
7 Render the scene.

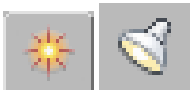
Objects in the scene now cast shadows

Note the improvement that shadow casting has on the rendering of the jeep.

Next, you will add a light object to each barracks light fixture.

8 Close the rendered frames, activate the Top viewport, and zoom in to the light fixture above the entrance to the far left barracks.

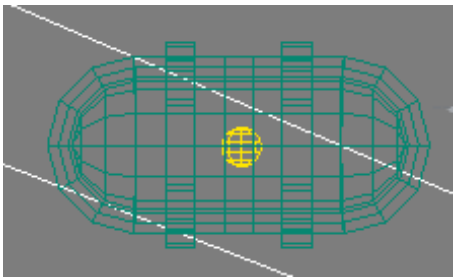


9  On the Create panel, choose Lights.

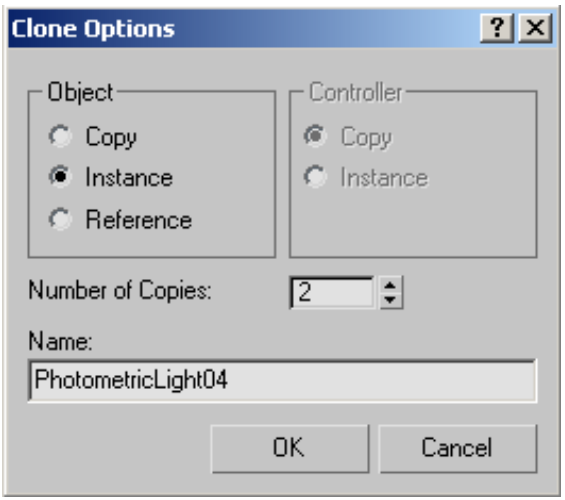
10 On the Object Type rollout, click Free Light.

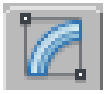
11 Click once on the center of the light fixture to create the light object.

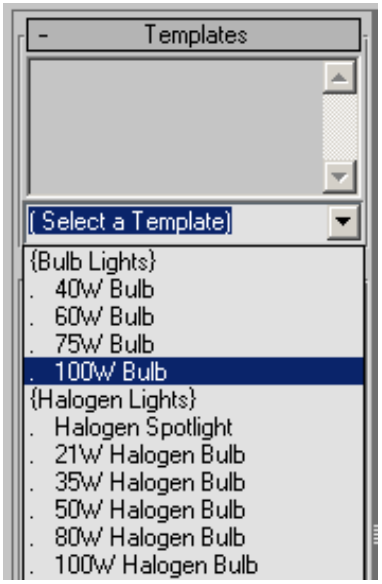
12  Activate the Front viewport and use the Move and Select tool to move the light object on its Y axis until it is level with the light fixture.



13 In the Top viewport, zoom out until you can see all three doorways, then Shift + drag the light to the right, creating two instances of the light, each positioned above one of the remaining two barracks entrances.



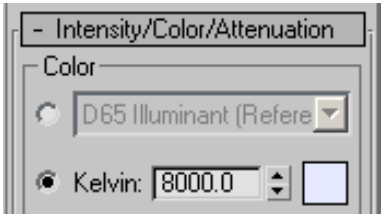
14  With any of the barracks doorway lights selected, go to the Modify panel > Templates Rollout, and choose 100W Bulb.



Keep in mind that the light you choose in this list possesses the same properties as real-world lights do. In terms of light attenuation, for example, for every 10 meters distance travelled, light intensity from this bulb will drop off to 1/100th of its initial strength.

15 On the Intensity/Color/Attenuation rollout > Color group, assign a Kelvin value to the light cast by the bulb. You want the bulb to project a light blue color, so click to choose Kelvin, and then enter a value of **8000.0**.

In the range of degrees Kelvin, light color varies from 1000 (pink) to 20,000 (blue).



16 Activate the Camera01 viewport and render the scene.

Rendered scene with all light systems in place

All objects in the scene foreground look properly lit.

Next

Adding a Background Image and Lighting Effects on page 1423

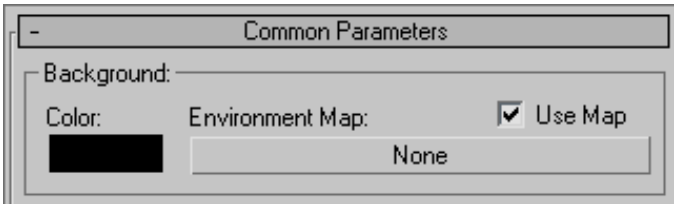
Adding a Background Image and Lighting Effects

You will now take a daylight image of a desert panorama, adjust its contrast and exposure to resemble night lighting conditions, then incorporate the result into the scene as a backdrop. You'll introduce a few more photometric lights to illuminate the interior of the barracks, then add a glare effect as a finishing touch.

Add background image and set exposure:

1 Continue working on your own scene file, or from the *\lighting_and_rendering\army_compound* folder, open the scene file *army_compound-lighting_no_bkrnd.max*.

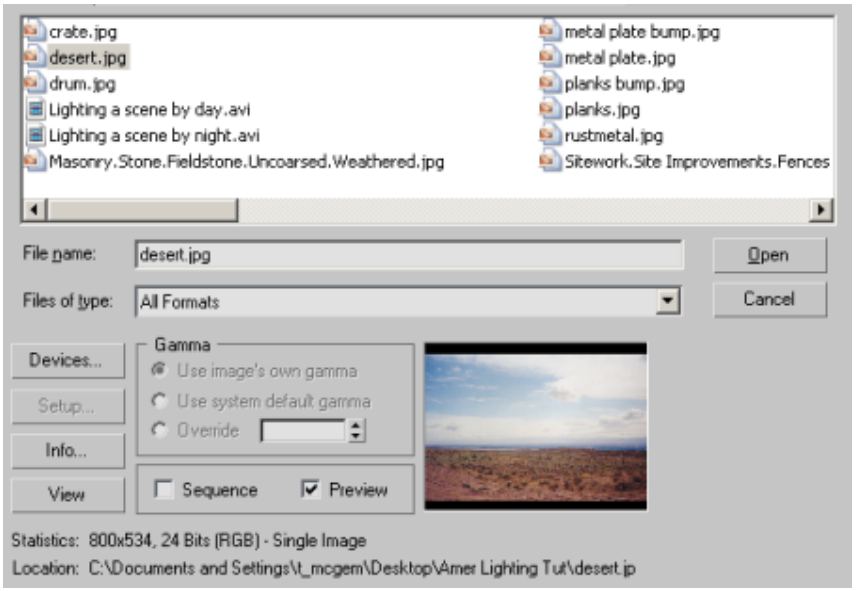
2 From the Rendering menu > Environment > Common Parameters rollout, click the Environment Map button (at present, the text on the button says "None").



3ds Max opens the Material/Map Browser.

3 On the Material/Map Browser, double-click the Bitmap map type. (Keep the Environment and Effects dialog open for now.)

4 In the file dialog *\images* folder, click *desert.jpg* to highlight it.



5 In the file dialog, click View.

The image is a desert landscape, taken during the day. You will need to adjust image brightness and contrast to make it suit the nighttime scene.

6 Close the bitmap view, then click Open to add the image as a background to the scene.

7 Make sure no object is selected in the viewports, then right-click to display the quad menu.

8 Choose Hide Unselected, then render the scene.

With objects hidden, you are rendering only the background. However, the rendered frame shows nothing but black because mental ray has under compensated the exposure.

9  Press M to open the Material Editor.

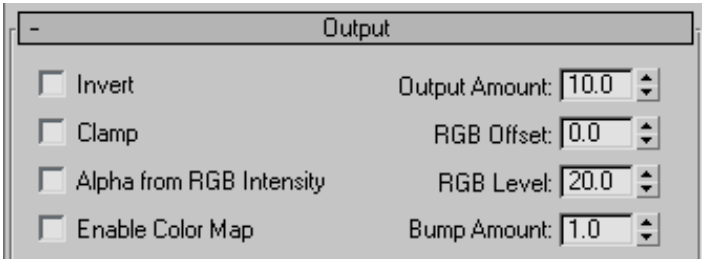
10 Drag the Environment Map button from the Environment And Effects dialog onto any unused sample slot in the Material Editor.

A prompt asks if this should be an instance or a copy. Make sure Instance is selected, and then click OK.

11 Close the Environment And Effects dialog.

You will now use the Material Editor to adjust the color and contrast of the bitmap to compensate for the low-exposure night scene.

12 On the Material Editor > Output rollout, increase Output Amount to **10.0** and RGB Level to **20.0**.



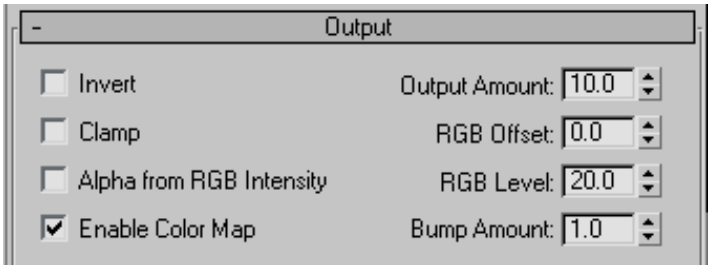
These values will restore the output value of the original bitmap.

13 Render the image.

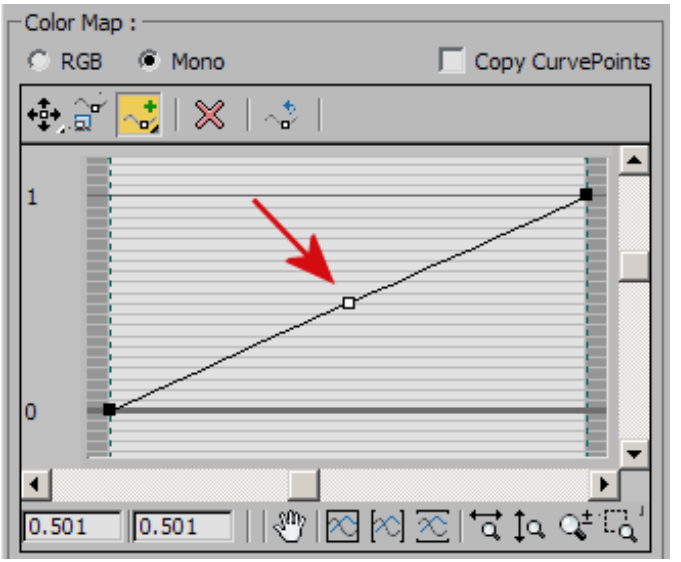
Background bitmap before adjustment to contrast level

The image appears washed out. Adjusting image contrast should solve this problem.

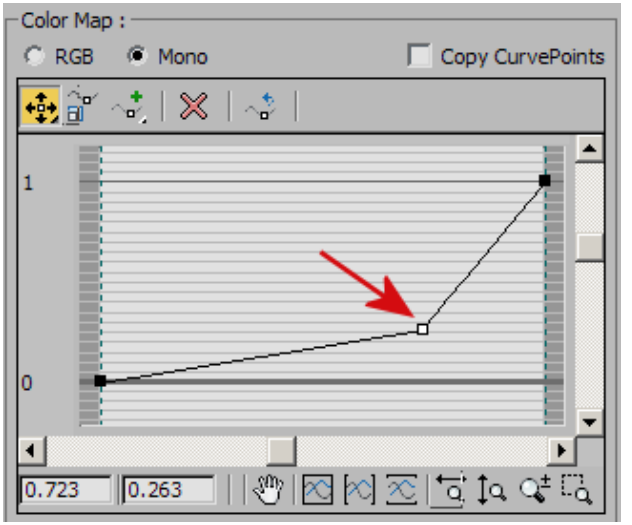
14 On the Output rollout, turn on Enable Color Map.



15  In the Color Map group, click the Add Point button, then click at the midpoint of the color map graph.



16 Click the Move Point button and drag the new point down and to the right as shown in the next illustration.



17 Render the image again.

Background bitmap showing improved contrast after adjustment to its color map

The color map has generated more contrast, emphasizing features that will still be visible after you deliberately underexpose the image in the next step.

18 On the Output rollout, decrease the Output Amt to **1.0** and RGB Level to **10.0**.

The result is a heavily underexposed scene, resembling a night sky: a digital version of filming "day for night."

Background bitmap heavily underexposed to suit night scene

19 Right-click any viewport, select Unhide All from the quad menu, then render the scene again.

Bitmap image added to scene background

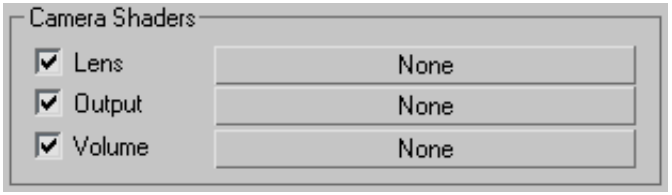
The background is properly exposed, adding depth and interest to the scene.

20 Close the Material Editor.

Add glare effects:

mental ray provides a number of special effects designed to give light objects added realism. Here, you will add a glare effect to the army compound lights, to simulate their interaction with dust particles and ambient humidity.

1  Click Render Setup, and on the Render Setup dialog > Renderer tab > Camera Effects rollout > Camera Shaders group, turn on the Output shader button.



3ds Max opens a Material/Map Browser.

2 Close the Render Setup dialog.

3  Make a clone of the existing rendered frame, then render the scene.

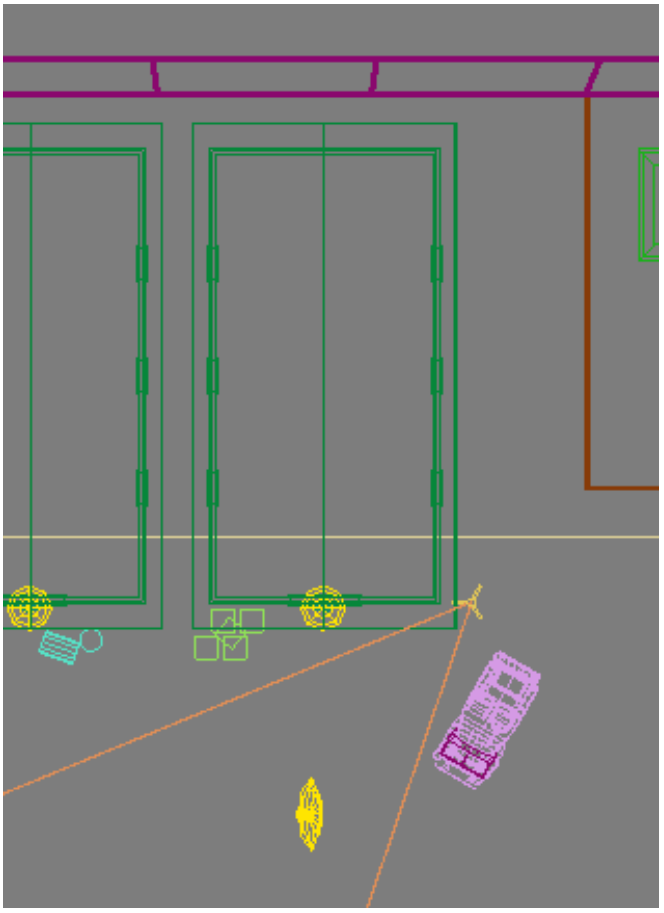
Rendered scene with Glare effect added to light sources

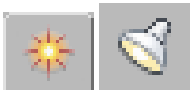
Compare the two rendered frames to see the glare effect. This effect is most pronounced on the suspended lamp over the jeep.

4 Close the rendered frames.

Add interior lights:

1 Activate the Top viewport, then zoom and pan until the far right barracks comes into view.

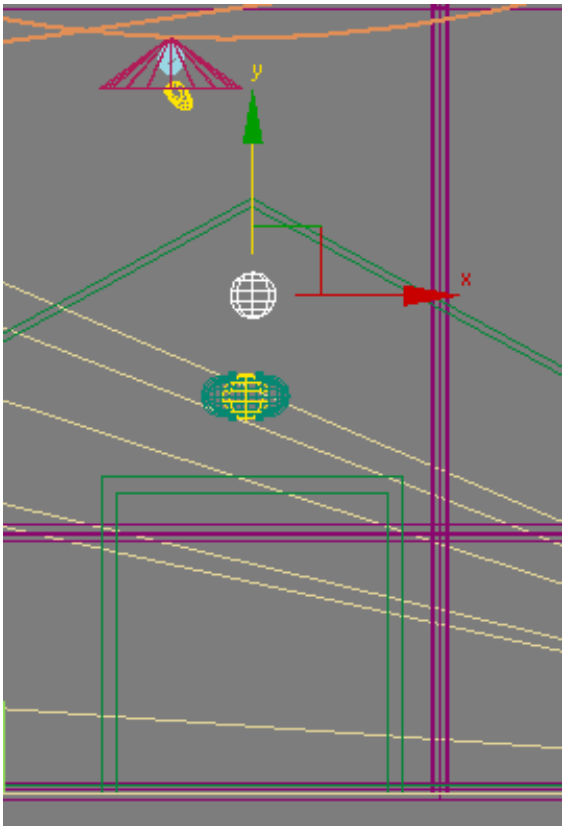


2  On the Create panel, choose Lights.

3 On the Object Type rollout, click Free Light.

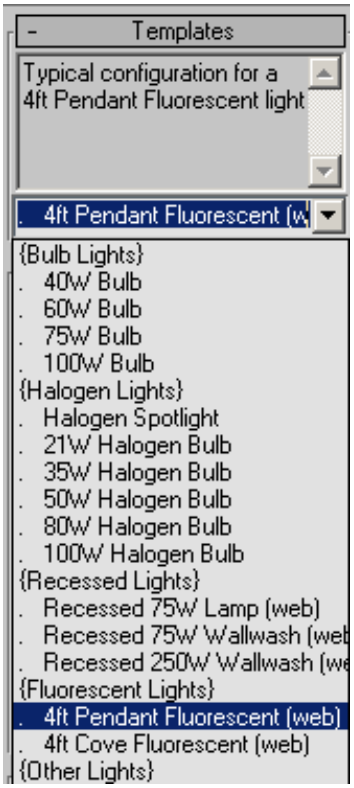
4 Click on the apex of the barracks roof, near the entrance.

5  Activate the Front viewport and use Select And Move to raise the light object on its Y axis until it is at a suitable height above the floor, as shown below.



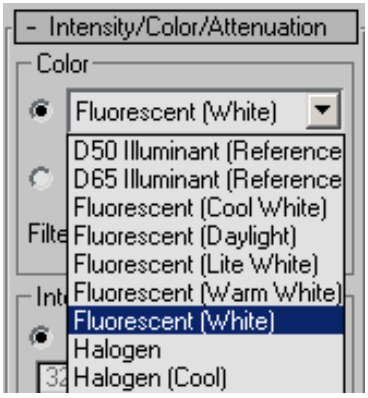
You are about to create a set of fluorescent lights, so the light object should be suspended roughly two feet from the ceiling.

6 Go to the Modify panel > Templates rollout and from the drop-down list, choose 4ft Pendant Fluorescent.



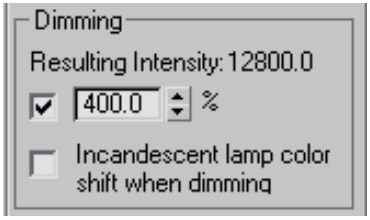
You will now choose the color of the light to be cast.

7 On the Intensity/Color/Attenuation rollout, choose Fluorescent (White) from the Color drop-down list.

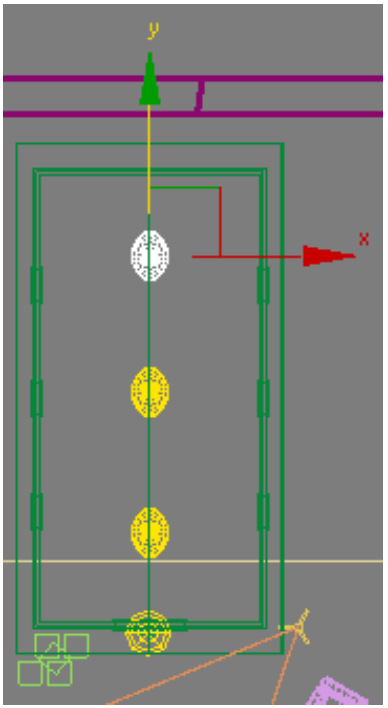


The scene calls for a standard fluorescent fixture consisting of four tubes. Rather than physically re-creating each tube, you can simply bump up the intensity of the single light object by a factor of four.

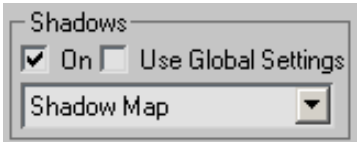
8 On the Intensity/Color/Attenuation rollout > Dimming group, update the Intensity spinner box to **400**%.



9 Make two more instances of the light object and distribute them evenly along the length of the barracks.



10 On the Shadows rollout, turn shadows On to create shadow maps of the ceiling lights.



11 Activate the Camera01 viewport and render the scene again.

Rendered scene with interior lights added to barracks

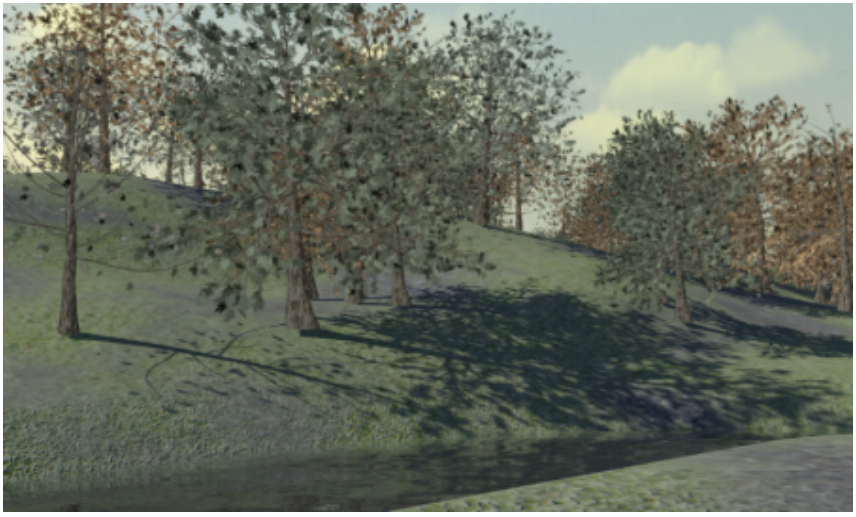
The inside of the barracks is now illuminated, with light spilling out of the entrance to form a shadow on either side of the door frame.

Summary

In this tutorial, you learned how to use photometric lights to illuminate a night scene. You specified the color of the light source and defined how shadows were cast. You also learned how to take a background image, adjust its exposure, brightness, and contrast, and apply it as a background to the night scene. Finally, you saw how a mental ray special lighting effect can be applied to a light object to produce added realism.

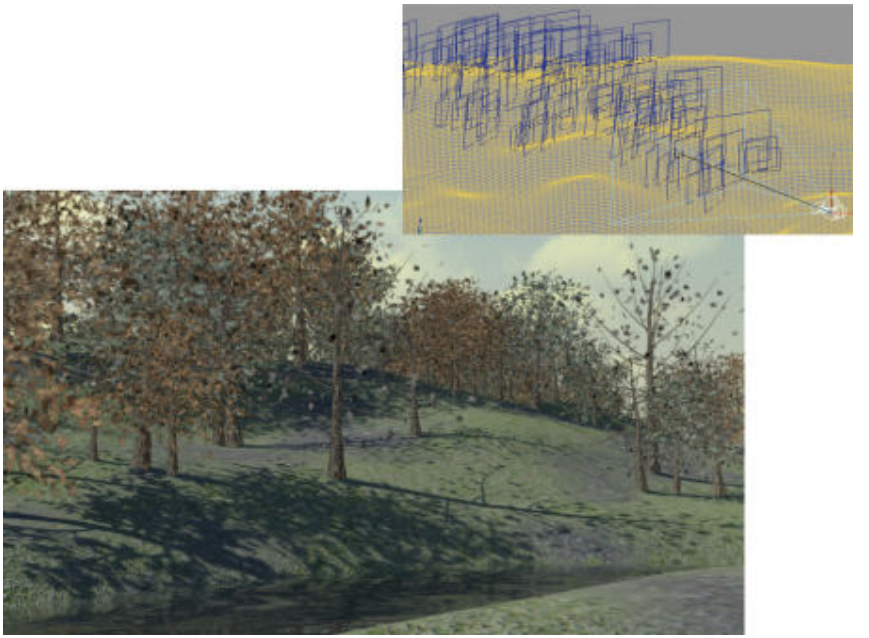
Reducing Complexity in Your Renderings

When you render a scene, the number of faces in the scene model directly affects rendering time: the greater the number of faces, the longer the rendering takes. The tutorials in this section use trees as an example of objects with a high face count. They show you to ways to reduce that count: by turning trees into particles, a method you can use with either renderer; and by turning trees into mr Proxy objects, a method that applies to the mental ray renderer.



Trees set up as "particles" to render a wooded area in a short amount of time

Particle Trees



Trees modeled using conventional 3D techniques can produce authentic results, but a single tree typically can include 20,000 polygon faces or more. If you need to duplicate the tree many times, to create a forest for example, you can be faced with a lengthy render involving millions of polygons.

There is a way however, to populate your scene with many life-like trees without sacrificing render speed. You can do this by using a particle system to generate a number of particles in the shape of two-dimensional planes, or "billboards". A map of a tree is then projected onto each billboard.

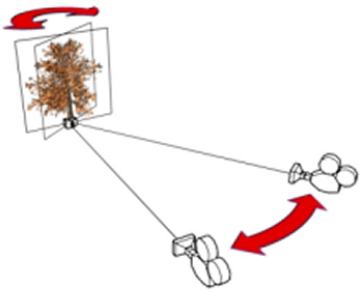
This particle method permits the mapping of different sizes and shapes of trees and is very economical to render. But it also raises several important issues.

Because the tree image is two-dimensional, it can be seen properly only when facing the camera directly. If seen from an angle, it loses its realism.

Left: Particle tree facing camera

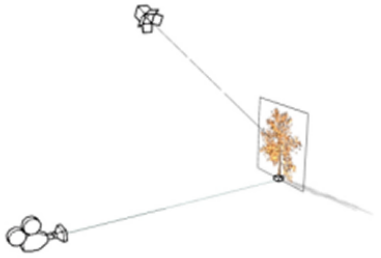
Right: Particle tree at oblique camera angle

For this reason, the flat plane on which the image is mapped must be continuously re-oriented toward the camera as the camera moves around the scene.



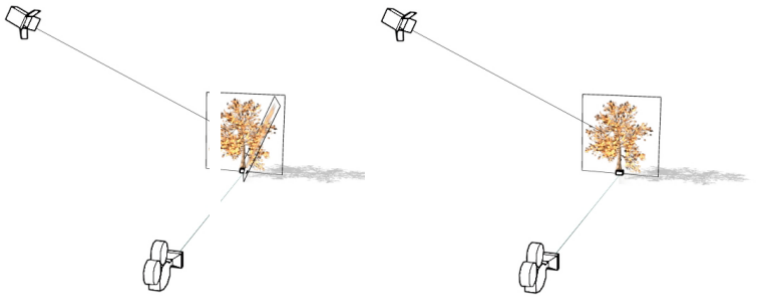
Particle tree continuously faces the camera

Another consideration is how your two-dimensional particle trees cast their shadows. If the light source (usually the sun) does not directly face the billboard plane, the tree will cast an unrealistic oblique shadow, as shown in the next illustration.



Light source causes the particle tree to cast a shadow at an oblique angle

You must therefore generate a second set of particle tree planes. The first set should show the tree and no shadow, while the second set should show a shadow and no tree.



Left: Second particle tree oriented toward the light source, with its shadow visible

Right: Second particle tree hidden, with only its shadow visible

The visible tree planes are oriented to continually face the camera, while the shadow-only tree planes continually face the light source. You define the tree and shadow orientation in the particle system parameter settings.

You should also introduce a degree of self illumination to the particle-based trees you generate. Otherwise, if the light source is behind the object in camera view, as shown in the next illustration, the object can appear darker that it should.

Left: Camera view of backlit particle tree with no self-illumination

Right: Camera view of particle tree illuminated directly by light source

In this tutorial, you will learn how to:

- Create tree objects and modify their material
- Create a particle system
- Use operators to shape particle system events
- Map images to generated particles
- Set particle visibility
- Assign sub-materials to generated particles
- Rearrange particle placement in a scene
- Use polygon selection to define the area in which to render the particles.

Skill level: Intermediate

Time to complete: 1 hour 30 minutes

Creating Billboard Tree Maps

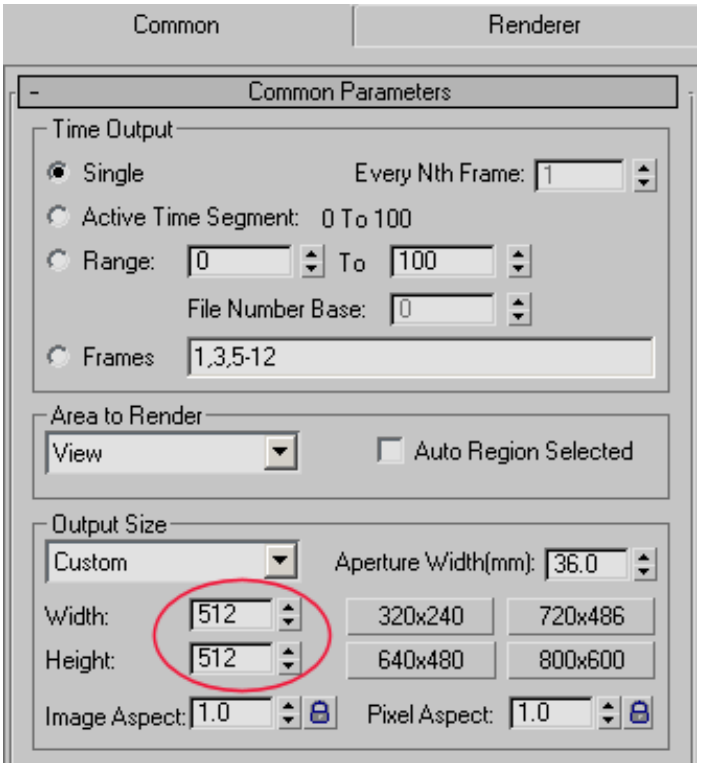
In this lesson, you will choose a tree from the 3ds Max library of ready-made plant objects and edit its material to resemble an elm in spring. You will save this object as a *.tif* image, ready to be projected onto the billboards of your particle system.

NOTE In addition to the tree objects available in 3ds Max, there are a number of commercially available plug-ins, such as Forest from Itoo Software, or RPC from ArchVision, that offer a wide range of alternative tree species.

Define a tree object:

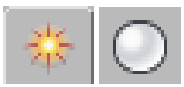
1  Open 3ds Max and on the main toolbar, click Render Setup.

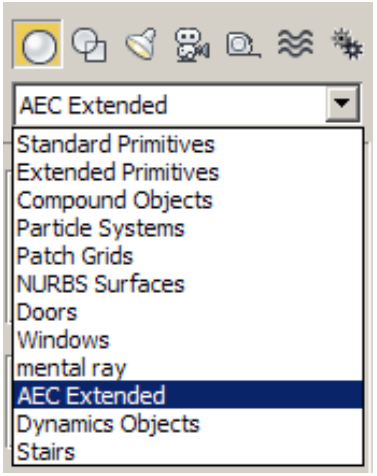
2 In the Render Setup dialog > Common panel > Common Parameters roll> Output Size group, set Width and Height to **512**.



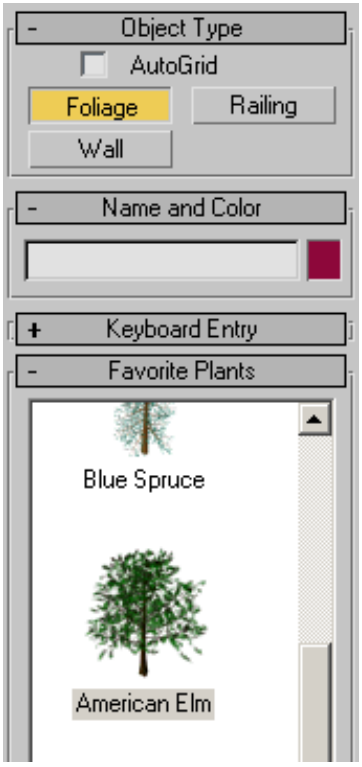
Each particle, or billboard, you generate from the particle system will be perfectly square, so the resolution of the map you want to use for the tree must be square as well.

A value of 1024 x 1024 or even higher is permissible, but the higher the resolution, the longer it will take to render the particle trees.

3  From the Create panel > Objects list, choose AEC Extended.



4 On the Object Type rollout, click Foliage and on the Favorite Plants rollout click American Elm.



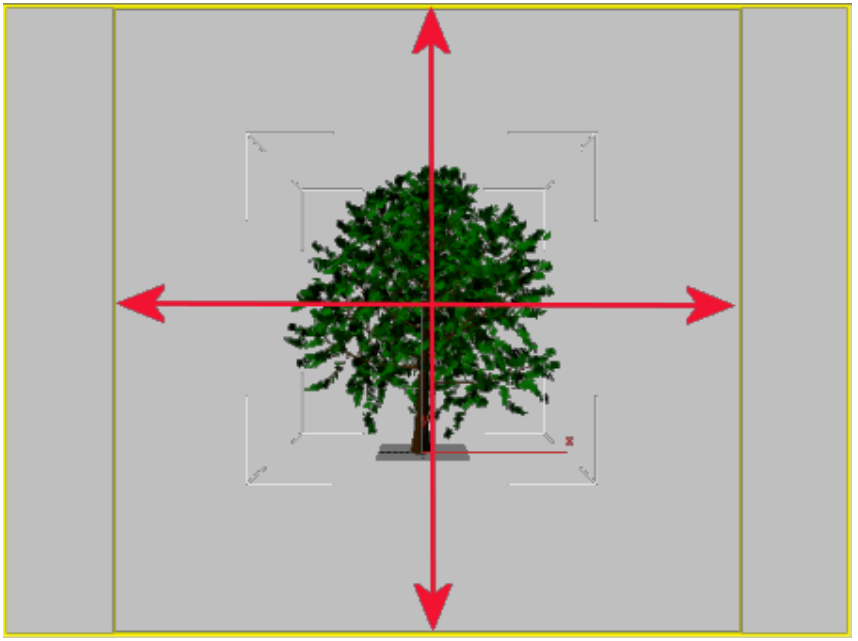
5 Click anywhere in the Perspective viewport to place the tree.

6 Right-click to exit object creation mode.

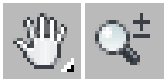
7 Activate the Front viewport and press P to switch to Perspective view.

8 Click the viewport Perspective label and choose Show Safe Frames. Make sure viewport shading mode is set to Smooth And Highlights.

The safe frame displays as a yellow square, indicating the extent of the render area.



Perspective view with the safe frame displayed

9  Use the Pan and Zoom controls to reposition the tree until it fully occupies the safe area.

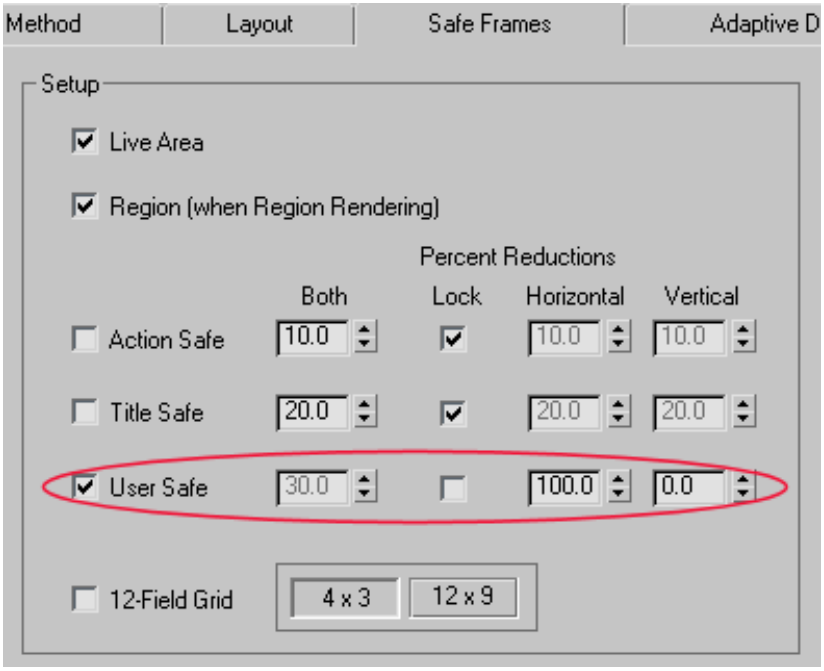
Tree repositioned to fill the safe area

You now need to make sure the base of the tree trunk is centered precisely at the bottom mid point of the frame. In doing so, you ensure that the trunk of this tree and the shadow of the second tree you'll derive from this image, will be properly aligned.

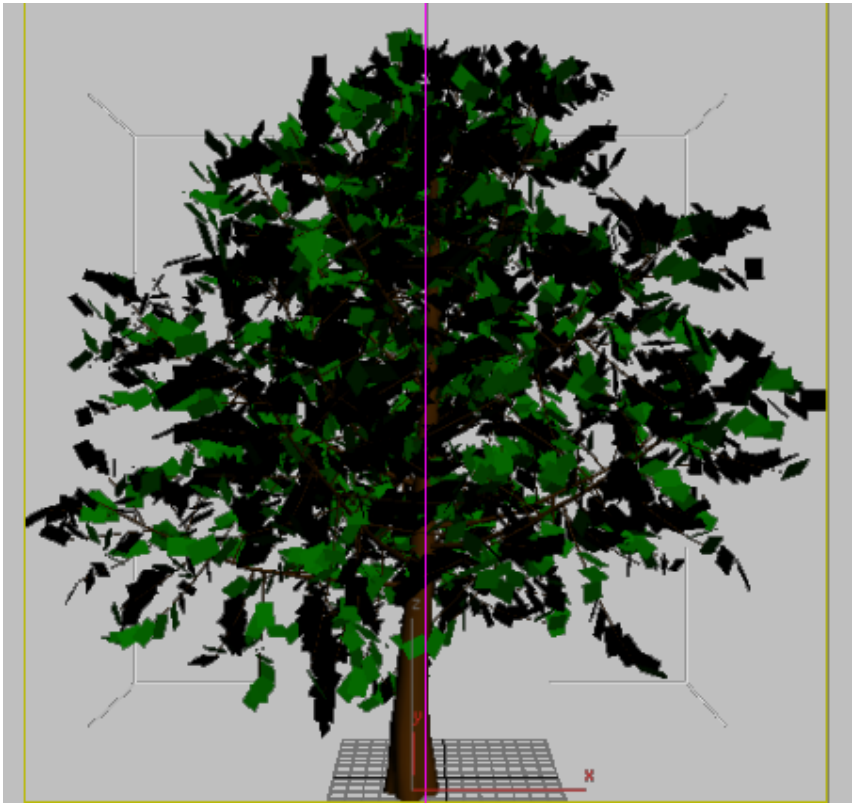
10 Click the Perspective viewport plus (+) sign and choose Configure.

11 In the Viewport Configuration dialog > Safe Frames panel > Setup group, turn off User Safe Lock, then turn on User Safe.

12 Set the User Safe Horizontal spinner to **100.0**, the Vertical spinner to **0.0**, and click OK.



A purple vertical guide line displays in the viewport safe area. (This guide line is actually a rectangular safe area with no width.)

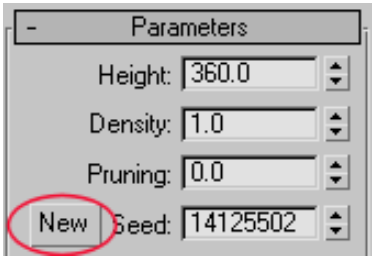


User safe area that acts as a guideline to center the tree in the frame

13 Reposition the tree until the center of the trunk base is aligned with the purple line.

The next step shows how to replace the tree with another one that may be more to your liking.

14 On the Modify panel > Parameters rollout, click the New button to the left of Seed until you see a tree you prefer.



15 Reposition the base of the tree as you did in step 13.

This time, also make sure the tree base extends slightly below the bottom edge of the safe area. This will cause the particle tree to slightly sink in to the emitter object and form a solid connection with the ground. Also, be sure no leaves or tree branches extend beyond the safe area.

Base of the tree repositioned so it extends slightly into the safe area

16  On the main toolbar, click Render Production.

Rendered version of the tree object

The tree is rendered using the default 3dsMax render settings. The trunk is quite dark, and the leaves are too uniform in color. To correct this problem, you will change their material diffuse values.

Edit the Tree Materials

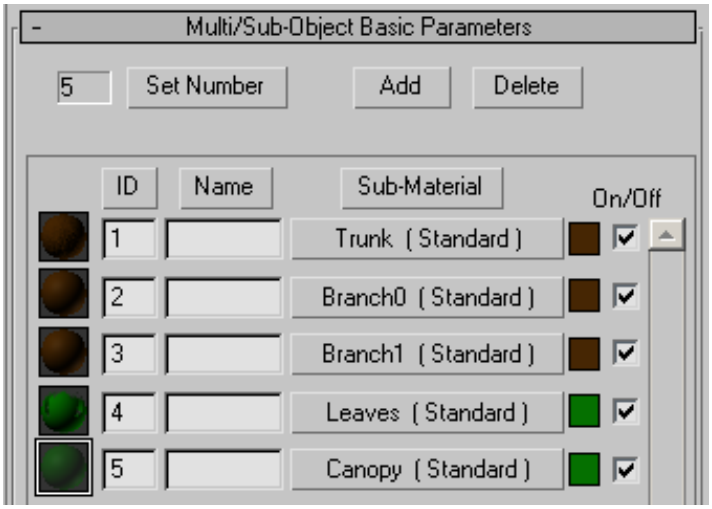
1 Close the rendered frame and press M to open the Material Editor.

The top left corner sample slot is already active. You will use this slot to edit the default tree material.

2  Click the eye dropper icon and in any viewport click on any part of the tree to display the tree material parameters.

The Multi/Sub-Object Basic Parameters rollout shows how the tree material has been created at a sub-object level, with sub-materials assigned separately to the trunk, branches, and leaves.

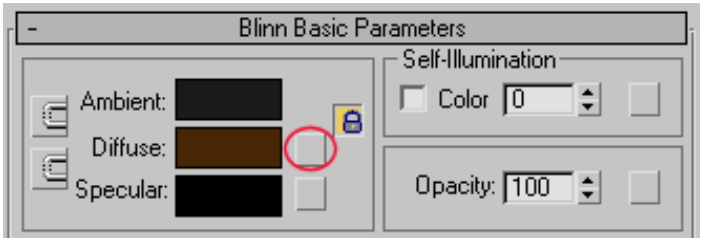
NOTE The Canopy sub-material is for viewport display when the tree object is not selected.



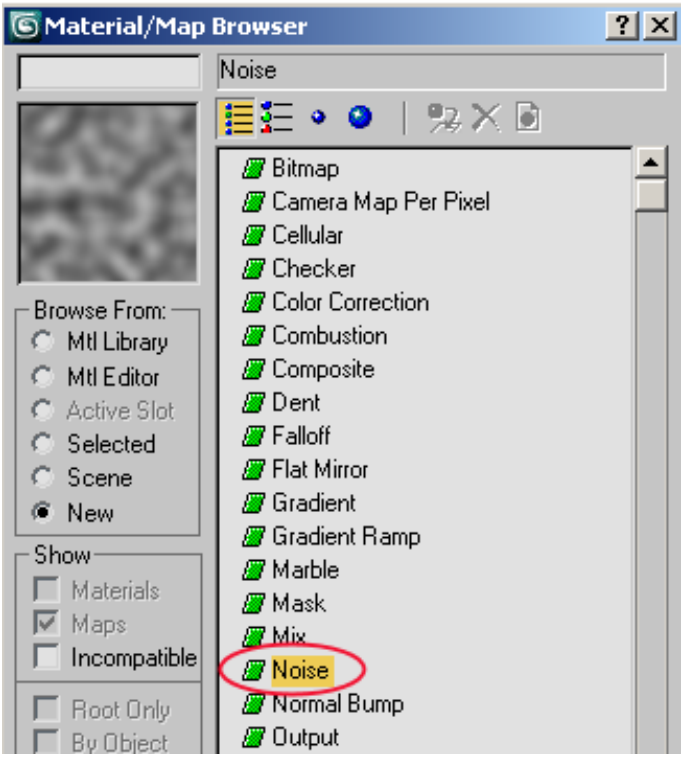
You will now change the diffuse values of the trunk material to brighten up the rendered image.

3 On the Multi/Sub-Object Basic Parameters rollout, click Trunk (Standard).

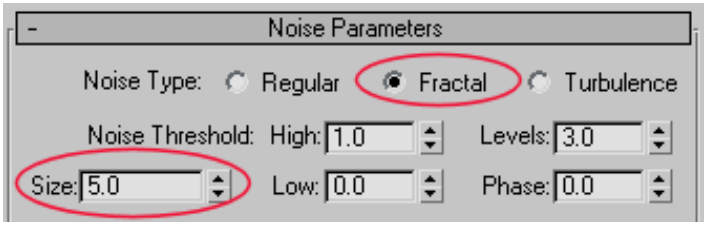
4 On the Blinn Basic Parameters rollout > Diffuse option, click the map button.



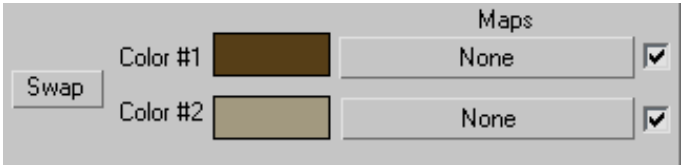
5 On the Material/Map Browser dialog, double-click on Noise.



6 On the Noise Parameters rollout, choose Fractal for noise type, and set the Size spinner to **5.0**.



7 Click the Color #1 color chip and choose a medium-dark brown color, (such as R: 77, G:41, B:5), then click the Color #2 color chip and choose a light tan or beige color (such as R: 146, G:124, B:102).



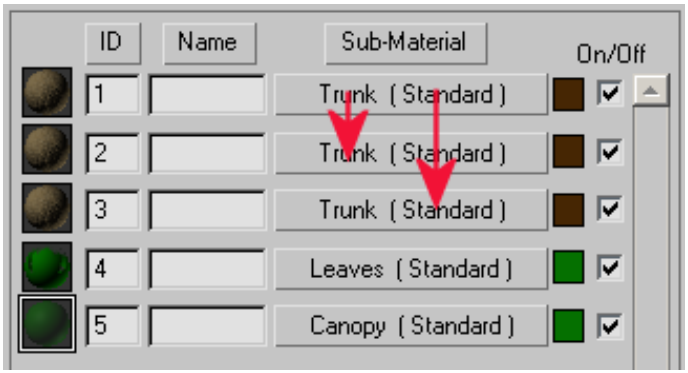
8 Render the Perspective viewport to see the new diffuse values you set for the tree trunk material. If you are not satisfied with the result, feel free to make further changes to the material color.

Tree object rendering after new diffuse values were added to the trunk

Next, you will copy the diffuse values of the trunk to the branches.

9  Click Go To Parent twice to go up two levels and display the parameters of the parent material.

10 Click and drag the Trunk material as an instance to the Branch0 material, then do the same for the Branch1 material.

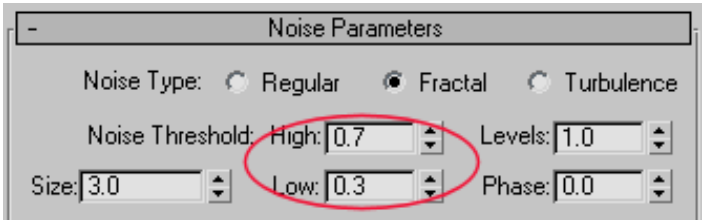


11 On the Multi/Sub-Object Basic Parameters rollout, click Leaves (Standard).

12 On the Blinn Basic Parameters rollout > Diffuse option, click the map button and on the Material/Map Browser dialog, double-click on Noise.

13 On the Noise parameters rollout, choose Fractal for noise type, and set the Size spinner to **3.0**.

14 Set the Noise Threshold High spinner to **0.7** and the Low spinner to **0.3**.



These values will increase the level of sharpness between the two colors you are about to choose.

15 Click the Color #1 color chip and choose a medium-dark green color, (such as R: 0, G:73, B:0), then click the Color #2 color chip and choose a light green color (such as R: 175, G:189, B:171).

16 Render the tree to see the new diffuse values for the leaf material.

Tree rendering with new diffuse values added to the branches and leaves

Note how the two-color combination makes for a more realistic result.

17  On the rendered frame window, click the alpha button to view the alpha channel of the tree object in the render.

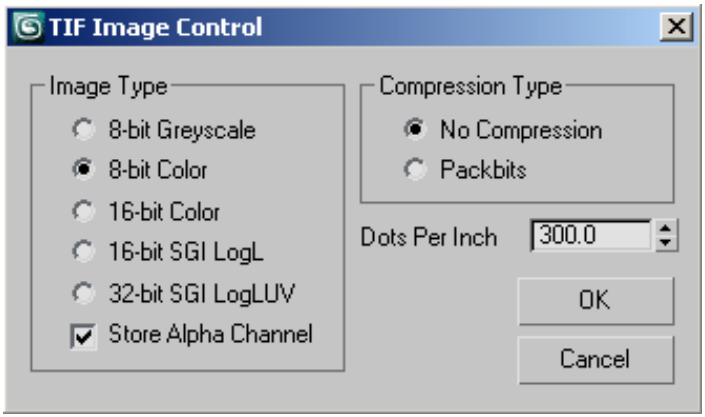
The alpha information provides the shape of the cutout for the particle trees you will later generate. You now need to save the tree object in an image file format that includes alpha information.

Alpha channel of the tree object rendering

18  On the rendered frame, click Save Image, and on the Save Image dialog File Name field, type **my_elm_spring.tif**, then click Save.

If you specified .tif as your file type, the TIF Image Control dialog opens. In the Image Type group, make sure 8-Bit Color is specified and Store Alpha Channel is on. If you chose another format, make sure to specify the alpha channel in your file setting.

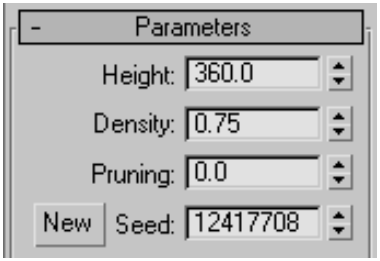
NOTE You can save your file in a format other than .tif, but be sure to choose a format that stores alpha information. Formats such as *.png* and *.tga* can include alpha, whereas *.jpg* cannot.



The particle system you are about to create can now use this tree image to populate a forest. To introduce some variation to the scene, you will create a second tree image to be referenced by the particle system as well.

Create a second tree image:

1. In the Perspective viewport, select the tree object and on the Modify panel > Parameters rollout, click the New button to the left of Seed.
2. Continue clicking the button until you obtain a tree you like.
3. Set the Density spinner to **0.75** and press Enter.



This value reduces the number of leaves on the tree.

4 If you need to, reposition the tree trunk as you did earlier so it is properly situated within the safe area.

5 On the Material Editor > Noise Parameters rollout, change Color #1 and Color #2 chips for the Leaves sub-material to red and orange respectively.

6 Render the image.

Tree object with fall-like parameters

By reducing the number of leaves and adjusting its color, you have created a tree that is suited to a fall scene.

7 On the rendered frame, click Save Image, then on the Save Image dialog File Name field, type **my_elm_fall.tif** and click Save. Be sure to specify the 8-bit and alpha channel options.

At this point, you could create as many different sizes, leaf density, pruning level, colors, and species of trees as you like to be referenced by the particle system.

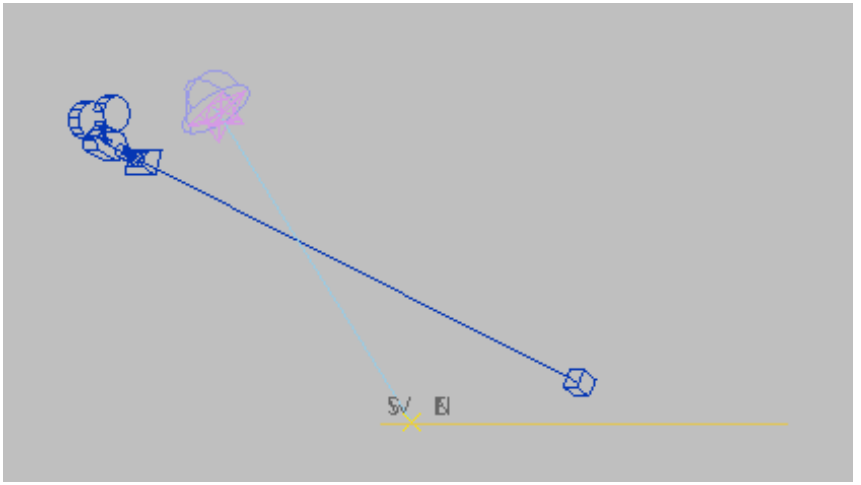
In this tutorial, however, you already have a dozen tree types made for you, sufficient to create a convincing-looking forest.

Creating a Particle System

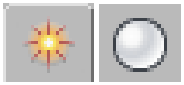
Now that you have set up the images you want to project on to the particle system, it is time to create the system itself.

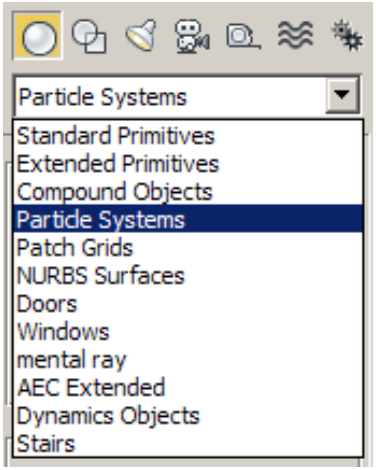
Create a particle system:

1  On the Quick Access toolbar, click the Open File button, navigate to the *\scenes\dynamics_and_effects\particle_trees* folder, then open the scene file *ptrees_basics.max*.



The scene consists of a simple plane on which you will place the particle-based trees. It also includes a daylight system for outdoor illumination, as well as a camera.

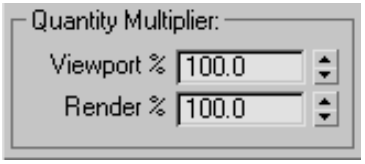
2  From the Create panel > Objects list, choose Particle Systems.



3 On the Object Type rollout, click PF Source and in the Top viewport, drag anywhere outside the plane to place the Particle Flow source icon.

The size and location of the source icon is not important, since the particles will be generated from the plane object.

4 In the Emission rollout > Quantity Multiplier group set the Viewport % spinner to **100.0**.

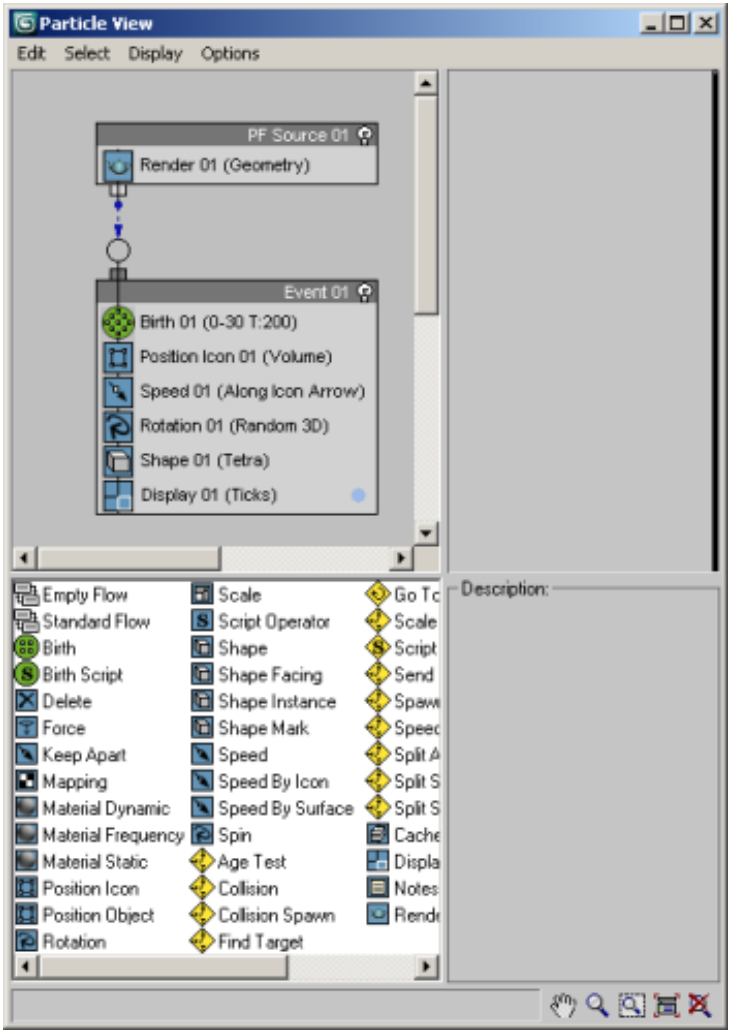


This setting lets you view each particle generated by the system in the viewports. When using particle systems to create such effects as smoke or fluid, you would not normally need to see all the particles and would typically reset this value to 50 percent or lower.

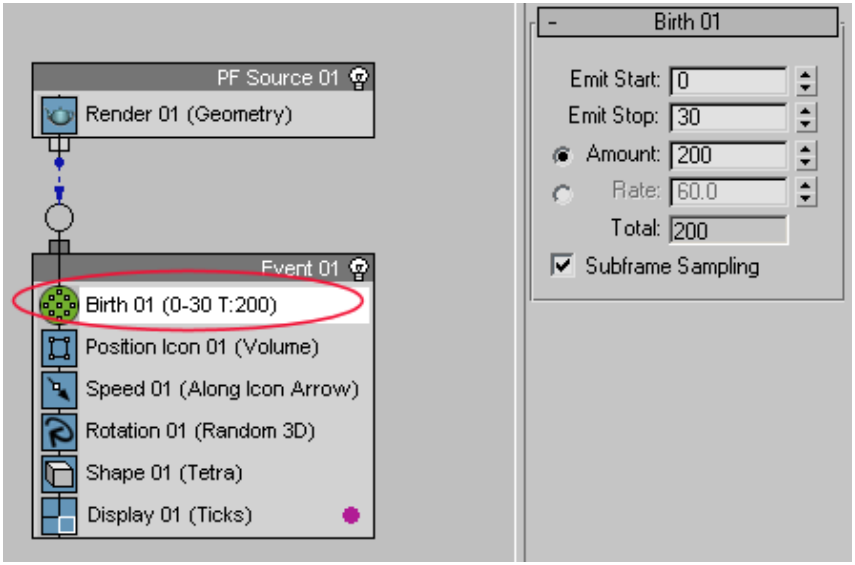
5 On the Setup rollout, click Particle View.

TIP You can also display Particle View by pressing 6 on your keyboard.

Particle View is a graphic display that lets you visualize the particle source and parameters, as well as events that influence particle appearance and behavior during its life span.

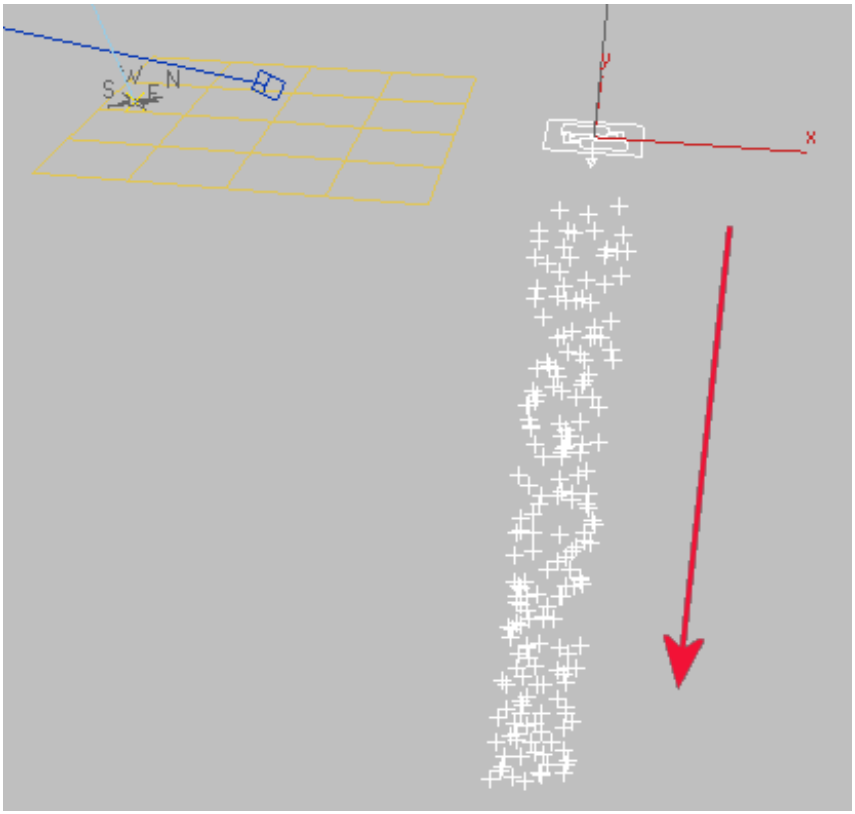


6 From the Event01 list of operators, click Birth01.



The Birth 01 rollout to the right displays parameters that relate to particle creation. The Emit Start and Emit Stop spinners indicate that particle generation will start at frame 0 and end at frame 30. The Amount spinner indicates that 200 particles will be generated by the system.

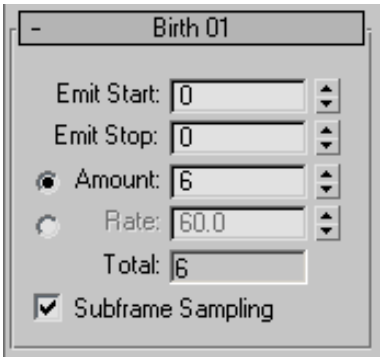
7 Drag the slider to scrub the particle animation and see how the particles are generated.



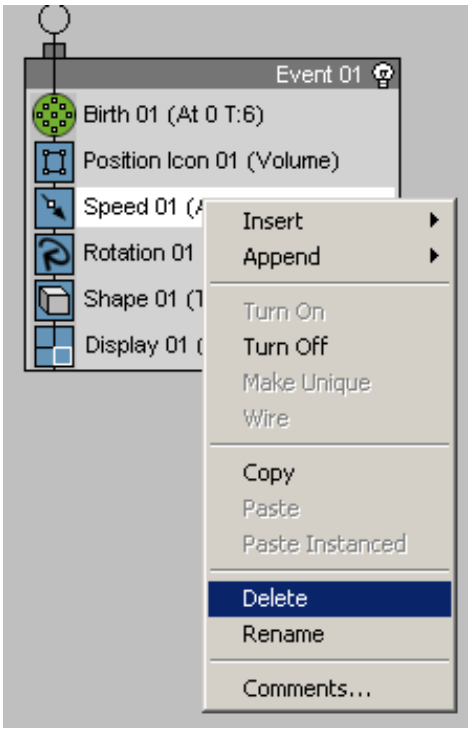
Particles emanating from the emitter object

You now need to modify the Birth 01 operator's parameters so that only six particles are generated and remain stationary at all times.

8 Set the Birth 01 rollout Emit Stop spinner to **0** (this ensures that the particles do not pop up over time) and set the Amount spinner to **6**, so that only six particle trees are created.

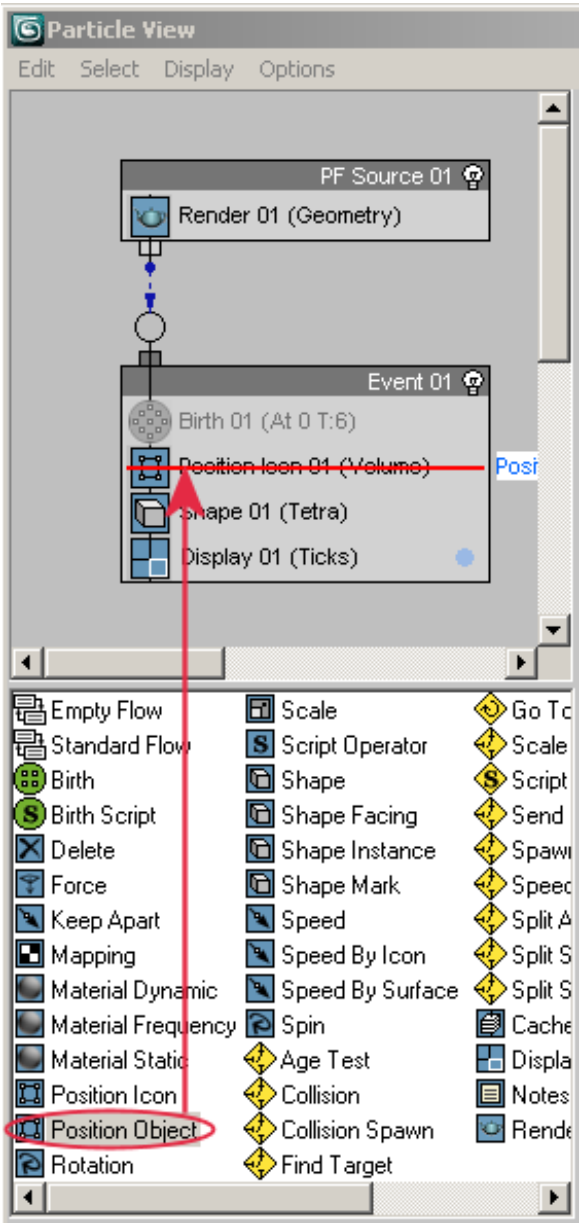


9 Highlight, then right-click the Speed 01 operator and choose Delete, since you do not want the particle trees to move.



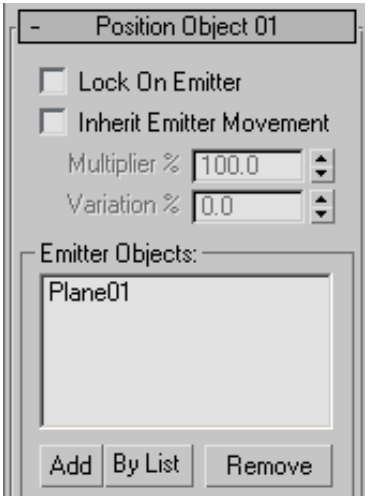
10 Highlight, then right-click the Rotation 01 operator and delete it as well, since the orientation of the particles will be driven by the camera position.

11 From the list of operators, click and drag the Position Object operator and drag it directly over the Position Icon 01 operator in the Event 01 box.



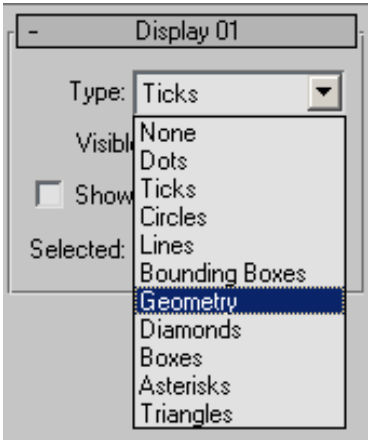
A red line displays, indicating you will replace the existing operator with the selected one as soon as you release the mouse.

12 Click the Position Object 01 operator and in the Position Object 01 rollout > Emitter Objects group click Add. In any viewport, pick the *Plane01*object.

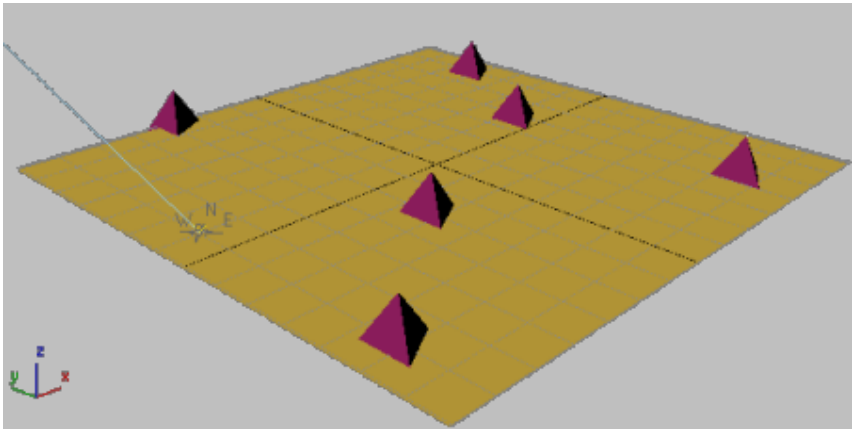


Before, particles were emitted from the particle source icon. Now, particles are emitted from the *Plane01* object and can be seen scattered about the plane's surface.

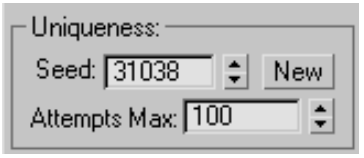
13 Click the Display01 operator and from the Type list, choose Geometry.



It is now easier to visualize the particles, although you will soon be replacing these shapes with tree images.

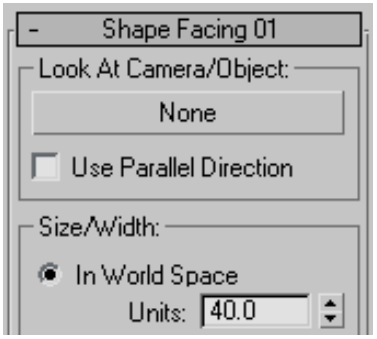


14 Click the Position Object 01 operator again and scroll down to the Uniqueness group. Click New to change the positioning of the particles. Continue clicking the button until you get a grouping you like.



15 From the list of operators, drag the Shape Facing 01 operator directly over the Shape 01 operator to replace it.

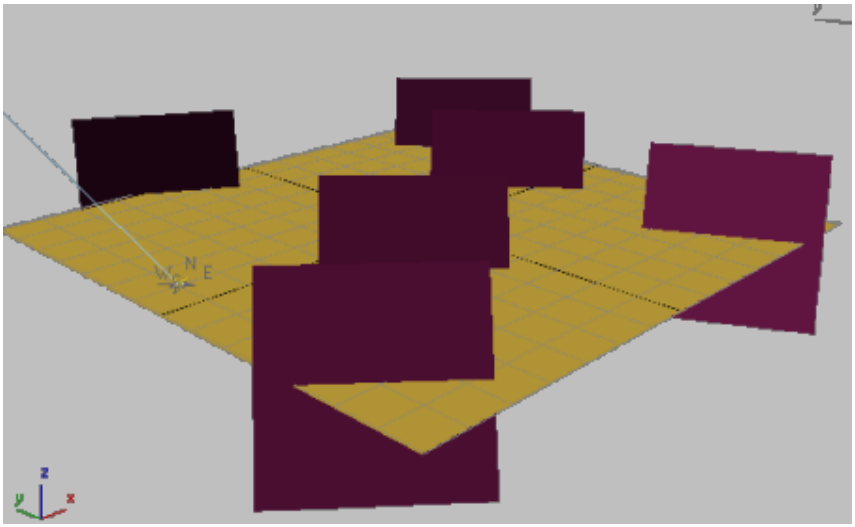
16 Click the Shape Facing 01 operator and in the Size/Width group In World Space units option, type **40.0** and press Enter.



This value increases the size of the particles.

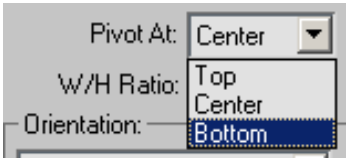
17 In the look At Camera/Object group, click the button labeled “None” and in any viewport, pick the *Camera01* object.

The particles, which previously lay flat on the plane emitter, now face the direction of the *Camera01* object.



NOTE To refresh the scene properly, you may need to adjust your view in the camera viewport, using any viewport navigation control.

18 From the Shape Facing rollout > Pivot At list, choose Bottom to raise the particles on the plane.



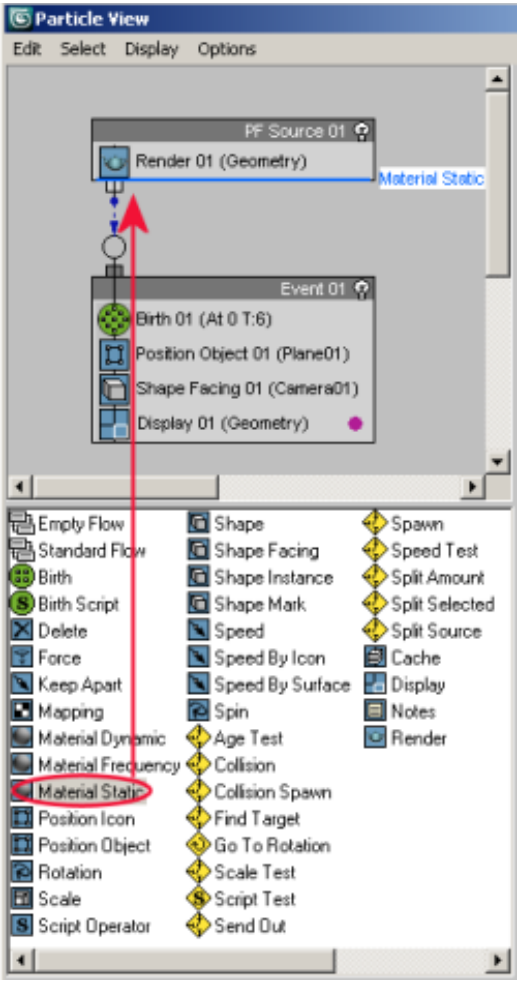
19 In the Size/Width group, set the Variation % spinner to **25.0**.

This creates a range of particle sizes. The tree images mapped onto each particle will also vary in size.

Next, you will map the tree images onto the particles. You will do so using the Material Static operator, the best option for a material that is not animated.

Map tree images to the particles:

1 From the list of operators, drag the Material Static operator to the PF Source 01 box, below the Render 01 operator. A blue line indicates the point of insertion.



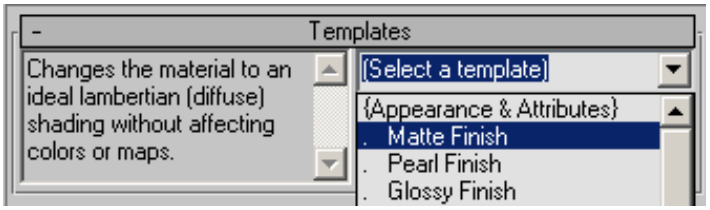
You are defining the material at the PF Source 01 level because you want all the trees to share the same material throughout the particle life span. If you wanted to assign the trees different materials based on a specific particle event, you would have instead dragged the static material operator to the respective event box.

2 Press M to open the Material Editor.

The mental ray Arch & Design materials library is already active.

3 From the Templates rollout templates list, choose Matte Finish.

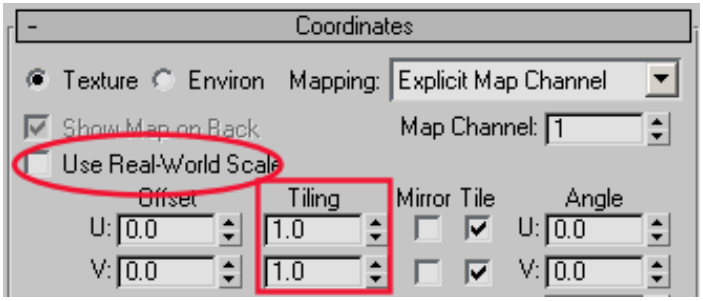
With Matte Finish selected, the trees will not pick up any reflection from neighboring objects.



4 In the Main Material Parameters rollout > Diffuse group, click the map button to the right of the Color chip.

5 On the Material/Map Browser, double-click Bitmap. On the Select Bitmap Image file dialog, navigate to one of trees you created in the previous lesson or a tree already prepared for you in the tutorial scene file. Select it and click Open.

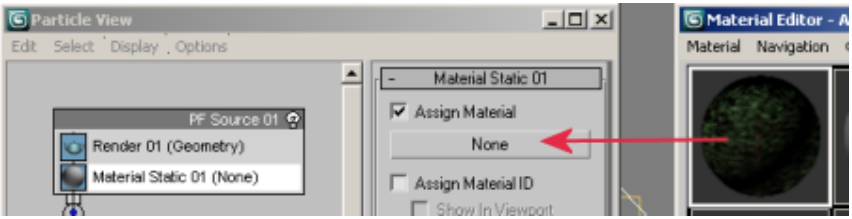
6 On the Material Editor > Coordinates rollout, turn off Use Real-World Scale and make sure Tiling is set to 1.0 for U and V.



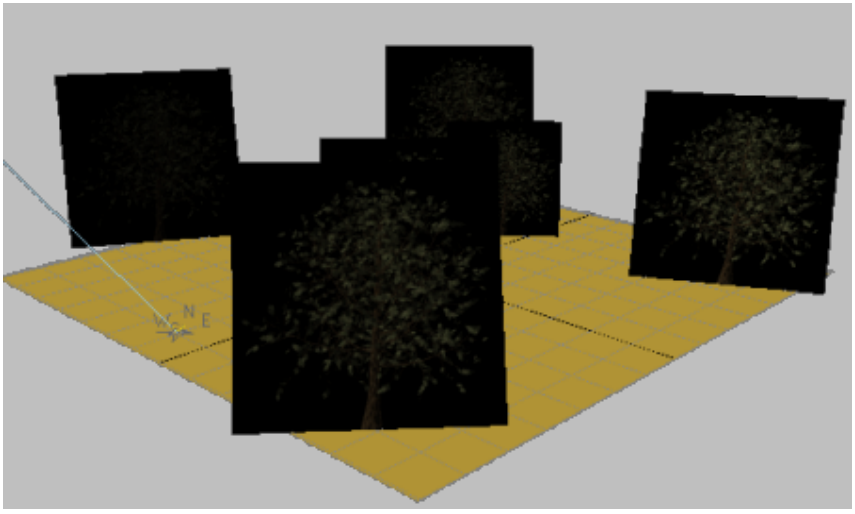
This step ensures the image area matches the size of the particle.

7  Go up one level and click Show Standard Map In Viewport to turn it on.

8 In Particle View, highlight the Material Static 01 operator, then drag the tree material from the Material Editor sample slot to the Assign material button (initially labeled “None”) as an instance.

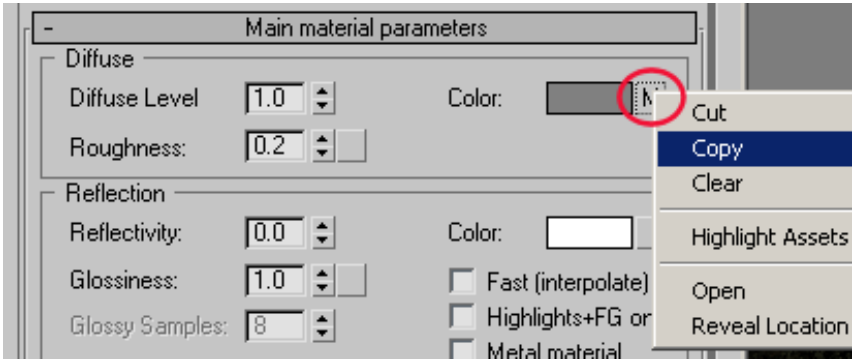


The tree map is now applied to all particles generated in the scene. The trees appear rather dark, but this is because their background remains visible: you now need to apply their cutout information.

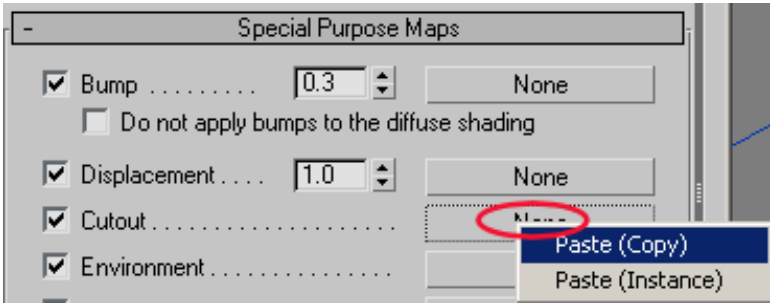


Tree map applied to all particles in the scene

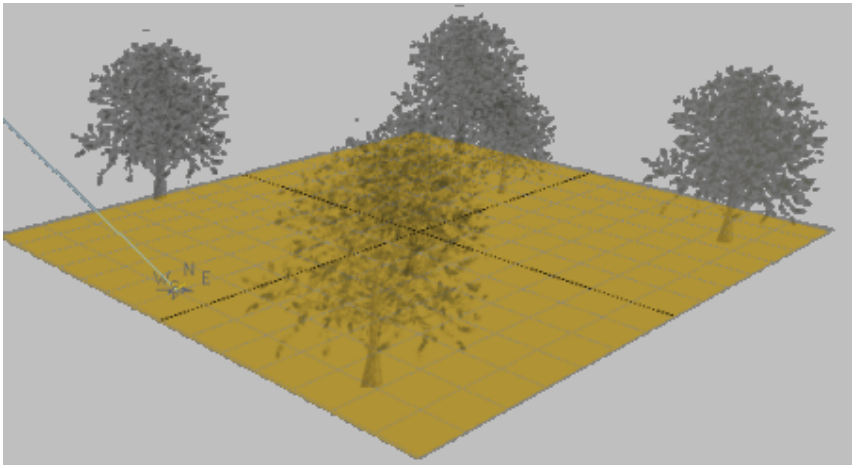
9 In the Material Editor > Main Material Parameters rollout > Diffuse group, right-click the Color map button (which now has an “M” label) and choose Copy to copy the tree map to memory.



10 Scroll down to the Special Purpose Maps rollout, right-click on the Cutout map button and choose Paste (Copy).



You are pasting as a copy, not an instance, because you will need to make a few changes to the map.

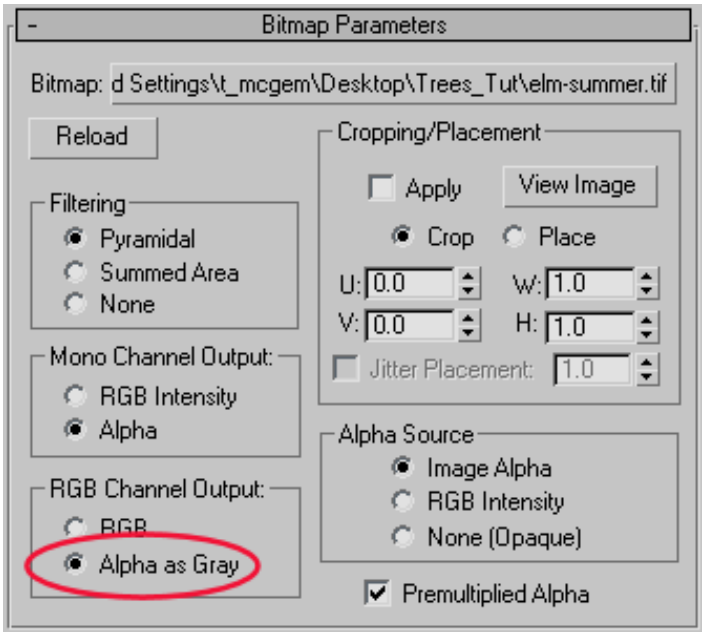


Particle trees with cutout information applied

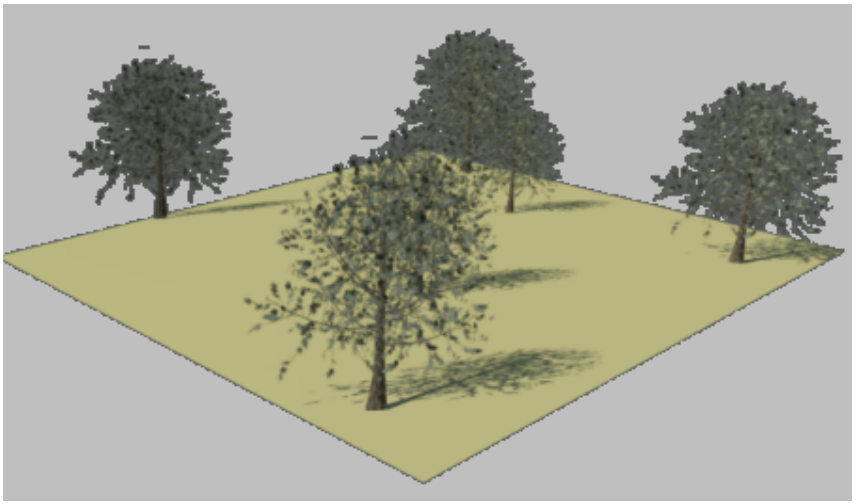
The trees appear semi-transparent in the shaded viewports.

Tree transparency is based on their RGB values. Black regions are completely transparent, creating the outline of the cutout you require. Reds and yellows, however, include RGB values that are partially transparent, resulting in an unwanted gradient of gray scale information.

11 On the Special Purpose Maps rollout, click the Cutout map button and in the Bitmap Parameters > RGB Channel Output group, turn off RGB Intensity and choose Alpha As Gray.



12  Go up one level and render the Camera01 viewport.



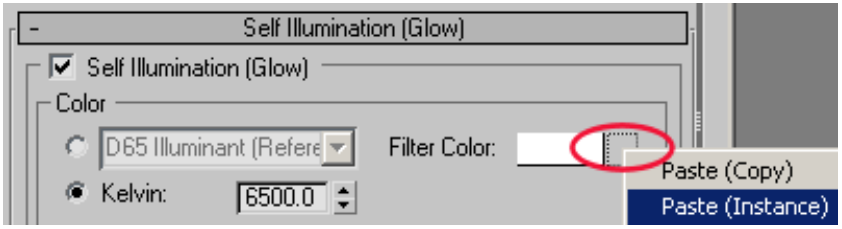
Particle trees with RGB alpha channels converted to gray

You have properly defined the diffuse values for the tree, as well as their cutout values. But the trees still appear somewhat dark in places.

You now need to boost the amount of self-illumination so that all parts of the tree can still be visible even when the leaves and branches are not in direct sunlight.

Set particle tree self-illumination:

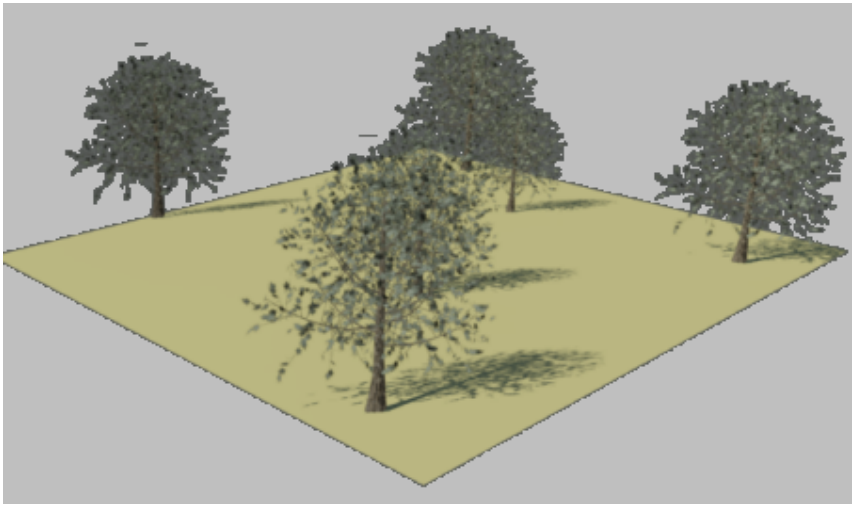
1. In the Material Editor > Main Material Parameters rollout > Diffuse group, right-click the Diffuse Color map button and choose Copy to copy the tree map to memory.
2. Scroll down and on the Self Illumination (Glow) rollout, turn on Self Illumination.
3. In the Color group, right-click on the Filter Color map button and choose Paste (Instance) to apply the RGB values of the tree map to the self illumination values.



The self-illumination will have no real effect at this point because the default Luminance values are overpowered by the daylight system exposure value set for your exterior scene.

4. In the Self Illumination (Glow) rollout > Luminance group, type **5000.0**.

5. Close the Material Editor and render the scene.



Particle trees with self illumination added

The self-illumination of the trees is now apparent.

6 Save your scene as **mytrees.max**.

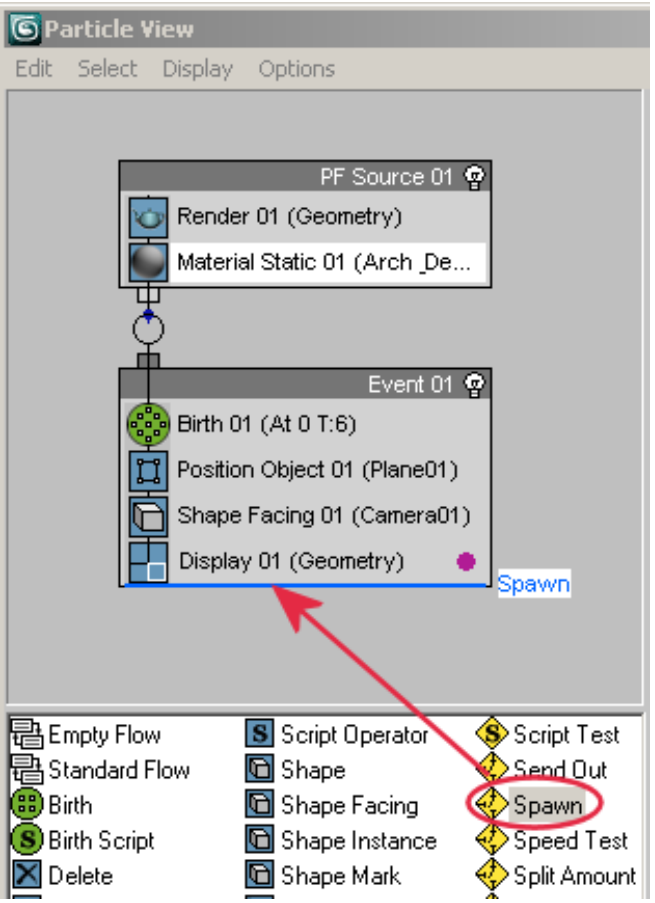
Defining Tree Shadows

In this lesson, you will instruct the particle system to generate a second set of trees, with only its shadows visible. You will then orient the shadows so they continually face the light source in the scene. As a result, the shadows will appear to belong to the first set of visible trees.

Generate a second set of tree particles:

1 Continue working on the scene file you saved in the previous lesson, or open the file called *ptrees.max*.

2 Press *6* to display Particle View, and from the Particle View list of operators choose Spawn, then drag it to the Event 01 box, below the Display 01 operator.



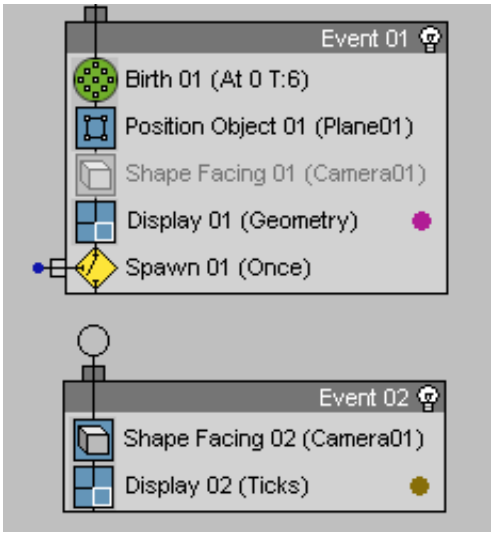
The Spawn operator will generate a new set of particles from the ones you defined in the Event 01 box.

3 Highlight the Spawn 01 operator to display its parameters.

On the Spawn 01 rollout > Spawn Rate And Amount group, the Once option should be chosen, indicating that only one set of particles will be created.

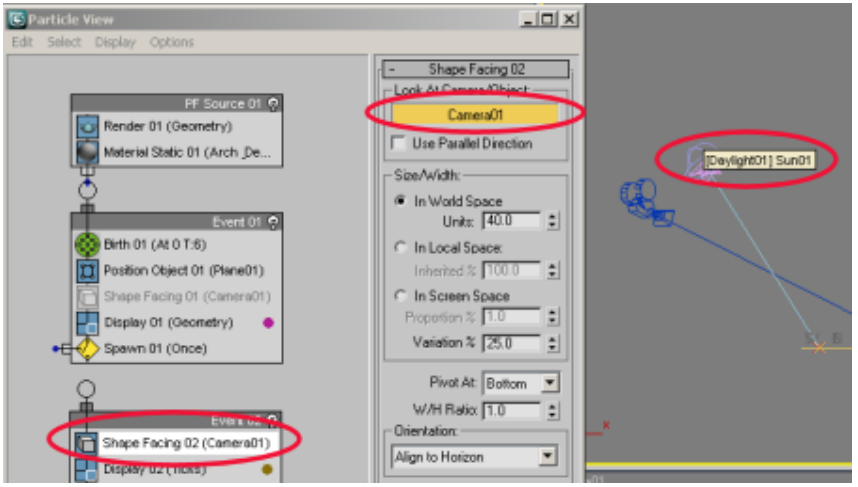
4 On the Event 01 box, highlight, then right-click the Shape Facing 01 operator and from the menu, choose Copy.

5 Right-click an empty area below the Event 01 box and choose Paste.

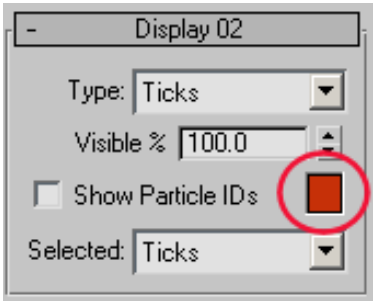


This creates a new event, called Event 02, with an operator that instructs the particles to also face the camera. You will now modify this operator so that the particles will face the scene light source instead.

6 Click the Shape Facing 02 operator and in the Shape Facing 02 rollout > Look At Camera/Object group, click Camera01. In any viewport, pick the *Daylight01/Sun01* object.



7 On the Event 02 box, click the Display 02 operator. On the Display02 rollout, click the paint chip and use the Color Selector controls to choose a red color.

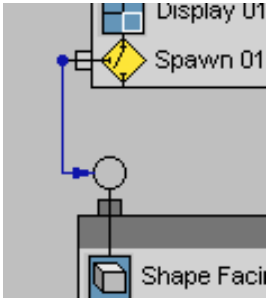


This color is used to display the shapes of the second set of particles in wireframe only, and will not be visible in the render. The red color will help you better identify the second set of particles.

8 On the Type box, choose Geometry.

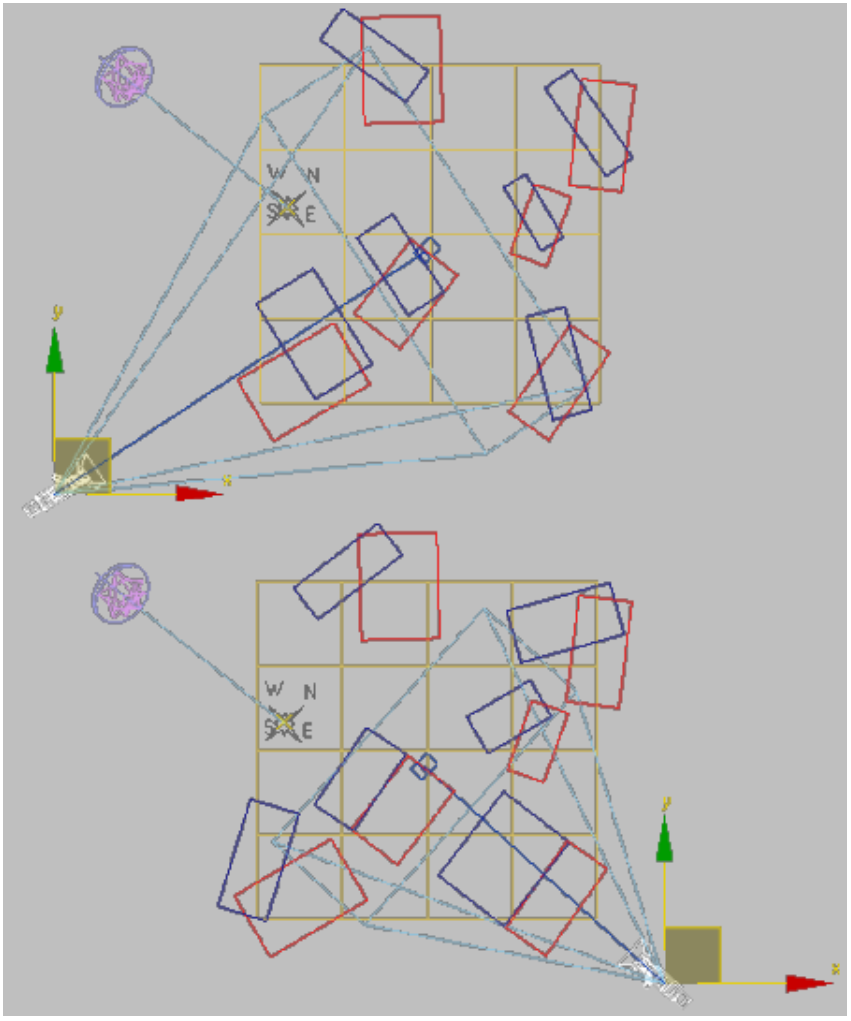
9 On the Event 01 box, click the Display 01 operator and choose a dark blue color, to better see the first set of particles in wireframe view.

10 Click the blue handle to the left of the Spawn operator and drag it to the empty circle that protrudes from the Event 02 box.



With this connection, the particle system spawns a set of particles once and sends them to Event 02 where they are instructed to face the sun.

11  In the Front viewport, select the camera and on the main toolbar, click Select And Move. In the Top viewport, rotate the camera around the scene.

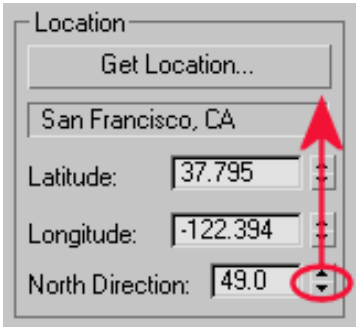


Top: Camera position 1 -- Bottom: Camera position 2

Billboard trees (shown in blue) follow the camera position, while the shadow particles (shown in red) do not

12 Select the *Daylight01/Sun01* object and in the Motion panel > Daylight Parameters rollout, click Setup.

13 In the Control Parameters rollout > Location group, drag the North Direction spinner upward.



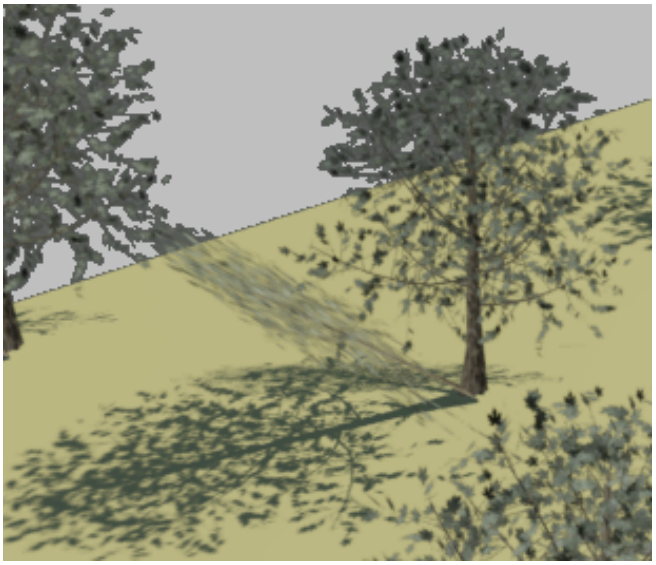
Note how the shadow trees, shown in red outline, follow the sun position, while the billboard trees do not. There is some irregular rotation to the shadow trees, however. This is because the sun's orbital position is too close to the trees.

14 In the Control Parameters rollout > Model Scale group, set the Orbital Scale spinner to **5000.0**.

15 Drag the North Direction values as you did in step 13.

The orientation of the particle trees are constant and parallel to one another.

16 Render the scene.



Rendered scene showing two sets of particle tree shadows

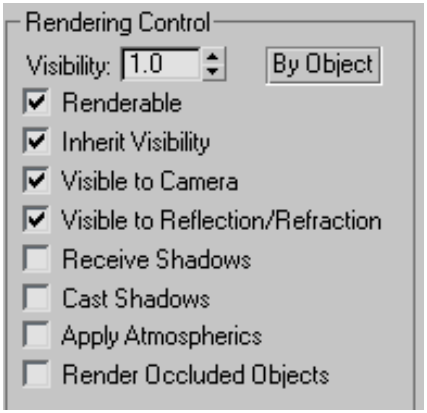
There are now two sets of particle trees, each of which cast shadows. You need to hide the shadows of the particle trees that face the camera, then hide the particle trees that face the sun but keep their shadows visible.

Set particle tree visibility:

1. Highlight, then right-click the Event 01 header, and from the menu, choose Properties.

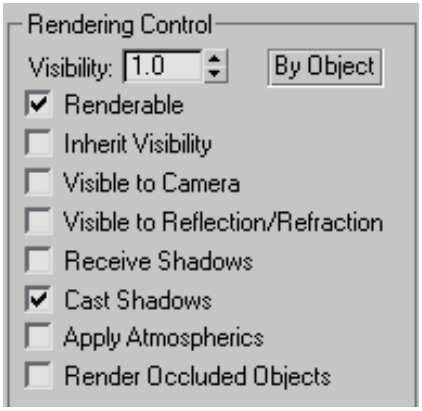
   Remember that in Particle View, the Event 01 box represents the particle trees facing the camera and Event 02 represent the particle trees facing the sun.

2. In the Object Properties dialog > General panel > Rendering Control group, click By Layer (if By Object is not already active) and turn off Receive Shadows, Cast Shadows and Apply Atmospherics. Click OK.

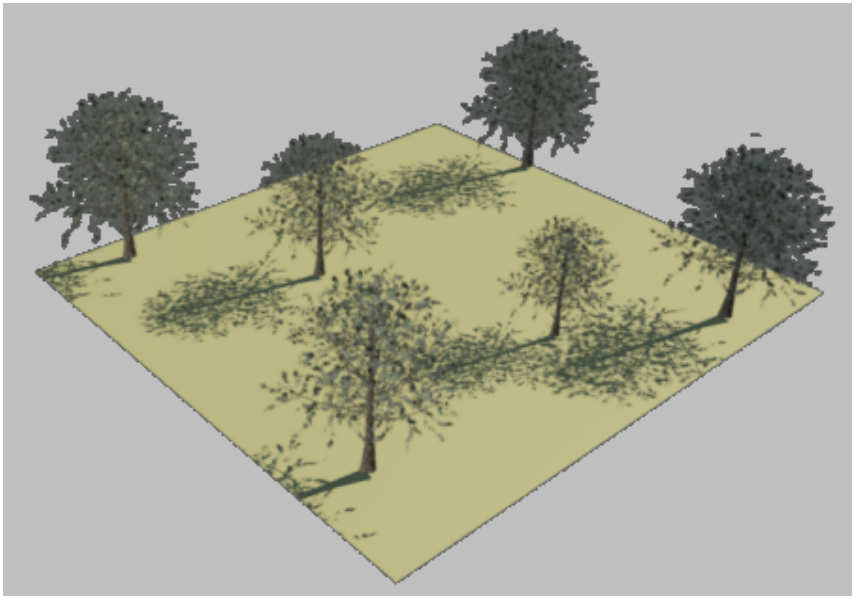


3 Highlight, then right-click the Event 02 header, and from the menu, choose Properties.

4 In the Object Properties dialog > General panel > Rendering Control group, click By Layer (if By Object is not already active) and turn off Inherit Visibility, Visible to Camera, Visible to Reflection/Refraction, Receive Shadows and Apply Atmospherics. Click OK.



5 Render the scene again.



Particle trees with only one set of shadows visible

The scene shows one visible set of particle trees with a second set of trees hidden and only their shadows visible.

6 Save the scene as *my_ptrees_shadows.max*.

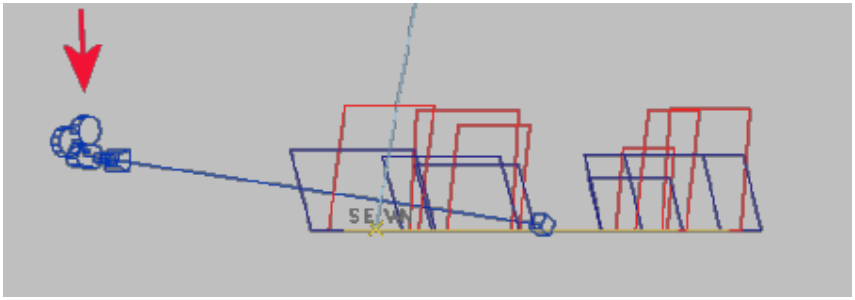
Introducing Variety

The trees in your scene are casting shadows properly, but while they vary in size, they are all identical in shape and color. To make a convincing forest, you now need to add a few more tree varieties into the mix.

Define tree types used in particle generation:

1 Continue working on the scene file you saved in the previous lesson, or open the file called *ptrees_shadows.max*.

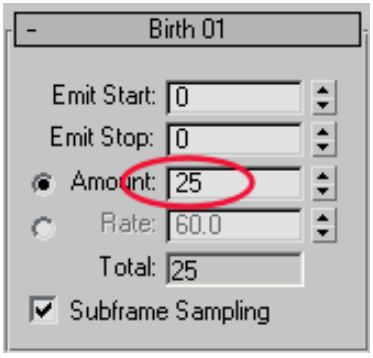
2  On the main toolbar, click Select And Move, and in the Front viewport, move the *Camera01* object until it is closer to the ground.



3  Activate the Camera viewport and dolly forward until the trees are in full view.

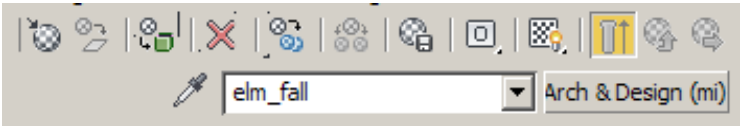
4 In Particle View, on the Event 01 box, click the Birth 01 operator to highlight it.

5 On the Birth 01 rollout Amount box, type **25** then close the Particle View window.



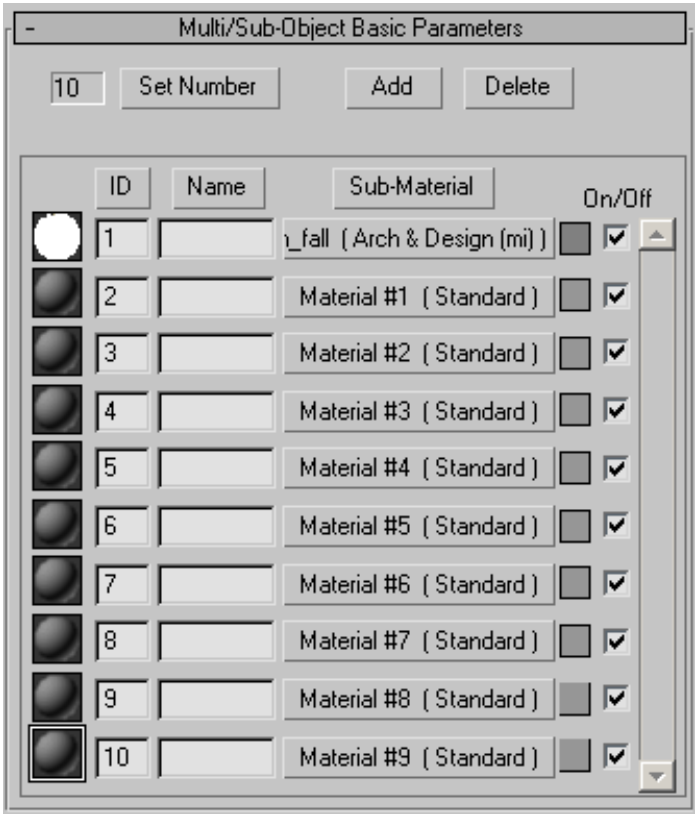
The number of trees generated by the particle system is now 25. Each particle uses the same image map of the elm tree you selected earlier. You now want some generated particles to reference three different types of trees.

6 Press M to open the Material Editor and rename the tree material **elm_fall**.



7 Click the Arch + Design button and on the Material/Map browser, double-click on Multi/Sub-Object.

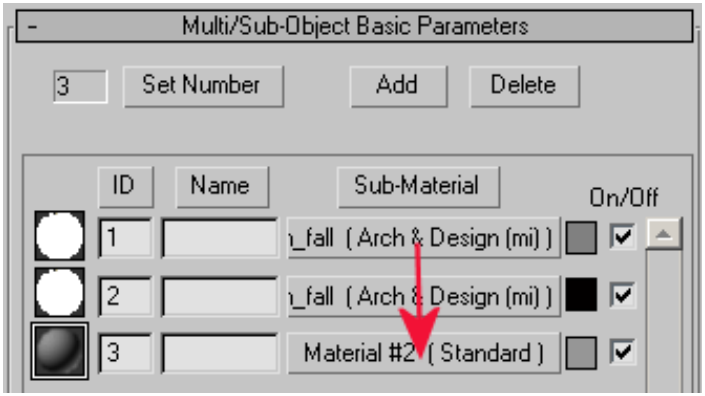
8 On the Replace Material dialog, make sure Keep Old Material As Sub-material is chosen, and click OK.



The Multi/Sub-Object Basic Parameters rollout displays. It contains 10 entries, each of which allows you to specify a sub-material.

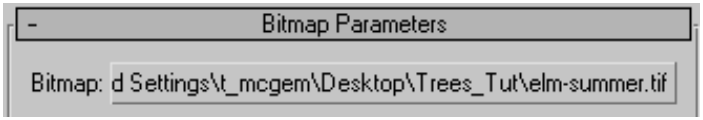
9 Click Set Number and on the Set Number of Materials dialog, type **3**, since you want to specify a total of three different types of trees in the particle generation.

10 Click and drag the elm_fall material as a copy to the Material #1 and Material #2 buttons.



11 Click the second elm_fall material button and rename the material **elm_spring**.

12 In the Main Material Parameters rollout > Diffuse group, click the Color browser button and on the Bitmap Parameters rollout, click the Bitmap button.



13 On the Select Bitmap Image File dialog, choose *elm-spring.tif* and click Open.

14  Move up one level, right-click the Material Main Parameters rollout > Diffuse Color map button and choose Copy from the menu.

15 Scroll down and in the Self Illumination (Glow) rollout > Color group, right-click the Filter Color map button and choose Paste (Instance).

16 Scroll down to the Special Purpose Maps rollout and right-click the button to the right of Cutout and choose Paste (Copy).

17 Click the renamed Cutout map button and in the Bitmap parameters rollout > RGB Channel Output group, choose Alpha As Gray.

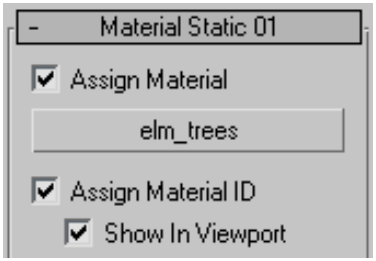
18 Go up two levels, click the bottom sub-material, and rename it **elm_winter**.

19 Repeat steps 12 to 17, choosing *elm-winter.tif* as the image file to use for the material.

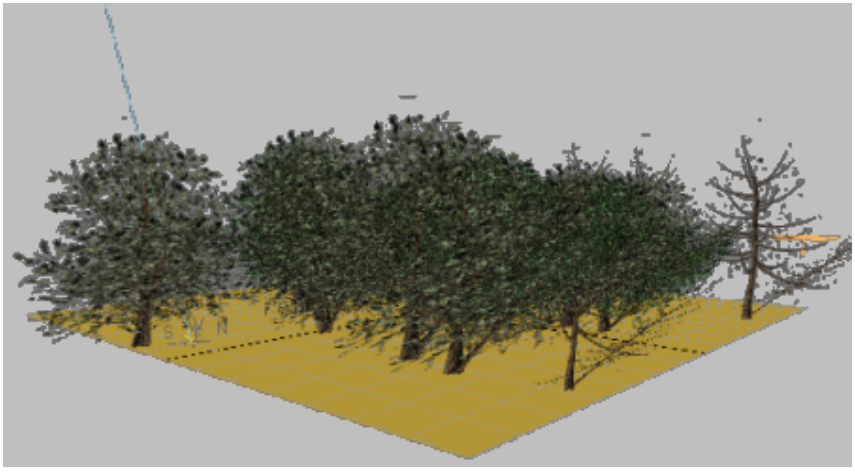
20  Go up two levels and rename the top-level material **elm_trees**.

21 Press 6 to display the Particle View window.

22 On the PF Source 01 box, highlight Material Static 01 and on the Material Static 01 rollout, turn on Assign Material ID and Show In Viewport.



23 On the Material ID box, click 1, 2 or 3 to display one of the three different tree sub-materials you set up earlier. Since you want a mix of all three types, turn on Random.

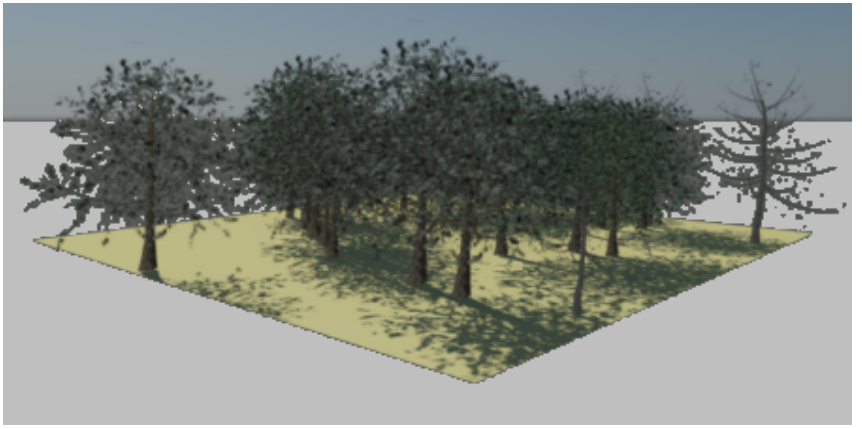


Random assortment of particle trees

The Camera01 viewport updates to show a random selection of all three tree types.

24 In the Material Static 01 rollout > Uniqueness group, click New repeatedly until you obtain a mix of tree types that look the best.

25 Render the scene to view the result.



Particle Tree Placement

In this lesson you will use polygon selection to define the area in which to generate tree particles.

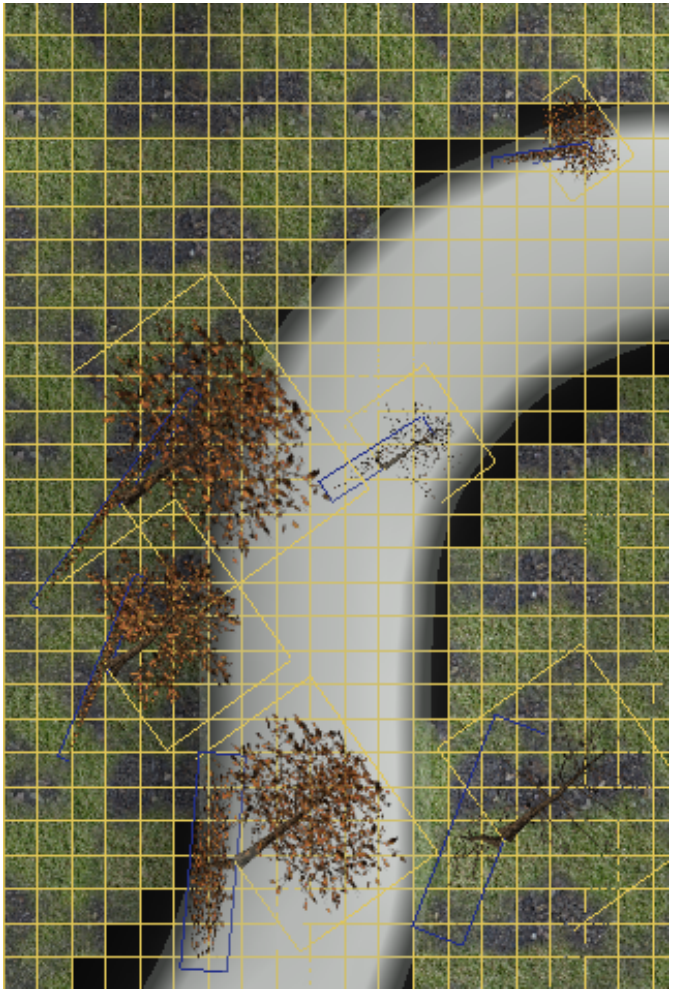
Use polygon selection to define the render area:

1 Open the scene file called *ptrees_placement.max*.

The scene consists of an undulating terrain bisected by a riverbed and populated by a number of particle-based trees.

2  Maximize the Top viewport and set viewport shading mode to Smooth + Highlights.

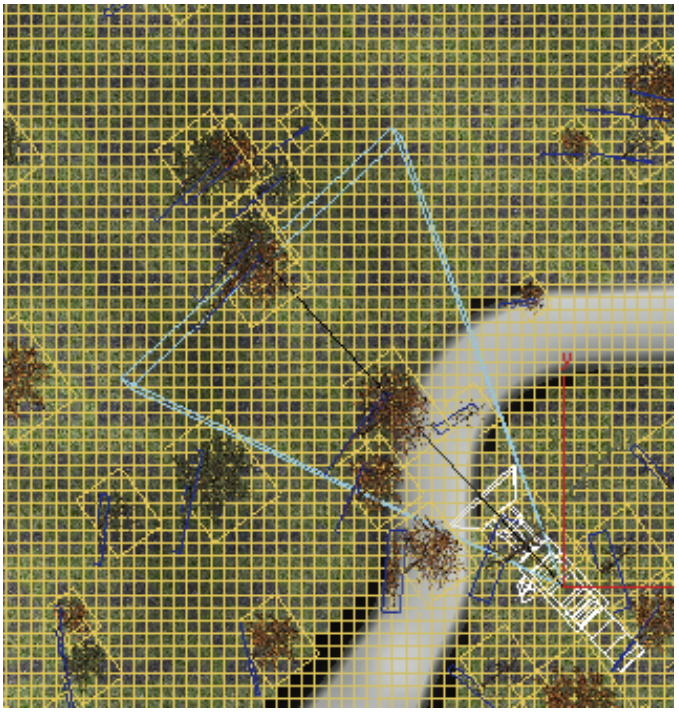
3  Zoom in to the river.



Notice how a few particle trees stand in or on the very edge of the river bed.

4 Zoom out again and select the *Camera01* object.

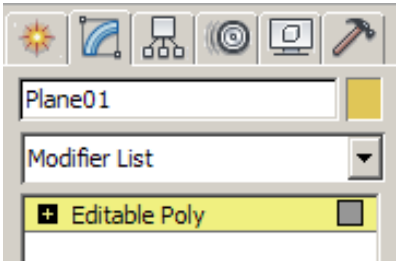
The light blue guidelines show the camera field of view. Assume for a moment that you only want a static shot, or plan to have the camera move towards the upper-left corner of the terrain. This means there are many particle trees elsewhere in the plane that will never be seen and consequently do not need to be rendered.



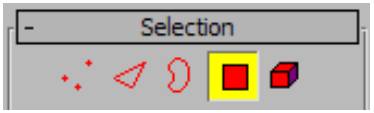
Camera field of view

You will now use polygon selection to indicate where to place the particle trees (within the field of view and not in or near the river).

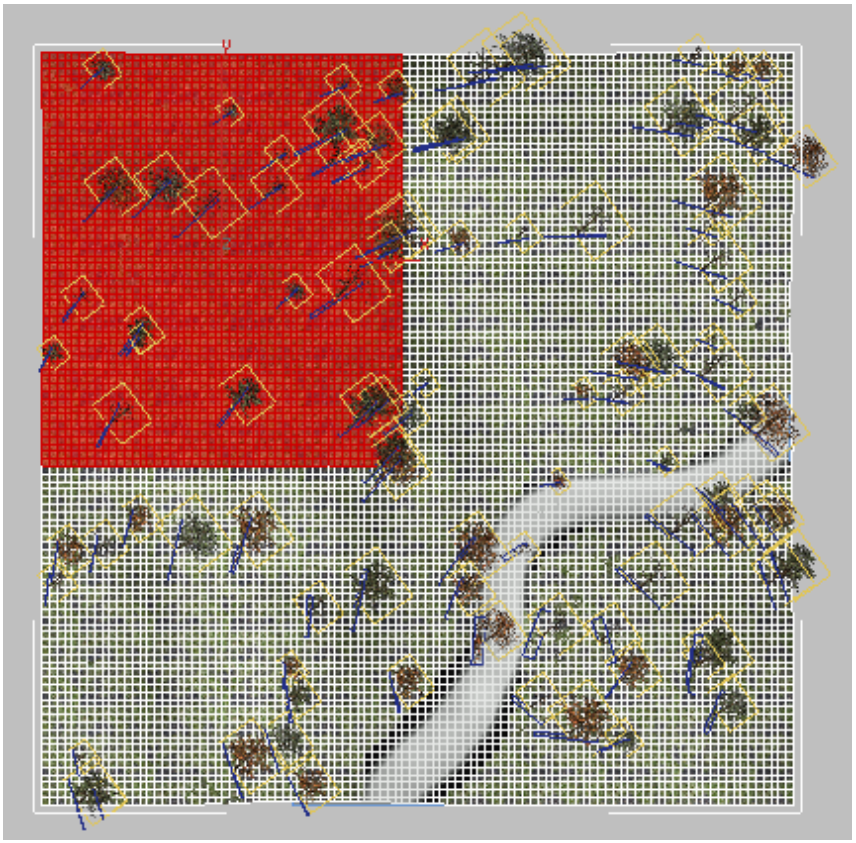
5  Switch back to four-viewport view, select the *Plane01* object and from the Modify panel > Modifier List, choose Editable Poly.



6 On the Selection rollout, click Polygon Selection.

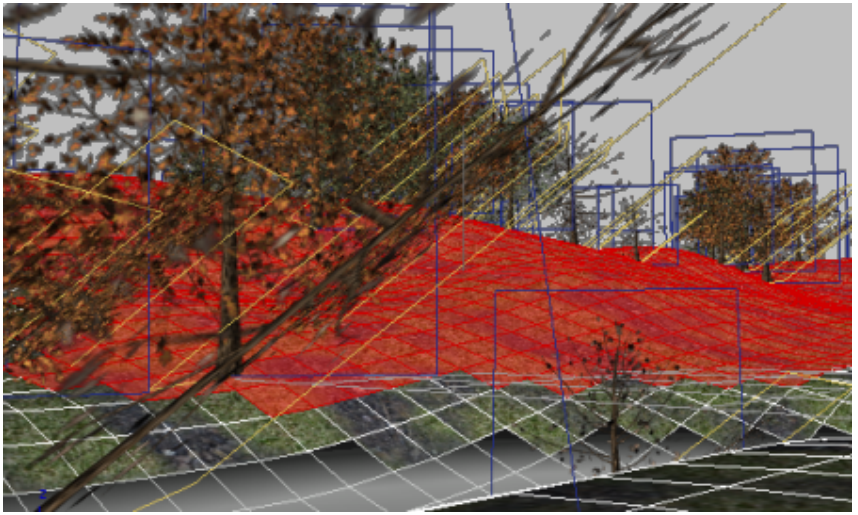


7 Click just outside the top left corner of the *Plane01* object and drag toward its center.

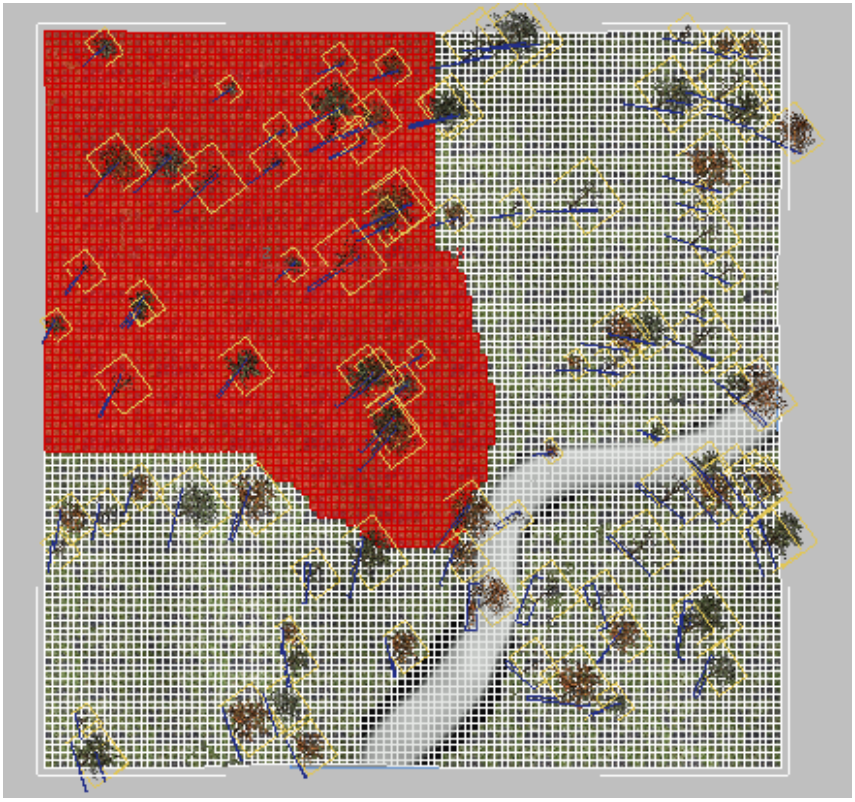


8  From the main toolbar, choose the paint selection tool, then the Select Object tool.

9 In the Camera01 viewport, hold down Ctrl and start painting over the polygons adjacent to the riverbank.

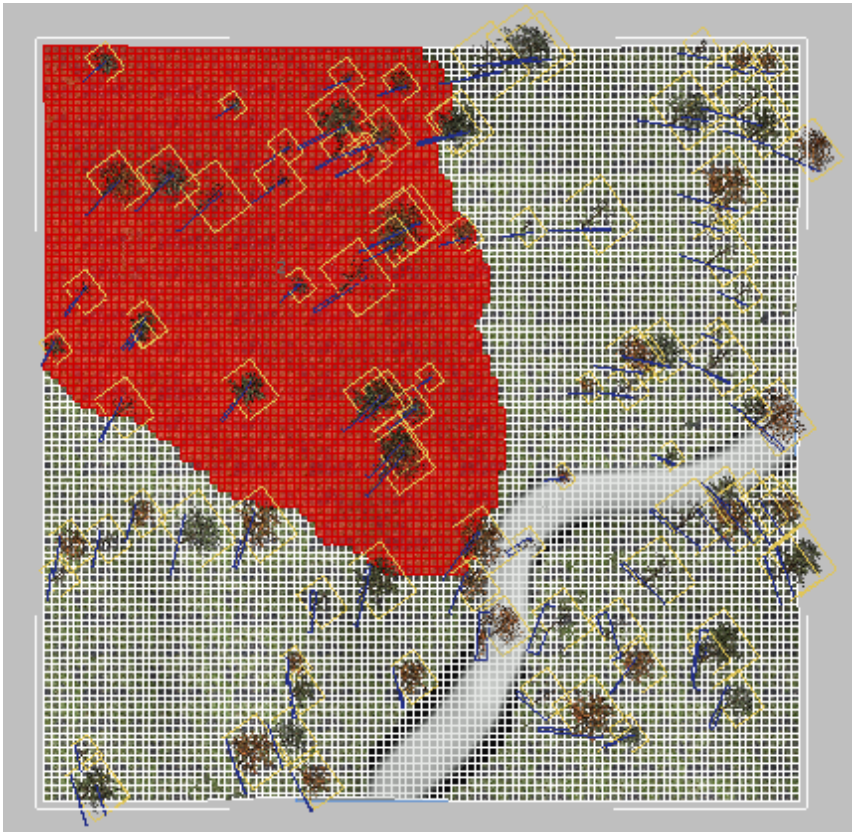


Selected polygons near riverbank



Top view, showing selection of polygons near the riverbank.

10 In the Top view, hold down Alt and eliminate the polygons at the periphery of the camera field of view, as shown in the next illustration.



Top view, with polygons beyond periphery of camera view deselected

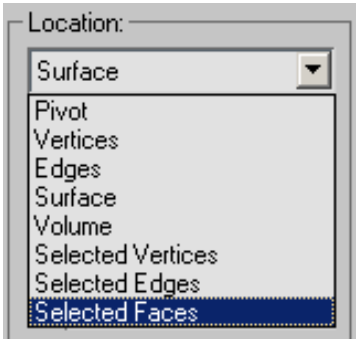
11 Zoom in and continue to use the Ctrl and Alt keys to add or subtract polygons by the riverbank until you are satisfied with the result.

12 On the Selection rollout, click Polygon Selection again to exit polygon selection mode.

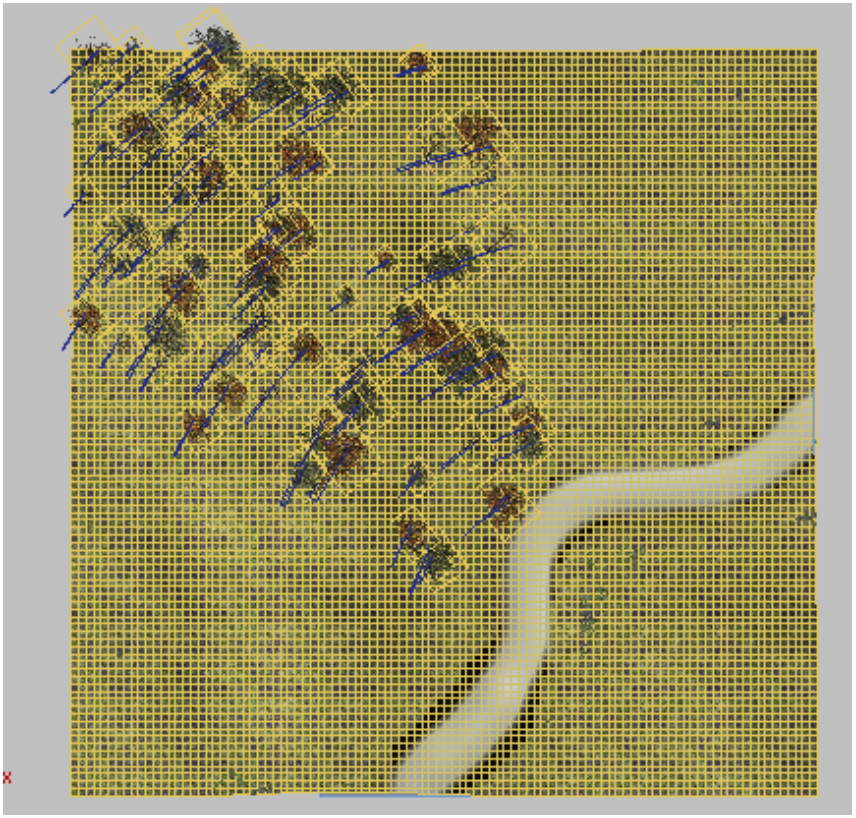
13 De-select the terrain object and press 6 to open the Particle View window.

14 On the Event 01 box, click the Position Object 01 operator.

15 In the Position Object rollout > Location group, from the Surface list, choose Selected Faces.



Previously, particles were generated across the entire plane. Now, the same number of particles are generated only on the polygon faces you just selected.



Particle generation restricted to top left region of plane object

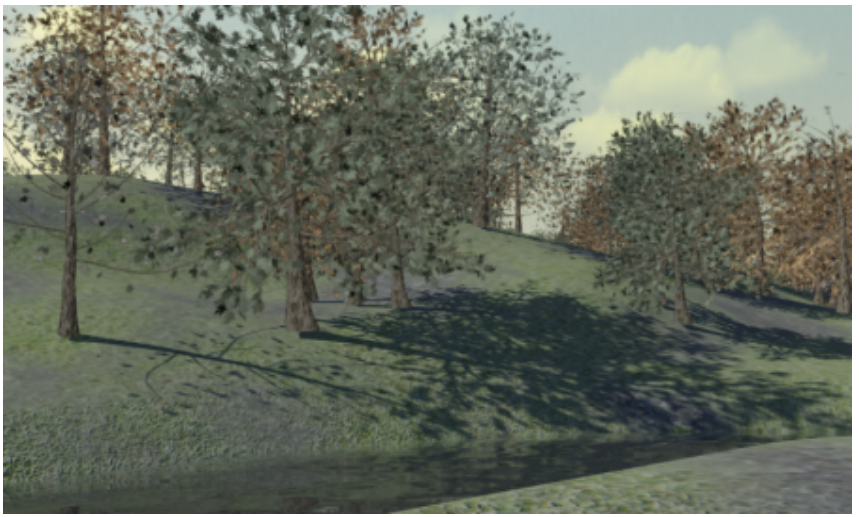
Because generation area is reduced, you can reduce the total number of particles generated.

16 In the Birth 01 operator rollout, set the Amount spinner to **50** and press Enter.

If you like, adjust tree placement in the Position Object 01 > Uniqueness group by clicking New until you see a grouping you prefer.

17 On the PF Source 01 box, click the Material Static 01 operator and in the Material Static Parameters rollout > Uniqueness group click New until the Camera01 viewport displays a mix of trees that looks best.

18 Render your scene.



Rendered 50-tree view of the particle forest

The 50 particle trees should take just a minute or two to render. If on the other hand, the scene was made up of 3D trees at 30,000 polygons each, you would need to process over a million polygons and require a great deal more time to render.

There is one aspect to watch out for when using particle systems to create trees with shadows. As the next illustration demonstrates, the base of the middle foreground tree does not quite match the base of its shadow.

Tree trunk not aligned with particle tree shadow

Recall that you created two sets of particle trees: one set oriented to face the camera and another, hidden set that faces the sun. Depending on the respective positions of the light source and camera, a hidden tree might cast a shadow that is slightly different to that of the visible tree.

To solve this problem, rearrange tree placement by changing the particle trees' seed value, or add objects such as rocks to obscure unwanted detail.

A completed version of this scene can be found in a scene file in the *\scenes\dynamics_and_effects\particle_trees* folder, called *ptrees_completed.max*.

Summary

Particle systems can offer a fast, effective way to populate scenes with multiple objects.

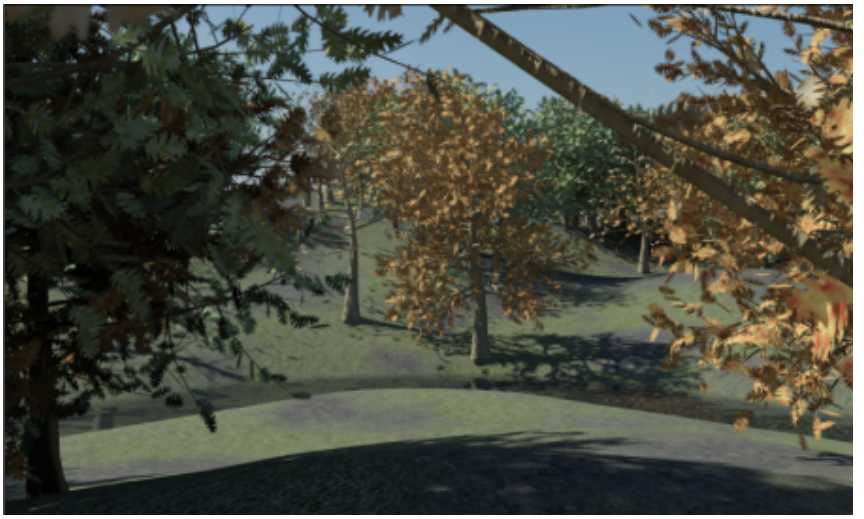
In this tutorial you used images of trees and mapped them onto billboard-sized particles. But you could just as easily have mapped other types of images, such as those of people, to create a crowd scene.

When using this particle-creation technique, make sure your particles are set to face the camera. If you need to cast shadows, generate a second set of particles and make sure their shadows continually face the light source.

mr Proxies

In this tutorial, you will learn how to use mr Proxy objects to create a scene of a forest that, despite its large size, can be quickly rendered.

You will create eight tree objects as a source, convert them to mr Proxy format, then give the proxies a material you saved in a material library. Finally, you will use the Scatter utility to instance the proxies multiple times and distribute them across the scene.



In this tutorial, you will learn how to:

- Create tree objects and define their species, shape, and foliage
- Define materials for the tree trunk, branches, and leaves
- Save materials to a material library
- Save objects in mr Proxy file format
- Create mr Proxies and associate them with imported proxy files
- Add materials to mr Proxies

- Use the Scatter utility to instance and distribute mr Proxies in a scene

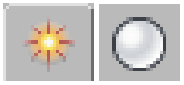
Skill level: Intermediate

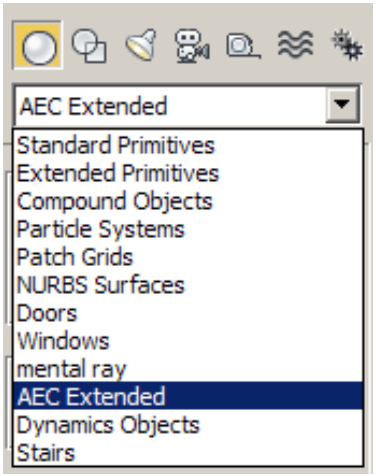
Time to complete: 1 hour 30 minutes

Preparing Source Objects

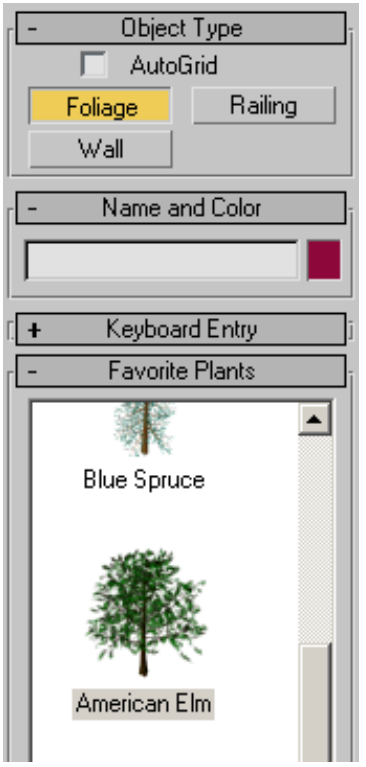
You will start by creating a group of tree objects which the proxies will use as a source. You'll then define materials for the trees and save the materials to a library for later use.

Define a tree object:

1  Open 3ds Max and from the Create panel > Objects list, choose AEC Extended.



2 On the Object Type rollout, click Foliage and on the Favorite Plants rollout click American Elm.

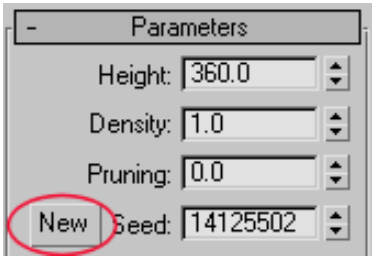


3 In the Perspective viewport, click on the center of the grid to place the tree.

4  Zoom out until the tree is in full view, then maximize the viewport.

5  On the Modify panel > Parameters rollout, click the New button to the left of Seed.

Each time you click the Seed button, the tree branch and trunk configuration changes.



6 Continue clicking on New until you obtain a tree you like.

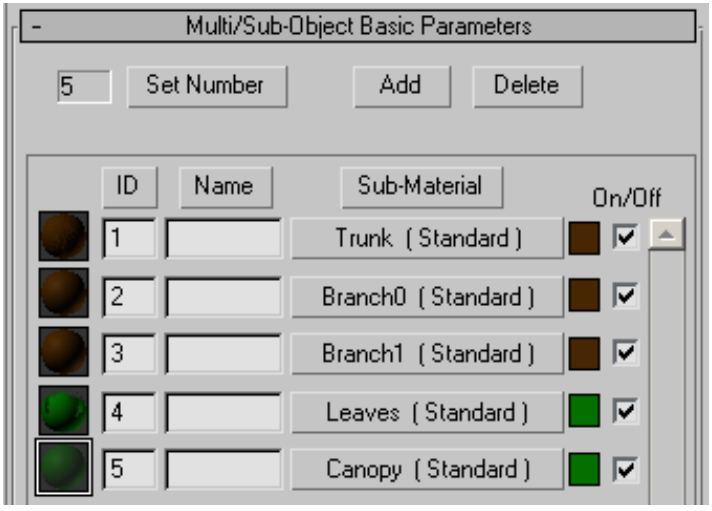
Edit Tree Material

1 Press M to open the Material Editor.

The top left corner sample slot is already active. You will use this slot to edit the tree material.

2 Click the eye dropper icon then click any part of the tree.

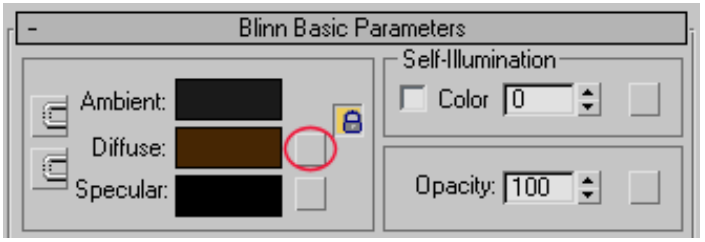
The Multi/Sub-Object Basic Parameters rollout contains five sub-materials, each assigned separately to the trunk, branches, and leaves. The Canopy sub-material is for viewport display when the tree object is not selected.



You will now change the diffuse values of the trunk material to brighten up the rendered image.

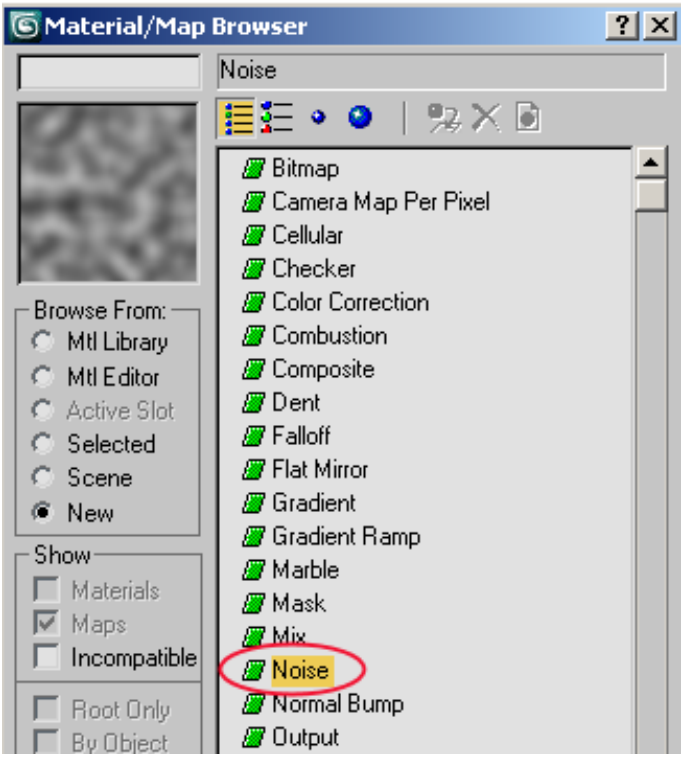
3 On the Multi/Sub-Object Basic Parameters rollout, click Trunk (Standard).

4 On the Blinn Basic Parameters rollout > Diffuse option, click the map button.

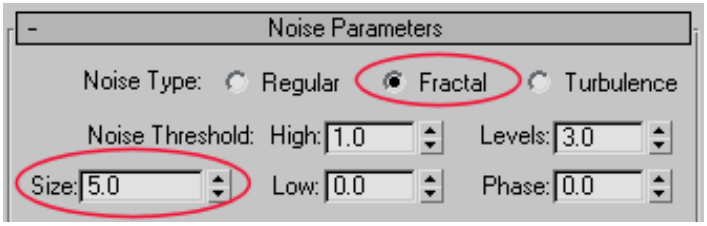


5 On the Material/Map Browser dialog, double-click on Noise.

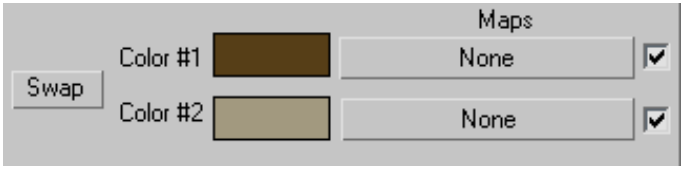
The noise map randomly mixes two colors or materials, to create an irregular surface.



6 On the Noise Parameters rollout, choose Fractal as the Noise Type, and set the Size spinner to **5.0**.



7 Click the Color #1 color chip and choose a medium-dark brown color, (such as R: 77, G:41, B:5), then click the Color #2 color chip and choose a light tan or beige color (such as R: 146, G:124, B:102).



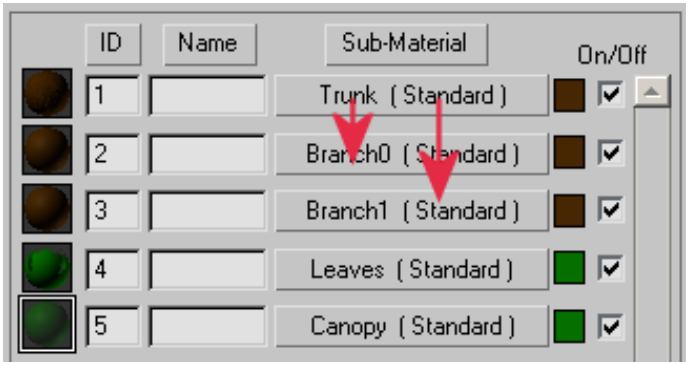
8  Render the Perspective viewport to see how the new diffuse values appear on the tree trunk. If you are not satisfied with the result, feel free to go back and make further changes to the material color.

Rendering of new trunk material

Now, you will copy the modified trunk material to the branches.

9  Click Go To Parent twice to go up two levels and display the parameters of the parent material.

10 Click and drag the Trunk material as an instance to the Branch0 material, then do the same for the Branch1 material.

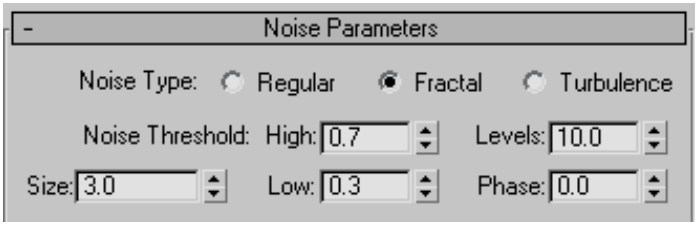


11 On the Multi/Sub-Object Basic Parameters rollout, click Leaves (Standard).

12 On the Blinn Basic Parameters rollout > Diffuse option, click the map button and on the Material/Map Browser dialog, double-click on Noise.

13 On the Noise parameters rollout, choose Fractal for Noise Type, and set the Size spinner to **3.0**.

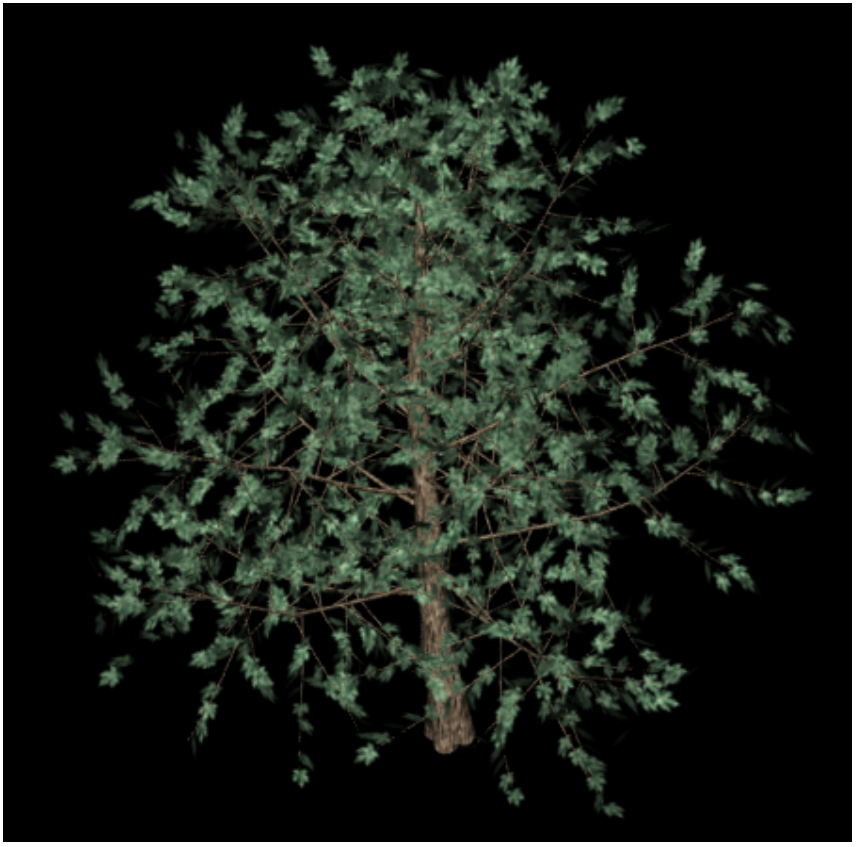
14 Set the Noise Threshold High spinner to **0.7**, the Low spinner to **0.3**, and the Levels spinner to **10.0**.



These values will increase the level of detail between the two colors you are about to choose.

15 Click the Color #1 color chip and choose a medium-dark green color (such as R: 0, G:73, B:0), then click the Color #2 color chip and choose a light green color (such as R: 175, G:189, B:171).

16  Render the tree to see the new diffuse values for the leaf and branch material.

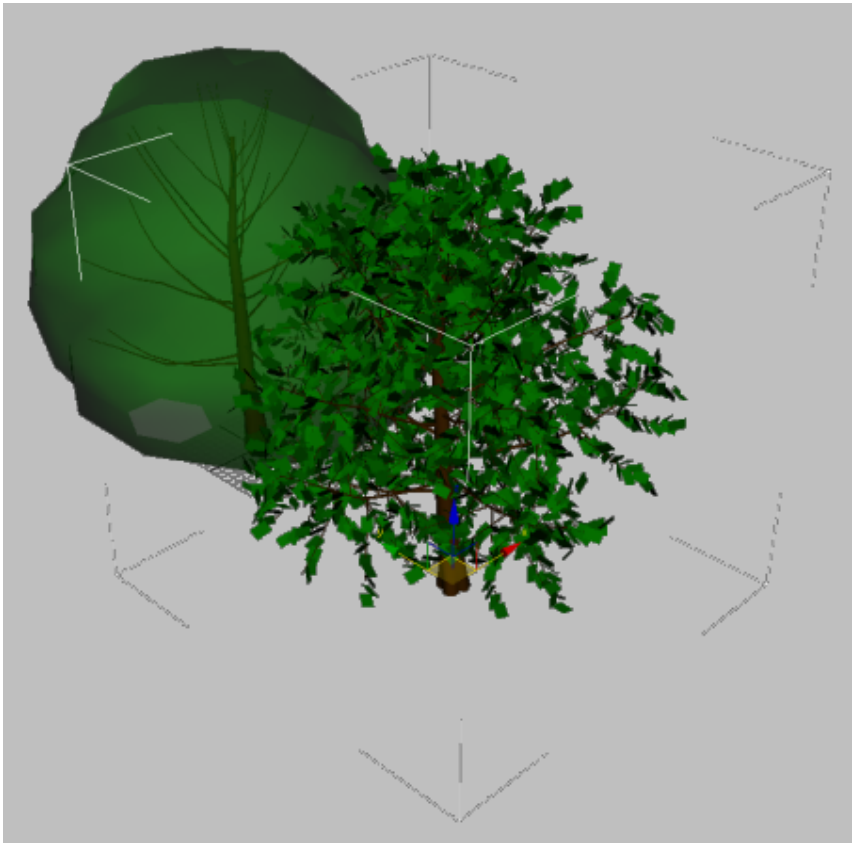


Tree with two-color leaf material

17  Go up two levels and rename the material **Tree-Spring**.

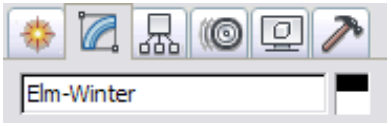
Add more trees:

1  On the main toolbar, click Select And Move. In the Perspective viewport, Shift+select and move the tree object to the right.



2 Create three copies so that you have a row of four trees.

3 Select the far left tree and on the Modify panel, rename it **Elm-Winter**.



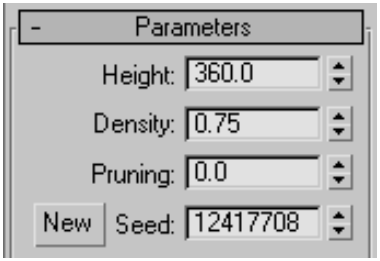
4 Select the tree to its right and on the Modify panel, rename it **Elm-Spring**.

5 Rename the remaining two trees **Elm-Summer** and **Elm-Fall**.

6 Select the *Elm-Summer* object and on the Modify panel > Parameters rollout, click the New button to the left of Seed.

7 Continue clicking on New until you obtain a tree you like.

8 Set the Density spinner to **0.75**.



This value reduces foliage by a slight amount to reflect the leaf loss a typical tree experiences by mid-summer.

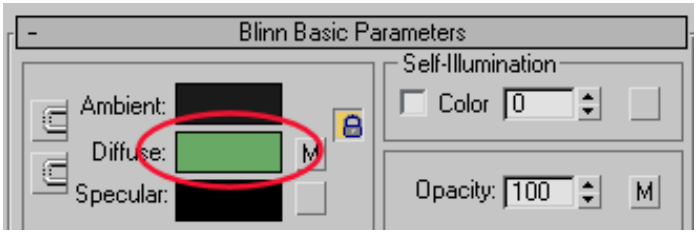
Next, you want to alter the leaf material to give its diffuse color value a less saturated shade of green.

9 On the Material Editor, drag the tree material one slot to the right to copy it.

10 Rename the copied material **Tree-Summer**.

11 On the Multi/Sub-Object Basic Parameters rollout, click the Leaves sub-material button and on the Blinn Basic Parameters rollout, click the

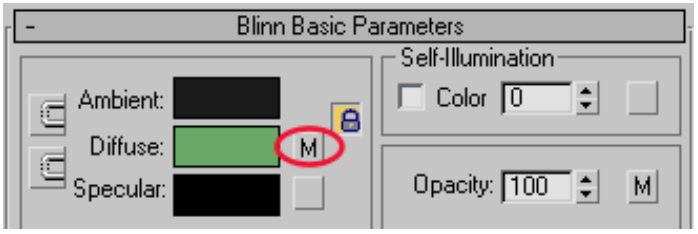
Diffuse color chip, and using the color controls that display, choose a lighter green color.



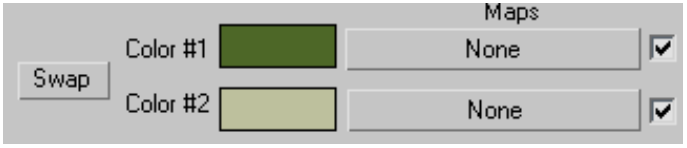
12  Make sure the *Elm-Summer* object is still selected, and click the Assign Material To Selection to apply color to it.

The diffuse color you just selected is applied to the tree object in the viewport only and not in the final render. You must now choose the color of the leaf material to be rendered.

13 Click the Diffuse map button.



14 On the Noise Parameters rollout, update the Color #1 and Color #2 values to display a yellowish, less intense shade of green.



15 In the Perspective viewport, zoom in and pan until both the spring and summer trees are visible, then render the image.

Summer tree (right) shows different leaf density and color

By specifying a new seed value, reducing the number of leaves, and adjusting leaf color, you can see how the summer tree is distinctly different to the others.

16 In the Perspective viewport, select the far right tree object and on the Modify panel > Parameters rollout, click the New button to the left of Seed.

17 Continue clicking on New until you obtain a tree you like.

18 Set the Densityspinner to **0.7**.

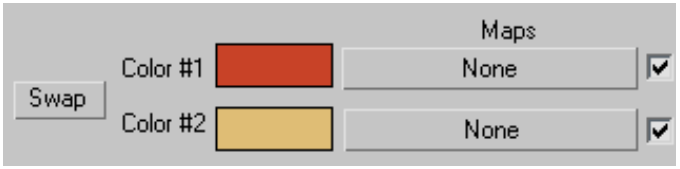
19 On the Material Editor, drag the Tree-Summer material one slot to the right and rename the copied material **Tree-Fall**.

20 On the Multi/Sub-Object Basic Parameters rollout, click the Leaves sub-material button and on the Blinn Basic Parameters rollout, click the Diffuse color chip, and choose a red-orange value for the viewport display color.

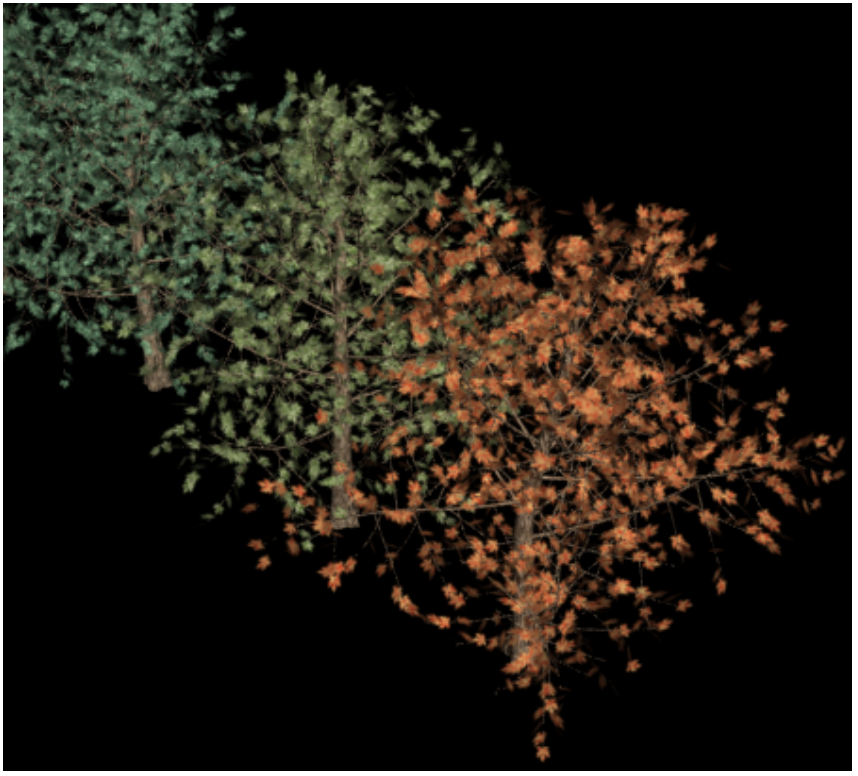
21  Click Assign Material To Selection to apply the diffuse color to the selected tree.

22 On the Blinn Basic Parameters rollout, click the Diffuse map button.

23 On the Noise Parameters rollout, update the Color #1 and Color #2 values to display red and orange.



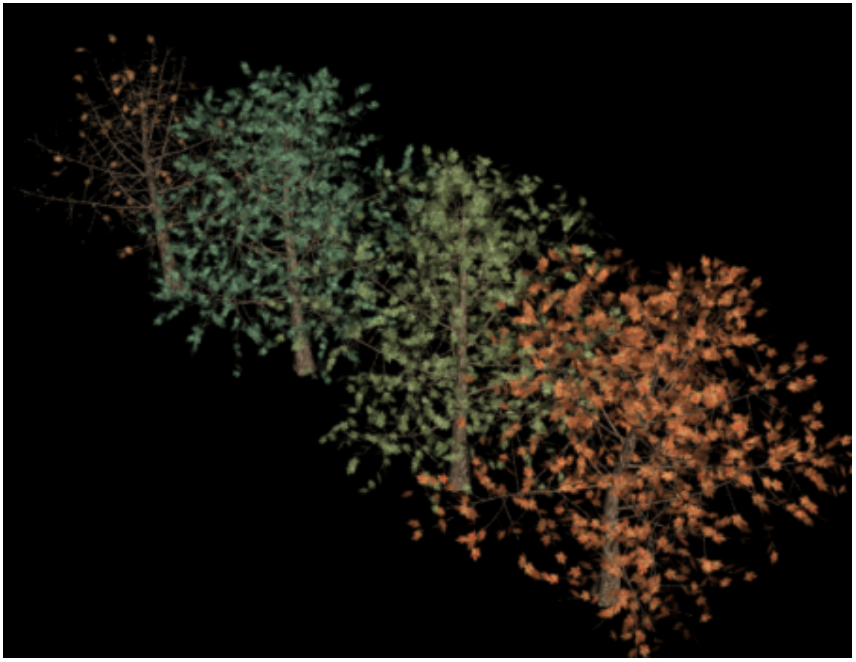
24 Render the viewport to see the result.



Tree-Fall object shows diffuse material values typical to a tree in autumn

25 Repeat steps 16 to 23 for the far left tree, but with these changes:

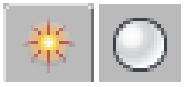
On the Parameters rollout, set the Density value to **0.05** and Level-Of-Detail value to Medium. Rename its copied material **Tree-Winter** and choose a suitable dark brown color combination for the few leaves that remain on the tree branches. When you are done, render the scene.

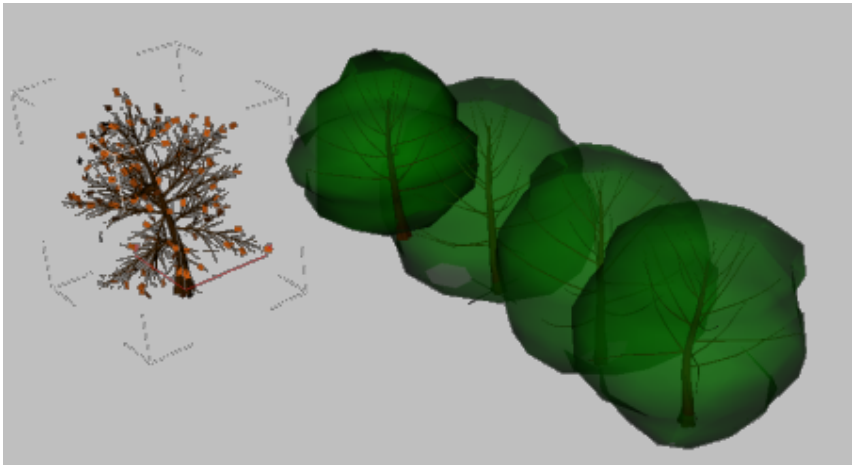


Range of elm trees showing material for all four seasons

Your elm trees have a range of tree materials, one material for each season. Next, when you create more trees of a different species, you can copy these materials to them rather than re-create the materials from scratch.

Create a second set of trees and copy materials to them:

1.  From the Create panel > Objects list, choose AEC Extended.
2. On the Object Type rollout, click Foliage and on the Favorite Plants rollout click Generic Oak.
3. In the Perspective viewport, zoom out and click anywhere in front and to the left of the elm trees.

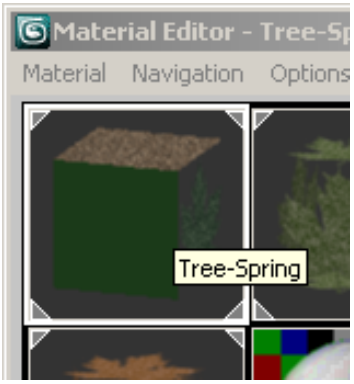


4 On the Modify panel, rename the object **Oak-Spring**.

5 In the Parameters rollout > Level-Of-Detail group, choose High and set the Density spinner to **1.0**. Click the New button to the left of Seed until you see a tree you like.

Now that you have the tree object defined, you can assign it a material created earlier for one of the elm trees.

6 On the Material Editor, click the top left corner sample slot, which contains the Tree-Spring material.

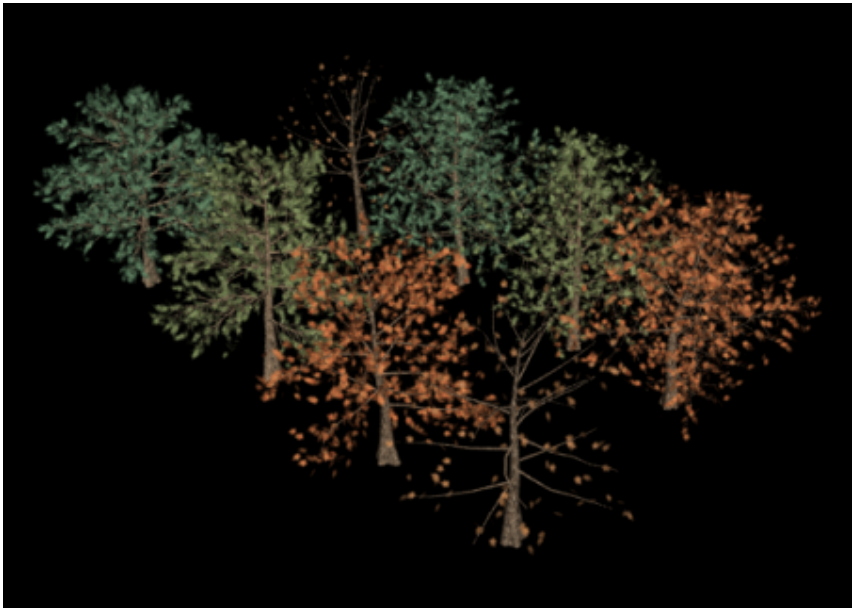


7  Click Assign Material To Selection to apply the material to your oak tree.

8 Create three copies of the oak tree, name them **Oak-Summer**, **Oak-Fall**, and **Oak-Winter**, and on their Parameters rollouts, change each of their Seed, Density, and Level-Of-Detail settings as you did for the elm trees.

9 Repeat steps 6 and 7 to assign each tree a summer, fall, and winter material respectively.

Now you have a set of elm and oak trees, with each set representing all four seasons. You could go on to add as many species as you like to your collection. These objects form the basis of a foliage library that you can re-use in any future scene.



Two sets of tree species, each set representing all four seasons

10 Save your work as **my_trees.max**.

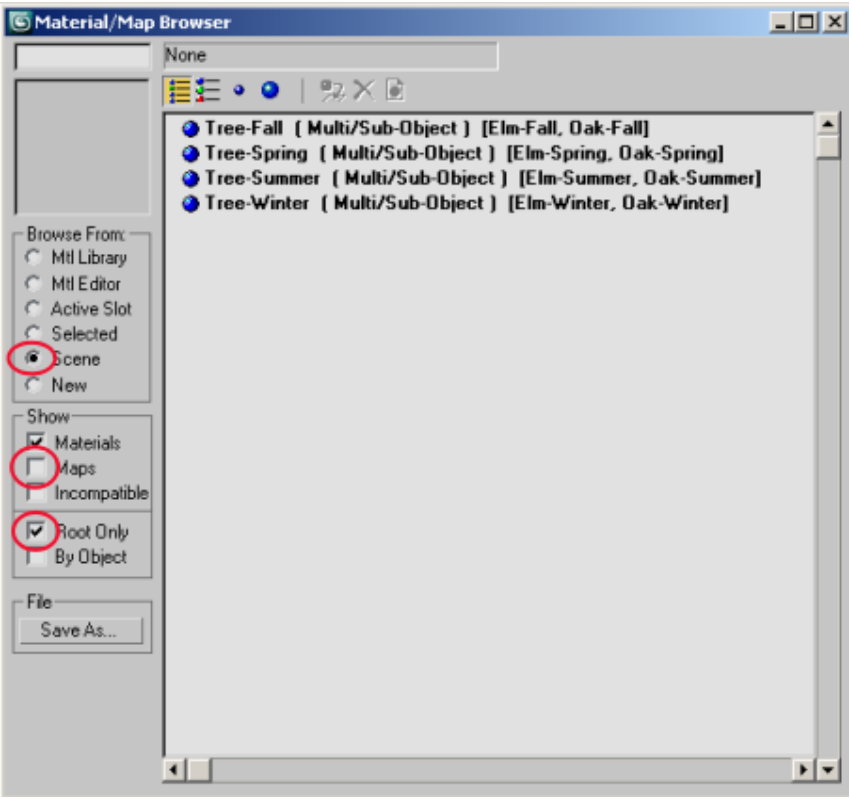
Next, you need to save the materials that you defined for the trees.

11 From the main menu, choose Rendering > Material/Map Browser.

12 On the Material/Map Browser > Browse From group, choose Scene.

13 In the Show group, turn off Maps, then turn on Root Only.

A list of all materials used in the scene is displayed at a root level.



14 In the File group, click Save As and on the Save Material Library dialog > File Name box, type **mytrees** and click Save.

The file is saved with a *.mat* file extension, indicating that it contains material information. The file is placed by default in the project's materiallibraries folder.

15 Close the Material/Map Browser and the Material Editor.

Creating mr Proxy Objects

Now that the tree objects you need for your scene are set up, you can convert them to *.mib* format so they can be used as mr Proxy objects.

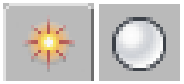
mr Proxies are useful when you want to fill a scene with instances of objects that have a high polygon count, such as 3D trees. Proxy objects save you time

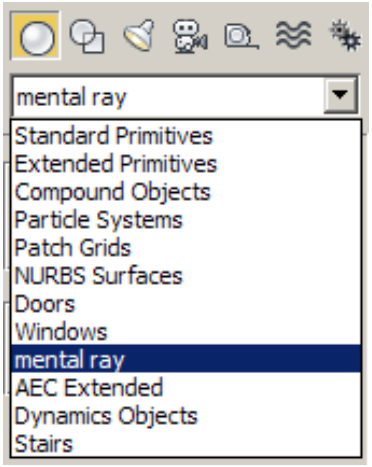
and free up memory because they do not need to be converted to mental ray format and their source objects do not need to be present during render time.

Save source objects in mr Proxy file format:

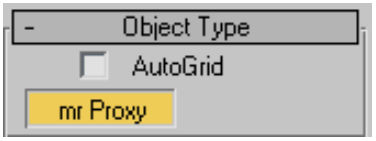
1  On the Quick Access toolbar, click the Open File button, navigate to the *\scenes\dynamics_and_effects\particle_trees* folder, and open the scene *ptrees.max,* or continue working in your own scene from the previous lesson.

You will now take the trees you created in this scene and save each one individually so they can be available for use in other projects.

2  From the Create panel > Objects list, choose mental ray.



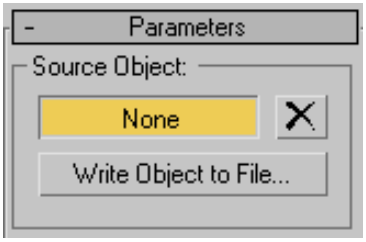
3 On the Object Type rollout, click mr Proxy.



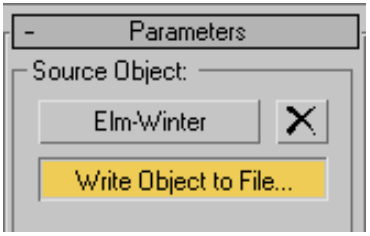
4 Maximize the Perspective viewport if required, then click and drag anywhere in the scene.

A proxy object is created.

5  Go to the Modify panel and in the Parameters rollout > Source Object group, click the Source Object button (initially labeled “None”), then in the viewport, select the *Elm-Winter* object.



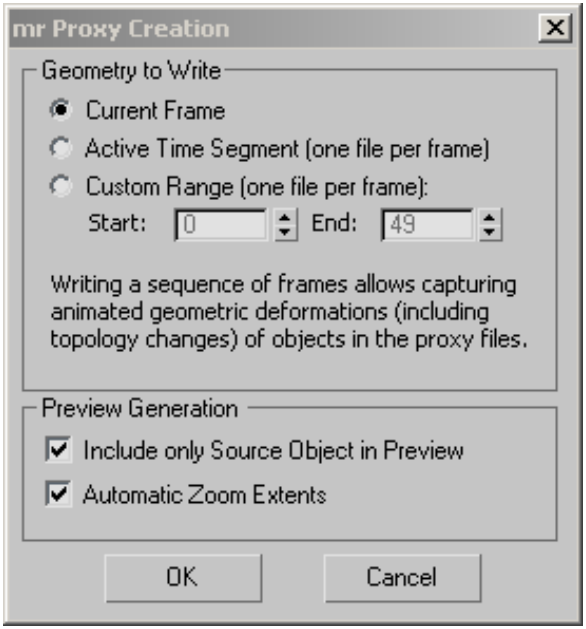
6 In the Parameters rollout > Source Object group, click Write Object To File.



7 On the Write mr Proxy File dialog > File Name box, type **Elm-Winter** and click Save.

The object will be saved in *.mib* file format, a mental ray proxy file type, and placed by default in the current 3ds Max project renderassets folder.

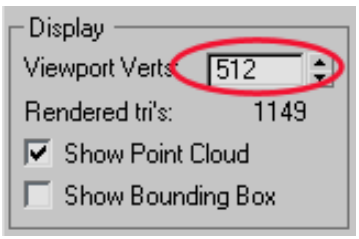
8 On the mr Proxy Creation dialog, click OK to accept the default values.

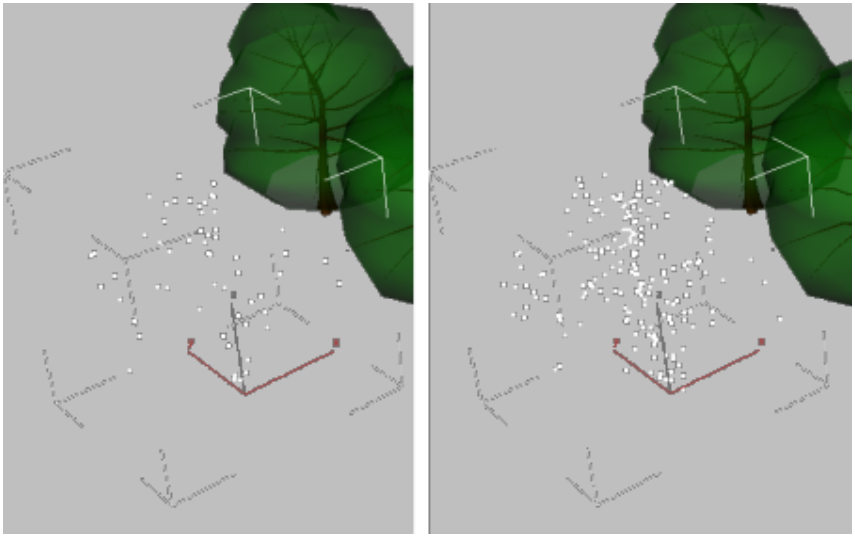


If your tree object contained animation, you would use the mr Proxy Creation dialog to save the object as a sequence of frames, with an *.mib* file created for each frame. You specify the time segment to be saved in the mr Proxy Creation dialog > Geometry To Write group.

After you save *Elm-Winter*, a thumbnail image of the file displays in the mrProxy Parameters rollout > Display group. The proxy displays in the viewport as a *point cloud*, a set of vertices showing the object size and approximate shape.

9 In the Parameters rollout > Display group, set the Viewport Verts spinner to **512** and press Enter to increase the number of points in the point cloud.



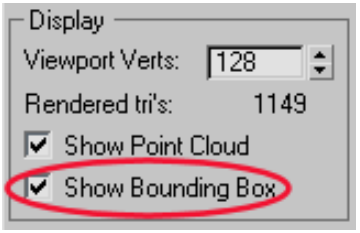


Left: Point cloud represented by 128 vertices

Right: Point cloud represented by 512 vertices

The object outline becomes more apparent as more points are displayed, but a denser point cloud can affect viewport performance.

10 Set the Viewport verts spinner to **128** to return to the original setting, then turn on Show Bounding Box to display the extents of the tree proxy.



11 With the proxy object selected, repeat steps 2 to 8 for the *Elm-Spring* tree object.

When you're done, you should have an *.mib* file for *Elm-Spring*. Ordinarily, you would repeat the steps for every tree in your scene, but to speed things up a little, *.mib* files have been created for all the tree types in the *\sceneassets\renderassets* folder. You will use these proxies in the next lesson.

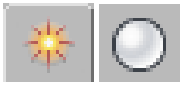
Loading Proxy Files Into a Scene

You will now create a group of mr Proxy objects, and associate each object with an *.mib* file you saved in the previous lesson. Then, you'll assign the object a material from your mytrees material library.

Create an mr Proxy object and associate it with an .mib file:

1. Open the scene file *proxy-trees_start.max*. This scene is in the folder *\lighting_and_rendering\mr_proxies*. If you have a scene open from the previous lesson, do not save it.

   The new scene features a rolling terrain intersected by a riverbed.

2.  From the Create panel > Objects list, choose mental ray.

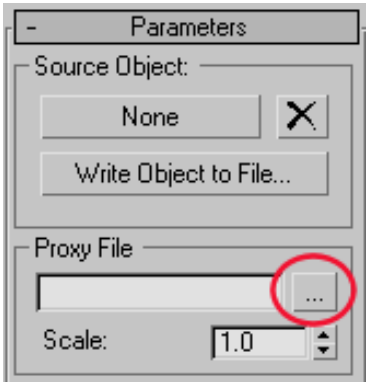
3. On the Object Type rollout, click mr Proxy.

4. In the Top viewport, click and drag anywhere to the right of the plane object.

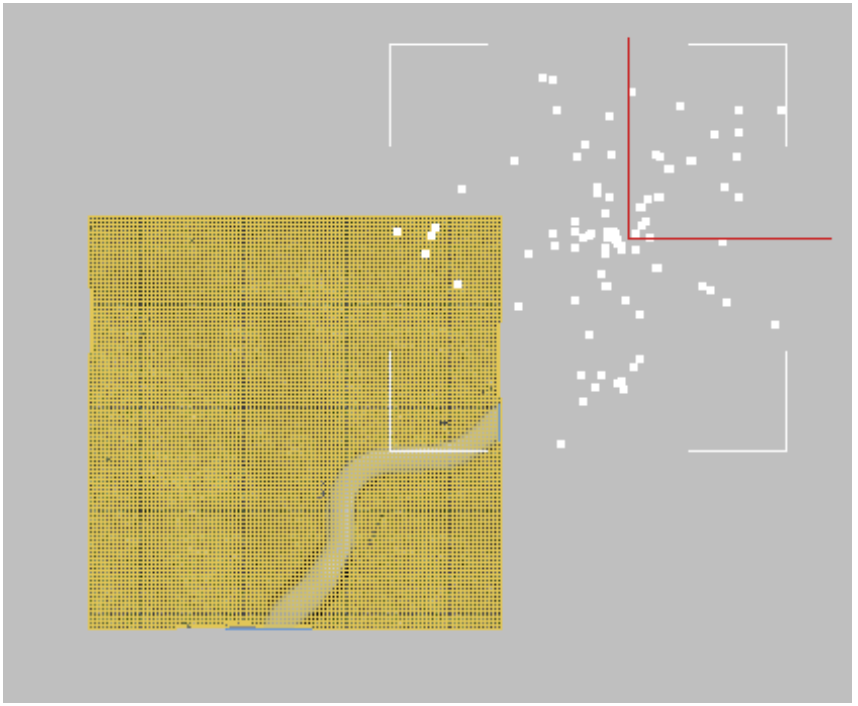
   The proxy object you create can be of any size.

5. Go to the Modify panel and rename the object **Elm-Winter**.

6. In the Parameters rollout > Proxy File group, click the browse button.



7. On the Load mr Proxy File dialog, navigate to the *\sceneassets\renderassets* folder, choose *Elm1-Winter.mib* and click Open.

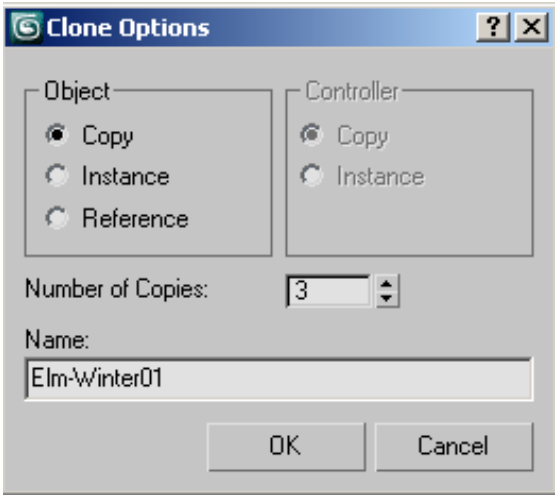


The scale of the imported proxy file is too large.

8 In the Parameters rollout > Proxy File group, set the Scale spinner to **0.1** to reduce the proxy to one tenth its default size.

9 In the Top viewport, hold down Shift and drag the proxy to the right.

10 In the Clone Options dialog > Object group, turn on Copy and set Number of Copies to **3**.



11 Select a copied proxy and in the Modify panel, name it **Elm-Spring**.

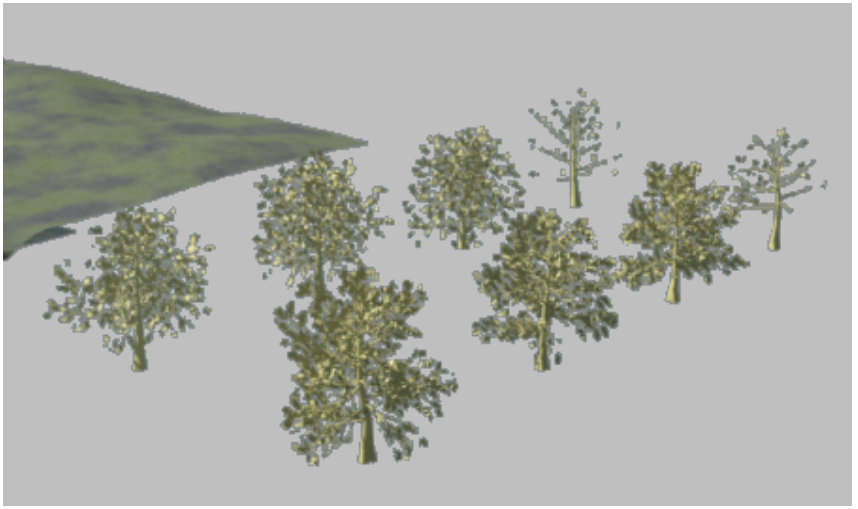
12 In the Parameters rollout > Proxy File group, click the browse button and from the browser choose *Elm2-Spring.mib*.

13 Repeat steps 11 and 12 for each of the two remaining proxies, rename them **Elm-Summer** and **Elm-Fall**, and associate them with their respective *.mib* files.

14 Select all four proxy objects and make a copy of them.

15 Repeat steps 11 and 12 for each copied proxy object. Rename them **Oak-Winter**, **Oak-Spring**, **Oak-Summer**, and **Oak-Fall**, and associate them with their respective *.mib* files.

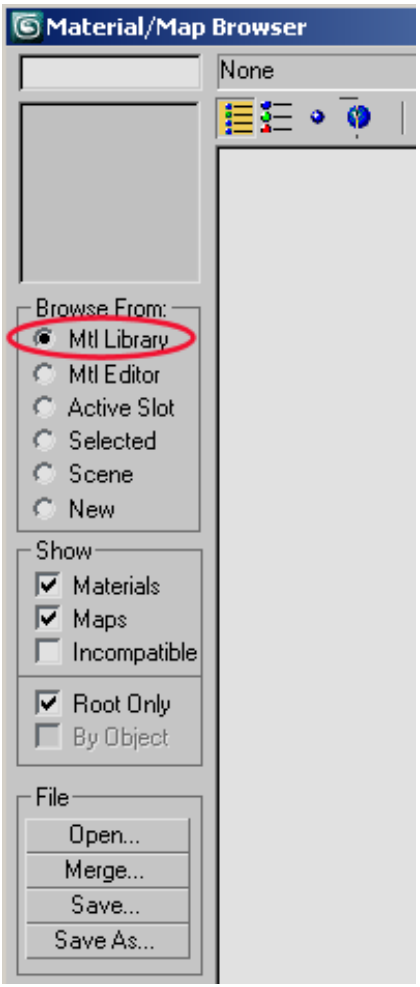
16 In the Camera01 viewport, use the viewport controls to bring the eight tree proxies into view, then render the scene.



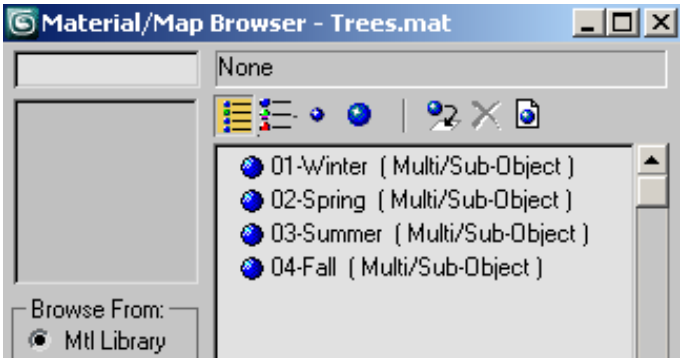
The tree proxies look different in shape and leaf density, but their material is identical. Next, you will associate each proxy with the material you saved earlier in the material library.

Assign materials to the tree proxies:

1. From the main menu, choose Rendering > Material/Map Browser.
2. In the Material/Map Browser > Browse From group, choose Mtl Library. In the Show group, turn on Root Only and in the File group, click Open.

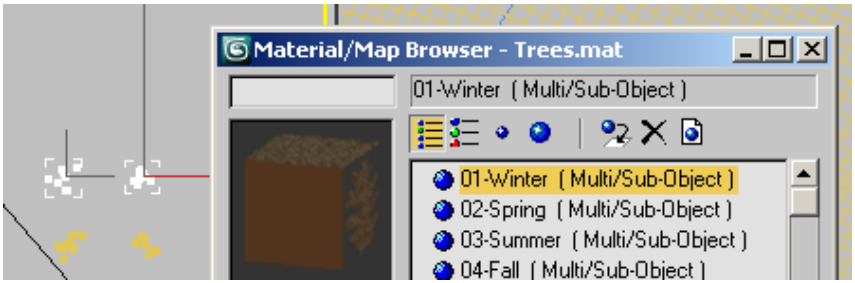


3 Navigate to the *materiallibraies* folder and choose the file *mytrees.mat*.



The Material/Map Browser updates to show the four tree materials you created in the first lesson of this tutorial.

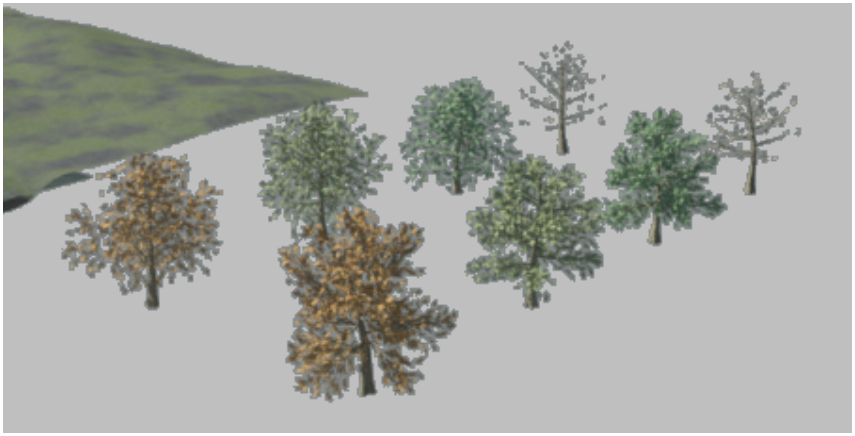
4 In the Top viewport, Ctrl+select the *Elm-Winter* and *Oak-Winter* objects and in the Material/Map Browser, highlight the 01-Winter material.



5 Drag the material to the selected proxies in the scene and on the Assign Material dialog, choose Assign To Selection and click OK.

6 Repeat steps 4 and 5 for each of spring, summer and fall pairs of oak and elm tree proxies.

7 Activate the Camera01 viewport and render the scene again.



Tree proxies after receiving material from the material library

You now have eight different types of trees that are ready to be multiplied and distributed across your scene.

8 Save your file as **my8_trees.max**.

Next

Scattering mr Proxies in a Scene on page 1528

Scattering mr Proxies in a Scene

Now that you have your tree proxies properly defined, you need a way to instance them multiple times and distribute them across your terrain. You will complete this task using the Scatter utility.

Load the Scatter utility:

1 Open a web browser and type **www.maxplugins.de**.

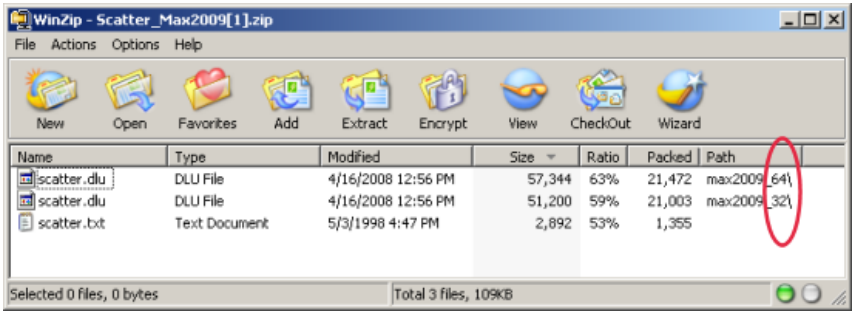
2 From the MAX Plugins web page list, choose the version of 3ds Max you are currently using.

3 From the main menu, next to Plugin search, type **scatter** and click Search.

4 Click Scatter v1.63 on the Name/Download column and click Save.

A zip browser opens.

5 Choose the *scatter.dlu* file that applies to your computer setup, either 32- or 64-bit.



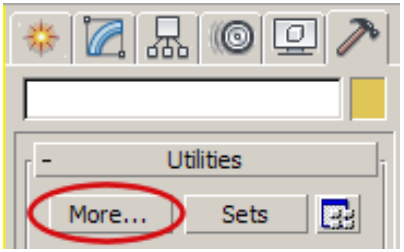
6 Extract the *scatter.dlu* file and save it to your 3ds Max program folder > plugins directory.

7 Use the Explorer to look at your *\plugins* folder. If the *scatter.dlu* file is in a folder called *\max2009_32* or *\max2009_64*, move it to the main *\plugins* folder.

8 Close 3ds Max, then restart. Open your scene from the previous lesson, or open the file *8_trees.max*.

Define the instance and scatter operations:

1 Go to the Utilities panel and on the Utilities rollout, click More.



2 On the Utilities dialog, choose Scatter from the list and click OK.

The Scatter rollout > Distribution Method group is set to the parameters you initially need.

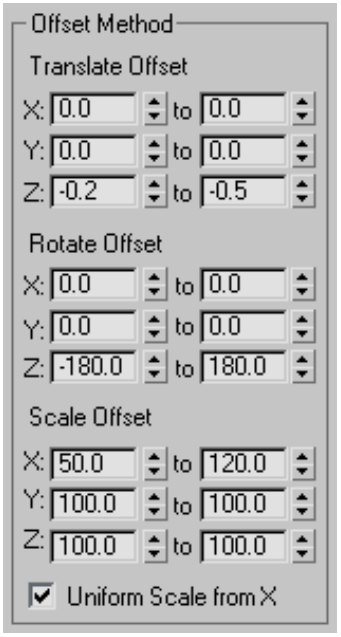
One hundred objects will be distributed across the terrain, aligned vertically on their Z axis. In the Copy Method group, Scatter is the name assigned to the copy method. The method itself is Instance, the best distribution technique since it requires less memory and saves a good deal of render time.

3 On the Offset Method group > Translate Offset Z spinners, type **-0.2** and **-0.5** to sink the trees slightly into the *Plane01* object. This way, if the trees are situated on a steep hill in the terrain, no part of their tree base will appear above ground.

4 On the Rotate Offset Z spinners, type **-180** and **180** to give the trees a random rotation on their Z axis so they are not all oriented vertically in the same way.

5 On the Scale Offset X spinners, type **50** and **120** to give the trees a random differential in size, with a value of 100 being 100% of the default size of the proxy.

6 Turn on Uniform Scale From X.



Next, you will choose which proxy objects to include in the scatter operation.

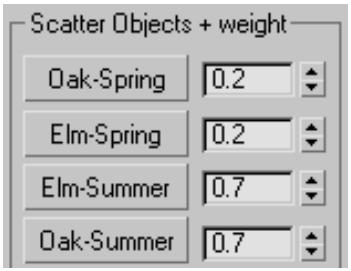
7 In the Scattered Objects + Weight group, click the top button initially labeled “None”, and in any viewport, select a tree proxy.

The name of the selected tree displays on the button, indicating that it is now associated with a weight control.

8 Repeat the previous step for each of the seven remaining tree proxies.

At their default weight values of 1.0, each tree is equally represented in the scatter operation.

9 In this lesson, you need to create a fall scene. Assign the Oak-Spring and Elm-Spring proxies a value of **0.2** to reduce their population to 20% of the other types. Assign the Elm-Summer and Oak-Summer proxies a value of **0.7**.

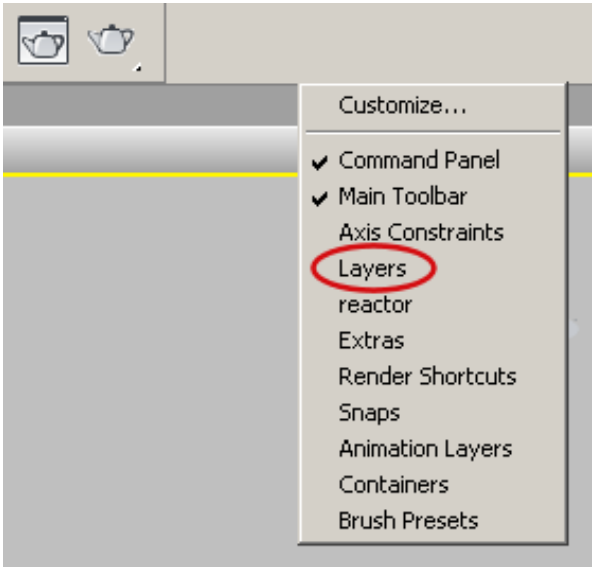


10 In the Emitter Object group, click the button initially labeled "None", and in any viewport pick the *Plane01* object.

This identifies *Plane01*, the rolling terrain, as the object across which tree proxies will be scattered.

Before you launch the scatter operation, you will create a layer. This way, if you do not like how the proxies are distributed in the scene, you can delete them as a group and start over.

11 On the main toolbar, right-click on any gray area and choose Layers.

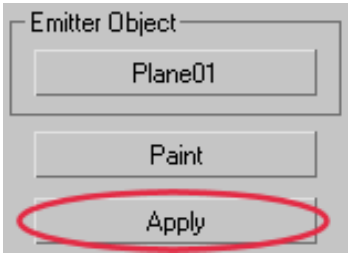


12  Make sure nothing is selected in the viewports and on the Layers toolbar, click Create New Layer.

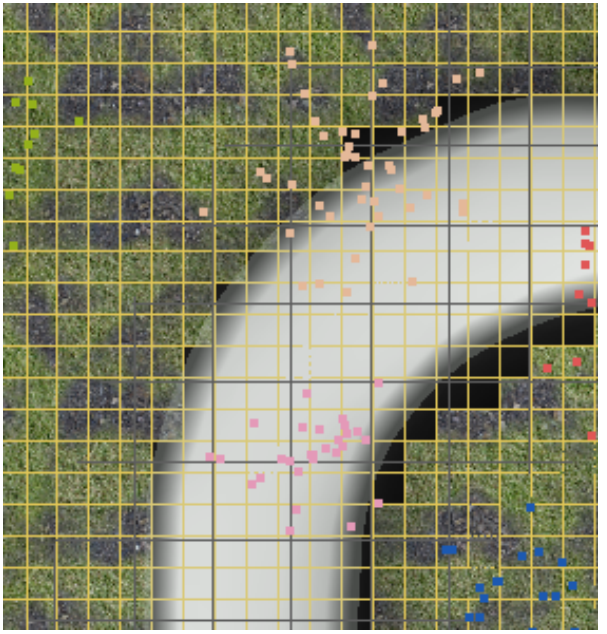
13 On the Create New Layer dialog > Name box, type **ProxyTrees** and click OK.

Now, any tree proxies you create in the scatter operation will be placed on this layer.

14 On the Scatter rollout, below the Emitter Object group, click Apply.



The scatter utility starts to populate your emitter object, *Plane01*, with 100 tree proxies according to the rotational and size variation as well as the mix of tree types you defined in the preceding steps.



Trees in the river bed after random scatter operation

15  Maximize the Top viewport and zoom in to the riverbed.

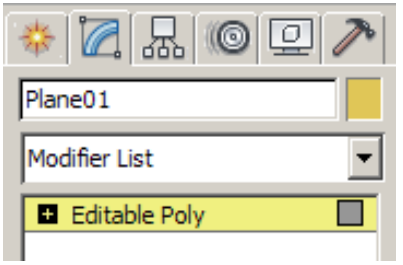
Because the trees were scattered at random, some of the proxies ended up in the river. To solve this problem, you will scatter the tree proxies using a different method.

Use polygon selection to define the instance and scatter operations:

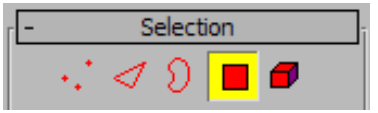
1  On the Layers toolbar, click Select Objects In Current Layer and press Delete.

This removes all the scattered trees from the scene.

2 Select the *Plane01* object and in the Modify panel > Modifier List, choose Edit Poly.

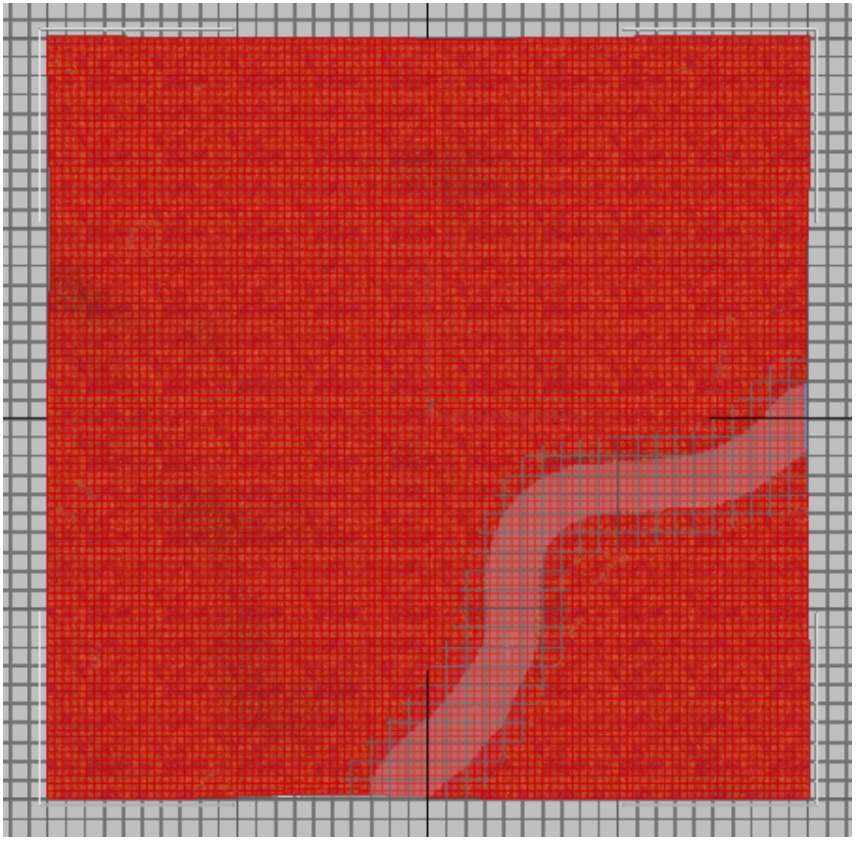


3 On the Selection rollout, click Polygon Selection.



4  On the main toolbar, click Select Object and zoom out until the entire *Plane01*object is visible.

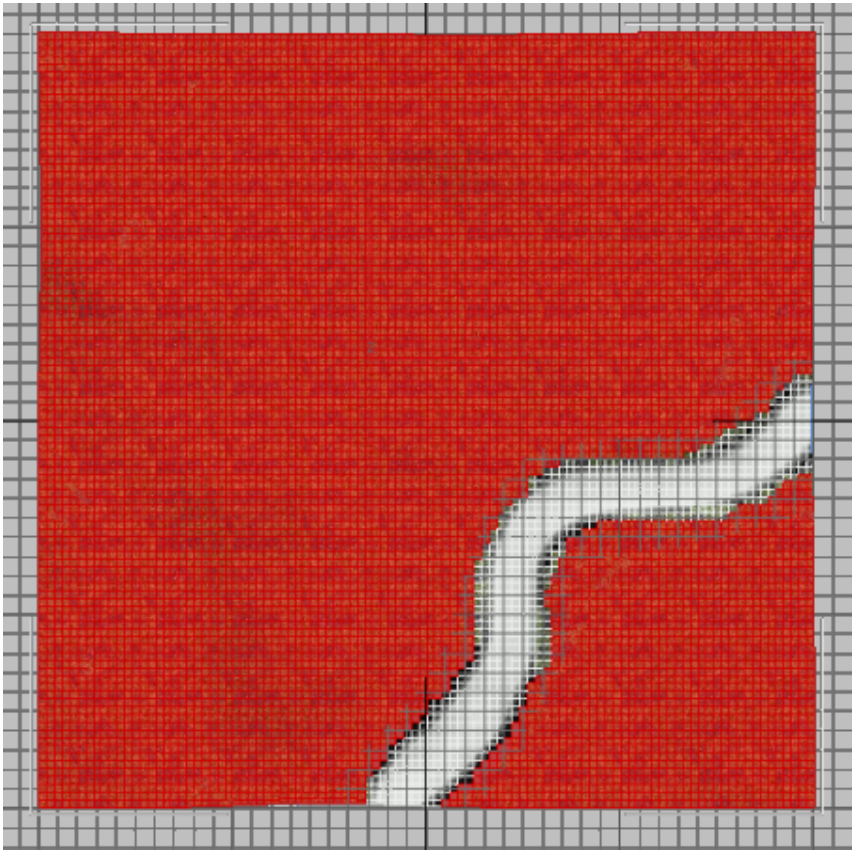
5 Press Ctrl+A to select all the polygons in *Plane01*.



Plane01 with all polygons selected

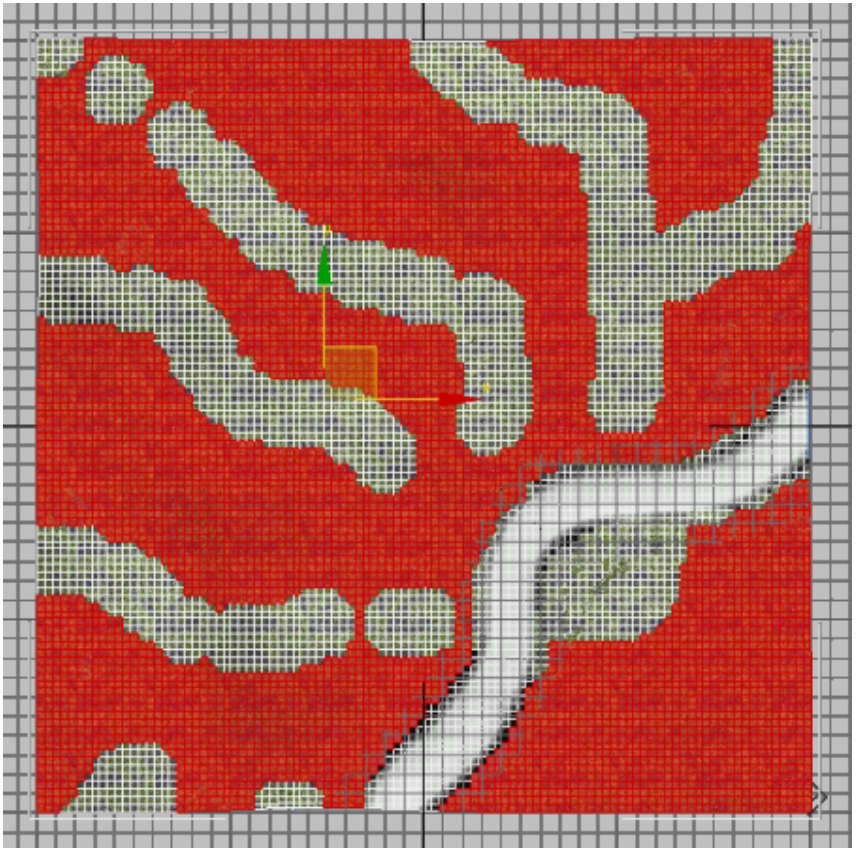
6  On the main toolbar, click Paint Selection Region.

7 Hold down the Alt key and paint over the river until all the polygons are deselected.



Plane01 with polygons in riverbed deselected

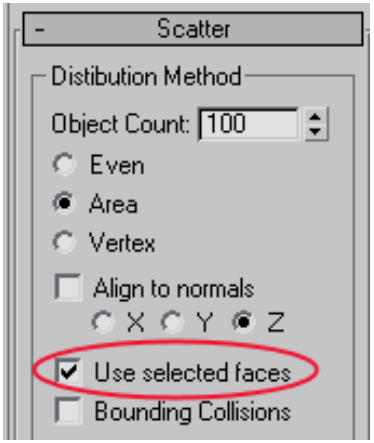
8 Continue holding down the Alt key, and paint to deselect the region where the camera is located, then paint over more areas on the terrain to create clearings in the forest.



Open spaces created from deselected polygons

9 On the Selection rollout, click Polygon Selection again to exit selection mode.

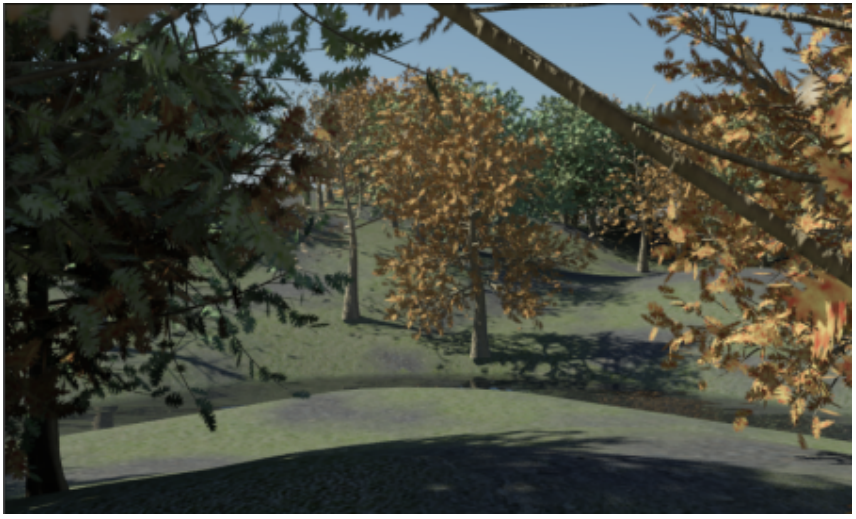
10 Go to the Utilities Panel and in the Scatter Rollout > Distribution Group, turn on Use Selected Faces.



11 Scroll down and click Apply to re-distribute the tree proxies.

No trees appear in areas where you deselected the polygons, including the riverbed and the small clearing where the camera is positioned.

12  Switch back to four-viewport view, right-click the Camera01 viewport to activate it, and on the main toolbar, click Render Production.



Rendered scene, showing open spaces created by deselected polygons

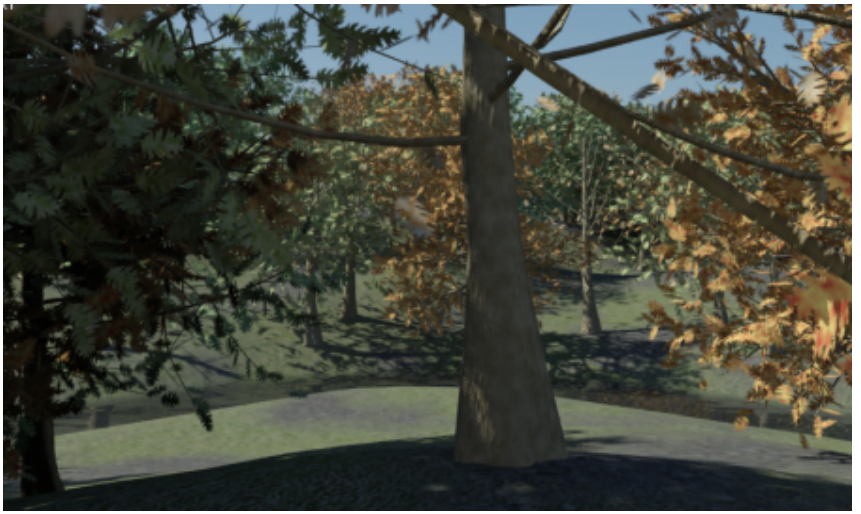
If you are not satisfied with the tree placement, you can start over by selecting the layer, deleting the trees and using polygon selection to re-define the scatter area.

You can also, at any time, add tree proxies individually to your scene.

13 On the Utility panel > Scatter rollout, scroll down and click Paint.

14 Make sure the terrain object is selected, then click once for every tree you wish to add to the scene.

15 Render the scene again to view the result.



Rendered scene, after new trees were added to the terrain

If you like, compare your work with a finished version of this scene, *proxy-trees_final.max*.

Summary

When rendering in mental ray, mr Proxies are a useful way to create a large scene with many instances of a similar object.

While mr Proxy objects cannot be edited directly, they offer the advantage of freeing up memory and speeding render time.

Network Rendering

Included with 3ds Max is functionality that lets you render an animation or a high-resolution image over a computer network, using multiple computers simultaneously. Each computer on the network, if properly set up, can render different frames of the animation or different sections of the image, greatly reducing overall rendering time.

This tutorial provides a brief overview of the process of rendering an animation over a local area network. For detailed information, see the section on network rendering in the help, beginning with *Introduction to Network Rendering*. Also see *Down on the Farm*, an informative online white paper in PDF format by Gary M. Davis.

NOTE *Down on the Farm* is a fairly large document; it might take a little while to download after you click the link.

Set up the rendering network:

1. Create a local area network or use an existing one. Each machine, or Server, that you plan to use for rendering should meet or exceed the minimum requirements for running 3ds Max.
2. On each Server, install 3ds Max using the Compact installation option. No authorization is required for this option.
3. At least one machine on the network should contain a full, licensed version of 3ds Max for creating scenes to be rendered.
4. Determine which machine on the network will act as Manager. Typically, this machine is different from the machine on which scenes are created, but it can be any machine on the network. On the Manager machine, run the Manager program as an application or service. You can also use the Manager machine as a Server. Do this only if you won't be using 3ds Max at the same time to create or modify scenes.
5. On each Server machine, run the Server program as an application or a service. The Manager assigns tasks to the Server program.

Set up for network rendering:

1. Create a scene containing animation that you want to render on the network, and specify where the output image files should go. When specifying directories for maps and output files, be sure to use the

Universal Naming Convention (UNC) so that all machines on the network will be able to find the directories. Also, the directories should be shared.

TIP The easiest way to specify a UNC path is to start with Save In > My Network Places, and then navigate through the network to the machine and directory.

For further information, see *Setting Up Directories*.

2. Open the Render Setup dialog (press F10), and in the Render Output group, turn on Net Render.
3. Click Render.

   The Network Job Assignment dialog opens.
4. Specify a job name and, optionally, a description of the job.
5. Set a priority and options for the job. All of these are explained in the topic *Network Job Assignment Dialog*.
6. Click the Connect button to find and register with the Manager. Optionally, if you want to connect to a specific manager, first turn off Automatic Search and enter the name of the Manager machine or its IP address.

   After you connect, the Network Job Assignment dialog displays a list of servers and current jobs.

Submit and monitor the job:

1. To use all available servers, make sure Options > Use All Servers is on, and click Submit. Alternatively, turn off Use All Servers, highlight the servers you wish to use, and click Submit.

   Your rendering job enters the queue, and will be undertaken as soon as the designated servers are available, depending on the presence of any existing jobs and their relative priorities.

   At this point, you can use the backburner Queue Monitor program to check the progress of your job. For detailed information on the Queue Monitor, see *The Queue Monitor Application*.

2.  Click the Connect button, and then use the Connect To Manager dialog to specify the same manager you connected to from the Network Job Assignment dialog.

3 In the Job list, find your job and click it to highlight it.

   A job summary appears in the list to the right.

4 Use the Queue Monitor tools to edit the job, stop or start it, delete it, and so on.

   When the job is finished, you'll find all the rendered frames in the directory you specified with the Render Setup dialog. You can convert these to a movie file using any of several different methods, such as with the 3ds Max RAM Player utility.

Summary

If you have access to multiple networked computers, you can save enormous amounts of time rendering both animations and high-resolution still images on the network. All it takes is a bit of setup and administration, and the payoff makes it well worthwhile.