

ARETE IMAGE SOFTWARE

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Digital Nature Tools for Softimage

# Reference Manual

DIGITAL NATURE TOOLS FOR SOFTIMAGE

# **Reference Manual**

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# Table of Contents

|  |           |   |           |
|--|-----------|---|-----------|
| <b>INTRODUCTION</b>  | <b>3</b>  | <b>NATUREFX RIPPLE</b>                    | <b>15</b> |
| <b>RELATION BETWEEN<br/>SOFTIMAGE AND PHYSICAL<br/>UNITS</b> | <b>4</b>  | Accessing the Ripple                      | 16        |
| <b>NATUREFX SUN</b>  | <b>6</b>  | Ripple Model                              | 16        |
| Accessing the Sun  | 6         | Ripple Grid                               | 16        |
| Sun Parameters   | 6         | <b>NATUREFX SWELL</b>                     | <b>17</b> |
| <b>NATUREFX AIR</b>  | <b>7</b>  | Accessing the Swell                       | 17        |
| Accessing the Air  | 7         | Basic Properties                          | 17        |
| Clean Air Properties   | 8         | Advanced Properties                       | 17        |
| Haze Properties  | 8         | Grid Size                                 | 18        |
| Light Source Display Properties                              | 9         | <b>NATUREFX WAKE</b>                      | <b>18</b> |
| <b>NATUREFX OCEAN</b>  | <b>10</b> | Accessing the Wake                        | 18        |
| Accessing the Ocean  | 10        | Boat Geometry                             | 19        |
| Ocean Preview Grid   | 11        | Boat Trajectory                           | 19        |
| Wave Field   | 11        | Wake Settings                             | 19        |
| Global Wave Model Settings                                   | 12        | <b>NATUREFX OUTPUT SCALER</b>             | <b>20</b> |
| NatureFX Ocean Displacement Shader                           | 13        | Accessing the Output Scaler               | 20        |
| NFX Ocean Shader Properties                                  | 14        | Output Scaler Parameters                  | 20        |
|  |           | <b>NATUREFX/RENDERWORLD<br/>INTERFACE</b> | <b>4</b>  |

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|                           |          |   |          |
|---------------------------|----------|---|----------|
| <b>Rendering Range</b>    | <b>4</b> | <b>Output Image Scaling</b>                 | <b>5</b> |
| <b>Output Image Files</b> | <b>4</b> | <b>Ocean Render Optimization Parameters</b> | <b>6</b> |
| <b>Camera Settings</b>    | <b>5</b> | <b>Processing Control</b>                   | <b>6</b> |

# Introduction

Digital Nature Tools for Softimage is a comprehensive set of physics based tools for simulating high-fidelity ocean and atmospheric effects. The complete package includes:

1. The RenderWorld rendering engine. This is a standalone product that creates oceans and atmospheres of extremely high fidelity. It is driven through a set of ASCII text files that are described in the RenderWorld documentation.
2. NatureFX modelers and shaders. These are a set of Softimage/Mental Ray tools that use the physics-based models of RenderWorld to create ocean/sky imagery solely within Softimage.
3. The NatureFX/RenderWorld Interface. This interface enables the launching of RenderWorld from within Softimage. The interface generates ASCII text input files for RenderWorld using the positions and settings of the NatureFX scene elements. In this mode of operation, the Mental Ray renders are used to provide a preview of the final RenderWorld image.

The RenderWorld and NatureFX tools provide complementary capabilities. Renderworld is capable of generating ocean scenes with high resolution all the way out to the horizon and of performing air calculations involving a round earth more efficiently than NatureFX; however, RenderWorld only renders ocean and air. If you want to include other objects in the scene, you must render them separately and composite them in afterwards.

NatureFX, on the other hand, allows the rendering of oceans and air simultaneously with all other Softimage objects, creating a seamless 3D image including all reflections. The tradeoff is that the NatureFX plug-ins do not yet attain the level of fidelity of the RenderWorld renderings.

There are currently four NatureFX modeling and rendering tools: Sun, Air, Ocean and Output Scaler. Each of these tools can be used independently and in combination with other Softimage objects. When other objects are present, the atmosphere will fill in around them and the water will show their reflections and transmissions.

In this manual, each chapter describes an individual model/shader which can be added to the scene by clicking on the appropriate entry under **Model->Get**. Each model/shader is controlled using a dialog box which is divided into sections. These sections each deal with a different parameter, and the same parameter names, with

descriptions, appear in this manual. In addition, some models have icons that can be used to directly manipulate a few key parameters.

## Relation Between Softimage and Physical Units

The RenderWorld modeling and imaging algorithms used by the NatureFX shaders perform all their calculations in real physical space. This means that there is an absolute meaning to distances, wavelengths and light radiance. Softimage, on the other hand, is based on an arbitrary distance scale and an arbitrary light scale. This chapter explains how the physical units of RenderWorld are mapped into Softimage, allowing you to convert your Softimage results into physical units and properly scale your objects to the NatureFX models.

All distances in RenderWorld are measured in meters. This corresponds to one distance unit in Softimage.

$$1 \text{ meter} = 1 \text{ Softimage distance unit.}$$

If you have an object which is 100 cm long, you would want to model it as being 1 unit long in Softimage.

Softimage renders all images as RGB while RenderWorld models can work with any physical wavelength. For instance, the scattering of light by air and water is a function of the frequency of the light. In order to get RGB values from the RenderWorld algorithms, we must map each RGB value into a spectral range that simulates what the eye sees as R, G and B. The wavelengths used to calculate the RGB values in Softimage are as follows:

|   | Wavelength (μm) | Width (μm) |
|---|-----------------|------------|
| R | 0.701           | 0.158      |
| G | 0.535           | 0.085      |
| B | 0.473           | 0.037      |

Finally, values in Softimage light typically range from 0 to 1 as do the radiance values in the final image. In the real world, however, the sun is much brighter than the surrounding world. If the sun's intensity is scaled to 1, the brightness of the world will be near zero. This problem is resolved by the NatureFX shaders. The sun intensity is set at 1 (the sun source value is taken to be the radiance of the sun), but the air and ocean shaders multiply the sun's value by 15 prior to using the values in any imaging calculations. This allows any defined Softimage objects to interact with the sun as if it were a light source of strength 1, but objects such as the air and ocean still appear suitably bright.

If you want to convert the final radiance values into physical units, the conversion is as follows:

$$1 \text{ unit of solar radiance} = 1500 \text{ W/m}^2 \mu\text{m}.$$

$$1 \text{ unit of scene radiance} = 100 \text{ W/m}^2 \mu\text{m sr}.$$

# NatureFX Sun

The fundamental light source in RenderWorld is the sun which is modeled as a directional light source. The NatureFX Sun is a directional light within Softimage that represents the RenderWorld sun. It is identical to a Softimage directional light with the additional feature that it is automatically coupled to the NatureFX Air and Ocean shaders. In addition, the NatureFX /RenderWorld interface uses its properties when constructing the ASCII files for the RenderWorld sun.

## Accessing the Sun

- To add the sun to a scene, use **Model→Get→NFX\_Sun**. This adds a directional light source with unit strength to the scene that is identified as the RenderWorld sun.
- To edit an existing sun:
  1. Select the icon that represents the sun.
  2. Click **Model→Light→Edit**.
  3. The dialog box for a directional light appears. You should see the directional light option selected. The sun's intensity is controlled by the light intensity dialog box.. This is the only parameter in the dialog box that affects the other NatureFX shaders and RenderWorld.

## Sun Parameters

**Direction:** The direction of the sun is determined by selecting the light icon and either entering the direction using the translation dialog box or by moving the icon in the same manner as for any directional light.

**Intensity:** The intensity of the sun is determined by setting the RGB values of the light in the directional light dialog box. RGB values of 1 are recommended for generating results that correspond to the Earth's sun.



# NatureFX Air

The NatureFX Air shader is a fully three dimensional volume shader that accurately simulates the scattering of light of the atmosphere and the attenuation of light as it propagates through the atmosphere. When rendered in Mental Ray, the air can be set to interact with any directional lights in the scene. (The algorithm is currently constrained to work with directional light sources only.) When rendered in RenderWorld, the air will only interact with the RenderWorld sun.

The air shader consists of two basic components. The first is clean air, which is the basic molecular air that surrounds the planet and gives the sky its blue hue. The parameters that determine the molecular air are described in **Clean Air Properties**. The second component of air is haze which simulates a water vapor layer added to the molecular air. This can be used to simulate effects such as fog or smog. The parameters for controlling the haze are under **Haze Properties**. You can also control the way the light sources are displayed in the air as described in the **Light Source Display Properties** section.

## Accessing the Air

- To add the air to the scene, use **Model→Get→NFX\_Air**. This adds the RenderWorld air volume shader to the scene.
- To edit existing air:
  1. Click **Matter→Atmosphere→Depth-Fading**.
  2. You should see that the mental ray volume shader box has been selected, and a shader named NFX\_Air has been installed. If not, then air has not yet been added to the scene. Click on **NFX\_Air**.
  3. Click on **Edit**.
- To add a directional light source to the air:
  1. Edit the existing air as described above.
  2. Click the **Select** button next to the **Lights** text window.
  3. Select the desired lights from the list of lights in the scene.

## Clean Air Properties

**Natural Coloration:** This parameter controls the color of the clear air. Positive values scatter more blue than red; negative values scatter more red than blue. A value of 0 gives a gray atmosphere. The default value of 4.1 is the value of this parameter that corresponds to Earth. To explain in greater detail, the clean air model is simulating the Rayleigh scattering of light off an atmosphere with the density and atmospheric height profile of the earth. This parameter allows you to vary the power of the wavelength dependence of the scattering.

**Air Model Shape:** There are two air models, **Flat Earth** and **Round Earth**. The flat earth model assumes that the earth is flat and allows for fairly rapid calculations. The round earth model is currently only implemented in RenderWorld. The round earth model offers more accurate results near the horizon and allows the simulation of atmospheres when the sun is below the horizon. It is usually worthwhile to use this option when doing RenderWorld renders. When using the round earth option, you must also specify the **Earth Radius**.

**Height Offset:** This parameter determines how the base height of the air is set relative to zero height. By default this value is -10 meters. This value is typically set to a negative value so that air can exist within the troughs of waves or canyons that descend below sea level.

## Haze Properties

**Include Haze:** The include haze checkbox determines whether or not haze is present in the scene.

**Height:** This parameter controls, in meters, the height of the haze. Since the haze itself dies off gradually as its height increases, this haze height represents the point at which the haze has dropped to about one third of its ground level value. The higher the haze, the darker the scene gets when you are within the haze. A typical value for a haze height is 500 meters.

**Visibility:** This parameter controls how far you can see objects through the haze at ground level. The less the visibility, the denser the haze. As objects are placed farther away, their visibility will begin to fade into the haze. A moderate haze layer has a visibility of several kilometers.

**Light Scattering:** When light scatters from haze, its direction can be greatly altered (broad scattering) or its direction can be barely altered (narrow scattering). The light scattering parameter allows you to control this scattering. Values near zero correspond to diffuse scattering, values near one correspond to forward-peaked scattering. Typically, small values give a more fog-like appearance, and large values a more smog-

like appearance. One of the most dramatic effects of this parameter occurs when looking at the sun. With broad scattering, the sun lights the entire atmosphere equally; with narrow scattering, a narrow halo appears around the sun.

**Coloration:** The coloration parameter determines the color of the scattering coefficient of the haze. This is both the color with which the haze will scatter light and the color with which the haze will attenuate light. If the sun is white and the haze is thin, then this will represent the color of the haze. As the haze gets denser, light of this color will be increasingly attenuated, and the haze will appear as the complementary color.

## Light Source Display Properties

**Source:** Use this parameter to select the directional lights that couple to the air. By default, we add in the NatureFX sun. This parameter is only available when editing the volume shader directly. It is not available in the dialog that appears when NatureFX air is first added to the scene. Note that these lights only effect the Mental Ray render; they have no effect on a RenderWorld render.

**Sun Diameter Scale:** This parameter scales the diameter of the directional light source for the purpose of displaying it in the image. The diameter does not presently influence the actual air lighting calculation although larger values make the sun appear larger.

**Sun Intensity Limit:** This parameter limits the maximum intensity of a viewed light source. Directly viewed light sources are truncated to this value while preserving their color. This allows you to dim the sun in the sky without changing the air color.

# NatureFX Ocean

The NatureFX Ocean consists of a wave height model that generates realistic 3D wave geometry and a material shader that provides realistic ocean coloring. These can be used to provide standalone ocean renders within Mental Ray or to provide previews of Renderworld ocean renders.

The ocean geometry appears in Softimage as a grid of points, each point displaced by the ocean height field. The size and location of the grid can be controlled by the user with the Wave Preview Grid group of parameters. Although the ocean height field appears fairly complex, it is controlled by a very small group of parameters as described in the Wave Field section. You can optionally generate the waves to be identical to the waves generated in a RenderWorld render by choosing the Global option under Wave Preview Grid. When using this option, the parameters described under Global Wave Model are used to specify the underlying geometry that is used to generate the total ocean height field. If you want to render a large ocean scene then you will frequently not have enough memory to model it all as geometry. In this case NatureFX provides a mental ray displacement shader that can be used in the render instead of the grid geometry.

The ocean model is controlled via an arrow icon that appears above the ocean grid. Manipulating the icon allows you to control the average height and direction of the waves. The coordinates of the icon gives the average wave height and the y rotation determines the direction of the waves. All of the modeling parameters can be accessed by selecting the icon and following the procedure described in Accessing the Ocean. These models generate the same waves as in RenderWorld so that the Softimage ocean grid provides an exact duplication of the RenderWorld ocean.

The coloring of the Ocean is done by a material shader that is automatically attached to the ocean grid when the NatureFX ocean is added to the scene. Selecting this shader and editing it allows you to customize the coloring and reflective properties of the ocean. The shader parameters are described in the Surface Shading section. This ocean shader provides a simpler version of the lighting calculations than is performed in RenderWorld so that it is workable within the Mental Ray rendering framework. Because of this, Mental Ray results will differ in coloration from RenderWorld renders even though they are rendering the same ocean surface.

## Accessing the Ocean

- To add ocean to the scene use **Model→Get→NFX\_Ocean**.

- To edit an existing ocean model:
  1. Select the ocean icon (the large arrow over the ocean grid).
  2. Click **Model**→**Effect**→**Custom**→**Edit**.
- To edit the ocean shader:
  1. Select the ocean grid.
  2. Click **Matter**→**Material** to bring up the grid's material shader.
  3. You should see the mental ray material shader box selected, and a shader named NFX\_OceanShader installed. Click on **NFX\_OceanShader**.
  4. Click on **Edit**.

## Ocean Preview Grid

The NatureFX Ocean adds a grid into the scene that represents the ocean height field. The grid can be placed and oriented arbitrarily in space. The y value of the grid is always the height of the ocean at the x and z coordinates of the grid node. The Softimage Wave Preview section allows you to control the size and location of the grid as well as the precise way in which the waves are generated for the grid.

**Num Points:** The number of points in the x and z directions. Fastest results are obtained when the number of points is a power of two. Since actual geometry is being simulated, the memory required to render the grid is quite large. Typically on a 256 MB system, you can effectively use at most a 256 x 256 grid.

**Lattice Spacing:** The lattice spacing of the grid. For best results, adjust the spacing so the grid is only slightly larger than the field of view of the camera.

**Location:** The spatial location of the center of the grid.

## Wave Field

The wave field section contains the parameters necessary to specify an ocean surface. The ocean surface itself is made up of millions of individual waves, each of different phase and amplitude. All the details of the wave generation are performed by the NatureFX ocean effect so that the user can generate a very complicated and detailed ocean surface by specifying only a very few parameters.

**Average Wave Height:** This sets the average height of the waves.

**Wave Direction:** This sets the average direction of the waves. Note that there will be waves moving in a wide range of directions, but the dominant motion will be in the average direction.

**Wave Model Coverage:** This parameter controls whether the grid represents the ocean height field as determined by the RenderWorld grid settings (Global) or whether it is generated solely based on the Softimage grid (Local).

**Local:** This is the faster option. The waves are generated and evolved directly using the Softimage grid. When using this option ocean disturbances such as the ripple and wake will not effect the ocean height. As a result, the waves are not defined in absolute space and will move with the Softimage grid. This can be a useful effect for simulating river flow. But it is important to note that this wave field will not provide an accurate preview of a RenderWorld scene.

**Global:** This option uses the Softimage grid to preview the RenderWorld height field at the spatial location of the grid nodes. Because the RenderWorld height field is defined in absolute space, moving the Softimage grid does not cause the waves to move, instead the grid appears to glide over the wave field. This provides the more realistic looking waves at the expense of longer update times. Note that you must use this option if you are using Softimage to preview a RenderWorld render or want to add disturbances to the ocean. The parameters that control the setting of the global waves are in the Global Wave Model Settings section of the dialog box.

## Global Wave Model Settings

The ocean surface is generated over the entire space by summing up one or two periodic grids, the course wave grid and the fine scale wave grid. This allows the generation of the ocean height field everywhere while using a manageable amount of memory. By summing two periodic grids with different periods, the effect of the periodicity on large scale images can be reduced.

Each grid is characterized by a number of points in the x and y directions as well as a lattice spacing. The number of points is determined by selecting one of the Wave Complexity options. The lattice spacing is set through the Wave Resolution input box. The large wave grid should have a large lattice spacing so that the entire grid covers a large area of ocean and allows for the presence of long wavelength waves (typically 500 meters). The lattice spacing of the optional small scale grid represents the resolution at which the surface is rendered.

**Wave Complexity:** Wave complexity specifies the amount of complexity in the waves. The higher the complexity the greater the number of waves in the scene. In terms of RenderWorld rendering engine parameters the wave complexity determines

the size of the underlying grids that RenderWorld uses to generate the wave geometry. The three choices are High (a 2048 x 2048 grid), Standard (a 1024 x 1024 grid), and Low (a 512 x 512 grid). The higher the complexity, the higher quality ocean surface that can be generated at the expense of slower generation times. If you are doing a movie resolution view out to the horizon, High resolution should be used; otherwise, Standard is usually sufficient.

**Smallest Wave Size:** This parameter specifies the smallest distance scale over which waves will be generated. A typical value for the large grid is 0.5 meters. A general rule of thumb is that this size should be of order the pixel resolution on the surface to give an outstanding looking image.

**Wave Initialization Seed:** This specifies a random seed used to generate the ocean surface. As long as you use the same seed, you will generate the same ocean surface. By changing the seed, you can generate different realizations of the ocean surface.

**Surface Glassiness Filter:** Glassy water is water with no small scale waves. If you want to simulate glassiness, dial this parameter to a value larger than zero. Typically a scale of one meter gives a good glassy feel to the water. This is a useful parameter for simulating lakes.

## NatureFX Ocean Displacement Shader

Clicking on the NatureFX Ocean Shader causes a series of patches to be loaded into Softimage each of which has a mental ray displacement shader attached that exactly reproduces the RenderWorld ocean height fields. Because of this, the displacement shaders can only be used when the Global option under Wave Field is selected. Each patch tessellates at a different scale. The closest patch will have smaller triangles, the farthest patch bigger triangles. The user can control the number of patches that will fill the field of view, the maximum distance from the camera they will go out from, and the amount of triangles that will be generated relative to the field of view.

**Ocean End Distance:** The maximum distance from the camera that the displacement shader will extend.

**Max. Number of Patches:** The maximum number of patches that will be generated. Each patch generates triangles of a given size. If the image covers a small distance range then a smaller number of patches can be used while if the image covers a large distance range it might occasionally be useful to use more than the default value of 10.

**Shader Resolution:** Shader resolution controls the number of triangles that are generated on the surface. The higher the resolution, the better quality the image but the greater the RAM usage required. Preview gives quick renders that lack detail. Very High gives high detail down to the pixel scale, and the other two gives image quality in between. For most renders, High gives good enough results.

## NFX Ocean Shader Properties

The shader parameters allow control over the color of the ocean and whether or not other objects reflect off it or transmit through it.

**Surface Colorization:** This parameter controls how the surface of the ocean reflects and transmits light. Specifically it represents the index of refraction of the water in each band. A value of 1 will result in no light reflecting off the surface. Raising the value increases the reflection. The correct value for real water is 1.34 in all three bands. By altering the value in a specific band, you can adjust the color of the water.

**Transparency:** This parameter controls how the volume of the ocean scatters light back up towards the surface. There are five possible values numbered from 1 to 5. A value of 1 corresponds to clear water that scatters mainly in the blue, while 5 corresponds to murkier water that scatters almost as strongly in the green as in the blue. These five values correspond to the basic Jerlov water types: I, IA, IB, II, and III.

**Glitter:** Glitter refers to the reflection of the sun and other light off the water. If you turn on glitter, the RenderWorld sun and any other specified lights are reflected off the water using the RenderWorld ocean light reflection algorithm. This algorithm includes the effects of very small waves on the light reflection, giving results that are softer than pure specular reflection. There are two options you can specify with glitter: No Shadowing and Shadowing.

**No Shadowing:** In this option, light sources are not shadowed. This results in faster glitter calculations, but it doesn't provide the effects of shadowing or atmospheric attenuation on the glitter.

**Shadowing:** With this option, all light sources are shadowed by all shadowing objects in the scene and attenuated by the air.

**Lights:** This parameter allows you to select the lights you want to couple to the ocean. It is only available by editing the ocean shader directly. Clicking on **Select** brings up a list of lights. Choose the lights you want from this list. Unlike the air, which only uses directional lights, the ocean lighting algorithm works with any type of light. To select multiple lights, hold down the space bar while selecting.

**Reflections:** By default, only reflections and transmissions of the atmosphere can be seen off the ocean's surface. The reflections parameter controls whether the reflections/transmissions of objects other than the atmosphere can be seen off the ocean's surface. Turning on this option slows down rendering time but provides increased realism. There are three options: Above Water, Below Water and Both.

**Above Water Only:** All objects above the water are seen. If the camera is above water, reflecting objects will be seen; if the camera is below water, transmitted objects will be seen.



**Below Water Only:** All objects below the water are seen. If the camera is below water, reflecting objects will be seen; if the camera is above water, transmitted objects will be seen.

**Both:** All objects are seen regardless of their orientation with respect to the water surface.

**Reflection Method:** Reflection method determines how the reflection and transmission coefficients are calculated at the water surface. This parameter is only available by editing the ocean shader directly. There are two options Specular and Averaged.

**Specular:** This option simply uses the specular reflection coefficients.

**Averaged:** This option performs a more realistic reflection coefficient calculation by considering the effect of small scale waves on the reflection. This results in the highlights of waves being more subdued, giving a more realistic looking sea. The downside of using this parameter is increased scene set up time because of the need to generate a lookup table prior to rendering. The actual rendering times themselves are relatively unaffected. When using this option, you also need to set the **Avg Reflection Facet Size** parameter. All length scales smaller than this value are averaged when calculating the effective reflection. Larger values result in less contrast in the waves.

## NatureFX Ripple

The NatureFX Ripple allows you to add ripples to an existing ocean surface. Ripples can only be added to ocean surfaces that have the Global Wave Field option selected. Ripples represent disturbances caused in the water by an impact with the ocean surface. The user specifies the location, speed, and size of the impact and this effect calculates the resulting wave.

The ripple is represented in the scene by the ripple icon. Ripples are selected by selected this icon. Several ripple parameters can be controlled by directly transforming the icon. The location of the icon represents the location of the impact. The x scale of the icon represents the radius of the impact, while the y scale of the icon represents the velocity of the icon. The y rotation value of the icon corresponds to the time of the impact. Additional parameters are controlled by editing the custom effect that the ripple icon corresponds to.

## Accessing the Ripple

- To add a ripple to the scene use **Model→Get→NFX\_Ripple**.
- To edit an existing ripple:
  1. Select the ripple icon .
  2. Click **Model→Effect→Custom→Edit**.

## Ripple Model

**Impact Time:** The time in seconds at which the ripple is generated. Prior to this time there is no ripple in the scene. At this time the ripple will begin to generate and then move outward from the impact region.

**Impact Direction:** Whether the initial impact is coming from above the water (**down**) or below the water (**up**).

**Impact Speed:** The speed of the impact in meters per second. The greater the speed, the greater the ripple.

**Impact Diameter:** The diameter of the impact in meters.

**Impact Location:** The x and z coordinates of the center of the ripple.

## Ripple Grid

The ripple is represented internally by a one-dimensional grid that is determined by a number of points and a lattice spacing. In almost all circumstances the default values are good enough, but they can be changed if necessary.

**Number Radial Points:** The number of points in the grid. Making this number larger allows the ripple to extend over a greater distance. The maximum distance of a ripple is the number of radial grid points times lattice spacing.

**Radial Lattice Spacing:** The smallest distance scale over which the ripple will exit. Typically this should be less than one tenth of the impact diameter.

# NatureFX Swell

Swells are large waves moving through the scene that were generated by storms far away. These are in contrast to the basic ocean waves that are generated by the wind in the region of the scene.

Swell is represented in the scene by an S shaped icon. Several swell parameters can be controlled by directly manipulating the icon. Y-rotation controls the direction of the swell, X-scale controls the wavelength of the swell, and Z-scale controls the height of the swell.

## Accessing the Swell

- To add a ripple to the scene use **Model→Get→NFX\_Swell**.
- To edit an existing swell:
  1. Select the swell icon .
  2. Click **Model→Effect→Custom→Edit**.

## Basic Properties

The basic properties control the average characteristics of the swell.

**Direction:** The direction in degrees that the swell is moving.

**Average Height:** The average height in meters of the peaks of the swell.

**Wavelength:** The average wavelength (distance between peaks) of the swell in meters.

## Advanced Properties

The advanced properties allow control over the specific look of the swell.

**Inline Waves:** This parameter controls the amount of structure in the swell in the direction of travel. If the parameter is near zero the waves are very regular with each peak being about the same size. As this parameter is increased, increasing variance is seen in successive peaks of the swell.

**Cross Waves:** This parameter controls the amount of structure in the swell across the direction of travel. When this parameter is near zero, the peaks of the swell will have a constant size as you move along them.. As this parameter is increased, size fluctuations along a given peak begin to appear.

**Initialization Seed:** Changing this parameter results in a completely new realization of the swell being generated.

## Grid Size

The grid size represents the size of the underlying RenderWorld grid that generates the swell and controls the complexity of the wave surface. 128 represents the smallest reasonable complexity and generates the fastest. Increasing this number gives increasing complexity at the expense of slower wave generation.

# NatureFX Wake

A wake represents the v shaped waves that a boat generates when it travels through water. RenderWorld can generate a wake for a boat that moves in a straight line at a constant velocity.

A wake is represented in the scene by a boat icon that shows where the boat is located at a given frame. The x and z coordinates of the icon represent the location of the boat at the current frame number. The x-scale is the length of the boat, the z-scale is the width of the boat, and the y-scale is the depth of the boat below the water level. The direction of the boat is represented by the y-rotation of the icon.

## Accessing the Wake

- To add a ripple to the scene use **Model→Get→NFX\_Wake**.
- To edit an existing wake:

1. Select the wake icon .
2. Click **Model**→**Effect**→**Custom**→**Edit**.

## Boat Geometry

The boat geometry parameters control the physical dimensions of the boat. In general, the bigger the boat, the bigger the wake. The length and width have a complex effect on the structure of the wake. The depth, however, simply scales the wake height linearly so can be used as a rescaling parameter to control the magnitude of an otherwise desirable wake.

**Length:** The length of the boat in meters.

**Width:** The width of the boat in meters.

**Keel Depth:** The average distance in meters the boat extends below the water line.

## Boat Trajectory

The trajectory parameters control the velocity and location (at  $t=0$ ) of the boat.

**Speed:** The speed in meters per second of the boat.

**Direction:** The direction in degrees that the boat is moving.

**Start Location:** The x and z coordinates of the boat at time equals zero.

## Wake Settings

These parameters control aspects of the wakes propagation away from the boat.

**Wake Length:** This parameter controls to what distance behind the boat the wake is modeled. This length is in units of the boat length.

**Wake Damping:** This parameter controls how quickly the wake dies off as it leaves the boat. Increasing the parameter increases the rate of the damping. Best results are obtained if the wake has died of by the time it extends to the Wake Length.

# NatureFX Output Scaler

The output scaler is a Mental Ray output shader that is used to scale the intensity values in the final image. Gamma, log, and linear scalings can be applied to obtain an appealing dynamic range to the image. When the default sun, ocean and air parameters are used, an attractive ocean is rendered.

## Accessing the Output Scaler

The output scaler is automatically added to the scene whenever a NatureFX shader is present in the scene. To access the output scaler:

1. Select **Matter**→**Render**→**Options**.
2. You should see an output shader called NFX\_Output Scaler in the dialog box. Click on this.
3. Click on **Edit**.

## Output Scaler Parameters

**Method:** This parameter determines how to scale the image.

**Gamma:** This scales the image by raising it to a power specified by the value entered after the Gamma checkbox. It is then linearly rescaled so that the min value corresponds to 0 and the max value corresponds to 1. The default value is 0.45.

**Log10:** This scales the image by taking the log base 10 of it. It is then linearly rescaled so that the min value corresponds to 0 and the max value corresponds to 1.

**Linear:** This scales the image linearly so that the value specified by min corresponds to 0 and the value specified by max corresponds to 1.

**Min:** The value that gets remapped to 0 after the scaling method is applied. The default value is 0.15.

**Max:** The value that gets remapped to 1 after the scaling method is applied. The default value is 1.

# NatureFX/RenderWorld

## Interface

The NatureFX/RenderWorld interface allows you to configure a RenderWorld job and then launch it. RenderWorld is a standalone application that runs off a set of text input files. The NatureFX/RenderWorld interface will extract the NatureFX objects and camera in the scene and write out the corresponding RenderWorld text files. If desired, RenderWorld can then be launched.

The RenderWorld text files are written out in the same directory from which Softimage was launched, but you cannot monitor the progress of the job from Softimage. Job progress is written out to a log file whose name you specify in a directory. The output files are also written to this directory. These files can be viewed using the command line `imgshow` routine that comes with Softimage or by using the viewing tools within the Tools menu of Softimage.

It is important to keep in mind that RenderWorld will ignore all non-NatureFX objects in the RenderWorld scene. RenderWorld has many advanced features that are not supported yet through the NatureFX tools. To use these features, you will have to create and edit the RenderWorld text files by hand. These files and their features are detailed in the RenderWorld reference manual.

## Rendering Range

The following parameters control the frames to be rendered and the frame rate:

**Start:** First frame to render.

**End:** Last frame to render.

**Step:** Frame increment.

**Frames Per Second:** Number of frames that corresponds to one second of time.

## Output Image Files

**Root Name:** The root name of the RenderWorld output files. See the RenderWorld documentation for information on how output files are named.



**Format:** The file format of the RenderWorld output files. Also note that RenderWorld comes with a set of conversion routines to convert between these file formats (see the RenderWorld documentation).

**RGB 8-bit:** Outputs in the SGI 8 bit RGB format.

**RGB 16 bit:** Outputs in the SGI 16 bit RGB format.

**HDF 32 bit:** Outputs the exact floating point image values in the HDF floating point format.

## Camera Settings

These parameters set the specifics of the RenderWorld camera. The field of view, number of pixels, location, and orientation of the camera is determined by the Softimage camera. The output image scaling is determined by the output scaler and can also be altered in this dialog box. Additional options allow the user to render only a fraction of the field of view, render the scene in slices, and couple the camera to the ocean grid as if it were attached to a boat.

**Render All Pixels:** If set to no, only a rectangular region of the field of view is rendered. The image is output at full frame size, with black in the non-rendered pixels. The image to be rendered is set by X-range and Y-range.

**X-range:** The starting and ending pixels to be imaged in the azimuth direction. Pixels are numbered from 0 to one less than the number of pixels in the azimuth direction.

**Y-range:** The starting and ending pixels to be imaged in the elevation direction. Pixels are numbered from 0 to one less than the number of pixels in the elevation direction.

**Memory Slices:** This option causes the image to be rendered in a succession of slices. The slices are recombined at the end of the rendering and deleted from the disk. It is used to significantly reduce the amount of RAM needed for a RenderWorld render. For movie res frames, it is recommended to set this value to 10.

## Output Image Scaling

These are the same options used by the output scaler to control the conversion of the image into raster units.

**Method:** This parameter determines how to scale the image.

**Gamma:** This scales the image by raising it to a power specified by the value entered after the Gamma checkbox. The image is then linearly rescaled so that the min value corresponds to 0 and the max value corresponds to 1. The default value of 0.45.

**Log10:** This scales the image by taking the log base 10 of it. It is then linearly rescaled so that the min value corresponds to 0 and the max value corresponds to 1.

**Linear:** This scales the image linearly so that the value specified by min corresponds to 0 and the value specified by max corresponds to 1.

**Min:** The value that gets remapped to 0 after the scaling method is applied. The default value is 0.15.

**Max:** The value that gets remapped to 1 after the scaling method is applied. The default value is 1.

## Ocean Render Optimization Parameters

This section allows you to adjust parameters that control the quality and speed of RenderWorld renders.

**Grid Doubling Distance:** This parameter is a RenderWorld rendering engine control parameter, and it has no effect on Mental Ray renders. RenderWorld tessellates the surface with increasingly large triangles as you move away from the camera. The double distance is the distance at which the size of the triangle is doubled. Increasing this value increases the quality of the render but also increases the time needed to generate this render. It is the basic way in which to exchange image quality and rendering time in RenderWorld.

**Wave Cutoff Distance:** This parameter is a RenderWorld rendering engine control parameter, it has no effect on Mental Ray renders. RenderWorld will stop rendering the ocean at this distance along the surface from the camera. The remaining distance to the horizon will be filled in by a flat piece of ocean to give color continuity up to the horizon.

## Processing Control

**Launch RenderWorld:** When you click on **OK**, the RenderWorld ASCII files corresponding to this job are written out to the directory from which Softimage was run. In addition, if you want the RenderWorld job to be started, click on yes next to Launch-RenderWorld. To watch the progress of the RenderWorld job, view the log

file. For further information on running RenderWorld, see the RenderWorld documentation.

**Path to RenderWorld Executable:** Full path to the RenderWorld executable.

**Processing-Output Directory:** Full path name to directory where RenderWorld output should be written.

# **Index**

1.

