

# Designing a Fjord

**Author:** Aaron Torpy.

**Last updated:** 20th of Jan, '08.

## Introduction

I was just browsing [Wikipedia](#), as I am sometimes wont to do, and I came across the [article on fjords](#) (or fiords, for the Kiwis). Absolutely spectacular scenery. In this walkthrough-style tutorial, I will attempt to build a fjord from scratch, starting with a blank design map and ending with a complete terrain and texture.

## Making a blank design map

The first step in the process is to create a new design map. To do this, I'll select the 'new map' icon on the toolbar (shown below).

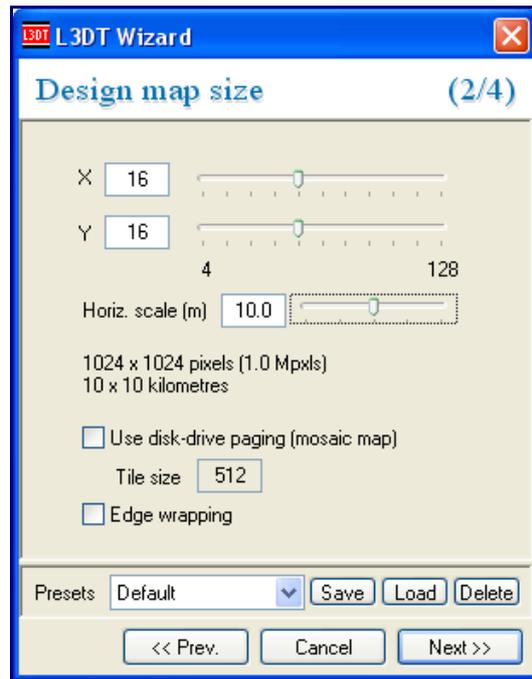


The 'new map' toolbar button.

That button will open the *Select terrain algorithm* wizard (below), from which I will select the *Design/inflate (blank)* option.



Clicking on the *Next >>* button takes me along to the *design map size* wizard (also below). For the purposes of this tutorial, I'm going to stick with the default design map size, which is 16×16 pixels. For the uninitiated, that corresponds to a 1024×1024 pixel height map (it's shown in the dialog below, in really small text).

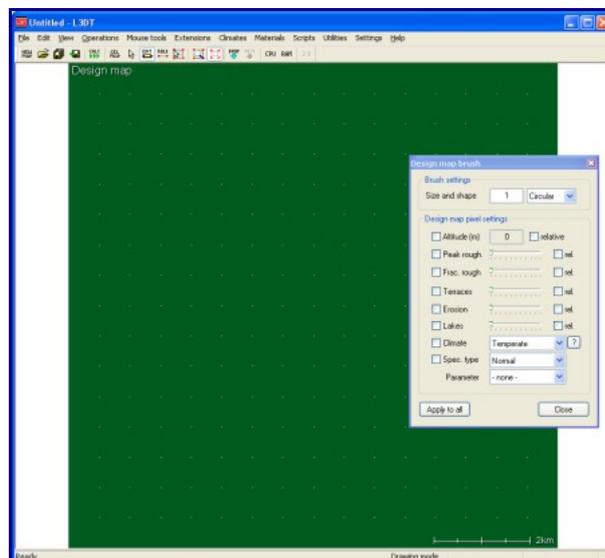


One more thing I'm going to do in the design map wizard is set horizontal scale of the terrain. A smaller horizontal scale gives you more detailed terrain that covers a small area (good for FPS-style games), and a larger horizontal scale gives you less detailed terrain that covers a larger area (good for RTS / flight-sim games). As a rough guide, the table below lists the typical range of horizontal scales used for popular types of games.

Game style	Horizontal scale
First person shooter	0.5m - 2m
Real time strategy	2m - 20m
Flight simulator	10m - 100m

For this demonstration, I'm going to pick a horizontal scale of 10m, which is pretty-much in between the two extremes (FPS and flight-sim). This will give me a map that covers 10x10 kilometers, or around about 6x6 miles in old-speak.

Continuing; I'll click *OK* in this wizard to take me to the blank design map:



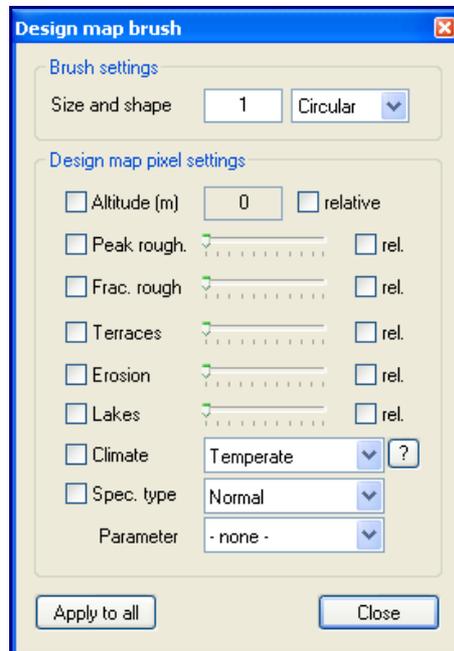
*The blank design map (boring, isn't it?).*

## Sketching the design

Since I want to design the whole map myself, I'm going to go straight for the [design map brush](#) (shown below), which is activated by clicking on the little 'edit' toolbar icon:



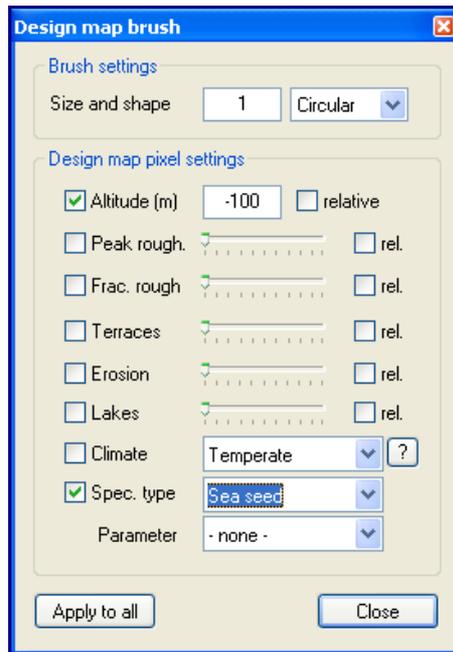
The 'edit active map' toolbar button.



*The 'design map brush' dialog.*

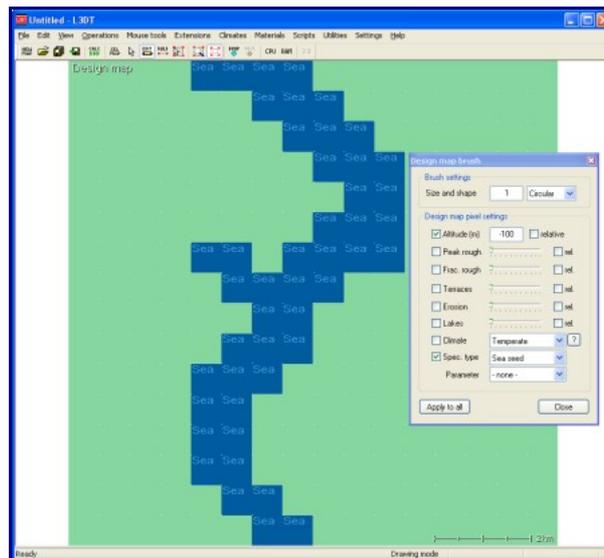
It's often easiest to start by drawing the water first, so as to define the coastline of the map. To do this I'll set the altitude (*Alt.*) to -100m [*I know fjords are typically deeper than this, but hey, it's made-up terrain, so it can be any depth I like.*]

Since I'm painting the sea, I may as well set the *Special overlay type* to 'sea seed' and enable it (see below). A 'sea seed', for those not in the know, is a flag for the automatic sea-flooding routine that says "*Hey, try to flood some sea here*". You only need one sea seed per water body, but it does no harm to paint them everywhere. The other way to flood sea is to use the [manual flooding tool](#), which should probably be the subject of another walkthrough tutorial. But I digress, I was setting the *Alt.* to -100m and the *Special overlay type* to 'sea seed':



*The 'design map brush' dialog, again.*

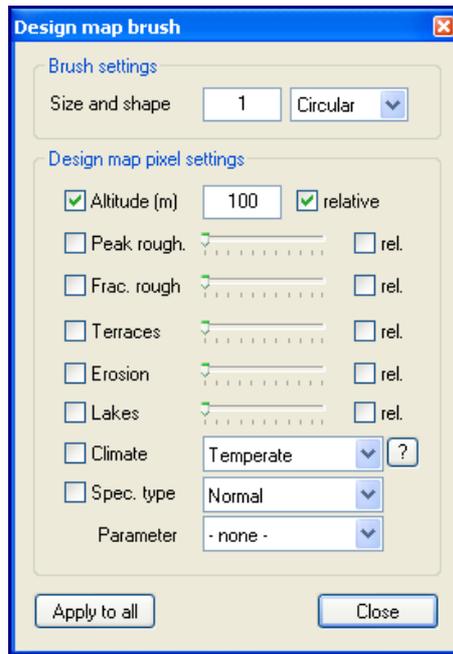
To paint the water, simply left-click and drag the pencil over the map:



*The design map, now with water.*

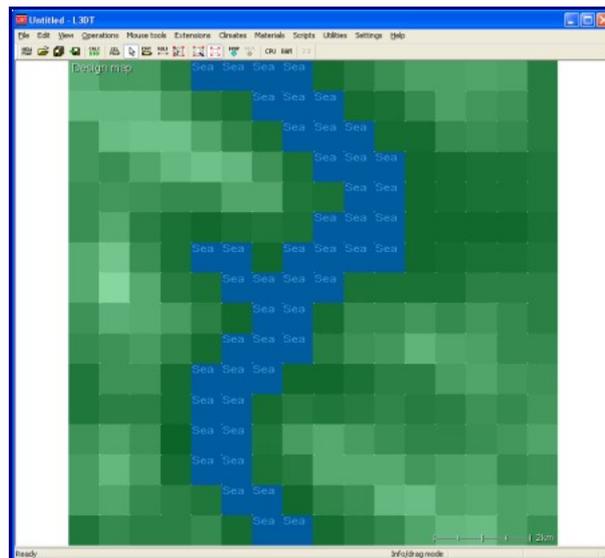
I should point out now that if you de-activate the design map brush (eg. by right-clicking on something else, zooming the map, etc), you can re-activate it by left-clicking within the tool window or on its title bar. This knowledge may come in handy later.

Now, an important feature of fjords are all the mountains around them. To build mountains, I'm going to set the *Alt.* to 100m, and enable the *relative* checkbox (see below). This means that wherever I click, I will be raising the terrain by +100m. If I hadn't checked the relative flag, I would only be setting the terrain to 100m, which is not what I want to do. Also, I'll disable the sea seed flag, as I don't want to try to put sea on the sides of mountains.



*The 'design map brush' dialog, for the 3rd time.*

Using these settings, I scribbled all over the map like a child with a crayon, resulting in this:

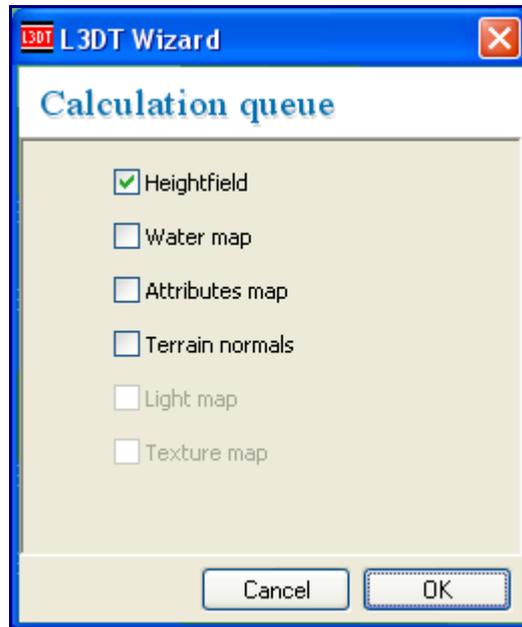


*The design map, with water and mountains.*

L3DT does a reasonably good job at interpolating between the values, so you don't have to be really precise or artistic here. Near enough is good enough.

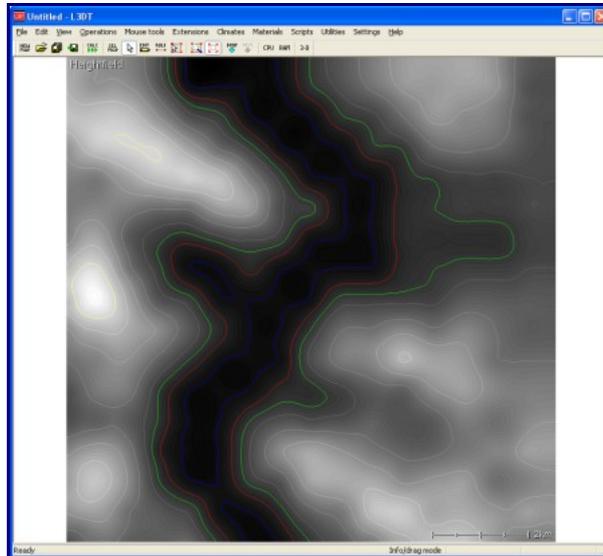
## Generating the heightfield (1st attempt)

To get a feel for what I've done, I'm going to go ahead and generate the heightfield by clicking on the 'calc' toolbar button. This will open the *calculation wizard*, shown below.



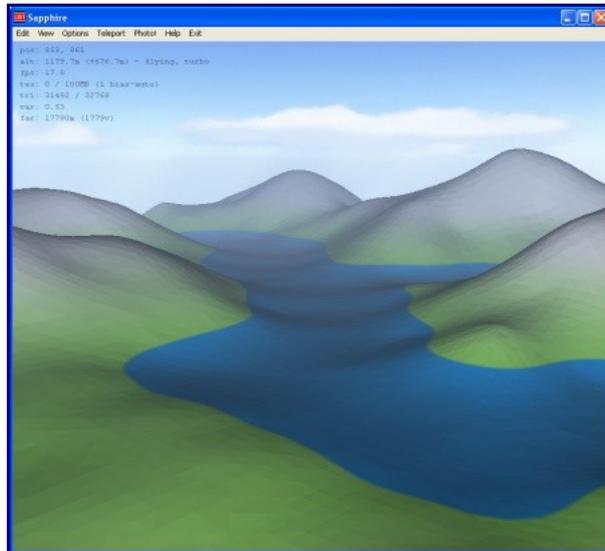
*The calculation wizard.*

In this wizard I'll select the 'heightfield' option and click OK. The result looks a little something like this:



*The heightfield, first attempt.*

Okay, it's about the right shape. To view this in 3D, I'm going to click on the '3D' button on the toolbar. This will open the [Sapphire](#) 3D viewer/editor window, as below:



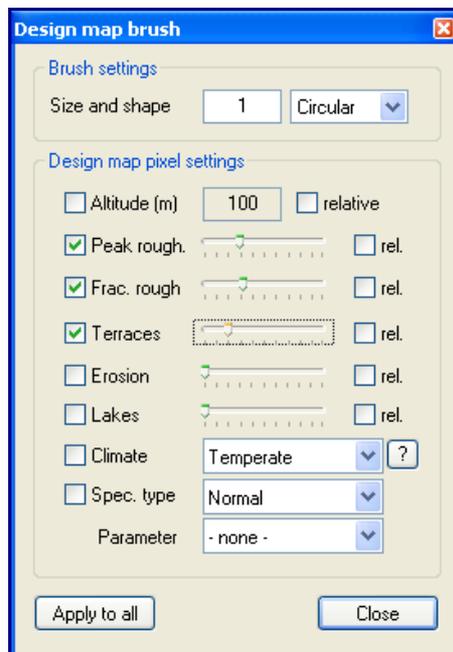
*The heightfield, first attempt (in 3D).*

From the 3D view I can see that the terrain is clearly too smooth and un-fjord-like. To fix this, I could use *Sapphire's* heightfield brushes to manually roughen the terrain and make cliffs. However, that would require a lot of brushwork. Instead, I'm going to take the easier (and better) path, and make L3DT's terrain algorithms do all the work for me. To do this, I'm going to add overlays in the design map for peak and fractal roughness, as well as cliffs and terraces.

## Roughness, cliffs, and terraces

Before I start painting these mask layers I will need to switch the view back to the design map (*View*→*Show map...*→*Design map*).

Alrighty, in the design map brush I'm going to enable the *Peak*, *Fractal* and *Terraces* options, and set the sliders to about 30%, 30% and 20% respectively:

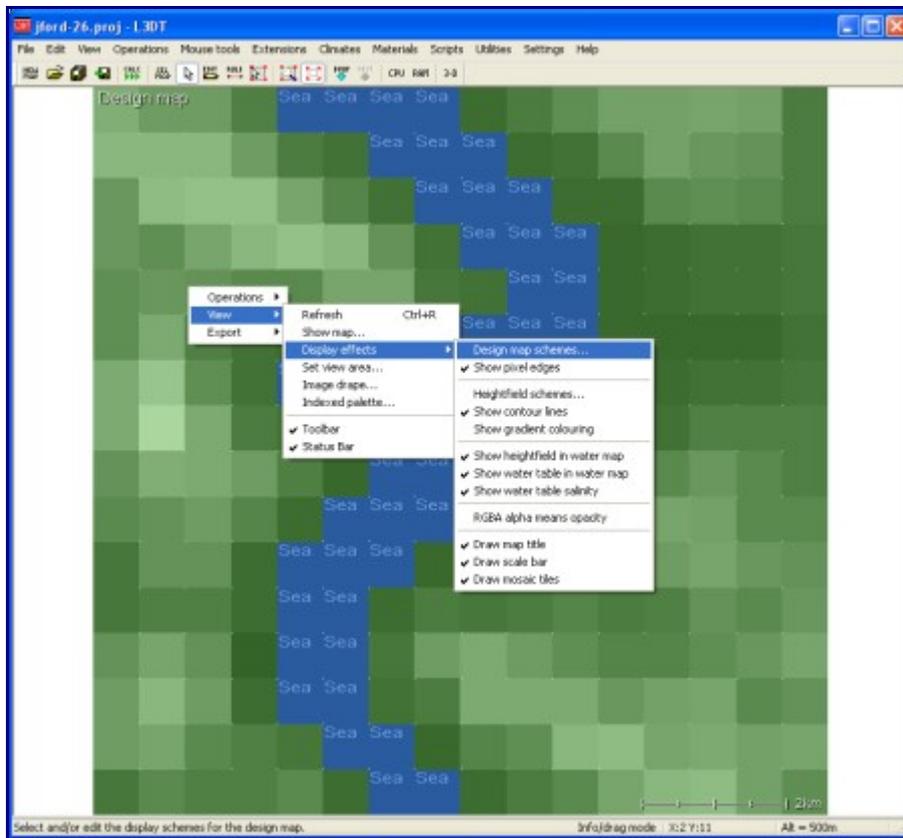


*The 'design map brush' dialog.*

I want to apply these settings to every pixel in the map, so I'll hit the *apply to all* button. This will make the terrain look better, but before I generate the heightfield again I'm going to lay down some erosion.

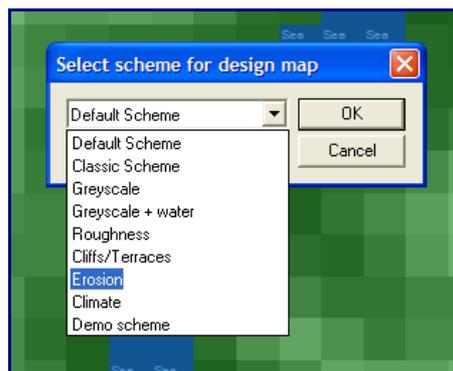
## 'Painting' erosion

Erosion, as I may or may not have remarked earlier, is what being a fjord is all about. However, before I go splashing water about I will need to change the display scheme so that I can see what I'll be doing. To do this, we right-click on the main window and select the 'View→Display effects→Design map schemes...' option from the pop-up menu (see below).



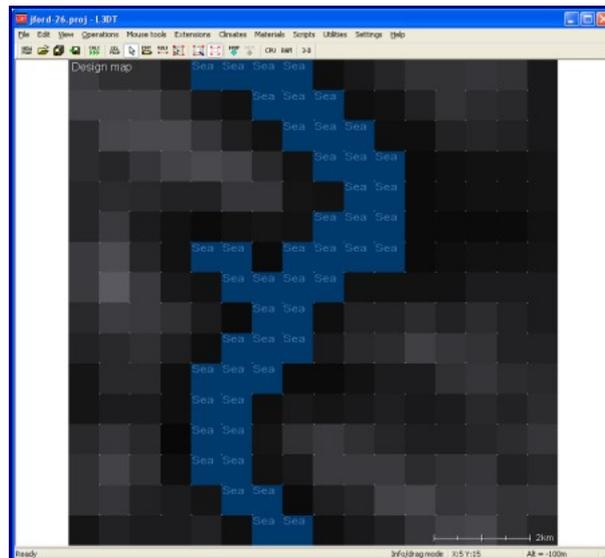
The pop-up menu.

This will open the *select scheme for design map* dialog:



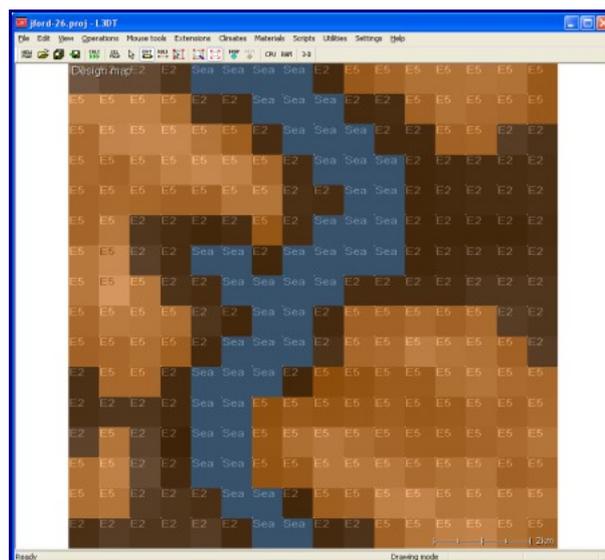
The 'select scheme for design map' dialog.

Because I'm going to be working with erosion, I'll select the *Erosion* scheme from the drop-down list. Since I haven't yet set any erosion in the map, this scheme will show the map as a plain greyscale height-map with a blue tint in the areas where I've previously painted water:



*The design map in the 'Erosion' scheme, but without any erosion overlays.*

My plan is to apply a little bit of erosion to the whole map, and strong erosion to the mountains. To do this, using the design map brush, I will enable the *erosion* option, set it to 20%, and click *apply to all*. Following that, I will set the erosion slider up to 50% and paint the erosion onto the mountains (see below).

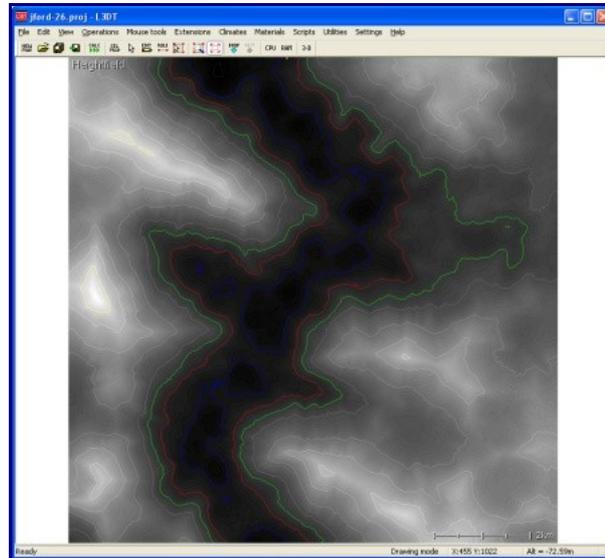


*The design map, now with erosion.*

Note that now the map has taken on a decidedly orange tint. This shows where I have painted the erosion overlays.

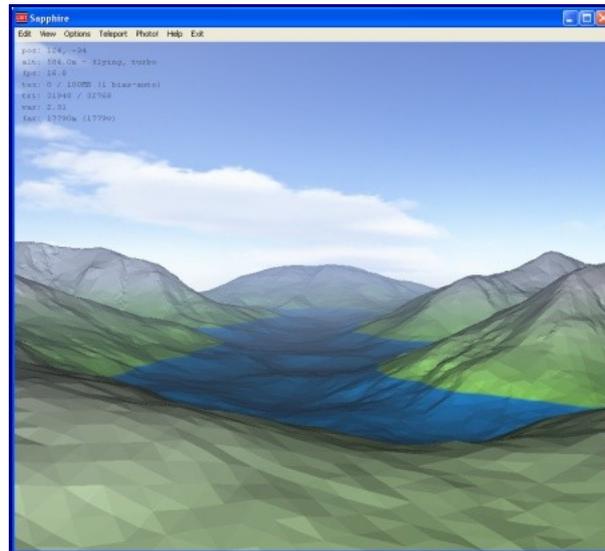
## Generating the heightfield (2nd attempt)

Anyhow, that's about it for the design bit. To proceed to the heightfield, I'll again select the *Operations*→*Heightfield*→*Generate map* menu option. The resulting heightfield looks like this:



*The heightfield, second (and final) attempt.*

Again, I'll take a look at how this map looks in 3D by clicking on the '3D' button on the toolbar. This opens the *Sapphire* 3D renderer:

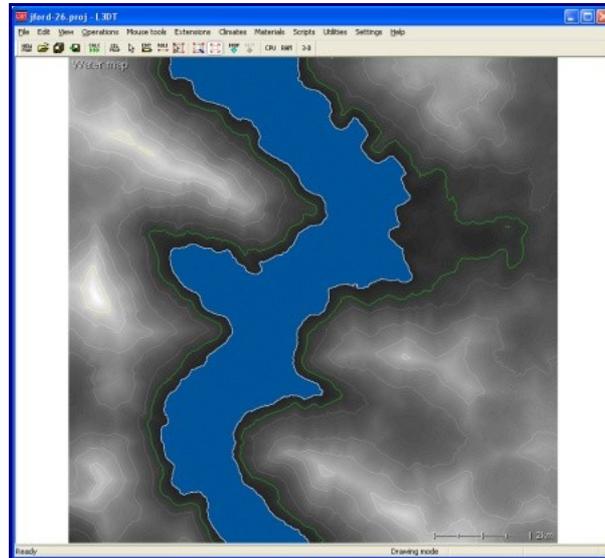


*The heightfield in 3D.*

Now, I could use *Sapphire*'s mouse-driven brush tools to further edit the heightfield in 3D. However, since this is a tutorial about how to use the design map to build terrain, I won't get side-tracked into a discussion of the heightfield editor. If you'd like to know more, please consult the [editor user-guide](#). In any case, the heightmap already looks OK to me, so no manual heightfield editing is necessary. Thus, I'll now proceed to generate the water map.

## Water mapping

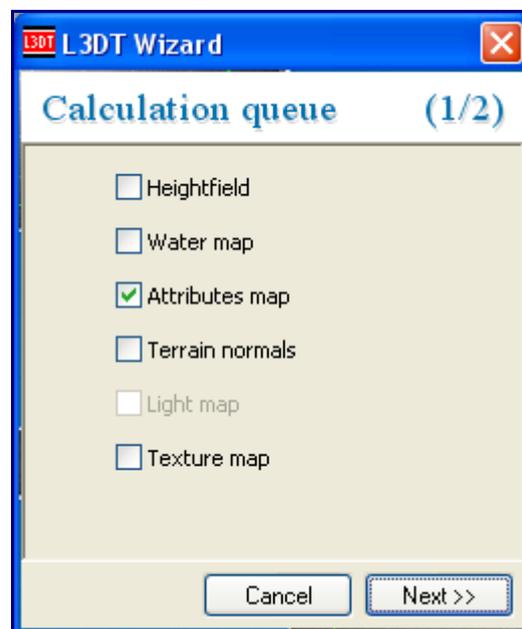
To flood seas automatically, I'm going to use the 'Operations→Water map→Auto-flood seas' menu option. This will flood seas in the areas where I had earlier put 'sea seeds'.



*The water map, with seas flooded.*

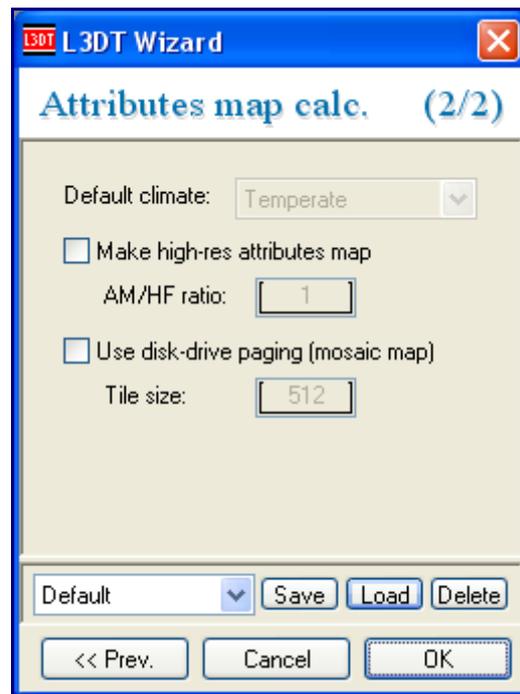
## Making the attributes map

The next step is to generate the 'attributes map', which is the mask map that controls which ground texture goes where when we finally generate the texture map. To generate the attributes map, select the 'Calc' toolbar button. This will open the 'Calculation queue' wizard, show below:



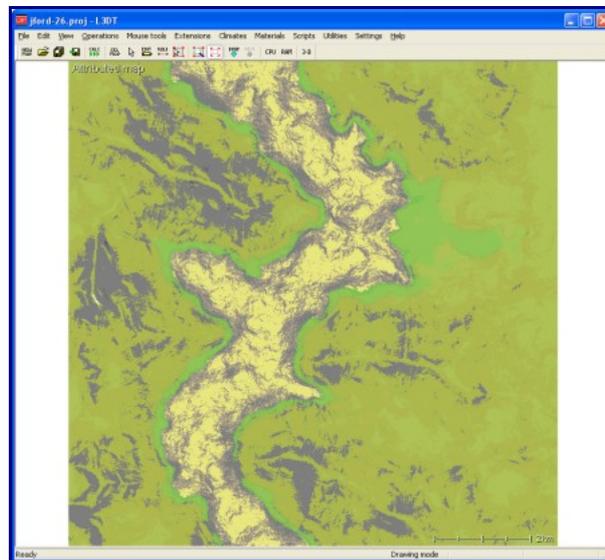
*The calculation queue wizard.*

In the wizard, I'll select the 'attributes map' option, and click 'next' to go through to the attributes map wizard:



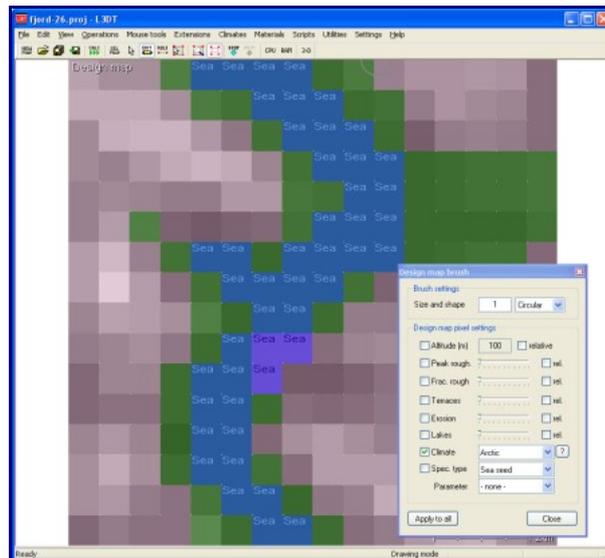
*The attributes map wizard.*

In this wizard I'm not going to touch the 'Make high-res attributes map' or 'use disk-drive paging' options. These options, which are only available in *L3DT Professional*, allow you to make very highly-detailed attributes maps, which are necessary for high-quality textures. In this tutorial I'll just stick with the default low-res, non-mosaic attributes map, and click OK. L3DT then generates the following attributes map:



*The attributes map.*

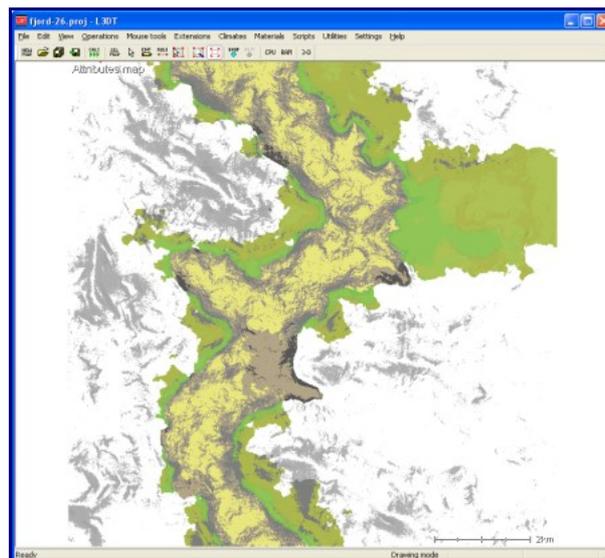
Oopsie daisy, this all looks a bit too balmy and green for a fjord. Clearly, I forgot to tell L3DT that I want this map to use a cold climate. To do this, I need to do is go back to the design map and, using the design map brush, paint some 'arctic' climate around the place:



*The design map, with arctic climate and a temperate valley.*

Note that I've left the temperate (green-coloured) climate near the coast and in a valley at top-right.

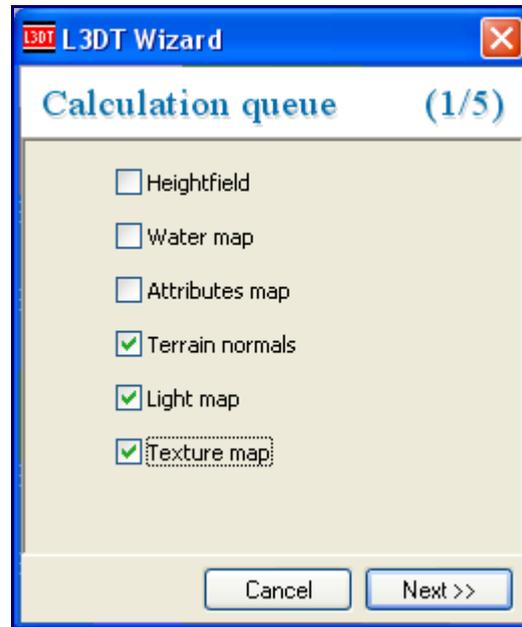
Okay, back to generating the map. What I need to do is re-calculate the attributes map, which is done by clicking on the '*Operations*→*Attributes map*→*Generate map*' menu option. The new attributes map looks decidedly more frosty:



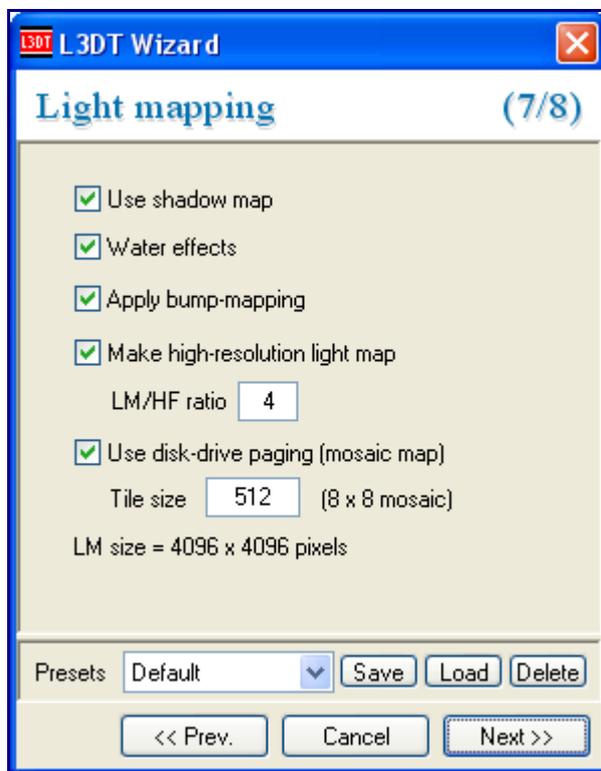
*The attributes map, redux.*

## Making the texture map

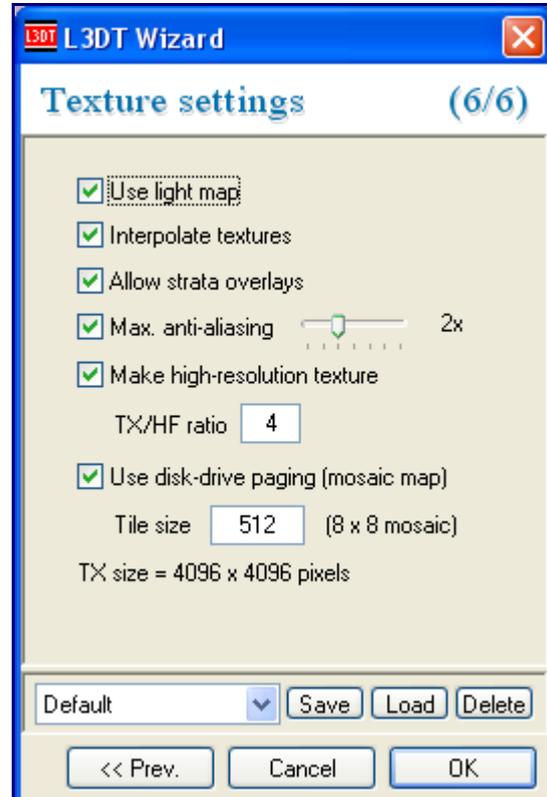
To make the texture map, I'm now going to click on the 'Calc' toolbar button, and enable the 'terrain normals', 'light map' and 'texture map' options in the calculation queue wizard (as below).



Because I want some pretty screenshots of this map for this tutorial, I'm going to make a high-resolution light map and texture map (4x in this case). The light map and texture map settings are shown below:

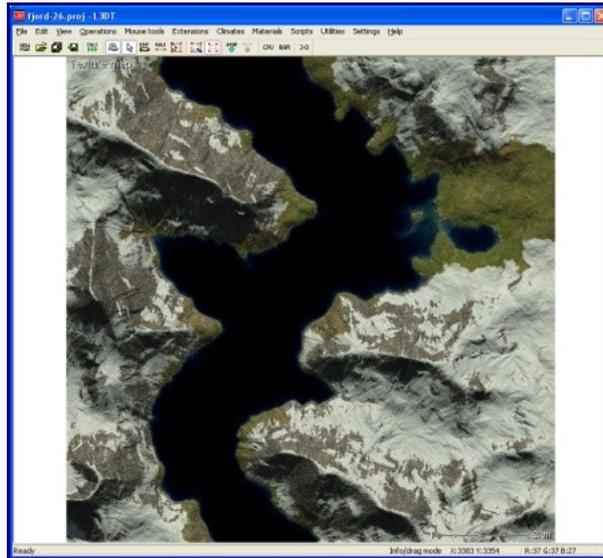


*The light map settings.*



*The texture map settings.*

After I clicked *OK*, L3DT generated the following texture map:

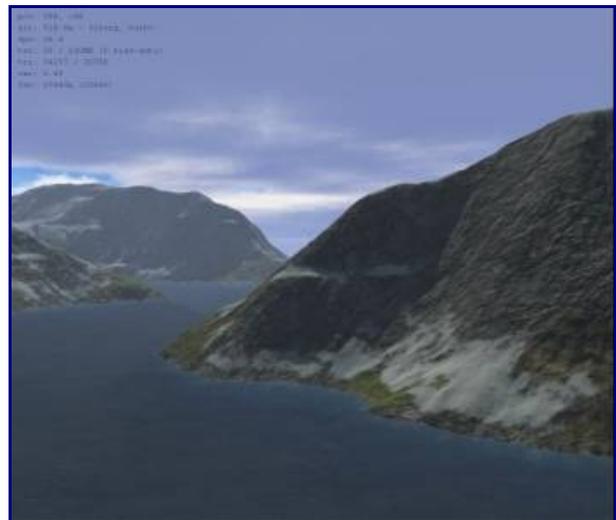


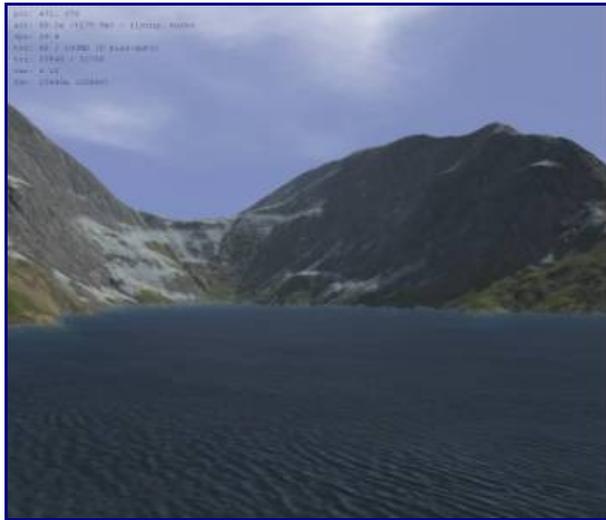
*The texture map.*

## Pretty pictures

*Voi la.* All that's left to do is to open Sapphire again and take some screenshots:

### The fjord, in Sapphire





And that's it. I hope this has helped.