

FS2004 / Ultimate Terrain Landclass Primer

Overview

Scenery Solutions is providing this technical overview of FS2004 landclass and its impact on Ultimate Terrain for the benefit of our customers.

Landclass In FS2004

As you already know, FS2004 covers the entire Earth. You can fly anywhere and get a pretty good representation of the types of vegetation and urban sprawl appropriate for the region you are in.

In order to do this efficiently, Microsoft came up with a clever way of representing the entire globe using what they call landclass. The FS2004 landclass system is based on a grid of 1km x 1km squares, which cover the entire Earth. These 1km x 1km squares are called LOD13 cells by developers. Each one of these 1km x 1km squares has a particular value assigned to it, that tells FS2004 which available texture, from a list of possible textures, is appropriate to be displayed for that 1km x 1km square area. For example, a value of 121, tells FS2004 to use a texture that represents a busy urban area with hi-rise structures.

The landclass system does a very good job of representing the Earth in FS2004, without taking up an excessive amount of resources (RAM and disk storage). At this point in time, it is not possible to cover the entire earth using photographic textures. Even if the photographic textures were available for the entire earth, the disk storage would exceed that of even the most powerful PC system today.

If you are interested, Microsoft gives a good, and technically detailed, explanation of FS2004 landclass at the link below (scroll down to section 7 for the landclass explanation).

http://www.fsinsider.com/articles/Global_Terrain_Technology.htm

The FS2004 Landclass And Other Products That Alter Coastlines

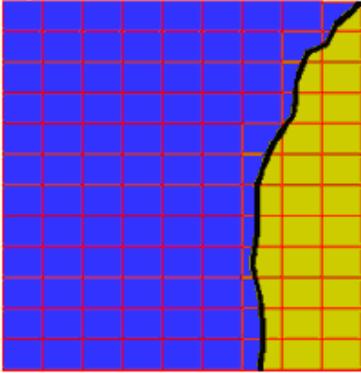
The FS2004 landclass only defines landclass values to cover the land areas provided in the base FS2004 product. The rest of the globe is filled with water.

Many products, like Ultimate Terrain, will provide coastlines that are more accurately positioned and more detailed than what is released in FS2004. Also, many islands may be added by these products that were not originally provided in FS2004.

These extended/expanded land areas can cause problems, because the default FS2004 landclass by itself may not provide landclass values for the extended areas. When this happens, square blocks of water or blocked off coastlines will appear in FS2004 instead of the expected land areas.

Here is a mythical example showing landclass cells (blue=water, gold=land), with the coastline drawn on top. Each square represents a 1km x 1km landclass cells.

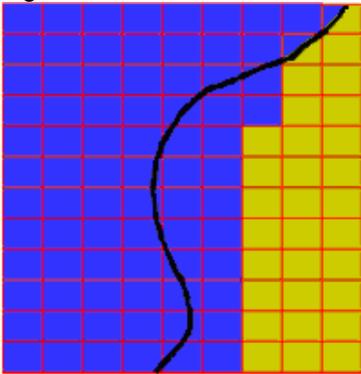
Figure 1A



The area to the right of the black line in Figure 1A is the land area. As you can, landclass values (gold color) are defined for the entire land area. As a result, this coastline will display just fine in FS2004.

Now, if a product redraws the coastline, extending it out to sea, then there will not be a complete set of landclass values defined for the newly reshaped land area. This is shown in Figure 1B

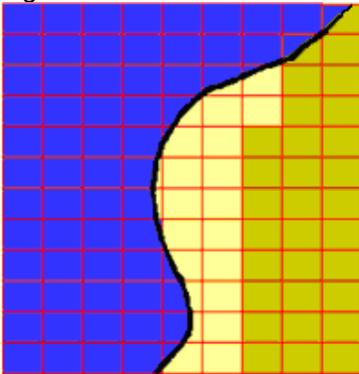
Figure 1B



What would the above image look like in FS2004 ? Well, you would only see land in the areas represented by the gold colored squares. The remaining land area to the right of the coastline would be filled in incorrectly with water.

To correct the situation, any scenery package that extends the coastlines must also provide an additional landclass layer to cover the missing landclass in the default FS2004 product. This is shown in Figure 1C, where the gold squares represent landclass from FS2004 and the yellow squares were provided by the addon scenery product to fill in the landclass not originally defined in FS2004.

Figure 1C



FS2004 Landclass Layering

FS2004 uses a priority layering system to display scenery. You can view and edit this layering from within FS2004, by selecting “Scenery Library” from the FS2004 “Settings” item in the main menu.

Figure 2

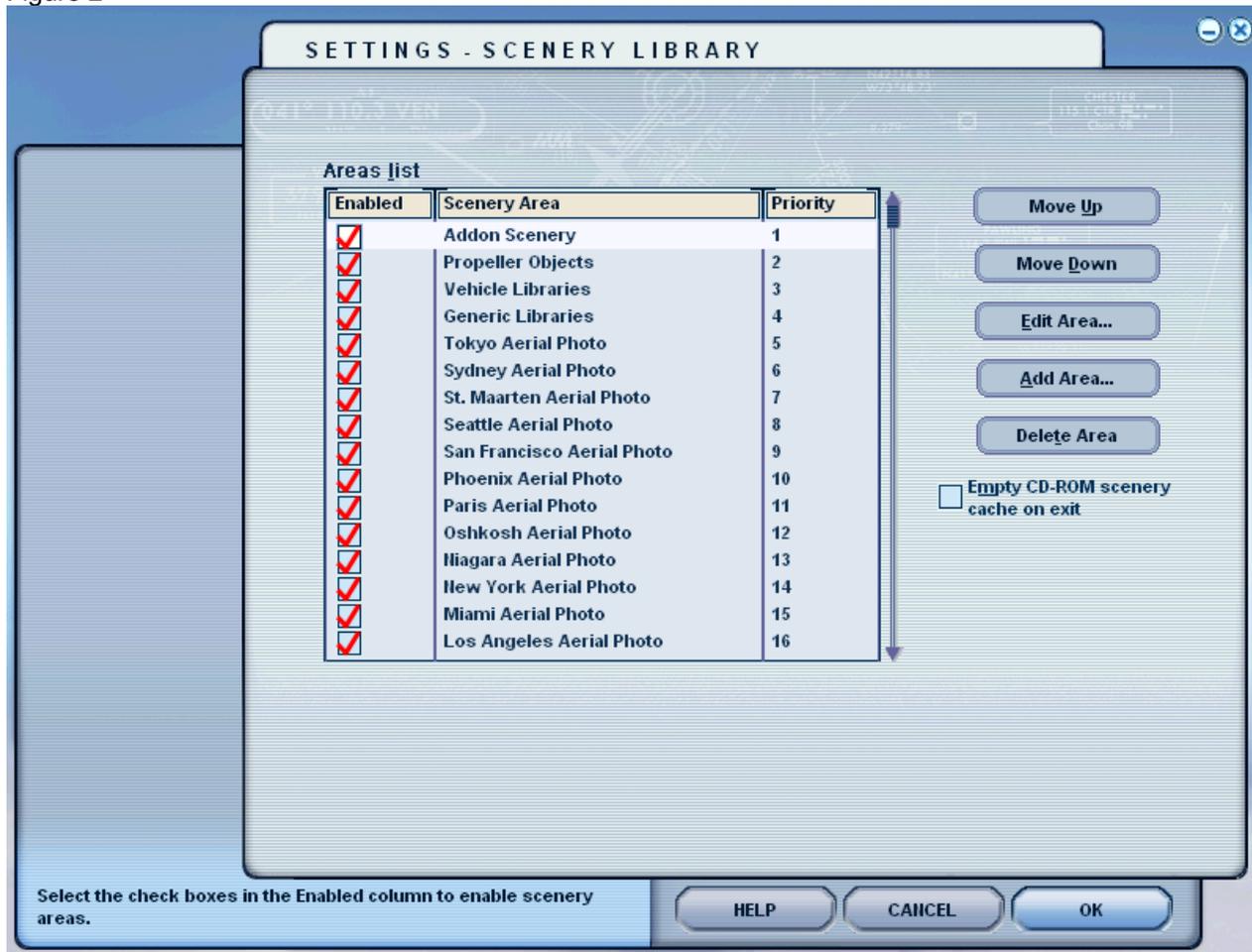


Figure 2 above shows what the “Scenery Library” looks like after a clean install of FS2004.

As new scenery products are added to FS2004, new layers are added to the “Scenery Library”.

Different scenery products installed for the same regions can provide different landclass values. When this happens, FS2004 begins drawing the landclass textures starting with the lowest priority landclass defined in the scenery library. The scenery product that has the highest priority will be drawn last. This information is very important to every FS2004 user who installs add-on scenery products. At some point, most users are probably going to have to manually order the scenery library list to give the desired results.

Transparent Landclass Values

If a developer wanted to create an island that was missing in FS2004, they would have to provide scenery files that define the shape of the island’s land area. They would also have to provide landclass for the islands, because it would probably not have been provided by FS2004 itself.

Unfortunately, the developer cannot just provide the few missing landclass cells that cover the island area. This is because FS2004 requires that all landclass be released on large LOD5 cell boundaries.

We discussed LOD13 cells earlier. These are approximately 1km x 1km in size. We also mentioned that each LOD13 cell gets assigned a unique landclass value. An LOD5 cell in FS2004 is 3.75 degrees wide by 2.81 degrees tall. Each LOD5 cell contains 65,535 individual LOD13 cells (arranged in 256 columns by 256 rows).

So, even though the developer wanted to only add a few missing landclass values, he must release landclass values for the entire LOD5 cell that covers the area (all 65,535 landclass values must be defined).

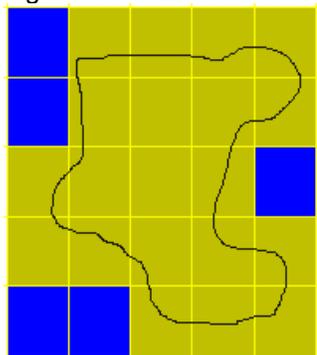
Fortunately, there is an easy solution. Transparent values can be defined for those individual landclass cells that the developer does not wish to alter. These transparent areas are then filled in by the next priority landclass in the FS2004 scenery library.

Here is a transparency example explained graphically.

Pretend that we had an island area containing 5 rows and 5 columns of LOD 13 cells (each 1km x 1km in size).

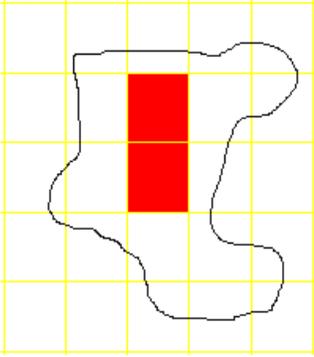
Figure 3A below shows the island and the default landclass values present in the base FS2004 product. The blue squares represent water and the gold squares represent various landclass values.

Figure 3A-FS2004 Island with landclass



In figure 3A,

Figure 3B-Addon Product Landclass



Lets say that another product wanted to provide some improved landclass values for the same area (to display more appropriate landclass for the area). In this example (figure 3B), they provided 2 landclass values (shown in red). The rest of the cells were transparent (white).

Assuming that the addon product shown in figure 3B had a higher priority than the default FS2004 landclass, then the following would actually be displayed in FS2004.

Figure 3C-Blending of landclass products

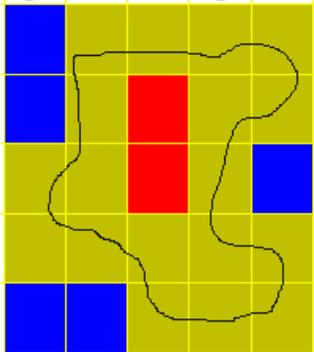


Figure 3C shows the blending of products. First, FS2004 would draw the base landclass. Then, it would draw the addon landclass textures on top of the base, ignoring the transparent cells.

Now that you have an understanding of landclass in FS2004, we will explain what we do with Ultimate Terrain.

Ultimate Terrain Landclass

Because Ultimate Terrain expands and enhances the shoreline areas, we must provide landclass to cover the areas missed by the default FS2004 landclass.

At this time, none of the Ultimate Terrain products provide vegetative landclass improvements. This is currently out of the product scope. However, all Ultimate Terrain landclass products provide:

1. Missing landclass values for newly exposed coastal areas.
2. Greatly improved urban landclass (cities).

If you are an Ultimate Terrain user, then you already know that our landclass greatly enhances the city/urban areas. This is one of the most popular features of the Ultimate Terrain series.

The Ultimate Terrain landclass should always be active. If you wish to use other regional landclass products, then they should be installed and given a higher priority in the FS2004 Scenery Library than the UT base landclass.

The rest of this document will discuss the interaction between the Ultimate Terrain landclass and other add-on landclass products.

Ultimate Terrain Europe Landclass

Ultimate Terrain Europe is broken separated into multiple layers in the FS2004 scenery library.

There are six regional layers:

- Ultimate Terrain – Europe 1
- Ultimate Terrain – Europe 2
- Ultimate Terrain – Europe 3
- Ultimate Terrain – Europe 4
- Ultimate Terrain – Europe 5
- Ultimate Terrain – Europe 6

Each of these regional layers contains both scenery files and the UT Enhanced landclass covering that region.

When you run the UT Europe Setup And Configuration tool, the “Enhance Landclass” button shown in figure 4A toggles the base landclass portion of the six layers above on and off. You should ALWAYS leave this button turned on. If you want to use another landclass product instead of UT, you just need to make sure that the product is given a higher priority in the FS2004 scenery library than the 6 UT Europe scenery layers just described.

Figure 4A



In the FS2004 scenery library, you will see another layer named

- Ultimate Terrain – ind/Comm Landclass

This landclass layer contains landclass values for industrial and commercial areas, surrounded by transparency.

The “Ultimate Terrain – ind/Comm Landclass” layer should always be given a higher priority in the FS2004 scenery library than the other six layers containing the base UT Europe landclass. So, the order should appear as follows:

- Ultimate Terrain – ind/Comm Landclass
- Ultimate Terrain – Europe 1
- Ultimate Terrain – Europe 2
- Ultimate Terrain – Europe 3
- Ultimate Terrain – Europe 4
- Ultimate Terrain – Europe 5
- Ultimate Terrain – Europe 6

Conclusion

The layering of landclass in FS2004 can be confusing for users. We hope this helps with some of the questions.

The landclass concept is a difficult one for many FS hobbyists. A good understanding of landclass and what it provides, will help you in the future when evaluating potential scenery products for personal use