



WaterRace Terrain Builder Tutorial

A step by step guide through the creation of a WaterRace level.

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Table of contents:

WHAT IS THIS TOOL FOR?.....	4
REQUIRED CONFIGURATIONS	5
WRTB INTERFACE	7
THINGS YOU SHOULD KNOW.....	12
WRTB PREFERENCES	14
DRAWING A LEVEL MAP.....	17
IMPORTING THE LEVEL MAP	18
DIVIDING THE GROUND MESH	21
TEXTURING THE NEW MESHES	24
REMOVING TRIANGLES	26
TEXTURING THE SEA MESH	27
DIVIDING THE SEA MESH	28
DIVIDING THE GROUND MESH (2).....	29
NAMING THE MESHES	30
CREDITS	31
SOFTWARE LICENSE AGREEMENT	32





Introduction

About WaterRace Terrain Builder

- What is this tool for?
- Required configurations
- Description of the program's interface
- Setting up WRTB: the preferences

About this tutorial

- Things you should know



WHAT IS THIS TOOL FOR?

WRTB is a powerful 3D level editor designed to create and edit levels (or terrains) for WaterRace with real-time rendering through the Infinity 3D Rave engine. WRTB create new terrains using gray levels images. Then you can apply textures and lighting on these terrains, add objects, place cameras, create animations...

You expressly acknowledge and agree that you may not sell or ask any fee for a WaterRace level made using the WaterRace Terrain Builder software.

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REQUIRED CONFIGURATIONS

Hardware requirements

Minimal configuration: Power Macintosh with a 832x624 screen resolution, but the Rave software engine provided by QuickDraw 3D Rave will probably be too slow for real-time editing.

Recommended configuration: a G3 (all G3 Power Macintoshes have ATI 3D chips on board) with an ATI Rage 128 or a Power Macintosh with a 3D accelerator card (with at least 4Mb of VRAM) which is Rave compliant, and 1024x768 screen resolution.

Best configuration: a G3 with an ATI Rage 128 and a 1024x768 screen resolution.

Software requirements

WRTB requires MacOS 7.1 or later. MacOS 8.5 is recommended.

WRTB requires QuickTime™ and the Appearance Manager - it is provided with MacOS 8.0 and later and is available as a separate extension for 7.x versions of MacOS. If you are using an earlier version of MacOS than the 8.5, you need to download a special version of WRTB on the web site which works around a bug in the Appearance Manager provided with these previous versions of MacOS.

WRTB does not require QuickDraw 3D™ to run, but only Rave: the "QuickDraw™ 3D RAVE" extension must be present in the extension folder of the System folder.

Notes

WRTB needs around 1Mb of free memory to run: the rest of the memory is used to store the object's data and the data of the Rave engine if you choose a software Rave engine.

WRTB is not compatible with most 3Dfx cards; it will either produce a black screen or freeze your computer. If WRTB is set to use the default Rave engine and the default Rave engine is a 3Dfx engine, it will display an error message at startup and automatically switch to another



engine. If you still want to use the 3Dfx engine, go into the preferences dialog, and explicitly select the 3Dfx engine as the Rave engine to use.

If WRTB freezes at startup, restart it and press the [Command] key while clicking on the About screen. Then select another engine in the Preferences dialog.

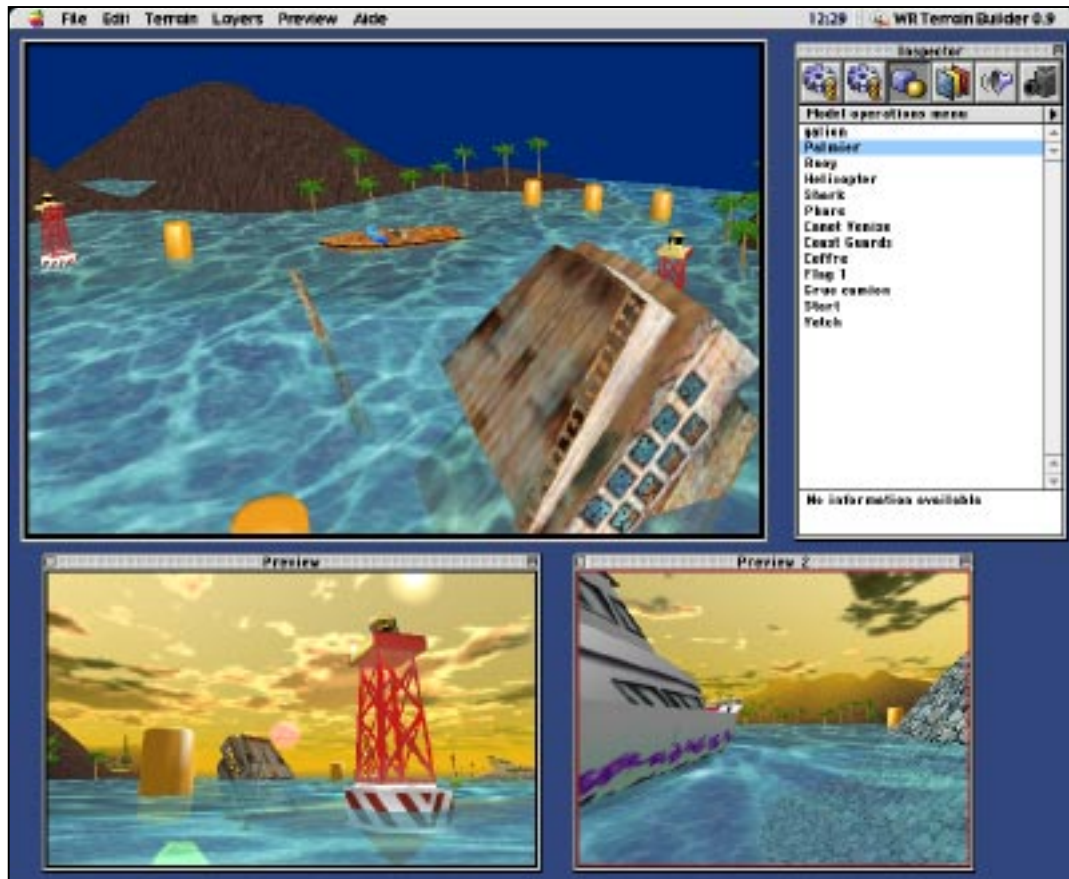
Because WRTB 3D engine draws directly to screen, palettes cannot overlay the construction window or the preview windows. As a consequence an 832x624 or a 1024x768 screen resolution is necessary to see the construction window, the preview windows and the palettes.

If you select the Apple software Rave engine, WRTB will run on 8-, 16- or 32-bit screens. If you select the ATI Rave engine and provided it has enough VRAM, WRTB will run on 16- or 32-bit screens.

If WRTB produces the error "Can't init Infinity Engine" at startup and if you have selected a hardware 3D engine, it's probably because there is not enough VRAM available or because the VRAM has been corrupted. Try to switch to a lower bit depth (thousands of colors) or reduce the screen resolution. If the VRAM has been corrupted, you need to purge it: by switching to another bit depth and back.



WRTB INTERFACE



The interface of WRTB is divided into 3 parts:

- a construction window in the top left corner of the screen in which you can edit the terrain (you cannot move this window).
- an Inspector palette which lists the content of the terrain's data: meshes, textures, 3D objects, cameras... You can drag this window wherever you want on the screen provided it does not overlay the construction window or any preview window.
- one or more preview windows which display the terrain as it will appear in WaterRace. You can drag these windows on the screen provided they do not overlay the construction window or the Inspector palette.



The Construction window

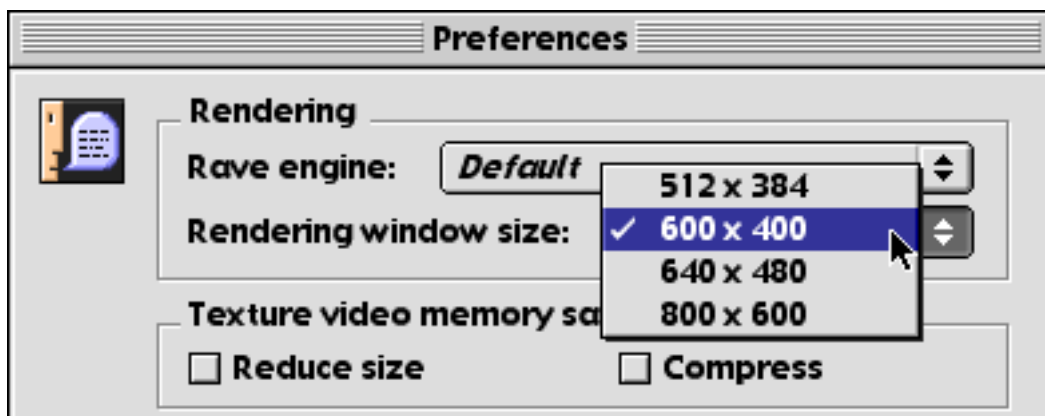
The construction window is where you will edit the terrain. To move the camera of the construction window, you may:

1) Click inside the window and let the mouse button down while pressing the [Spacebar]. The mouse turns into a hand cursor and when you move the mouse the camera follows. Press the [Option] key to zoom in / zoom out, the [Command] key to turn around and the [Control] key to orbit.

2) Click once inside the window. A red frame appears around the window indicating this window is now the target window for the arrow keys. Then use the arrow keys of your keyboard to move the camera. Press the [Command] key to translate the camera. Press the [Option] while using the vertical arrow keys to move up or down.

You can change the rendering options of the construction window in the Rendering menu. Choose either Textured rendering, WireFrame rendering or both.

You can change the size of the rendering window in the Preferences dialog (Edit menu -> Preferences).



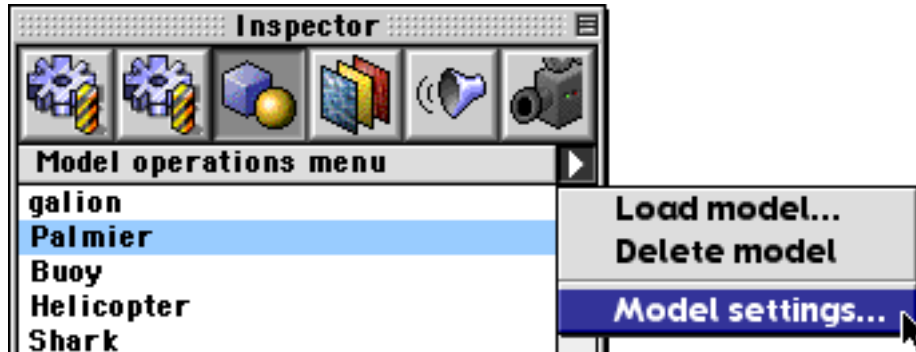
The Inspector palette

The inspector palette allows you to browse and edit the various elements a terrain is made of: 3D meshes, textures, 3D objects...



To edit a given kind of elements, just click on the related bevel button at the top of the window. You can see the name of currently edited element category under the set of bevel buttons (here: 3D Models).

The black triangle on the right pop ups a menu which contains the operations that apply to the list of displayed elements.



The preview windows

The preview windows are useful because they show exactly how the terrain will look like in WaterRace. You can create as many preview windows as you want as long as the 3D accelerator has enough VRAM and provided you have enough space on screen. Furthermore, a preview window can have any size and be located anywhere on the screen.

Preview windows characteristics including camera position are saved with the terrain file: when you will re-open the terrain file, the preview windows will be automatically restored.

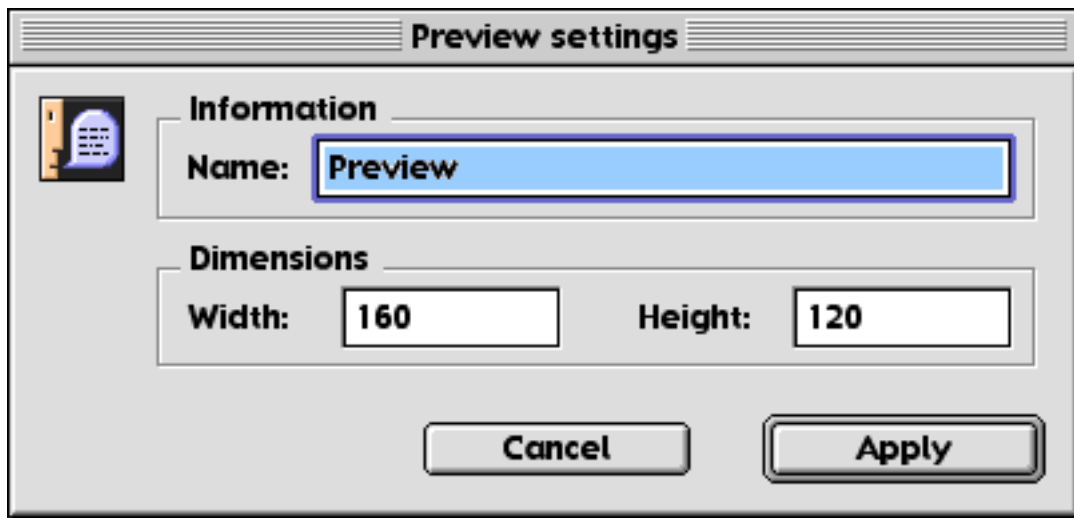


You cannot do any editing in the preview windows: they just display the terrain.

To move the camera of a preview window, you need to activate it first by clicking on it – an activated window has a red frame. Then use the arrow keys of your keyboard to move the camera. Press the [Command] key to translate the camera. Press the [Option] while using the vertical arrow keys to move up or down.



To create a new preview window, use the "Create new preview window..." in the Preview menu. Enter a name for the preview window and its width and height.



You can modify the settings of any preview window by selecting its name in the Preview menu.



THINGS YOU SHOULD KNOW

Before starting this tutorial, you should be familiar with some of the concepts in WRTB:

Terrain

A terrain is a collection of ground and sea meshes, 3D models, sounds, animations... which forms a WaterRace level.

Layers

A terrain is divided into "layers": there is the ground layer which describes the relief of the terrain, the sea layer, the models layers which contains the 3D models, etc...

You can select the layers to display in the Layers menu.

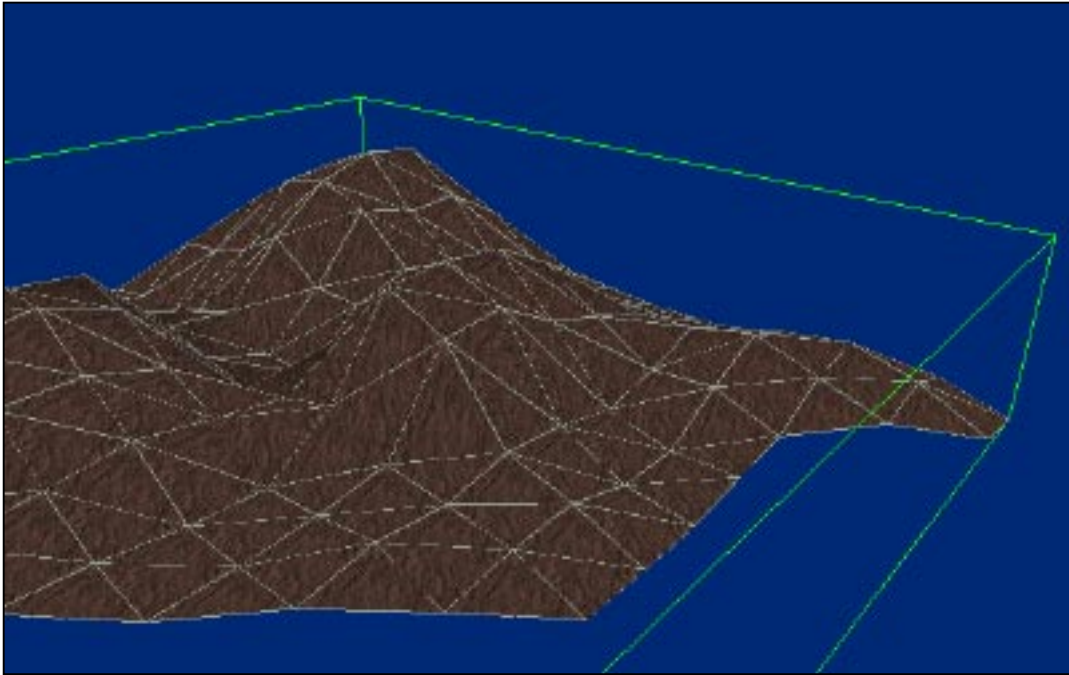
Note: You can switch the display state of the layers simply using the 1 to 5 keys on the numeric keypad.

You don't have to worry about layer selection: when editing the terrain, WRTB automatically selects the correct layer depending on the Inspector window mode.



Mesh

A mesh is the smallest division of the ground or sea layer. It contains a list of points and triangles.



If the inspector mode is "Ground mesh" or "Sea mesh", the selected mesh is shown with a green bounding box.

For easiest editing, you can display only the selected mesh thanks to the "Show selected only" item in the Rendering menu.

Note: A mesh can have only one texture applied.

Model

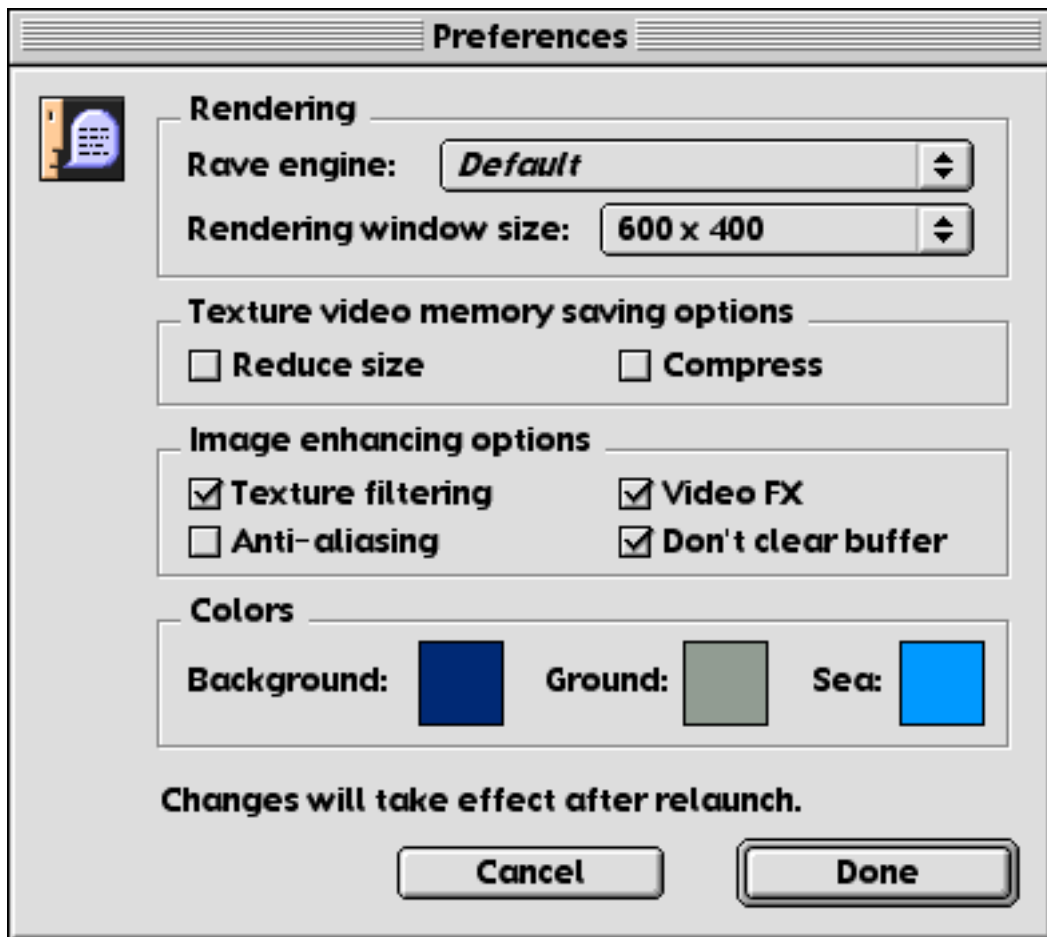
A model is a 3D object created in Fusion (the 3D editing program from French Touch) and imported in a WRTB terrain file. The textures of the object, the skeletons and the scripts are also imported in the terrain file.



WRTB PREFERENCES

To get the most out of WRTB you need to set up correctly the preferences through the preferences dialog (Edit Menu -> Preferences).

Note: The preference dialog is automatically displayed during first startup of WRTB. You may display the preference dialog at startup before the 3D engine has been initialized, by pressing the [Command] key while clicking on the "About" screen.



Rendering

Rave engine: select the Rave engine to use. This menu lists the available Rave engines for rasterizing. Select "Default" to let Rave choose the fastest engine.



Upon launch WRTB will try to use the selected engine, and if it's not available WRTB will then switch to the default engine. If no engine is available, WRTB quits.

Note: Be aware that some Rave engines require a specific screen bit depth to run.

Rendering window size: you may change the size of the main window here.

Note: If you use a hardware-based Rave engine, increasing the window size will need much more VRAM.

Texture video memory saving options

Reduce size: check this flag to reduce the width and height of the texture by a factor of 2 (for example, a 256x128 texture will be shrunk to a 128x64 texture). Original texture data is left untouched. A reduced texture requires 1/4th the Rave engine memory to run.

Compress: check this flag to force the 3D driver to compress the textures. Original texture data is left untouched. On ATI chips a compressed texture is converted to a special 8-bit format and will require half as much the memory when loaded into VRAM.

Image enhancing options

Texture filtering: check this flag on to turn texture filtering on.

Anti-aliasing: turns on the anti-aliasing feature of the 3D engine. This option seems not to be implemented in current Rave engines.

Video FX: turns on effects like Fog, lens flares...

Don't clear buffer: not documented – let this item checked.

Colors

Background: click on this button to define a background render color with the standard Apple Color Picker.

Ground: click on this button to define the color of the ground in WireFrame rendering.

Sea: click on this button to define the color of the sea in WireFrame rendering.





Step 1

Creating the terrain relief

- Drawing a level map
- Importing the level map and creating a new terrain



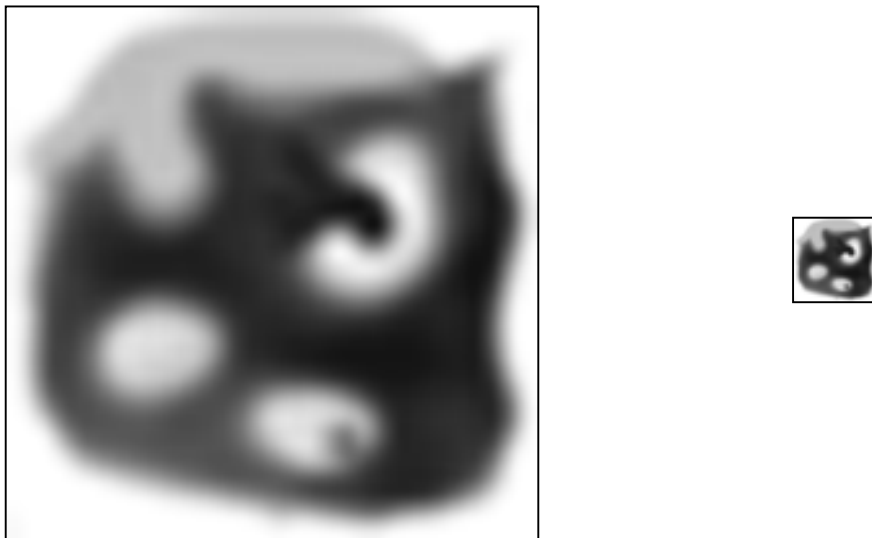
DRAWING A LEVEL MAP

To create a new terrain, your first step will be to draw a level map, which is basically a gray level image where white areas represent high altitude and dark areas low altitude.

When importing this level map to WRTB, the resolution of the generated terrain will depend on the size of the level map: bigger level map image means greater resolution, but also means slower rendering. Actually 1 pixel on the map generate 4 mesh triangles (2 triangles for the ground and another 2 for the sea).

We suggest you to draw the level map at a very high resolution like 200x200 (such a map would generate a $200 \times 200 \times 4 = 160'000$ triangles terrain, which is way to big) for two reasons:

- it's a lot easier to draw onto a 200x200 image than onto a 50x50 pixels stamp
- once the map is drawn, just resize it as many times as you want in order to get an acceptable resolution in WRTB.



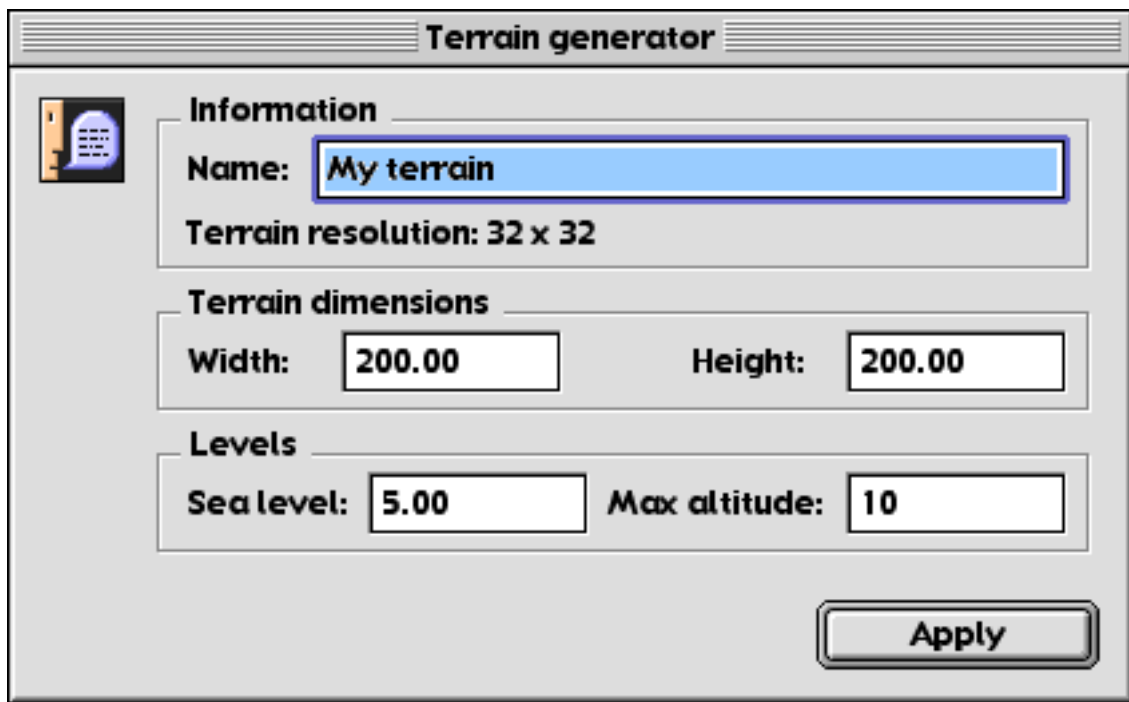
A 200x200 pixels level map and a reduced version of the level map to import in WRTB (only 32x32 pixels wide)

When the level is ready, reduce it to an appropriate size like 30x30 pixels, convert it to 256 gray levels, and save it as a standard PICT file.



IMPORTING THE LEVEL MAP

Launch WRTB and select "New terrain..." in the File menu. Then select the PICT you have just created and click "Open".



Terrain generator

Information

Name:

Terrain resolution: 32 x 32

Terrain dimensions

Width: Height:

Levels

Sea level: Max altitude:

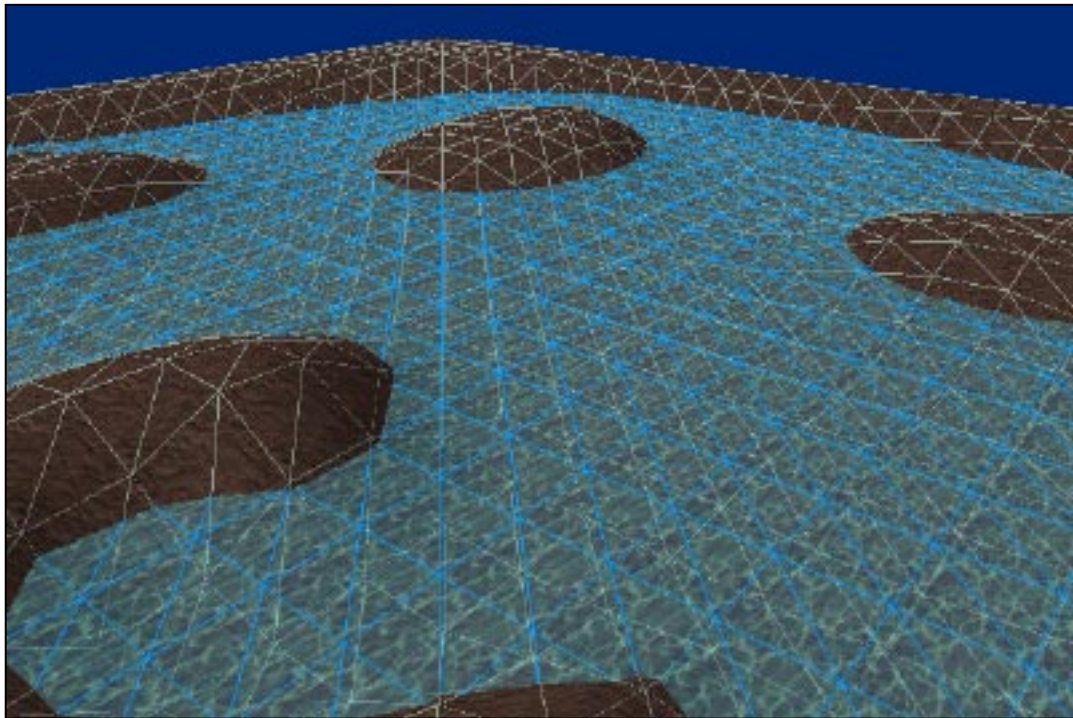
Apply

A dialog appears prompting for the characteristics of the terrain: you need to enter a name and its dimensions.

Note: All measures in WRTB are expressed in arbitrary units: as an example, a WaterRace ship is roughly 3 units wide.

Enter 200 for the width and height, 5 for the sea level and 10 for the maximum altitude of the terrain, then click "Apply".





This is how your terrain should look in the construction window (WireFrame rendering is on). The ground mesh and the sea mesh use default textures you will be replacing later on.

It's time to save your work now: press [Command]-'S' and save the terrain file.



Step 2



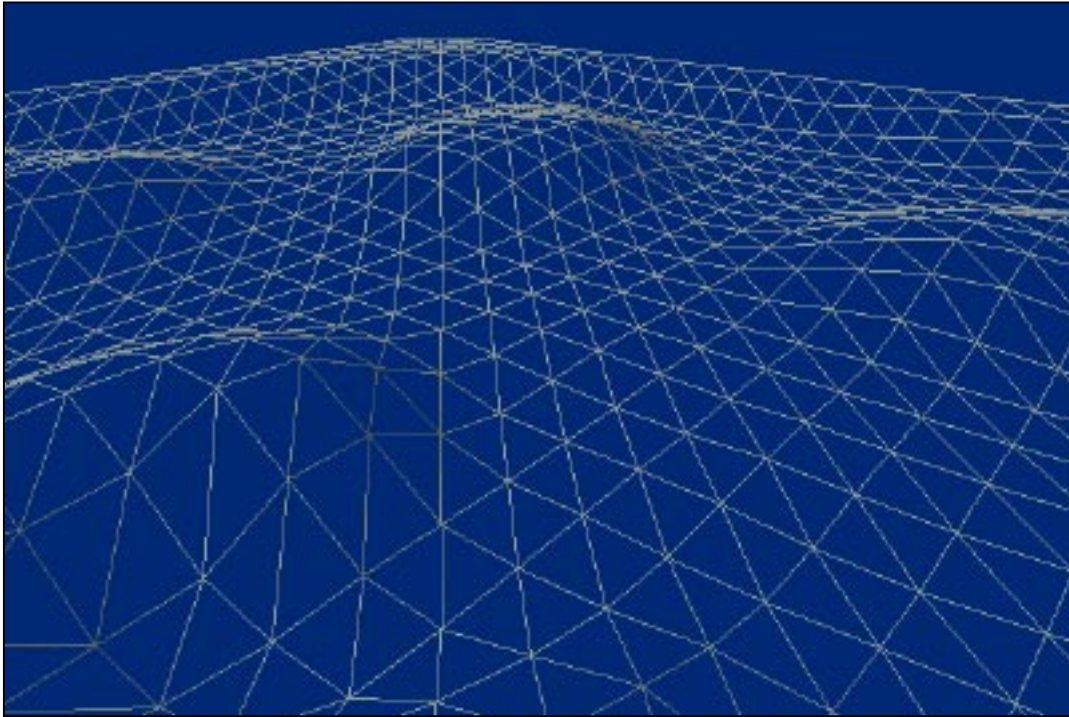
Cutting the ground mesh and the sea mesh

- Dividing the ground mesh
- Texturing the new ground meshes
- Removing unnecessary triangles
- Texturing the sea mesh
- Dividing the sea mesh
- Dividing the ground mesh – part 2
- Naming the meshes



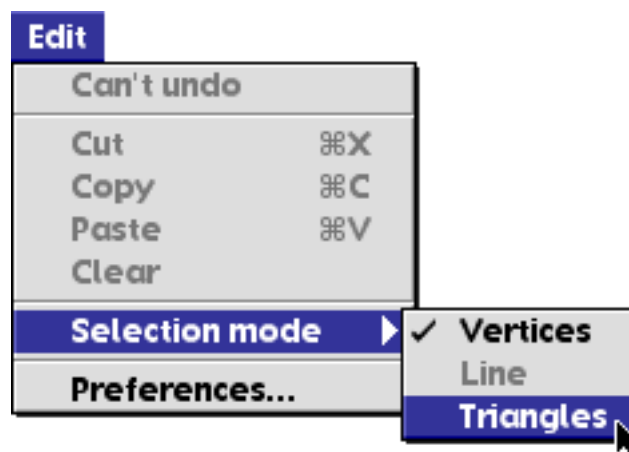
DIVIDING THE GROUND MESH

Now we need to divide the ground mesh in many meshes: the under water meshes and the upper water mesh.



Switch to WireFrame rendering only and turn off the display of the sea layer.

We are going to select all the triangles that belong to the under water mesh and create separate meshes with these triangles. Therefore we need to switch to Triangle selection mode – by default WRTB is in Vertex selection mode – through the Edit menu -> "Selection mode" submenu.

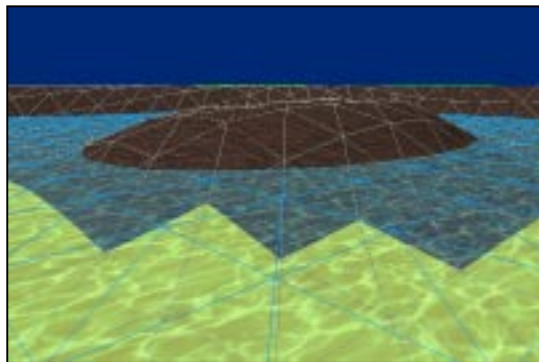


Make sure the Inspector mode is "Ground mesh", then press the [Shift] key while clicking on the triangles that are *really* below sea level – typically you will leave the first row of triangles under the sea level.unselected. Selected triangles are highlighted in yellow.

Tips: You can leave the mouse button down while dragging the mouse to select the triangles faster.

If you're not sure whether a triangle is below sea level or not, switch back temporary on the display of the sea layer.

To deselect a triangle, [Option] click on it.



Leave the first row of triangle under the sea level unselected.



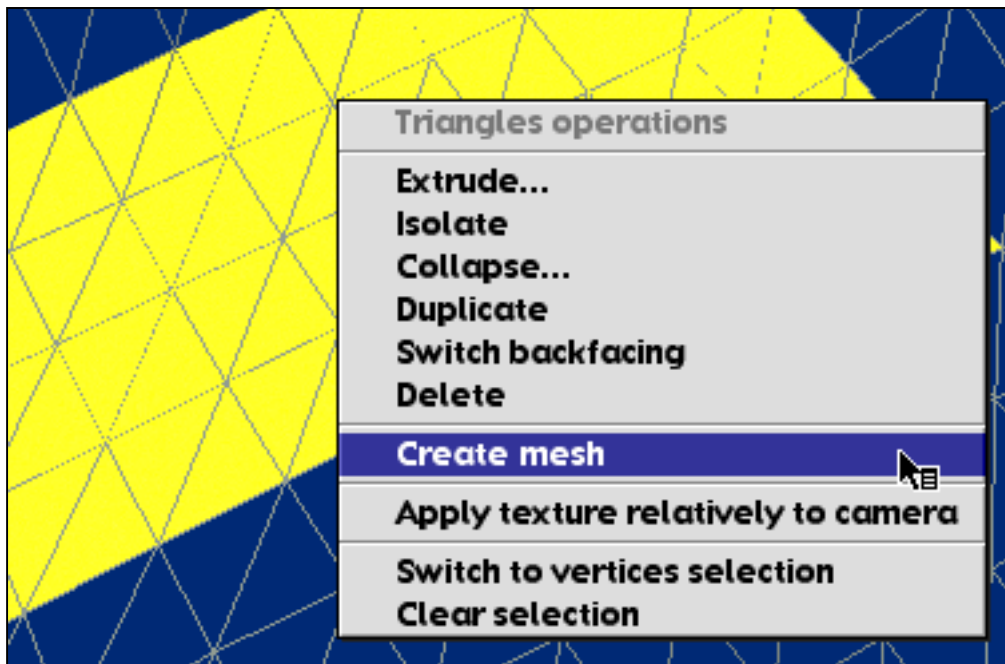
Example of a correctly selected area.

Once you have selected triangles in an area that looks roughly square or circular, you need to create a separate mesh with these triangles.

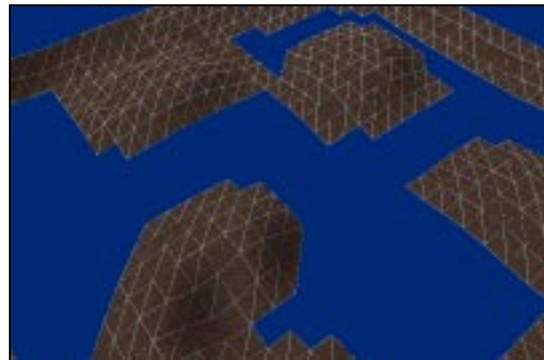
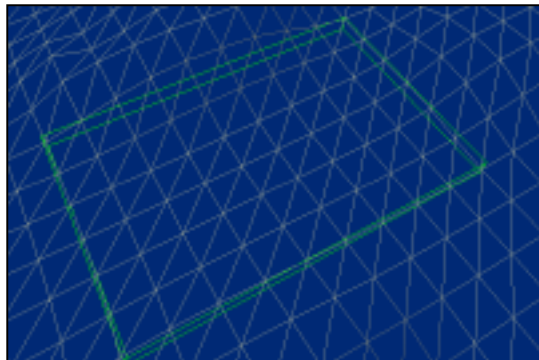
You may wonder why we need to cut the ground mesh; for several reasons:

- You can apply only one texture per mesh, and of course we don't want the bottom of the sea to have a rock texture.
- The terrain has to be rendered as fast as possible by the 3D engine and one of the optimization method is to divide the single mesh in smaller meshes which the 3D engine can reject when they are not visible instead of drawing all the triangles of a single mesh every frame.





[Control] click anywhere in the mesh and select "Create mesh" in the contextual menu. WRTB creates a new ground mesh from these triangles, add it to the ground mesh list in the inspector and select it.



Note: You can select triangles only in the selected mesh. To be able to select triangles again in the original mesh, you need to re-select it either by clicking on the first name in the inspector ground meshes list or by clicking on it in the construction window.

You need to repeat these steps until your mesh is fully divided. Since there's no undo in WRTB, don't forget to save regularly!

Tip: to help you see which triangles were removed and which were not, you should select "Show selected only" in the rendering menu.

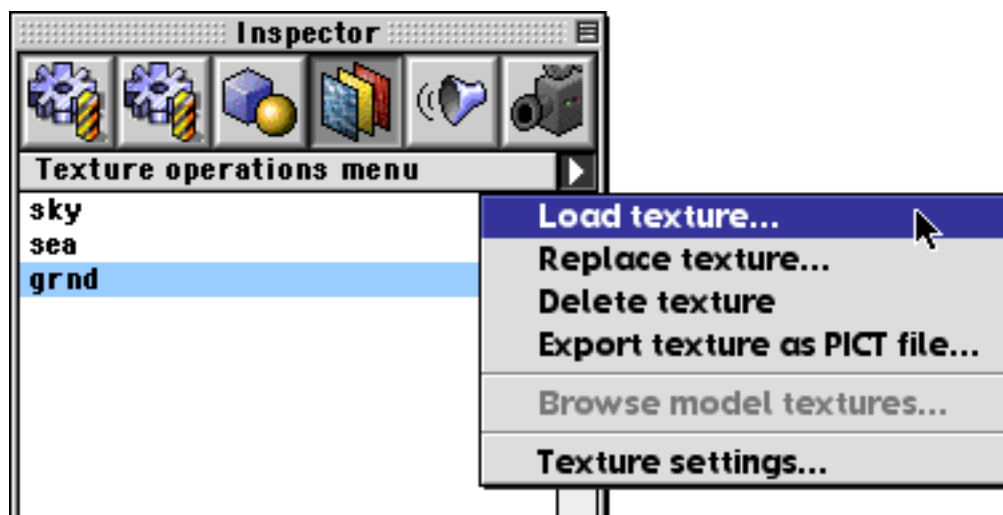


TEXTURING THE NEW MESHES

The meshes we have created are supposed to represent the bottom of the sea. So let's apply an appropriate texture to these meshes.

Loading a texture

To create a new texture, select the Texture mode in the inspector window and in the pop-up menu, choose "Load texture...".



Select the PICT file " Bottom texture" and click "Open".



A dialog then asks you to select an alpha mode: choose "No alpha" and click "Accept".



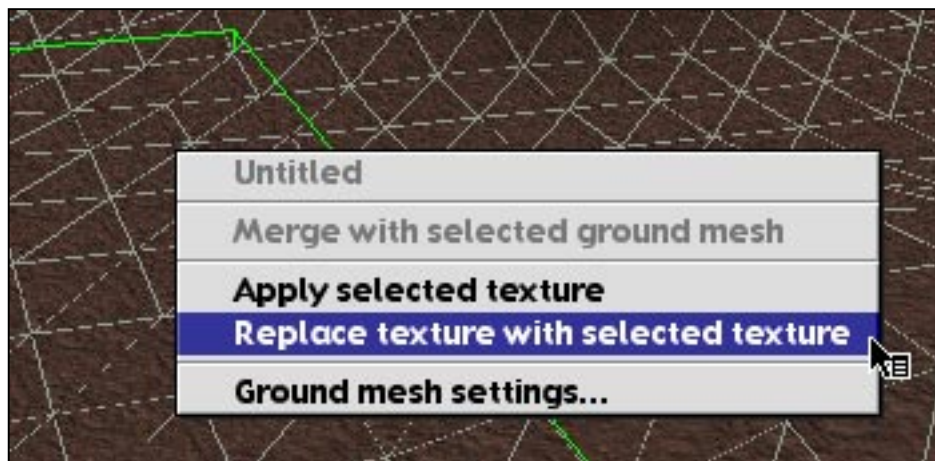
The texture has now been loaded in the terrain and its name has been added to the Inspector texture list.

Note: You can preview the texture and change its name by double clicking on it in the texture list.

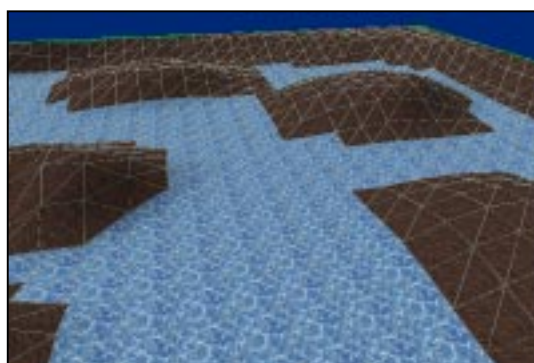
Replacing the ground texture with the new texture

Now we need to apply this texture to all the bottom sea meshes. First select the new texture in the texture list then switch back the Inspector mode to "Ground mesh".

You have to [Control] click on a bottom sea mesh in the construction window and select "Replace texture with selected texture" in the contextual menu.



Repeat these steps for each of the bottom sea mesh.



This is how your terrain should now look like.



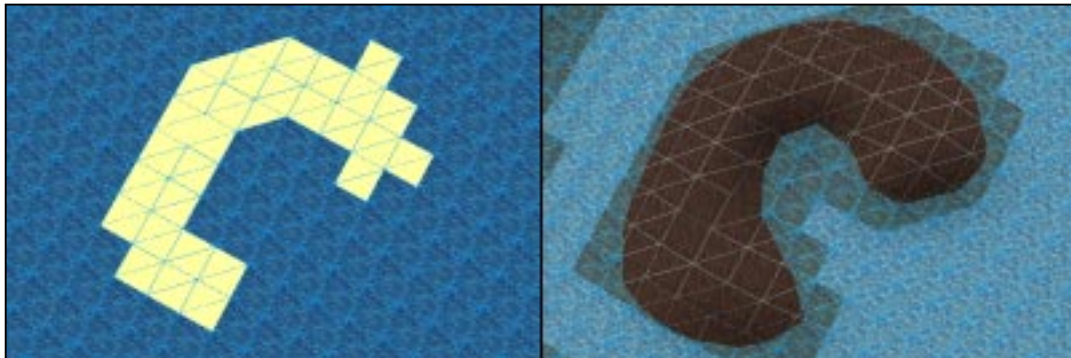
REMOVING TRIANGLES

To further optimize the terrain, we now have to remove all the invisible triangles. There are two kinds of invisible triangles:

- Triangles that belong to the ground mesh but will not be visible from the player's point of view.
- Triangles that belong to the sea mesh but are overlayed by the ground mesh.

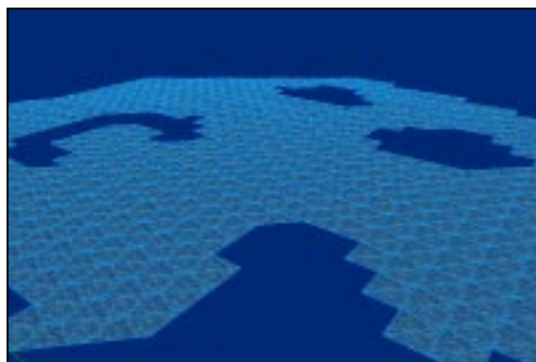
You shouldn't have any invisible triangle of the first kind in this terrain (usually these triangles are generated if you have a mountain in a corner of the terrain and the player can't go behind the mountain), so let's delete all the ones of the other kind.

Switch the Inspector mode to "Sea mesh" and make sure you are in Triangle selection mode. Then select some invisible triangles in the sea mesh using the now classical [Shift] click process.



Example of invisible triangles of the second kind.

To delete the selected triangles, simply press the [Backspace] key.



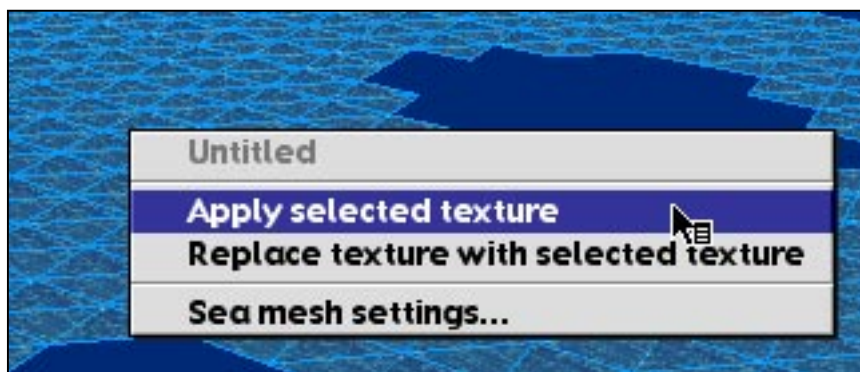
This is how the sea mesh should look like once all the invisible triangles have been removed.



TEXTURING THE SEA MESH

For the same reasons we have divided the ground mesh, we also need to divide the sea mesh. But first we are going to remap the texture of the sea mesh since the way it has been mapped makes the sea look to much repetitive.

First select the 'sea' texture in the texture list, then switch back to the "Sea mesh" Inspector mode. [Control] click on the sea mesh and select "Apply selected texture" in the contextual menu.



The cursor turns into an arrow cross and you are now able to move, scale and rotate the texture on the sea mesh.

- Move the mouse or use the arrow keys to move the texture.
- Move the mouse while pressing the [Command] key to scale the texture horizontally and vertically or use the vertical arrow keys.
- Move the mouse while pressing the [Control] key to rotate the texture or use the horizontal arrow keys.
- Press the [Option] key while using the arrow keys to scale the texture horizontally *or* vertically.

Tip: If your mouse is stuck in a corner of the screen, press the [Option] key while moving it to re-center the cursor without modifying the texture mapping.

Once the texture seems to be correctly mapped, click the mouse button.



DIVIDING THE SEA MESH

Now we need to divide the sea mesh using the same process as when we divided the ground mesh.

But this time, switch the Inspector to "Sea mesh" mode in order to select triangles from the sea mesh.

It's important to notice that dividing the mesh in too many sub-meshes (like hundreds each one made of less than 50 triangles for example) may actually slowdown the engine. It's also **very** important to divide the mesh in areas that are almost square or circular.

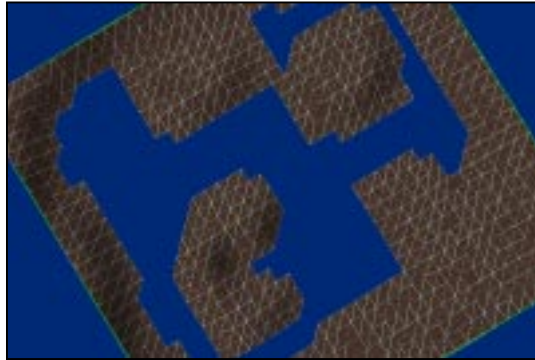
Tip: Move the camera on the top of the terrain and make a screen capture of the sea mesh. Then in a drawing program, draw lines on top of the image to figure out the best way to divide the mesh.

The number of currently selected triangles is indicated at the bottom of the Inspector window.



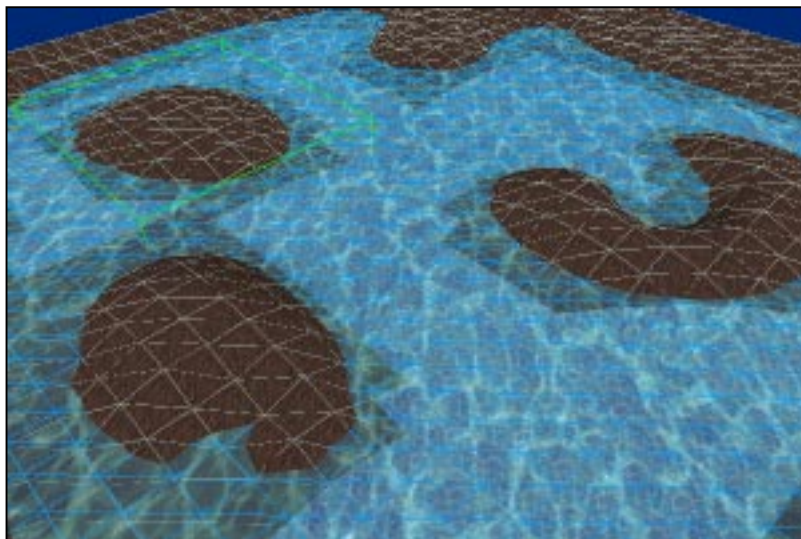
DIVIDING THE GROUND MESH (2)

Remember: we have divided the ground mesh in many meshes: the under water meshes and the upper water mesh; but the upper water mesh is still in one piece.



The upper water mesh needs to be divided too.

We now have to create separate meshes for the Islands and then to divide the rest of the original ground mesh into meshes.



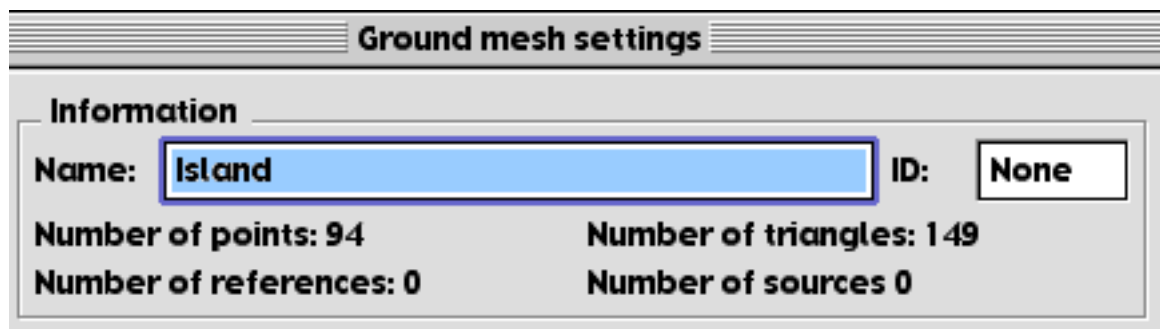
This is how your terrain looks finally.



NAMING THE MESHES

You terrain is now probably divided in more than twenty different meshes. You need to give them explicit names, or you might just get lost!

To name either a sea mesh or a ground mesh, switch to the related Inspector mode, then simply double click on its name.



The ground mesh settings dialog appears. Just modify the name field and left all the other fields untouched. Then click "Apply".

Congratulations: you have now finished the basic geometry of your terrain. Now make a backup copy of your terrain and prepare for step 3.



CREDITS

The French Touch team

Programming, Interface and User's Manual: Pierre-Olivier Latour

WRTB logo: Yann Lorgueilleux

3D Model collection: Didier Larue, David Lardat & Eric Dufresne

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Cool icons of the inspector window: Etienne Després

Internet stuff

General e-mail: info@french-touch.net

Technical support, bug reports: support@french-touch.net

WRTB web site (info, updates, FAQ...): http://www.french-touch.net/terrain_builder

French Touch web site: <http://www.french-touch.net>

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