TerreSculptor 4

HMES · Heightmap Editing Software
Reference Manual

Documentation for TerreSculptor HMES version 4.0.

Document Revision 2025-02-13

Preface

TerreSculptor HMES is the Heightmap Editor Software developed by Demenzun Media.
TerreSculptor HMES and its forerunner HMCS, Heightmap Conversion Software, contain a large number of years of software development in the field of computer generated and manipulated heightmaps.

See the website for current licensing and pricing information.

Contents

Preface

Welcome to the TerreSculptor Reference Manual.
This reference manual is part of the documentation set accompanying the TerreSculptor software.

This reference manual covers a complete set of topics for learning and using the software. Topics include installing the software, fundamental concepts, user interface controls, managing the 3D scene including cameras and lights, how to use all of the included tools, as well as many step-by-step tutorials.

For the Adobe PDF version of the reference manual, it is beneficial to open the Bookmarks tab in order to have the Table of Contents always available for quickly navigating the chapters. The Bookmarks tab can be activated through the Adobe Reader's View menu or the Bookmarks icon on the left pane, depending on the Reader version.

Before You Start

Before you start using TerreSculptor, you may wish to visit the Free Assets Google Drive from Demenzun Media.
The link to the Free Assets is on the software's Help menu.
The Free Assets include Sky Backdrop background textures, Water textures, Alpha Brushes, example Projects, example Terrains and Heightmaps, Terrain textures, Mapper Favorites, and much more!

About the Tutorials

The tutorials in this document assume that you are familiar with the terrain systems in the specified target video game engine. This document is a reference for the TerreSculptor software, it is not a reference for any of the mentioned video game engines. Refer to the documentation supplied by the engine developer/publisher for information on how to import and export files, perform basic level design skills, etc.

Reference Manual Conventions

This manual provides a significant amount of in-depth material accompanied by a large amount of graphical material and examples.

Notification Icons

This reference manual uses graphical icons to inform the reader of various actions.

Signifies important information

Mouse Icons

This reference manual uses graphical icons to depict the various possible mouse button and movement actions and combinations.

press the left mouse button

press the right mouse button

press the left and right mouse buttons

press the middle mouse button

move the mouse on its X axis

move the mouse on its Y axis

move the mouse on its X and Y axes

scroll the mouse wheel

\+ press the left mouse button and move the mouse on its X axis

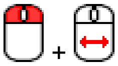
\+ press the left mouse button and move the mouse on its Y axis

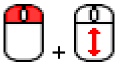
\+ press the left mouse button and move the mouse on its X and Y axes

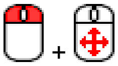
\+ press the right mouse button and move the mouse on its X axis

\+ press the right mouse button and move the mouse on its Y axis

\+ press the right mouse button and move the mouse on its X and Y axes

 press the left and right mouse buttons and move the mouse on its X axis

 press the left and right mouse buttons and move the mouse on its Y axis

 press the left and right mouse buttons and move the mouse on its X and Y axes

Features

General Features

- Single executable file for both 32-bit and 64-bit Windows operating systems.
- Multi-threaded performance for multi-core processors.
- Internal processing and algorithmic functions in 32-bit and 64-bit and floating-point format for greater accuracy.
- Edit heightmaps, weightmaps, normalmaps, colormaps and splatmaps using a wide number of tools.
- Digital Elevation Model (DEM) import, export, and editing functions.
- Mapper Digital Elevation Model Explorer and Downloader.
- Multi-level Undo system.
- Context-aware help on every edit and property dialog.
- Open and save a massive number of image, heightmap, digital elevation model, and mesh file formats.

World Editor

- World Editor 3D interface utilizing hardware-accelerated OpenGL.
- Create heightmap-based terrains up to 1 million × 1 million pixels.
- Terrain altitude coloring displayed in 48-bit simulated color on standard 24-bit color monitors.
- Terrain Auto-Material RGBAK coloring, Terrain RGBAK Splatmap coloring, Terrain texturing.
- Create weightmap alpha masks based on heightmap properties for layering and scattering.
- Import and export to many file formats up to 1 million × 1 million pixels.
- Perspective and Orthogonal viewport modes.
- Aggressive terrain level-of-detail mode for sharing video memory with other software applications.
- Multiple camera types, multiple camera navigation systems, camera bookmarks.
- Master Home grid and User grids.
- Configurable lighting system.
- Designer overhead.
- Scene Backdrop, Fog, Water and other visualization effects.
- Terrain Stack system for non-destructive heightmap creation and editing.
- Terrain Topology Tools for 3D interactive editing of the heightmap terrain.

Computer System Memory Limitations

TerreSculptor creates the heightmap and mask floating-point Datamaps in the computer system memory.
This means that the largest Datamap that can be created is dependent on the system memory.

Typical system memory maximum sizes include:

16GiB	65536 x 65536 maximum resolution
32GiB	92681 x 92681 maximum resolution
64GiB	131072 x 131072 maximum resolution
128GiB	185363 x 185363 maximum resolution
256GiB	262144 x 262144 maximum resolution
512GiB	370727 x 370727 maximum resolution
1024GiB	524288 x 524288 maximum resolution

Windows Imaging Limitations

The Microsoft Windows Imaging APIs for GDI+ and WIC have the following limitations.
Maximum 2GB image memory array independent of pixel format.

This affects a number of the TerreSculptor tools including the Bitplane Creator, Contour Creator, Normalmap Creator, Splatmap Creator, and Tile Creator.

This affects a number of the import and export file formats including BMP, GIF, JPG, JRX, PNG [old], and TIF [old]. Note that PNG [new] and TIF [new] are using other APIs that support files up to 1 million × 1 million pixels.

Maximum Bitmap Size for Windows Image API formats BMP GIF JPG JRX PNG TIF:

– 8-bit Color Indexed	2GB maximum	46340 × 46340
– 8-bit Grayscale	2GB maximum	46340 × 46340
– 16-bit Grayscale	2GB maximum	32767 × 32767
– 24-bit RGB Color	2GB maximum	26754 × 26754
– 32-bit RGBA Color	2GB maximum	23170 × 23170
– 48-bit RGB Color	2GB maximum	18918 × 18918
– 64-bit RGBA Color	2GB maximum	16383 × 16383

System Requirements

- A valid software license purchased from Demenzun Media.

Minimum system requirements:

- PC Compatible Computer
- 2.0GHz Dual-Core Processor
- 3GB system RAM memory
- AMD or Nvidia video adapter with 512MB video memory
- 17 inch or 19 inch Monitor at 1400x960 resolution
- Keyboard and Mouse
- Windows 7, 32-bit or 64-bit version
- Microsoft dot.NET 4.7.2
- OpenGL 3.0 or greater
- 10GB or more of free hard drive space for creating worlds

Recommended system requirements:

- PC Compatible Computer
- 4.0GHz Quad-Core Processor, or faster, or more cores, or hyper-threading
- 16GB system RAM memory or more, 32GB or more for large worlds
- AMD or Nvidia video adapter with 8GB video memory or more
- 24 inch Monitor at 1920x1080 or 1920x1200 resolution, or larger
- Keyboard and Mouse
- Microsoft Windows 7, 8, 8.1, 10 or 11 64-bit
- Microsoft dot.NET 4.7.2 (4.8 is included with Windows 10 and 11)
- OpenGL 3.0 or greater
- 10GB or more of free hard drive space for creating worlds

Optimal system:

- 4.5GHz or faster 8-Core through 32-Core processor
- 64GB or more system RAM memory
- AMD RX6800XT or Nvidia RTX-3080 or greater
- 32 inch or larger Monitor at 2560x1440 or greater
- Windows 10 64-bit
- 1TB or larger NVMe drive

Note: TerreSculptor is tested to work on the Apple Mac platform using the Parallels Desktop app.

Note: The current builds of TerreSculptor do not have international support.
The software is built and tested only on English US and English Canada localizations.
TerreSculptor may not successfully run on other localizations.

Note: Be sure to test TerreSculptor on your computer system before purchasing.
This can be accomplished by downloading and running TerreSculptor 2.0 or 3.0 or 4.0 in demo mode.
TerreSculptor is successfully running on more than 300,000 computers worldwide.
Downloads are available on the Demenzun Media website Support page.

Installation

The TerreSculptor application consists of a single executable file for both 32-bit and 64-bit operating systems, a configuration settings ini file, an event log file, this owner’s manual reference guide pdf, the release notes file, and a set of DLL files.

TerreSculptor makes no changes to the host computer or its operating system or system registry, other than the automatic creation of its configuration settings ini file, its event log file, and a license registry setting.

Automatic Installation

To automatically install the TerreSculptor software, use the installation Setup.exe file.

Manual Installation

To manually install the TerreSculptor software, including the ability to run different builds on one computer system, create a new folder called “Demenzun Media\TerreSculptor 4.0\” in the “C:\Program Files\” folder and copy the contents of the Manual Installation folder.
Right-click on the .exe file and choose "Pin to Start menu" to create a program shortcut on the Start menu.

If you receive a Windows Security pop-up dialog when you run the software, right-click on the .exe file, choose Properties on the context menu, and on the Properties dialog click on the *Unblock* button.

Configuration Settings Ini File

The TerreSculptor 4.0.ini configuration ini file will be automatically created by TerreSculptor the first time that the executable file is ran.
The configuration settings ini file will be created in the current user account’s *Application Data* folder.
For Windows 7, 8, 8.1, 10 and 11 this is located at:

C:\Users\<user>\AppData\Local\Demenzun Media\TerreSculptor

Each Windows user account will have their own independent ini file with unique settings for that user.

Event Log File

The TerreSculptor 4.0.log event log file will be automatically created by TerreSculptor every time that the executable file is ran. The log file is located in the same user account folder as the .ini file.

Uninstall

Automatic Uninstall

Use this method if you used the automatic install.

To automatically remove TerreSculptor from a computer, launch the Windows Control Panel, choose the Uninstall a program option, locate and choose TerreSculptor in the program listing and select Uninstall.

Manual Uninstall

Use this method if you used the manual install.

To manually remove TerreSculptor from a computer:
1. Delete the “C:\Program files\Demenzun Media\TerreSculptor 4.0\” folder which contains the application files.
2. Delete the “C:\Users\<user>\AppData\Local\Demenzun Media\TerreSculptor\” folder which contains the .ini and .log files.
3. Delete the TerreSculptor icon from the Start menu.

Overview

TerreSculptor is a three-dimensional terrain creation and editing software application designed for Windows-based PCs. You use TerreSculptor to create, edit and view professional quality heightmaps and weightmaps and masks for use in video games, film, and geographic systems.

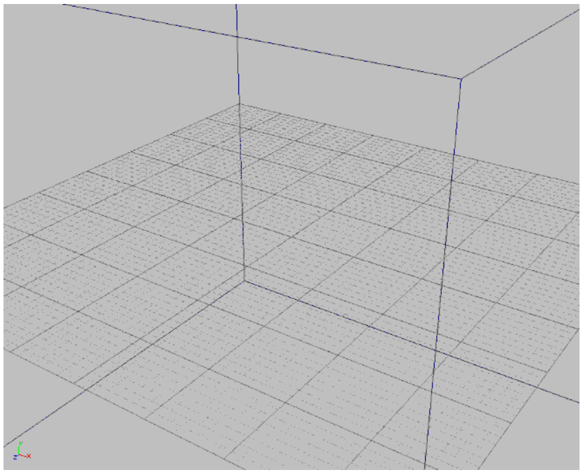
The TerreSculptor application presents all of the functions that you require in a single unified interface workspace. The standard Windows design and layout of menus and toolbars provides quick access to the commands and functions that you will use the most. The tab-based function area contains a rich interface to the tools for manipulating objects in your world scene.

World Space and Object Space

TerreSculptor uses two specific coordinate systems called *World Space* and *Object Space*.

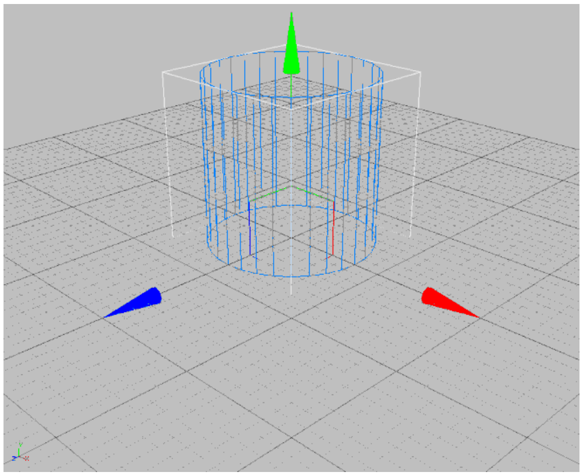
World Space

World Space is the global coordinate system that defines the location of all objects in the scene. The World Extents bounding cube and Home Grid show the world space coordinate system and its extents. World Space is always constant and never moves.
TerreSculptor defines the world space extents as a cube that is an equal number of world units in width, length, and height. Enabling the Scene World Extents helper will display the world bounding cube.

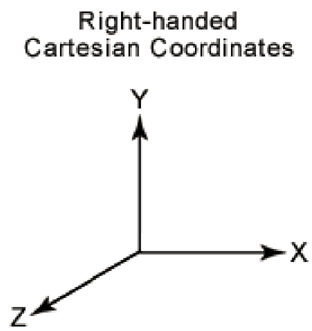


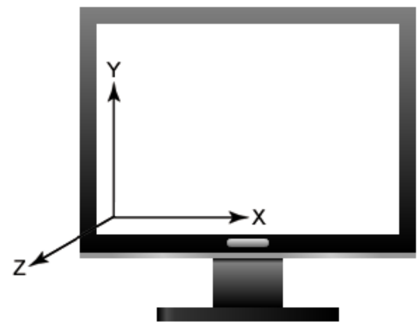
Object Space

Object Space is the coordinate system that is unique or *local* to each object in the scene. Object Space defines the local rotation and scale of each object. After any rotation and scale is applied, objects are then translated (moved) to the World Space to their final viewed location.



TerreSculptor uses the default OpenGL world coordinate system, which is commonly known as *Y-Up Right-handed Cartesian Coordinates*. The Y axis is positive upward, the X axis is positive to the right, and the Z axis is positive out of the screen.





This is similar to a flat 2D paper on the computer screen where X is the paper width left-to-right, and Y is the paper height up-and-down. Z would be moving the paper closer towards you or further away from you.

See the chapter on Coordinate Systems for additional information.

Working with Objects

In TerreSculptor, the term *object* refers to an item in the world scene. There are a wide variety of objects available including the terrain, cameras, lights, grids, backdrop and water. Each object has a variety of properties including its world location, color, size, etc.

Cameras: Provide a view into the scene. Multiple camera types and navigation styles are supported in addition to camera bookmarks.

Lights: Provide realistic scene lighting including brightness and color. There is one fixed ambient light and one moveable directional light available.

Grids: A fixed-position Home Grid and multiple user-configurable User Grids provide visual delineation of the world dimensions and locations.

Terrain: Provides a fixed-position 2D or 3D representation of the underlying heightmap or mask data.

Backdrop: Provides a fixed-position background to the world scene for a more realistic scene view.

Water: A fixed-position sizeable translucent water plane located at the mid-altitude point in the world scene.

Basic Object Properties

All objects have a set of common basic properties, such as their local pivot point and their world location. Some objects include additional properties such as color, rotation and scale.

Parameters

The object parameters describe the size and shape of the object. For some of the objects the number of editable parameters vary, for example one object may only allow setting its color, whereas another object may allow setting its color, size, rotation, and location.

Each set of object parameter values can be specified in the edit dialog for that object.

Pivot Point

Every object in the scene has a pivot point that identifies the local center and orientation of the object. The pivot point is the origin of the object's *local coordinate system*; it is the center of the object's rotation and scaling; and it is the center of the object's location in *world space*. Some objects have a fixed pivot point origin in world space while others can be modified.

Bounding Box

The bounding box is the cubic volume that completely encloses an object. Some of the object bounding boxes can be displayed in the scene while others are always invisible.

Transforming Objects

A transform is a 3D manipulation of an object's local coordinate system. The local coordinate system of an object is contained in a matrix of values that specify: the rotation of the object about its pivot point; the scale of the object along its local axes; and the position of the object's center in world space.

The object matrix is called the transformation matrix and its information relates directly to the transforms of Rotate, Scale, and Translate (move to location).

Some objects have one or more fixed transformations in the scene, preventing them from being moved or rotated.

Note: Object transform is not to be confused with the Heightmap Transform functions which perform geographic transformations on the heightmap data.

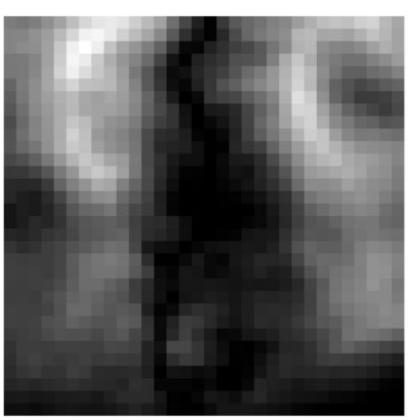
Datamaps

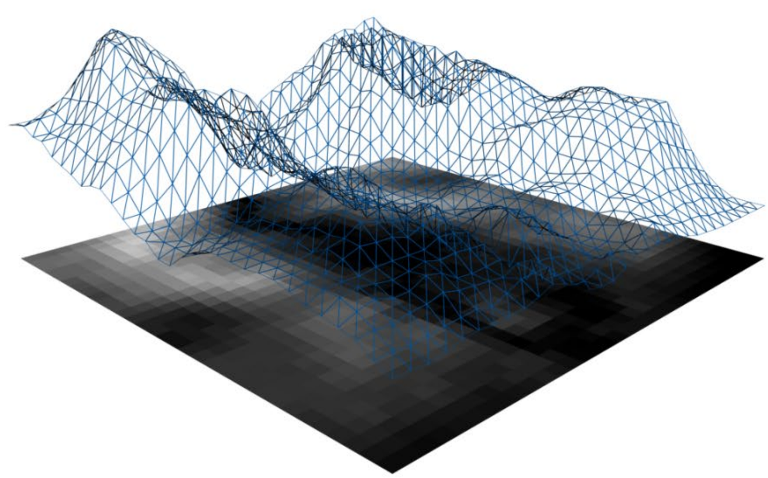
A datamap is a 32-bit floating-point two-dimensional array in computer memory that represents a heightmap, weightmap, or mask. Floating-point values are used in order to provide the highest quality.

Heightmaps

A heightmap is a rectangular array of numeric data representing the altitudes for a terrain mesh.
Heightmaps can appear to be similar to a grayscale image, however, each of their sample points contain altitude information instead of grayscale pixel information. Darker color values are lower altitude while lighter color values are higher altitude. Heightmaps are typically 16-bit sample data representing 65536 possible discrete altitudes. Under normal circumstances 8-bit data will not be used for heightmaps since that is only 256 discrete altitude values. Most standard paint software cannot properly edit 16-bit grayscale files. TerreSculptor manages heightmap data internally as 32-bit floating point values for high accuracy.

Example: A simple low resolution heightmap and its resulting equivalent mesh. Each heightmap value corresponds to a mesh vertex. Larger numerical heightmap values (lighter gray colors) are higher mesh altitudes.

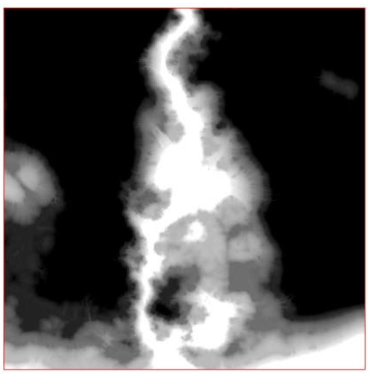


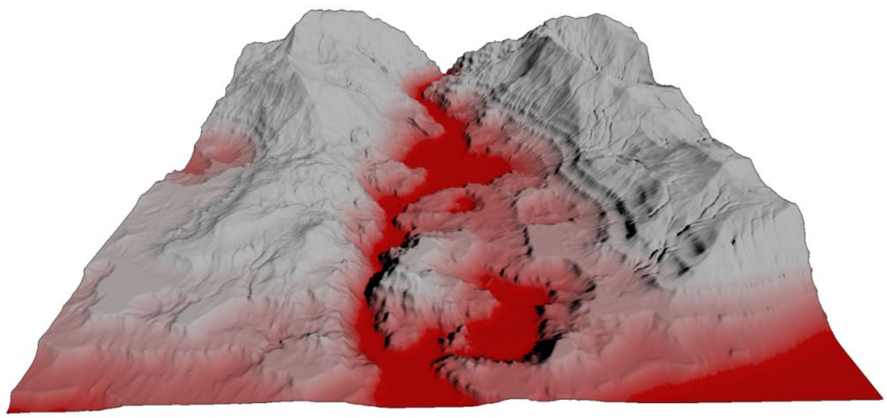


Weightmaps

A weightmap is an 8-bit grayscale *mask* or *alpha* image that represents the layout of some type of object that is overlaid on a heightmap. The overlaid object may be a texture or material shader, the area placement information for grass meshes, or other meaningful data as required by the game engine. Weightmap information can be algorithmically extracted from heightmap data for such features as by-altitude, by-slope, by-direction, by-flow, etc. A weightmap is typically the same rectangular dimensions of width and length as its source heightmap. Weightmaps, like masks, are typically 8-bit data and can be created and/or edited as a standard 8-bit grayscale image in paint software. TerreSculptor maintains weightmaps internally as 32-bit floating-point datamaps.
A weightmap is essentially the same as a mask, but by a different name in order to differentiate it functionality, and to prevent confusion as to its purpose. For example, a mask can be used within a shader to mix two textures together, which is then overlaid on a heightmap according to the content of a weightmap.

Example left: An algorithmically generated weightmap from the lower altitude range of a heightmap. Like a standard alpha mask, the pixels of black are typically treated as 0%, the pixels of white are typically treated as 100%, and the pixel values in between are the alpha gradient translucency.
Example right: The source heightmap with the weightmap used for the red color layer control. Areas of weightmap black (0) are not changed, areas of weightmap white (255) are tinted solid red, and weightmap values in between are a gradient red based on the pixel strength. In this example, this weightmap could be used for applying a river bed texture.

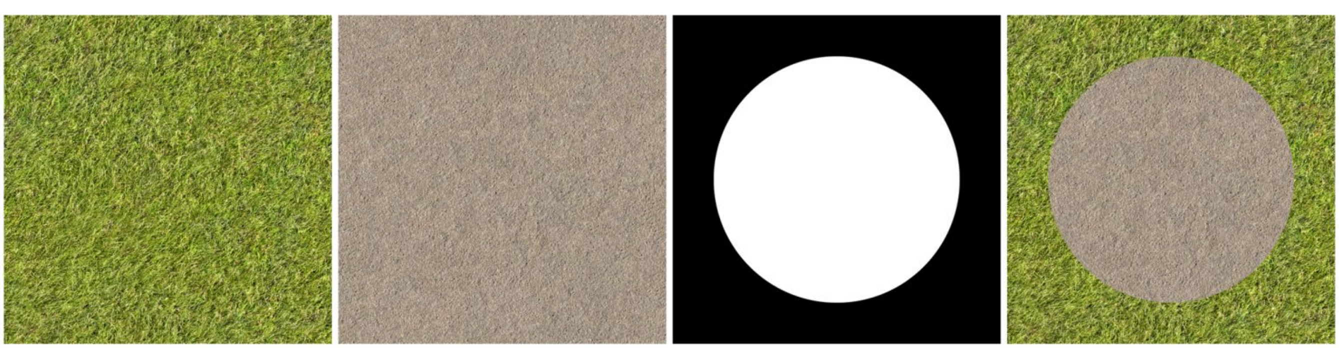




Masks

A mask is an 8-bit grayscale *alpha* image that is typically used to blend between two other images or sets of data. Masks are typically 8-bit data and can be created and/or edited as a standard 8-bit grayscale image in paint software. TerreSculptor maintains masks internally as 32-bit floating-point datamaps.

Example: A grass texture and dirt texture are blended using a mask. Where the mask value is 0, grass is shown; where the mask value is 255, dirt is shown; for all values in between, the two textures are blended based on the mask value weight.



Devices

A device in TerreSculptor is an object that can be executed on a datamap to provide a generated data set or a modification to the datamap data.

Some examples of devices include Noisemap Generators, Altitude Modifiers, Convolution Modifiers, and Erosion Modifiers. TerreSculptor has more than 100 devices available.

Devices are accessed in *Immediate Mode* from the device menus. Immediate mode executes the device when the device edit dialog is accepted.

Devices are also added to the *Terrain Stack* in order to create non-destructive terrain and weightmap and mask layer editing. The terrain stack must be built to execute each device added to the stack.

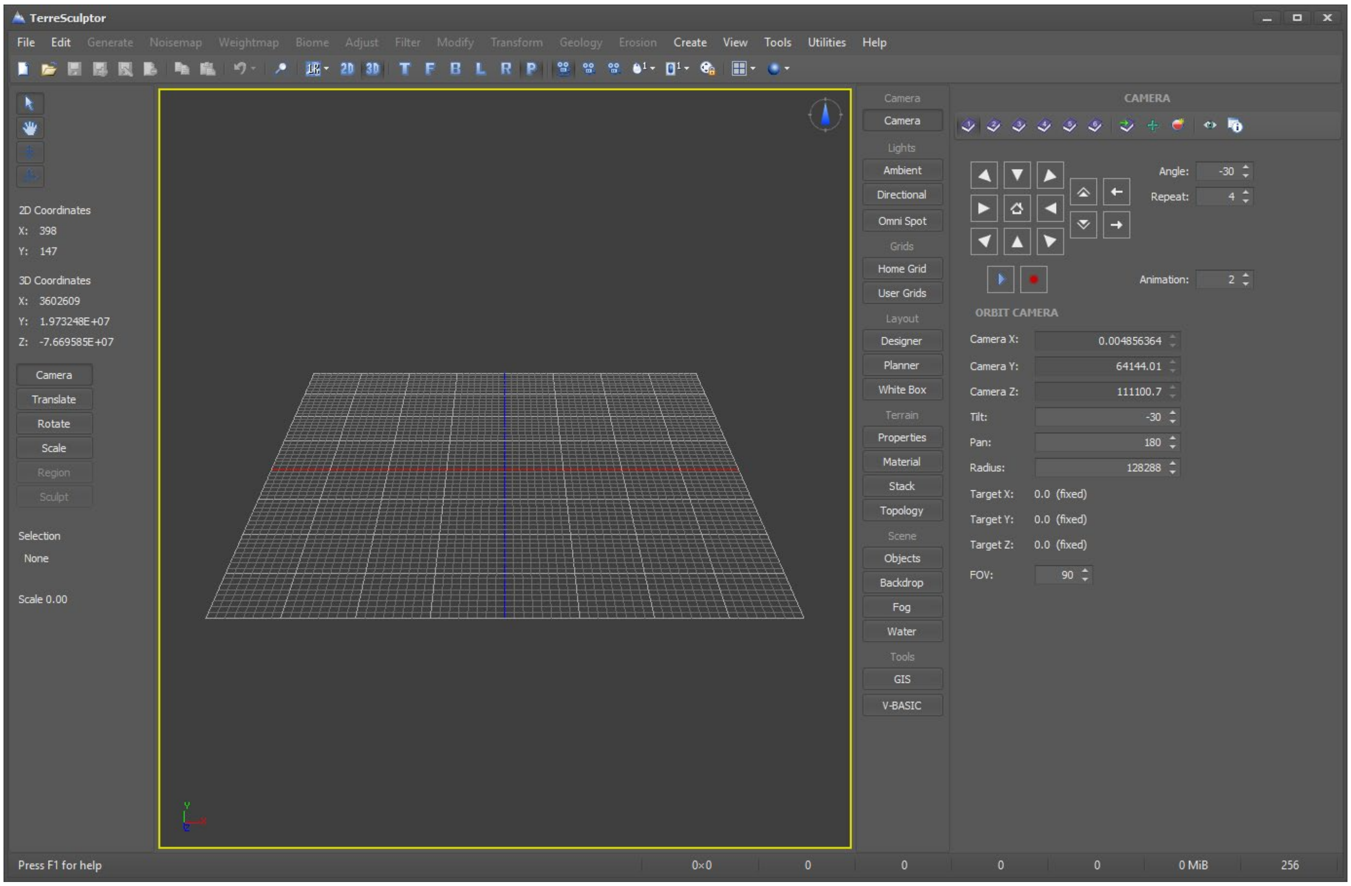
Most devices have editable properties dialogs that include slider and numeric controls for adjusting parameters, plus 2D or 3D preview viewports. See the chapters on Devices for more information.

Launching TerreSculptor

After you have installed TerreSculptor on your computer, you launch it by double-clicking the TerreSculptor icon created during installation, typically found on the Windows Start menu. You can also use other standard Windows methods to launch TerreSculptor such as double-clicking the .exe executable file in Windows Explorer.

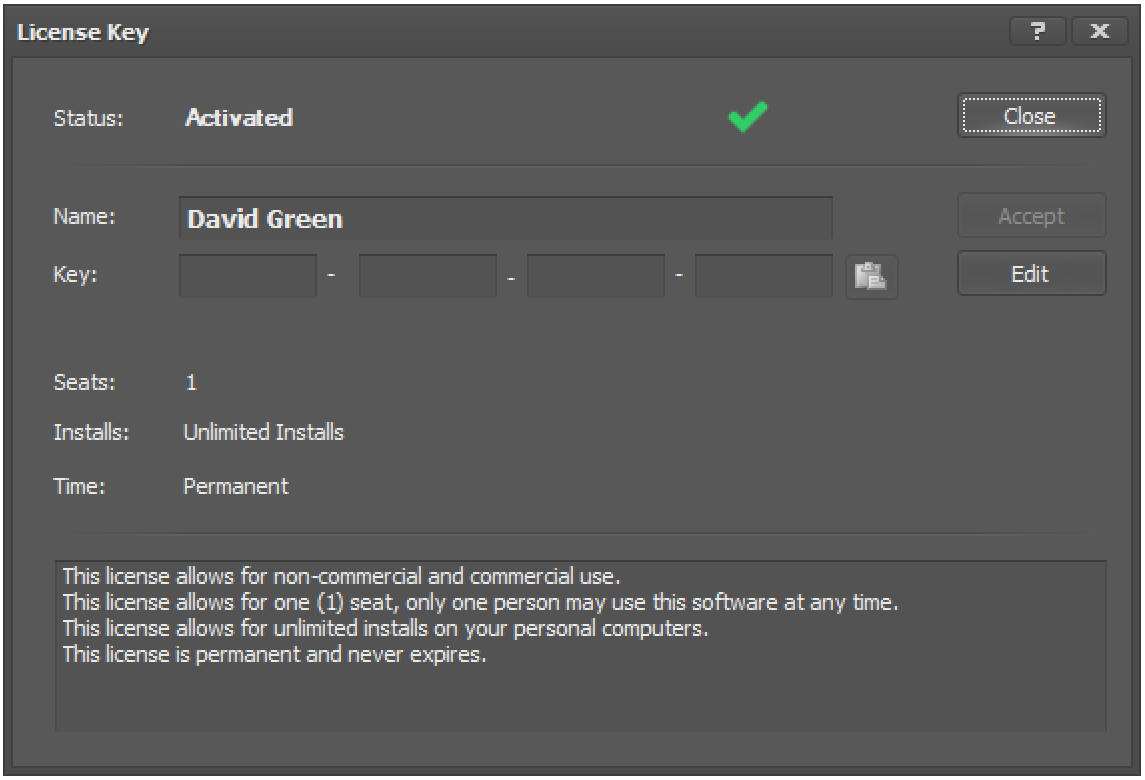
When TerreSculptor launches, the main application window appears on your desktop as shown below. The main interface design uses standard Windows controls and design conventions.

TerreSculptor is a single document application and therefore only one scene can be open at any time. Multiple copies of the software can run simultaneously on the same computer, although this is not recommended as the software requires a large amount of system resources.



License Key

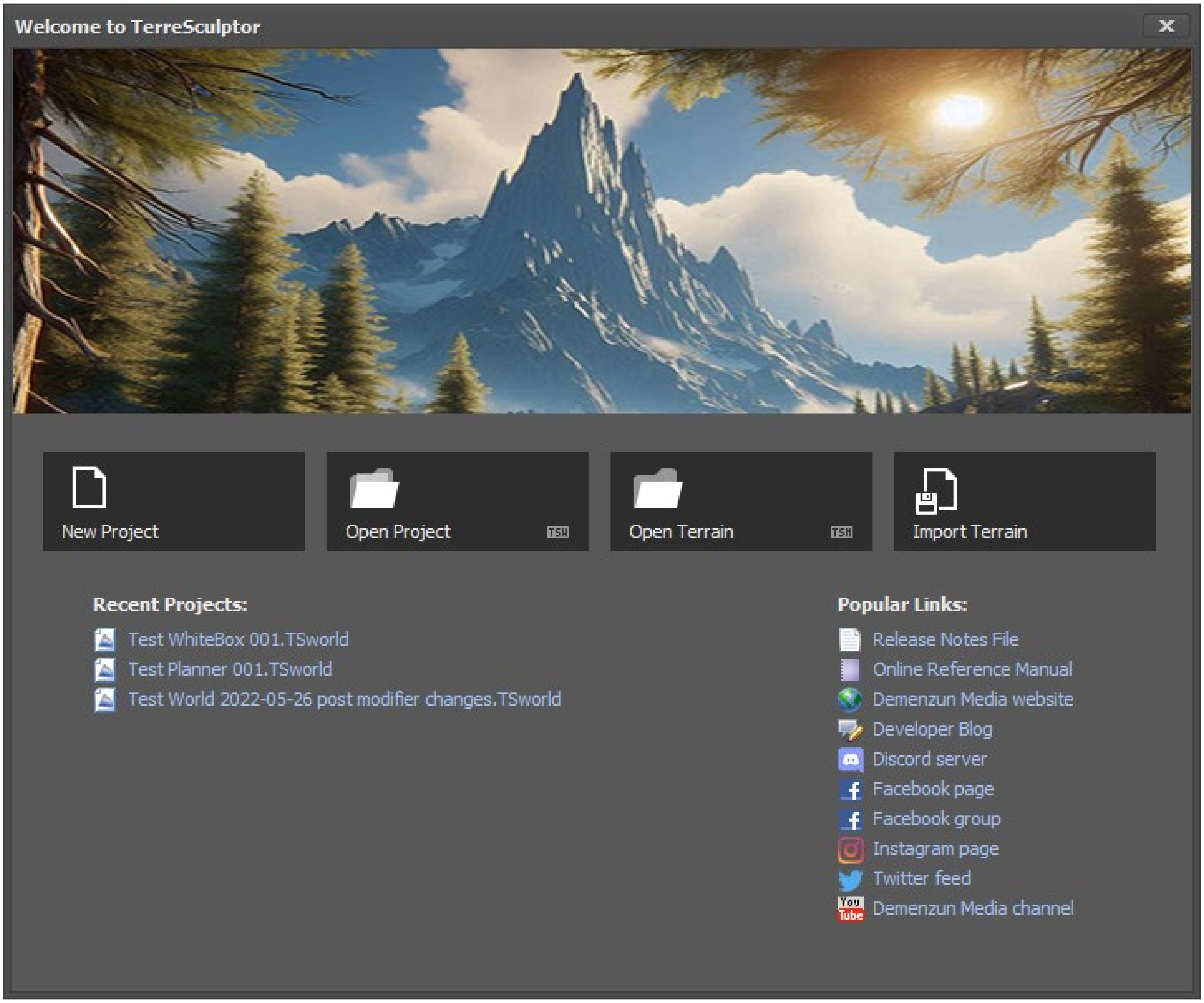
The first time that the software is ran, the license key dialog will appear.



When a copy of the software is purchased from the online store, an email with a 20-digit license key will be sent to the buyer. The license key is in the format of four sets of five digits, such as “AAAA-BBBB-CCCC-DDDD”.
Select and copy the license key from the email and click on the paste button on the dialog to paste in the key.
Enter in your name, then click on the Accept button.
If the license key is valid, the software will be activated.

The Welcome Dialog

The Welcome dialog is optionally displayed on application startup and contains a number of quick links to common application functions. These links include starting a new project, opening an existing TSworld project file, opening an existing TSmap terrain file, importing an existing terrain file, the last eight of the recent project files, and links to documentation and popular internet sites related to the software.



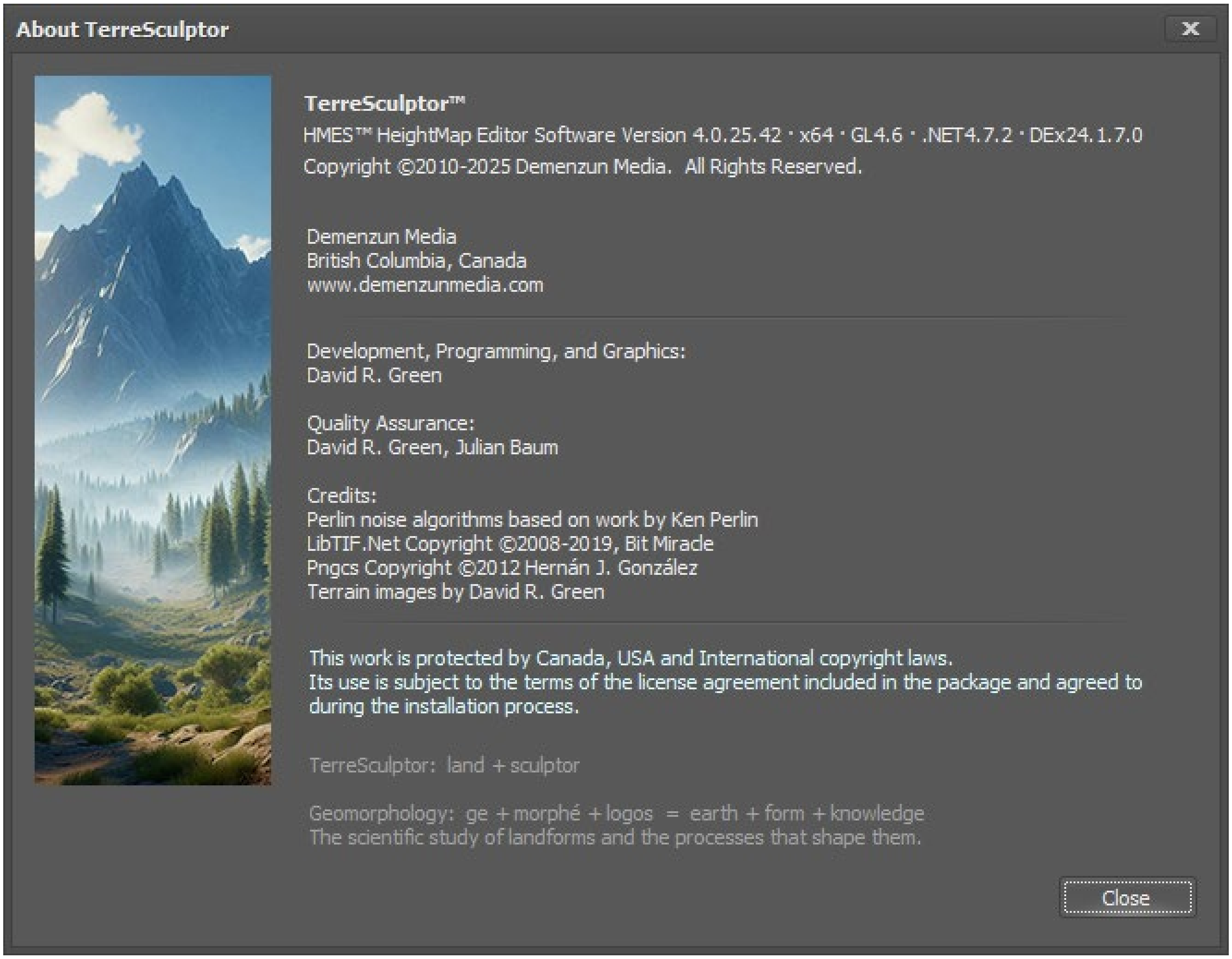
Click on a link to choose that action.
Click on the close button on the top-right corner of the dialog to cancel or close it.

The Recent Projects links also display a tooltip that shows the full drive path to the location of the file.

The Welcome dialog is displayed on application startup by default.
This behavior can be changed through the application Settings on the General tab Startup group.

The About Dialog

The About dialog, located on the Help menu, contains the general information about the software including the Version number, Development credits, and Copyright information.



TerreSculptor version builds are always a sequence of numeric digits that is in the order of:

version major . version minor . year . day of year

For example, 4.0.25.100 would be version 4.0 for the 100th day of 2025.

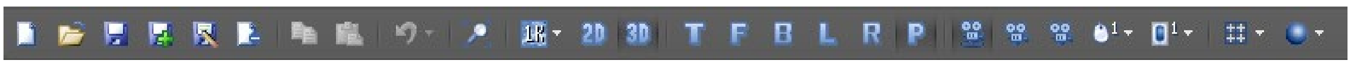
The TerreSculptor Interface

When TerreSculptor is launched you are presented with the main World Editor 3D interface. The world editor interface is similar to other 3D modeling software applications and is used to create and edit terrain systems targeted for video game development. The user-interface follows Windows guidelines for layout and functionality to provide a more intuitive experience.

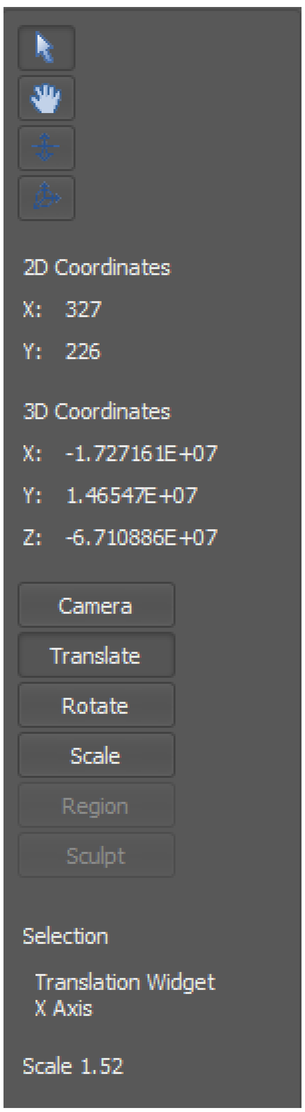
The software window has six main areas: the Menu bar, the main Toolbar, the Toolbox, the Viewport, the Function panels, and the main Status bar.

Menu bar – Contains functions for opening, saving and editing files, in addition to setting application options.

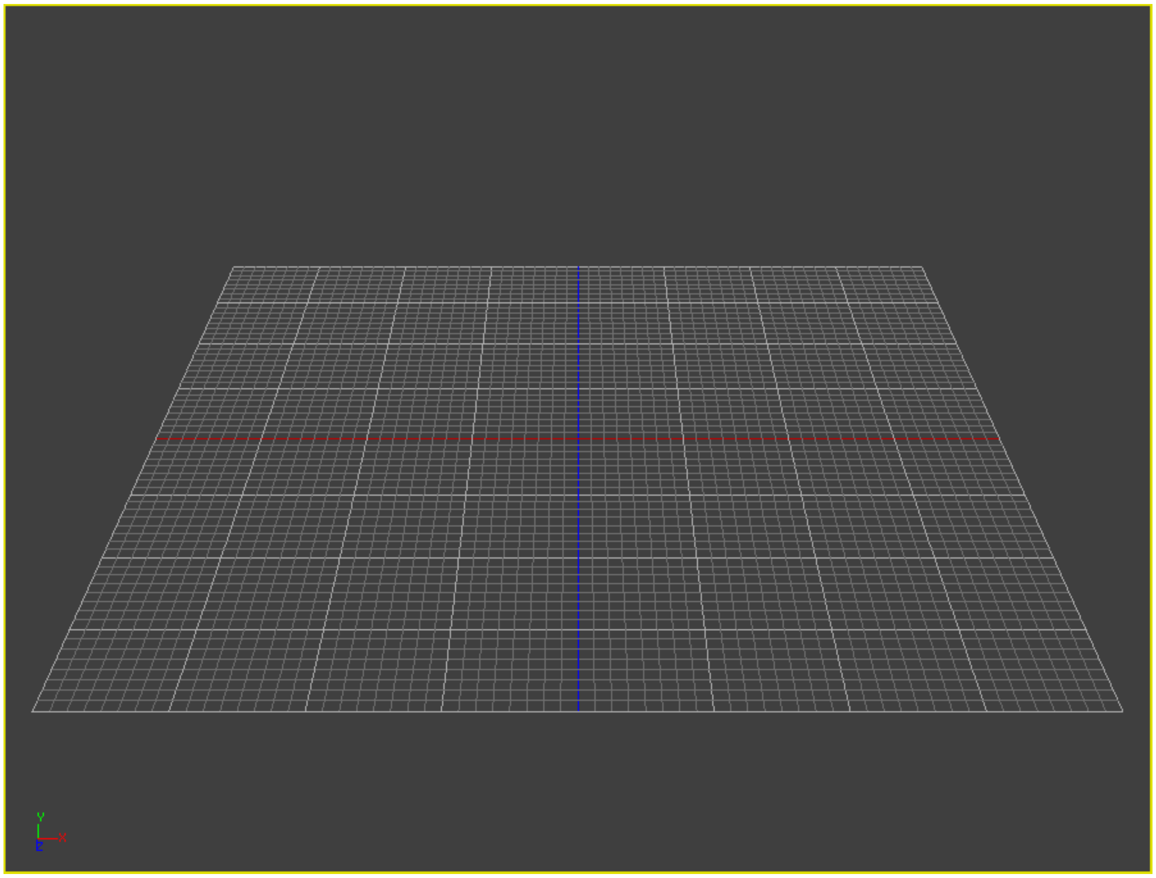
Toolbar – Contains functions that mirror many of the Menu functions, plus tools for viewport control and editing.



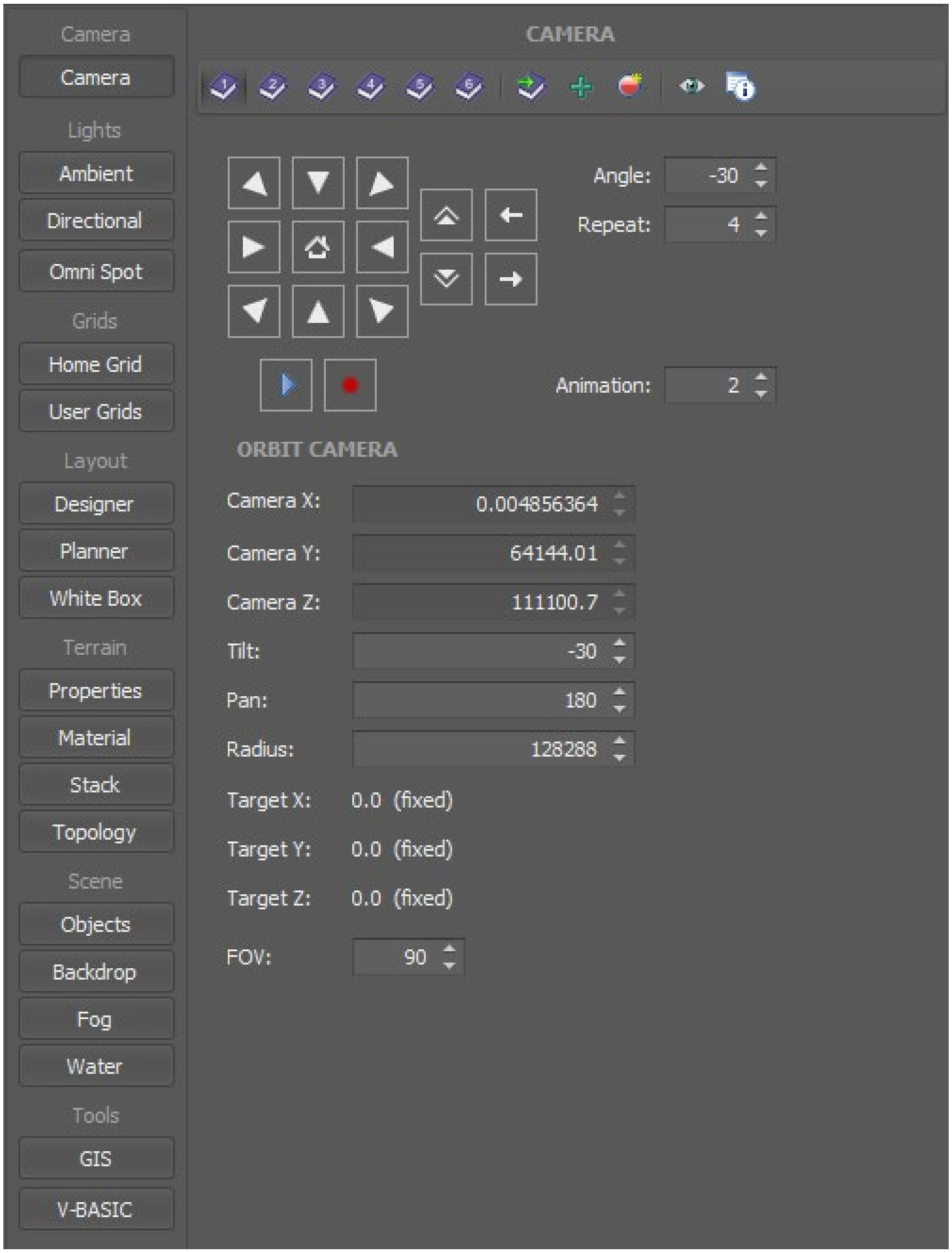
Toolbox – Contains functions for viewport camera control and widget selection.



Viewport – Allows viewing and editing the objects in the world.



Function panels – Provide access to the world scene objects and tools.



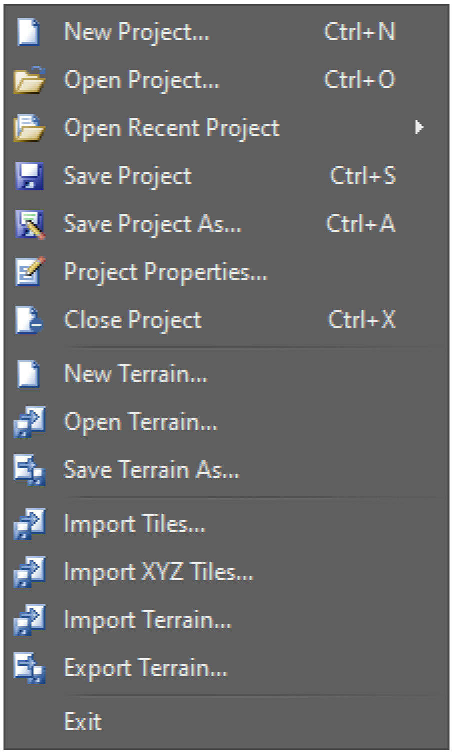
Status bar – Display current application status.

The Menu bar

The menu bar contains several categories of commands including standard Windows application operations.

File Menu

Contains the file related items.



New Project – Closes any current project and starts a new project, resets most project properties to default.
Open Project – Open an existing TSworld project file.
Open Recent Project – Re-open a recently opened TSworld project file from the menu list.
Save Project – Save the current project to a TSworld project file.
Save Project As – Save the current project with a specified project file name.
Project Properties – Display the current project file properties dialog.
Close Project – Close the current project.

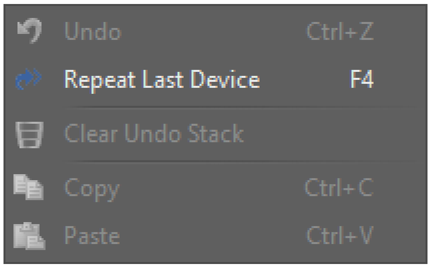
New Terrain – Creates a new terrain, replaces any current terrain, retains any current project properties.
Open Terrain – Open a TSmap terrain heightmap file into the current project.
Save Terrain As – Save the project terrain to a TSmap heightmap file.

Import Tiles – Stitches together tiles into a single heightmap.
Import XYZ Tiles – Stitches together TMS and XYZ folder layout tiles into a single heightmap.
Import Terrain – Import a digital elevation model, heightmap, image, or mesh file.
Export Terrain – Export the project terrain to a digital elevation model, heightmap, image, or mesh file.

Exit – Exit the application.

Edit Menu

Contains the edit items.



Undo – Undo the last operation.

Undo currently only undoes a specific set of actions. Not all application actions or changes can be undone by this menu item. See the chapter on Undoing Changes.

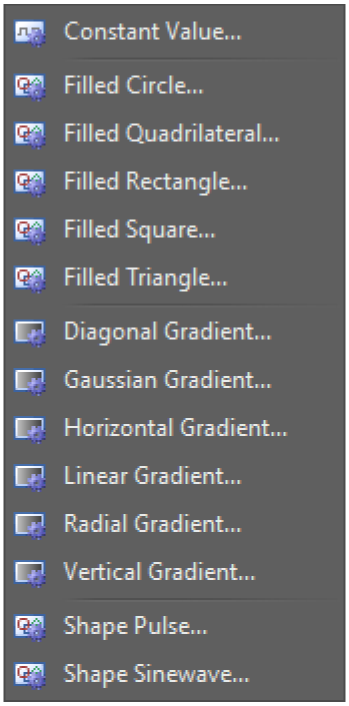
Repeat last Device – The last immediate mode device that was accessed will be opened with its last settings.

Clear Undo Stack – Clear the undo list and delete all undo temporary files from disk.

Copy – Copy the current object to the Windows clipboard.
Paste – Paste the contents of the Windows clipboard to the current object.

Generate Menu

Contains the fill, gradient, and shape generators.
See the *Devices: Generator* chapters for information on each individual device.



Constant Value – Generate a constant value.

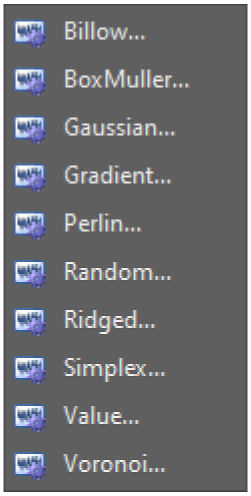
Filled Circle – Generate a filled circle.
Filled Quadrilateral – Generate a filled quadrilateral.
Filled Rectangle – Generate a filled rectangle.
Filled Square – Generate a filled square.
Filled Triangle – Generate a filled triangle.

Diagonal Gradient – Generate a diagonal gradient.
Gaussian Gradient – Generate a gaussian circle gradient.
Horizontal Gradient – Generate a horizontal gradient.
Linear Gradient – Generate a linear gradient.
Radial Gradient – Generate a radial circle gradient.
Vertical Gradient – Generate a vertical gradient.

Shape Pulse – Generate a pulse wave shape.
Shape Sinewave – Generate a sinewave shape.

Noisemap Menu

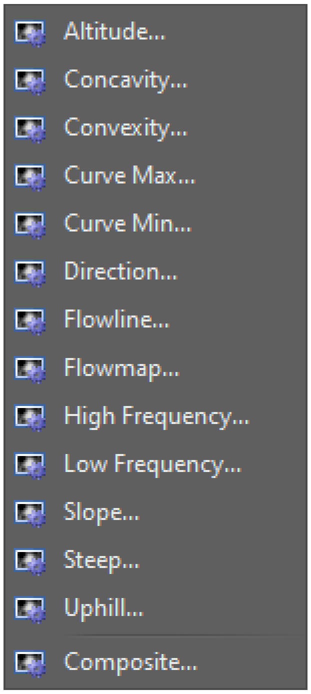
Contains the procedural noise generators.
See the *Devices: Noisemap* chapters for information on each individual device.



Billow – Generate billow perlin type noise.
BoxMuller – Generate boxmuller random noise.
Gaussian – Generate gaussian random noise.
Gradient – Generate gradient perlin type noise.
Perlin – Generate standard perlin noise.
Random – Generate standard random noise.
Ridged – Generate ridged perlin type noise.
Simplex – Generate simplex perlin type noise.
Value – Generate value perlin type noise.
Voronoi – Generate Voronoi noise.

Weightmap Menu

Contains the Weightmap mask extractors.
See the *Devices: Weightmap* chapters for information on each individual device.

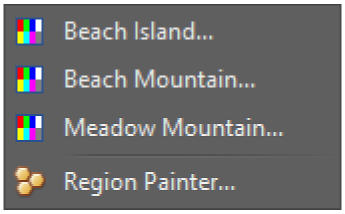


Altitude – Extract a weightmap mask based on altitude.
Concavity – Extract a weightmap mask based on concavity.
Convexity – Extract a weightmap mask based on convexity.
Curve Max – Extract a weightmap mask based on maximum curvature.
Curve Min – Extract a weightmap mask based on minimum curvature.
Direction – Extract a weightmap mask based on direction.
Flowline – Extract a weightmap mask based on water flow lines.
Flowmap – Extract a weightmap mask based on a water flow map.
High Frequency – Extract a weightmap mask of high frequency.
Low Frequency – Extract a weightmap mask of low frequency.
Slope – Extract a weightmap mask based on slope.
Steep – Extract a weightmap mask based on steepness.
Uphill – Extract a weightmap mask of uphill flow lines.

Composite – Extract a composite multiple weightmap mask.

Biome Menu

Contains the Biome Extraction Devices.
See the *Devices: Biome* chapters for information on each individual device.

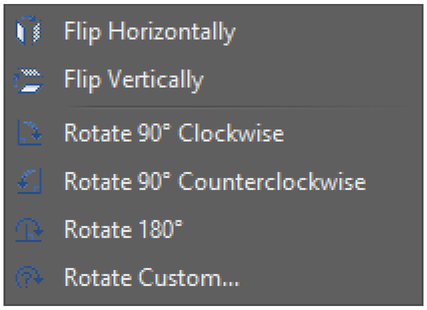


Beach Island – Extract a beach and island biome weightmap and splatmap.
Beach Mountain – Extract a beach and mountain biome weightmap and splatmap.
Meadow Mountain – Extract a meadow and mountain biome weightmap and splatmap.

Region Painter – Paint a multi-biome region (under development).

Adjust Menu

Contains the Adjust type Devices.
See the *Devices: Adjust* chapters for information on each individual device.

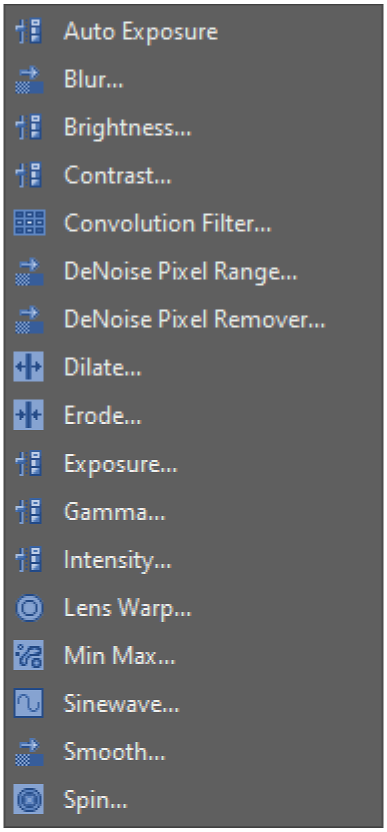


Flip Horizontally – Flip the heightmap horizontally.
Flip Vertically – Flip the heightmap vertically.

Rotate 90° Clockwise – Rotate the heightmap 90 degrees clockwise.
Rotate 90° Counterclockwise – Rotate the heightmap 90 degrees counterclockwise.
Rotate 180° – Rotate the heightmap 180 degrees.
Rotate Custom – Rotate the heightmap by a custom number of degrees.

Filter Menu

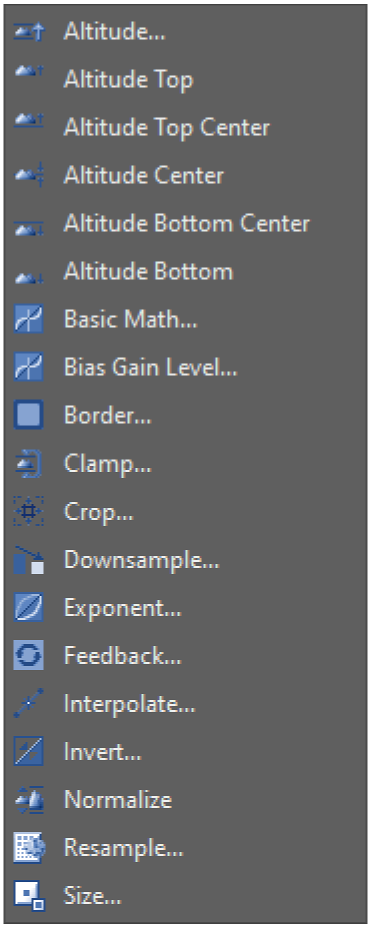
Contains the Filter type Devices, which are typically used on masks.
See the *Devices: Filter* chapters for information on each individual device.



Auto Exposure – Automatically adjust the mask exposure.
Blur – Gaussian blur the mask.
Brightness – Adjust the mask brightness.
Contrast – Adjust the mask contrast.
Convolution Filter – Adjust the mask using a number of convolution filters.
DeNoise Pixel Range – Remove salt-and-pepper type of noise.
DeNoise Pixel Remover – Remove isolated groups of pixel of noise on masks.
Dilate – Expend the edges of the mask.
Erode – Shrink down the edges of the mask.
Exposure – Adjust the mask brightness, contrast, intensity, and gamma.
Gamma – Adjust the mask gamma.
Intensity – Adjust the mask intensity.
Lens Warp – Apply a lens warping filter to the mask.
Min Max – Adjust the mask to only the minimum and maximum values.
Sinewave – Apply a sinewave warp to the mask.
Smooth – Smoothen the mask using a number of algorithms.
Spin – Apply a spin warp to the mask.

Modify Menu

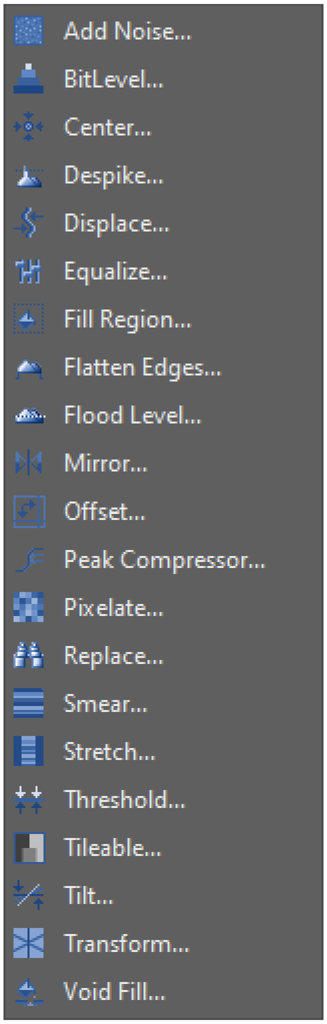
Contains the Modify type Devices.
See the *Devices: Modify* chapters for information on each individual device.



Altitude – Adjust the altitude of the heightmap.
Altitude Top – Adjust the heightmap to the top altitude location.
Altitude Top Center – Adjust the heightmap to the top center altitude location.
Altitude Center – Adjust the heightmap to the center altitude location.
Altitude Bottom Center – Adjust the heightmap to the bottom center altitude location.
Altitude Bottom – Adjust the heightmap to the bottom altitude location.
Basic Math – Adjust the heightmap with add, subtract, multiply, and divide.
Bias Gain Level – Adjust the bias gain and level of the heightmap.
Border – Apply a border around the heightmap.
Clamp – Clamp the heightmap altitude range.
Crop – Crop the heightmap to a smaller size.
Downsample – Reduce the dimensions of the heightmap.
Exponent – Apply a mathematical exponent to the heightmap.
Feedback – Apply a mathematical feedback to the heightmap.
Interpolate – Increase the dimensions of the heightmap.
Invert – Invert the heightmap.
Normalize – Normalize the heightmap to the full altitude range.
Resample – Change the dimensions of the heightmap.
Size – Change the size around the heightmap.

Transform Menu

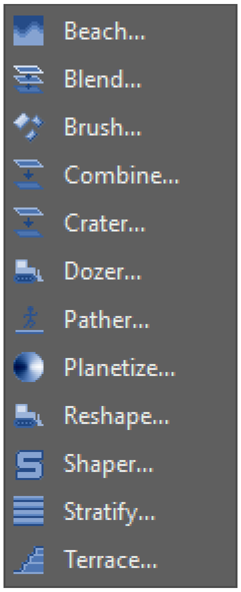
Contains the Transform type Devices.
See the *Devices: Transform* chapters for information on each individual device.



Add Noise – Add noise to the heightmap.
BitLevel – Convert the heightmap into bit levels.
Center – Center the heightmap on the XZ axes.
Despike – Remove small spikes from the heightmap.
Displace – Displace the heightmap using files or noise.
Equalize – Adjust the heightmap using curves.
Fill Region – Fill a region on the heightmap.
Flatten Edges – Flatten the edges of the heightmap.
Flood Level – Increase the water flood level on the heightmap.
Mirror – Mirror the heightmap on any axis.
Offset – Offset the heightmap.
Peak Compressor – Compress the high altitude peaks on the heightmap.
Pixelate – Convert the heightmap to elevation based pixels.
Replace – Replace any value in the heightmap.
Smear – Smear the heightmap based on any pixel slice.
Stretch – Stretch the heightmap on the XZ axes.
Threshold – Adjust the heightmap elevation up or down based on a specified elecation.
Tileable – Make the edges of the heightmap tileable.
Tilt – Tilt the heightmap.
Transform – Transform the heightmap on the XYZ axes.
Void Fill – Fill void values in the heightmap.

Geology Menu

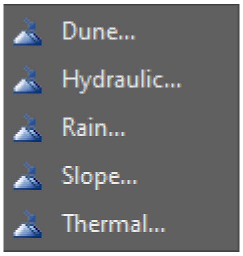
Contains the Geology type Devices.
See the *Devices: Geology* chapters for information on each individual device.



Beach – Smooth the beach elevation range of the heightmap.
Blend – Blend two heightmaps together.
Brush – Place an alpha brush on the heightmap.
Combine – Combine two heightmaps together.
Crater – Create a crater.
Pather – Flatten a path along the heightmap edge.
Planetize – Curve the heightmap like a planet.
Shaper – Shape the heightmap based on the specified mask.
Stratify – Create geological stratification lines in the heightmap.
Terrace – Create geological terracing in the heightmap.

Erosion Menu

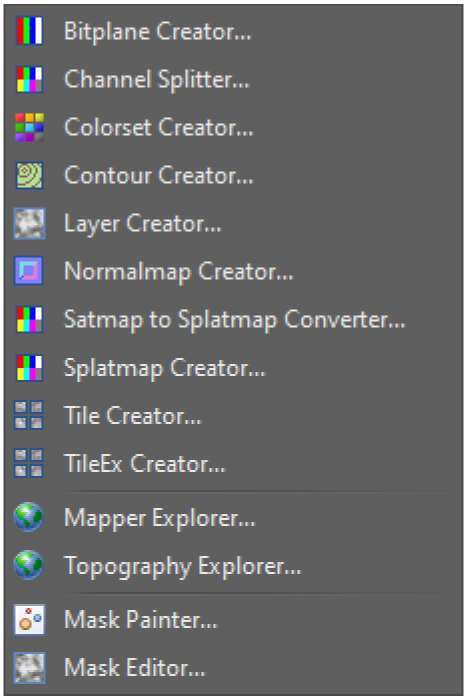
Contains the Erosion type Devices.
See the *Devices: Erosion* chapters for information on each individual device.



Dune – Perform dune-style slope drift on the heightmap.
Hydraulic – Perform hydraulic water erosion on the heightmap.
Rain – Perform rain particle erosion on the heightmap.
Slope – Perform slope-based erosion on the heightmap.
Thermal – Perform thermal erosion on the heightmap.

Create Menu

Contains custom asset creation items.
See the *Create* chapters for information on each individual tool.



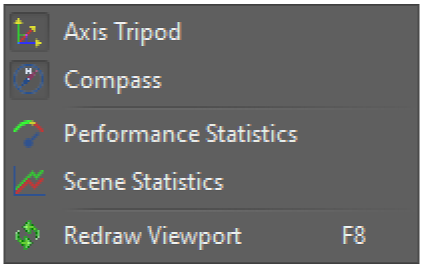
Bitplane Creator – Pack up to four masks into an RGBA texture.
Channel Splitter – Split color bitmaps into red, green, blue, alpha channels, used for retrieving weightmaps.
Colorset Creator – Create 48-bit gradient colorsets for the terrain material rendering.
Contour Creator – Convert the heightmap into a contour line image.
Layer Creator – Create blended weightmaps from up to 16 mask files.
Normalmap Creator – Convert a texture into a normalmap.
Splatmap Creator – Pack up to four weightmaps into an RGBA texture.
Tile Creator – Split a texture into tiles.
TileEx Creator – Split the editor heightmap into tiles.

Mapper Explorer – Explore and download Digital Elevation Models of the earth.
Topography Explorer – Explore and download Satmaps, Streetmaps,Topomaps with contour lines of the earth.

Mask Painter – Hand-paint masks.
Mask Editor – Display the mask editor dialog.

View Menu

The view menu toggles various widget icons and displays on the main editor viewport.



Axis Tripod – Toggle the editor viewport axis tripod visibility.
The axis tripod can be disabled in the Settings Scene settings.

Compass – Toggle the editor viewport compass icon visibility.

Performance Statistics – Display the viewport rendering performance statistics.
The performance statistics include the frame render time.
See the chapter on *Viewport Statistics*.

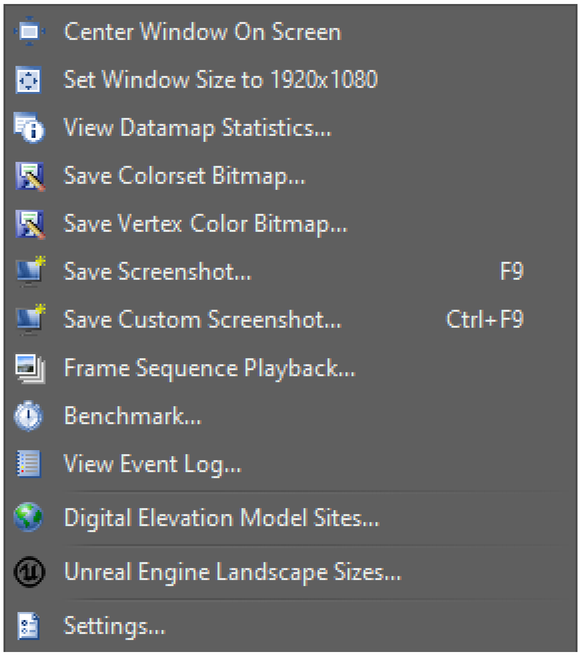
Scene Statistics – Display the viewport rendering scene statistics.
See the chapter on *Viewport Statistics*.

Redraw Viewport – Redraw the viewport scene.

The statistics display font can be changed in the Settings Viewport settings.
The performance statistics and scene statistics can be enabled in the Settings Scene settings.
The performance statistics units can be changed in the Settings Scene settings.

Tools Menu

Contains special tools items.



Center Window on Screen – Center the application window on the screen.
This properly handles multi-monitor setups.

Set Window Size to 1920x1080 – Set the main window size to 1920x1080.

View Datamap Statistics – View the statistics for the selected terrain stack datamap.
See the chapter on *Statistics*.

Save Colorset Bitmap – Save the heightmap colorset material as an image file.
See the chapter on *Saving Colorset Bitmaps*.

Save Vertex Color Bitmap – Save the terrain mesh colorset material as an image file.
See the chapter on *Saving Colorset Bitmaps*.

Save Screenshot – Save the current contents of the viewport as an image file.
This function is valid for all orthogonal and perspective views.
See the chapter on *Saving Screenshots*.

Save Custom Screenshot – Save the current contents of the viewport as an image file of the specified resolution.
This function is valid for all orthogonal and perspective views.
See the chapter on *Saving Screenshots*.

Frame Sequence Playback – Open and render a Frame Sequence to PNG files for creating a video.
See the chapter on *Frame Sequence*.

Benchmark – Run a computer system performance benchmark.
See the chapter on *Benchmarking System Performance*.

View Event Log – View the application event log file contents.
See the chapter on *Application Event Logging*.

Digital Elevation Model Sites – Display a dialog with links to common DEM sites.
See the chapter on *Digital Elevation Model Sites*.

Unreal Engine Landscape Sizes – Launch the Unreal Engine 3/4/5 Landscape Sizes dialog.
See the chapter on the *Unreal Engine Landscape*.

Settings – Display the application settings dialog.
Information on the *Settings* is provided in another chapter in this document.

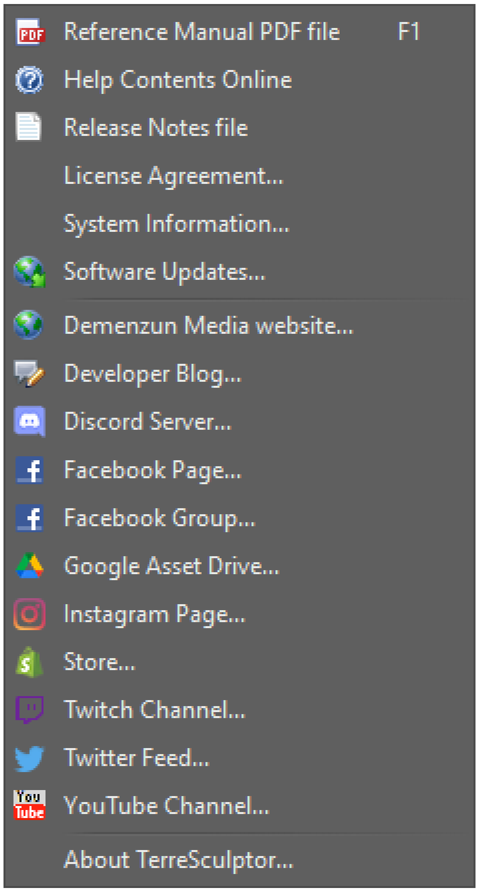
Utilities Menu

Contains special purpose utilities for performing automated tasks.

Max File Renamer – Rename Autodesk Max Batch Pro Optimizer files to remove the percent digits.

Help Menu

Contains help and social media links.



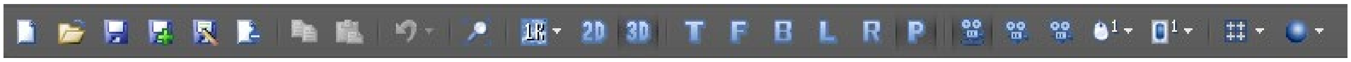
Reference Manual PDF file – Launch the reference manual PDF file.
Help Contents Online – Display the application online reference manual file.
Release Notes file – Display the application release notes file.
License Agreement – Display the software license agreement.
System Information – Display the system information dialog.
Software Updates – Check the Internet for application updates and new versions.
See the chapter on *Software Updates*.

Demenzun Media website – Connect to the software main website.
Developer Blog – Connect to the developer blog site.
Discord Server – Connect to the Discord server.
Facebook Page – Connect to the software Facebook web page.
Facebook Group – Connect to the software Facebook group.
Google Asset Drive – Connect to the Google Drive that contains free asset files.
Instagram Page – Connect to the company Instagram web page.
Store – Connect to the company Shopify Store page.
Twitch Channel – Connect to the company Twitch channel.
Twitter Feed – Connect to the company Twitter feed.
YouTube Channel – Connect to the software YouTube channel for video tutorials.

About TerreSculptor – Display the about and copyright dialog.

The Main Toolbar

The main toolbar provides quick *one-click* access to many of the common functions found on the menus. The main toolbar also contains additional application functions that are not available on the menus.



New Project – Closes any current project and starts a new project.

Open Project – Open an existing TSworld project file.

Save Project – Save the current project.

Save Project Incremental – Save the current project with an incremental file name.

Save Project As – Save the current project with a specified file name.

Close Project – Close the current project.

Copy – Copy the current object to the Windows clipboard.

Paste – Paste the contents of the Windows clipboard to the current object.

Undo – Undo the last operation.
This is a drop-down menu that lists the ordered undo actions.

Undo currently only undoes a specific set of actions.
Not all actions or changes can be undone by this button item.
See the chapter on Undoing Changes.

Zoom Extents – Zoom the viewport to the extents of the current terrain.
This will zoom only to the extents of the current terrain. If no terrain is loaded then this will have no effect.
If any scene objects lie outside of the current terrain area, this will not zoom to encompass them.

2D Texture Size – Choose the texture size used for the 2D Plane View.

2D Plane View – View the main viewport heightmap or mask as a 2D texture plane.

3D Mesh View – View the main viewport heightmap or mask as a 3D mesh.

Top – Select the viewport top orthogonal view.

Front – Select the viewport front orthogonal view.

Back – Select the viewport back orthogonal view.

Left – Select the viewport left orthogonal view.

Right – Select the viewport right orthogonal view.

Perspective – Select the viewport perspective view.

Orbit Camera – Select the orbit camera.
See the Viewport Cameras chapter for camera movement information.
The camera selection can also be assigned to one of the mouse X-buttons in the application Options.

Free Camera – Select the free movement camera.
See the Viewport Cameras chapter for camera movement information.
The camera selection can also be assigned to one of the mouse X-buttons in the application Options.

WASD Camera – Select the WASD first person camera.
See the Viewport Cameras chapter for camera movement information.
The camera selection can also be assigned to one of the mouse X-buttons in the application Options.

Mouse Speed – Camera mouse speed multiplier.
This is a drop-down menu that contains the available mouse speed multipliers.
The mouse speed can also be assigned to one of the mouse X-buttons in the application Options.

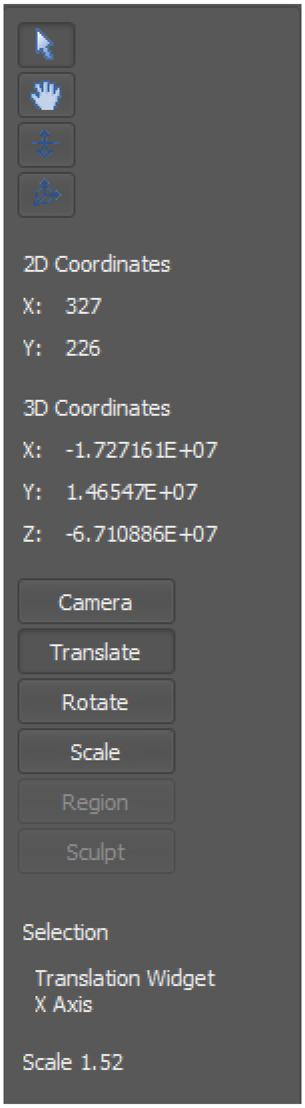
Mouse Wheel Speed – Camera mouse wheel speed multiplier.
This is a drop-down menu that contains the available mouse wheel speed multipliers.
The mouse wheel speed can also be assigned to one of the mouse X-buttons in the application Options.

LOD – Render the terrain mesh using multiple level-of-detail modes.
This is a drop-down menu that contains the available LOD modes.
See the Terrain LOD Modes chapter.

Render Mode – Render specific scene objects as wireframe, facetted, or smoothed triangles.
This is a drop-down menu that contains the available render modes.
The scene objects that support multiple render modes include the backdrop, terrain, and water.

The Toolbox

The Toolbox, always located on the left side of the main viewport, contains toolbox buttons and properties for controlling and manipulating a variety of viewport functions. These functions include camera control, transform widget selection, region selection, and terrain sculpting. Note that some of these features are currently under development.



Mouse Control

Pointer – Default camera mode.
Available for all cameras.

Truck / Pedestal – Truck (move left-to-right) and pedestal (move up-and-down) the camera.
Often incorrectly called Pan.
Available for the Free camera only.

Dolly – Dolly the camera (move in-and-out or towards-and-away).
Available for all cameras.

Orbit – Spin (orbit) and pitch the Orbit camera; free-look the Free and WASD cameras.
Available for all cameras.

2D Coordinates

XY The 2D coordinates of the mouse on the main viewport.

3D Coordinates

XYZ The 3D coordinates of the mouse on the main viewport.

Camera

Select this button to have the main viewport function in standard mouse mode controlling the cameras.
This button has no additional Toolbox panels.

Translate

Select this button to enable the Translation (move) XYZ Axis transform on the currently selected Gizmo.
See the chapter on Gizmos and Widgets.
This button can be toggled using the Shift+T key.

Rotate

Select this button to enable the Rotation XYZ Axis transform on the currently selected Gizmo.
See the chapter on Gizmos and Widgets.
This button can be toggled using the Shift+R key.

Scale

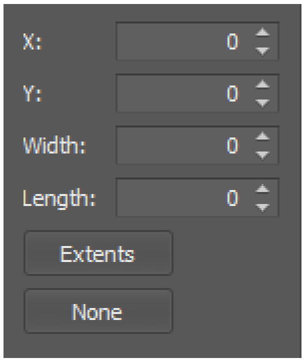
Select this button to enable the Scale XYZ Axis transform on the currently selected Gizmo.
See the chapter on Gizmos and Widgets.
This button can be toggled using the Shift+S key.

Selection

The Camera, Translate, Rotate, and Scale buttons will activate the default Selection panel in the Toolbox:
This panel will show which node axis on a Widget tripod is selected, plus the current Widget Scale factor.
The Widgets automatically scale with the camera distance from the gizmo.

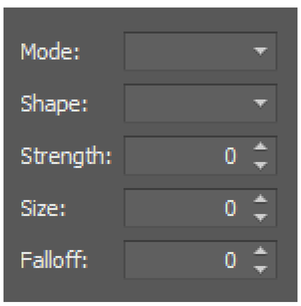
Region

Currently Under Development!
Select this button to enable the Region Selection in the main viewport.
Enabling this button will show the Region Toolbox panel:



Sculpt

Currently Under Development!
Select this button to enable the Terrain Sculpting tools in the main viewport.
Enabling this button will show the Sculpt Brush Toolbox panel:

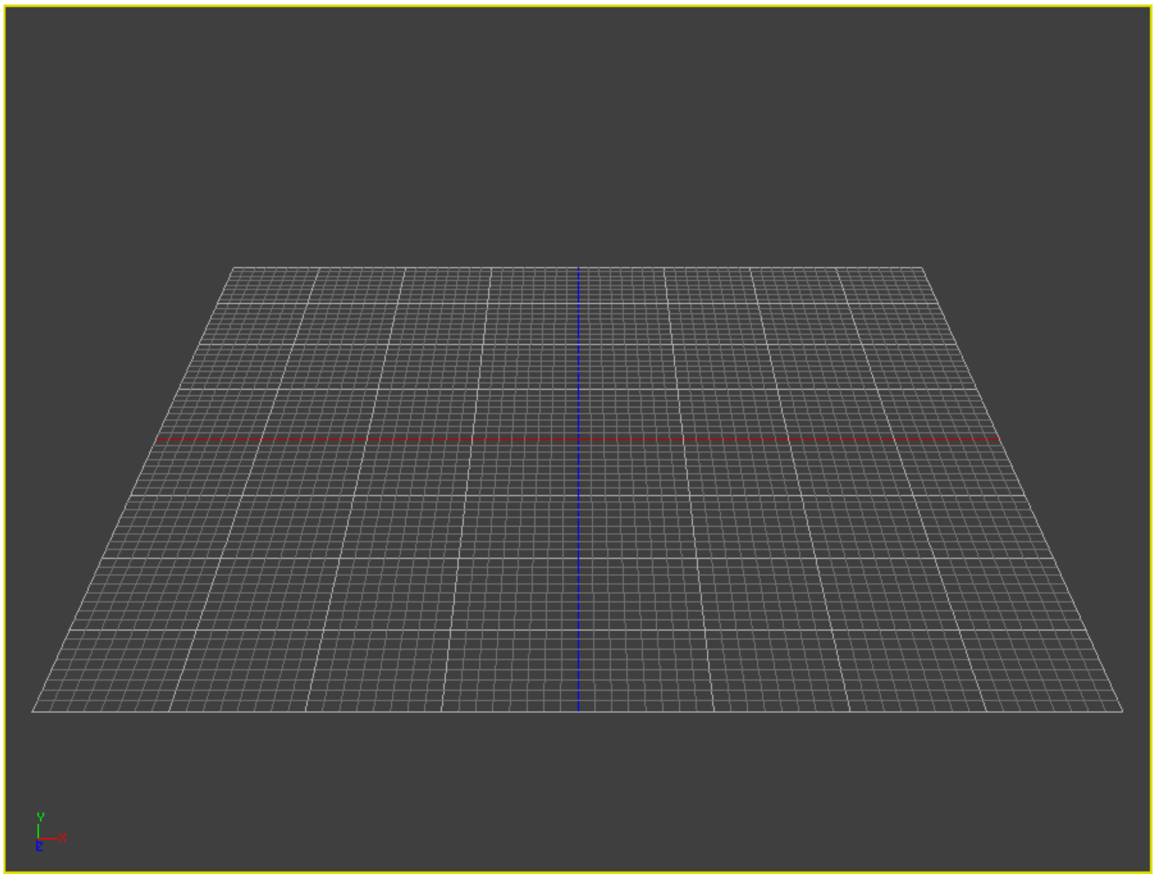


The Main Viewport

The main viewport is a view into the three-dimensional space of the world scene. While creating a world scene, the viewport provides a dynamic view of the world construction data and scene objects.

The viewport view is always through a default camera. With this viewport camera, the scene can be moved, panned, and zoomed. The viewport camera supports three different movement modes, orbit, free, and WASD. The camera is moved around the scene using a variety of mouse movements, mouse button combinations, and the mouse wheel, as listed in the shortcut options.

The viewport is active when its focus border is highlighted. The default highlight color is light yellow. The viewport must be active for camera movement to occur. To make the viewport active, click on it anywhere.



Viewport Cameras

Navigating the scene through the main viewport is accomplished by moving the camera. Three different camera movement modes are supported, orbit, free, and WASD, which use a combination of mouse movements, mouse buttons, the mouse wheel, and camera toolbar buttons.

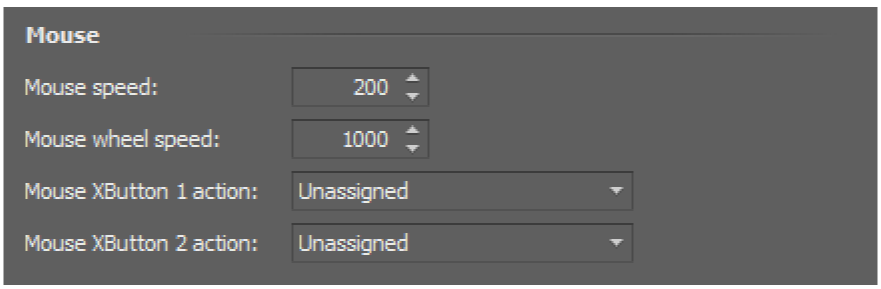
Each camera movement mode is fully independent, with each retaining its last world location when switching between the modes.

Two camera speed multiplier drop-down menus are provided on the toolbar to modify the speed of the mouse movement and mouse wheel. The wheel speed can also be changed by clicking the mouse wheel button.

 Changes the mouse movement speed by ¼×, ½×, 1×, 2×, 4× and 8×

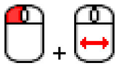
 Changes the mouse wheel speed by ¼×, ½×, 1×, 2×, 4× and 8×

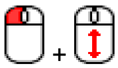
The mouse speed base setting is located in the Settings on the Viewports tab in the Mouse group.

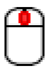


Orbit Camera

The orbit camera moves in a circle around the scene with its camera target always fixed looking at the scene world origin at 0,0,0.

 Orbit

 Pitch

 Cycle through the mouse wheel speeds 1×, 2×, 4×, 8×

 Dolly

Additional fixed-function *left mouse button* + *mouse movement* camera modes are available on the toolbox as:

 Pointer – Default orbit mode

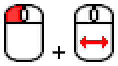
 Truck and Pedestal – Not used

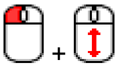
 Dolly – Dolly the camera in-out

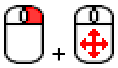
 Orbit – Orbit and pitch the camera

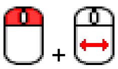
Free Camera

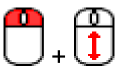
The free camera provides complete freedom of movement on any scene axis to any location and position in the scene.

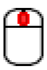
 Pan

 Dolly

 Free-look

 Truck

 Pedestal

 Cycle through the mouse wheel speeds 1×, 2×, 4×, 8×

 Dolly

Additional fixed-function *left mouse button* + *mouse movement* camera modes are available on the toolbox as:

 Pointer – Default free mode

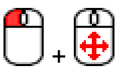
 Truck and Pedestal – Truck and pedestal

 Dolly - Dolly

 Orbit – Free-look

WASD Camera

The WASD camera simulates walking on the surface of the terrain in the viewport.

W	walk forward
S	walk backward
A	walk left
D	walk right
	Free-look

Additional fixed-function *left mouse button* + *mouse movement* camera modes are available on the toolbox as:

 Pointer – Default WASD mode

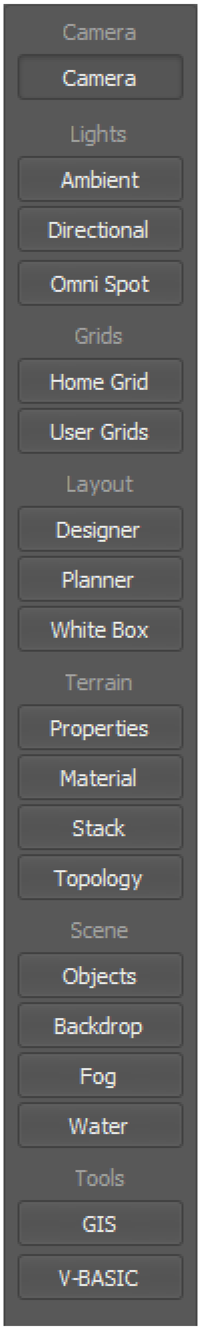
 Truck and Pedestal – Truck and pedestal

 Dolly - Dolly

 Orbit – Free-look

The Function Panels

To the right of the main viewport are the Function panel selection buttons and the panels.
The Function panels provide access to the scene objects including the camera, lights, grids, layout objects, terrain object, and scene objects.
Only one panel is visible at a time. The other panels are displayed by clicking on their selection button.



Camera – Provides controls for managing the camera position in the scene.

Lights – Provides controls for managing the lighting in the scene.

Grids – Provides controls for managing the home grid and user grids in the scene.

Layout – Provides controls for managing the optional designer, planner, and whitebox features in the scene.

Terrain – Provides controls for managing the terrain and terrain stack.

Scene – Provides controls for managing the scene objects and backdrop, fog, and water features.

Tools – Provides controls for extra application tools such as scripting and GIS.

Camera: Camera

The Cam-Nav, or Camera Navigation, area of the Camera panel provides quick access to common camera locations and positions in the scene.

Camera Bookmarks Toolbar

The Camera Bookmarks allow for bookmarking and returning to previously saved camera positions.

The toolbar buttons from left to right are:
Bookmark 1
Bookmark 2
Bookmark 3
Bookmark 4
Bookmark 5
Bookmark 6
Go to Bookmark
Set Bookmark
Reset Bookmark
Show Bookmarks
Bookmarks Information

To use the Camera Bookmarks, click on one of the Bookmark number buttons to make it the current selection, then click on the Set Bookmark button to save the current Camera position information into that Bookmark number. You can now click on the Go to Bookmark button to return to that Camera position at any time.

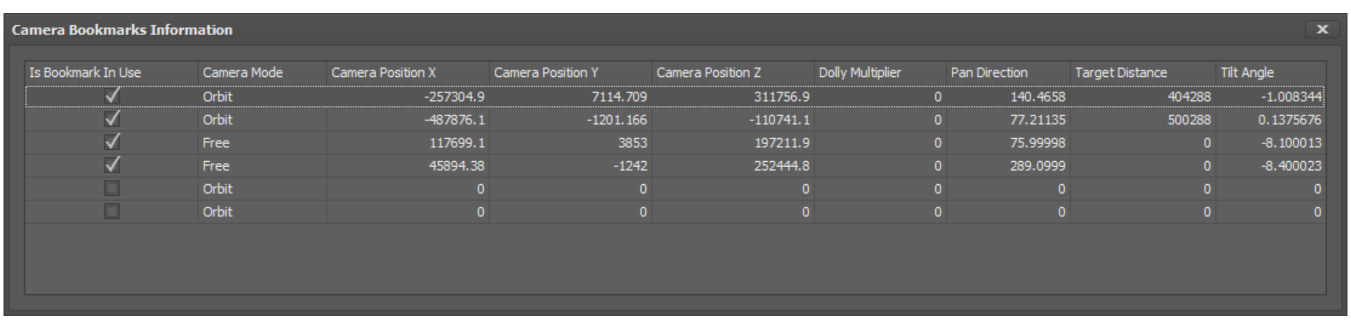
The popup ToolTip text that appears when you hover your mouse over one of the Bookmark number buttons, will show the Camera Mode that was saved to that Bookmark number. You must be in that current Camera Mode to use that Bookmark button settings for a Go to Bookmark function.

To reset a Bookmark number back to an empty state, click on one of the Bookmark number buttons to make it the current selection, then click on the Reset Bookmark toolbar button.

Show Bookmarks will show a violet-colored mesh in the viewport for each Bookmark position.

Bookmarks Information

Clicking on the Bookmarks Information toolbar button will display the Bookmark Information dialog.



Camera Bookmarks Information

Is Bookmark In Use	Camera Mode	Camera Position X	Camera Position Y	Camera Position Z	Dolly Multiplier	Pan Direction	Target Distance	Tilt Angle
✓	Orbit	-257304.9	7114.709	311756.9	0	140.4658	404288	-1.008344
✓	Orbit	-487876.1	-1201.166	-110741.1	0	77.21135	500288	0.1375676
✓	Free	117699.1	3853	197211.9	0	75.99998	0	-8.100013
✓	Free	45894.38	-1242	252444.8	0	289.0999	0	-8.400023
☐	Orbit	0	0	0	0	0	0	0
☐	Orbit	0	0	0	0	0	0	0

This information dialog contains all of the current properties for every Camera Bookmark.

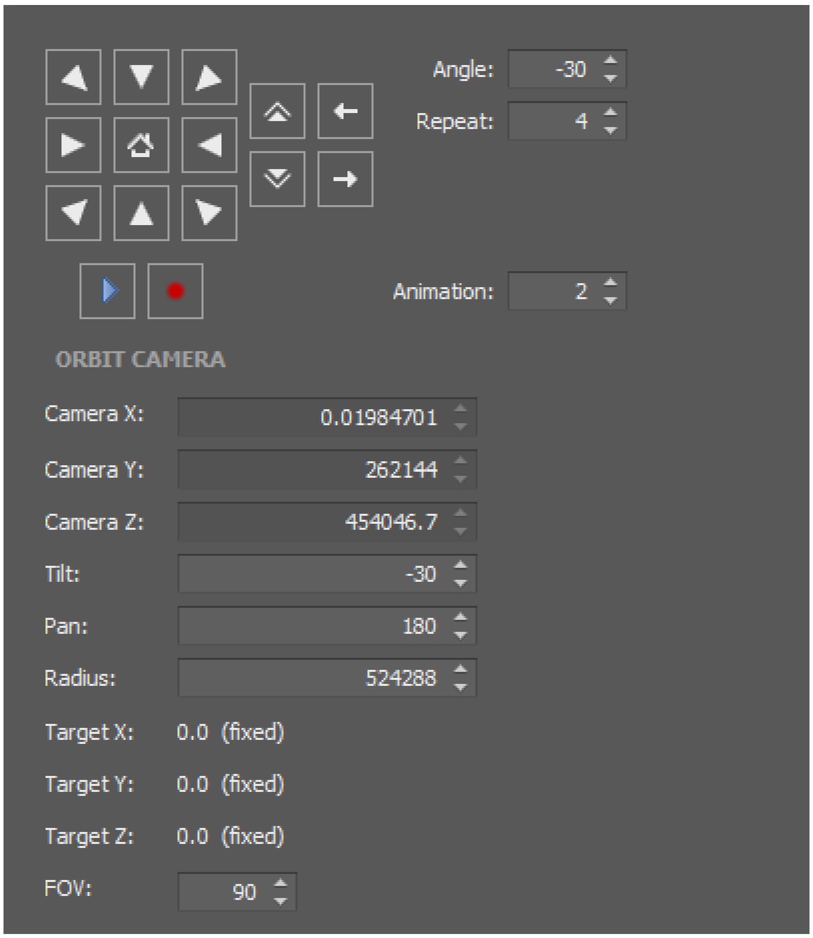
Orbit Camera

The Cam-Nav area for the Orbit Camera consists of the Navigation Pad and Angle/Repeat settings controls. The Navigation Pad has pads for positioning the camera at the Home location, 8 position fixed rotation pads at 45 degree angles, dolly in and dolly out pads, and two rotation clockwise and counter-clockwise direction pads.

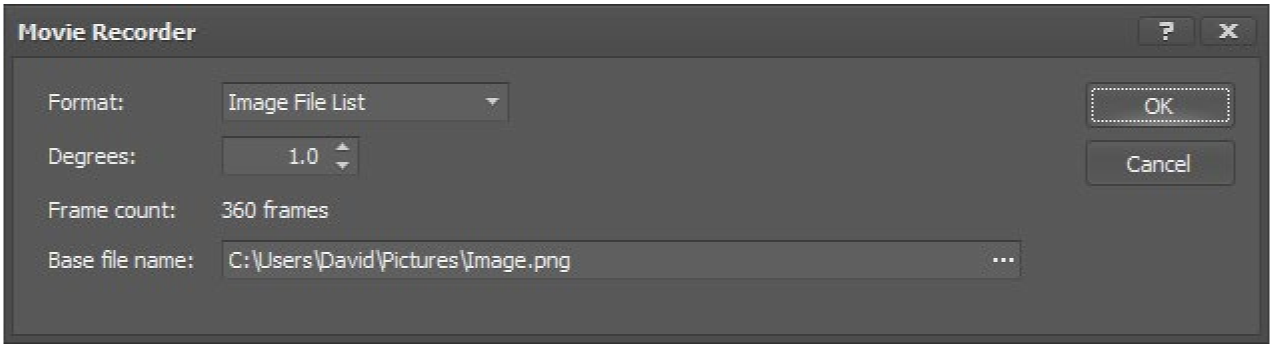
The Angle numeric control sets the angle in degrees for the fixed rotation pads.
The Repeat numeric control sets the repeat speed for the dolly and rotation pads.

The Play Button animates the orbit camera in a rotation mode.
The Record Button allows for saving a sequence of rotation image files that can be stacked into a movie.
The Animation Speed numeric control sets the speed of the rotation.

Below the Cam-Nav area is the Orbit Camera Properties, which automatically update their values as the mouse is used in the viewport to control the camera. These properties can also be changed via keyboard number entry to move the camera to the desired location and orientation.



Clicking on the Orbit Camera Record Button will display the Movie Recorder dialog. Here you can choose how many degrees rotation per frame, such as 10 degrees for 36 frames, and the output file name.
The Movie Recorder currently writes out an Image File List Sequence, such as Image000.png through Image359.png. This image sequence can be imported into software such as Adobe Premiere to create a video.

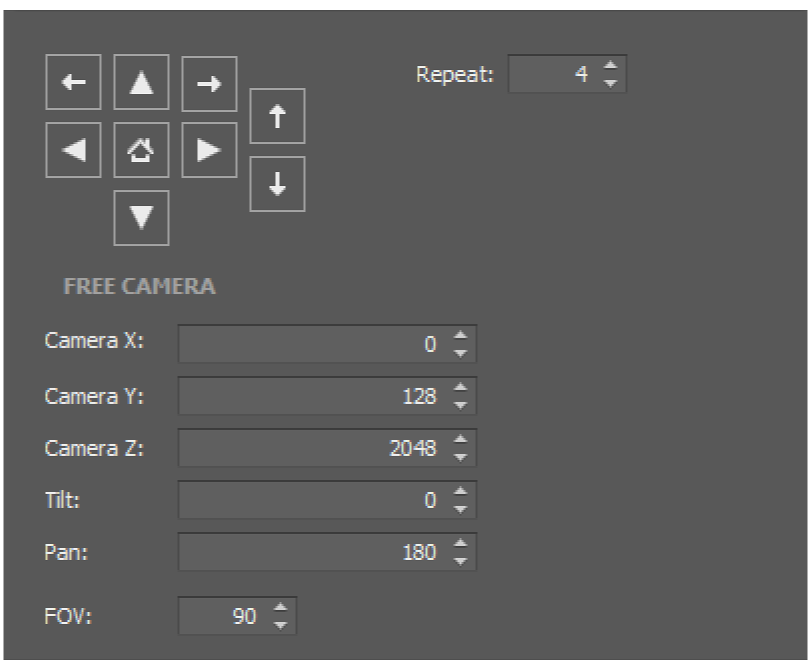


Free Camera

The Cam-Nav area for the Free Camera consists of the Navigation Pad and Repeat settings controls.
The Navigation Pad has pads for positioning the camera at the Home location, 4 direction pads for truck left/right and forward/backward, truck up/down pads, and two rotation clockwise and counter-clockwise direction pads.

The Repeat numeric control sets the repeat speed for the truck, dolly, and rotation pads.

Below the Cam-Nav area is the Free Camera Properties, which automatically update their values as the mouse is used in the viewport to control the camera. These properties can also be changed via keyboard number entry to move the camera to the desired location and orientation.

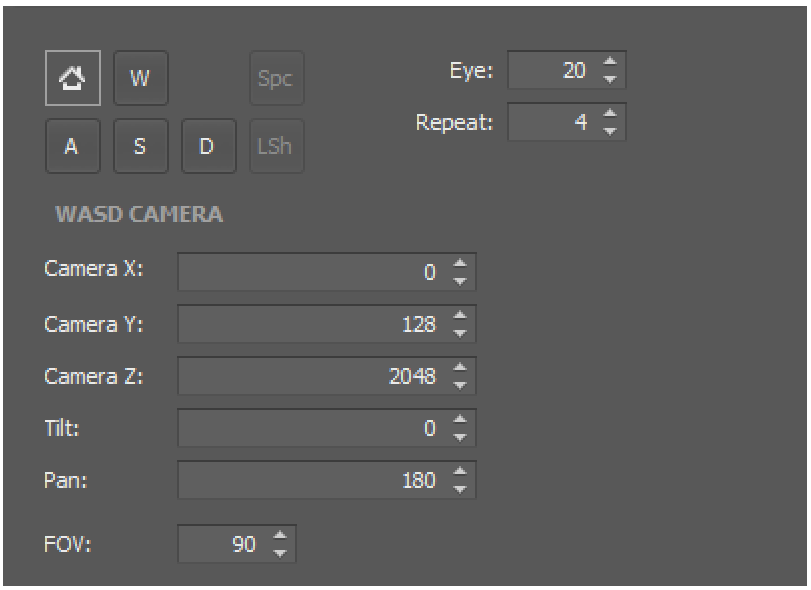


WASD Camera

The Cam-Nav area for the WASD Camera consists of the Navigation Pad and Eye and Repeat settings controls. The Navigation Pad has pads for positioning the camera at the Home location, plus the four WASD direction pads.
The WASD Camera is unique in that if it is placed above the main viewport terrain mesh, it will drop down and float along the terrain surface at the Eye height distance above the terrain, simulating walking on the terrain.

The Eye numeric control sets the height at which the camera is above the terrain mesh surface.
The Repeat numeric control sets the repeat speed for the WASD pads.

Below the Cam-Nav area is the WASD Camera Properties, which automatically update their values as the mouse is used in the viewport to control the camera. These properties can also be changed via keyboard number entry to move the camera to the desired location and orientation.

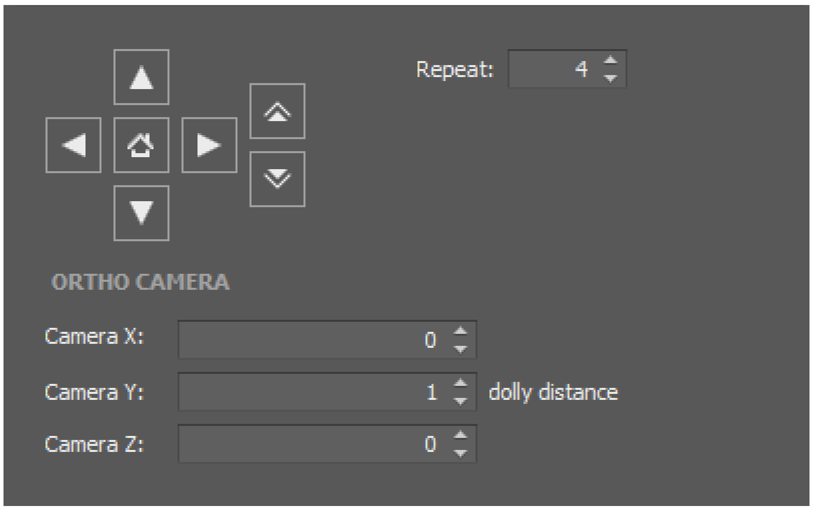


Ortho Cameras

The Cam-Nav area for the Ortho Cameras consists of the Navigation Pad and Repeat settings controls.
The Navigation Pad has pads for positioning the camera at the Home location, 4 direction pads for truck left/right and forward/backward, and dolly in/out pads.

The Repeat numeric control sets the repeat speed for the truck and dolly pads.

Below the Cam-Nav area is the Ortho Camera Properties, which automatically update their values as the mouse is used in the viewport to control the camera. These properties can also be changed via keyboard number entry to move the camera to the desired location and orientation.

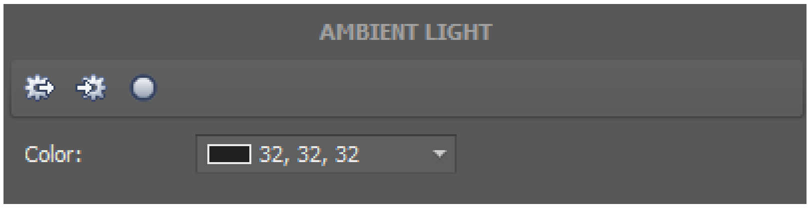


Lights: Ambient

The world scene includes two main light sources: an ambient light, and a directional light that simulates the sun or moon.

The Lights are toggled on and off with the Function panel Scene settings.

Ambient Light



Load the original lighting settings from the application settings file.

Save the current lighting settings to the application settings file.

Reset the lighting to the default settings.

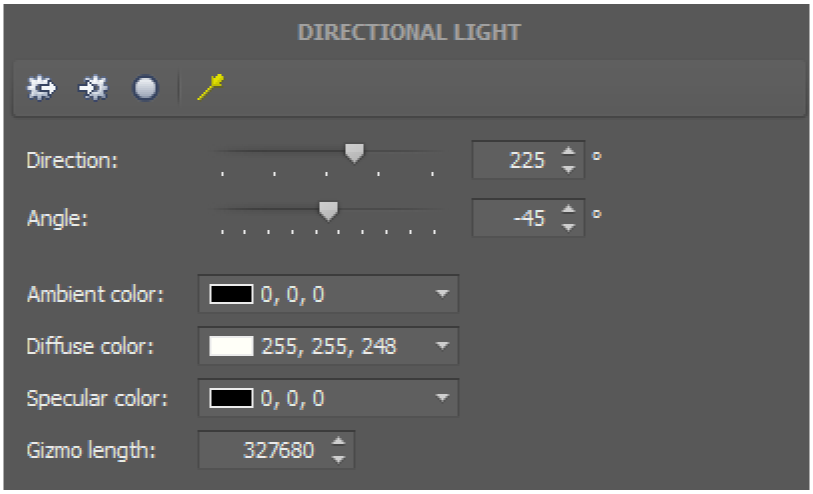
Color – Specify the color of the ambient light.

Lights: Directional

The world scene includes two main light sources: an ambient light, and a directional light that simulates the sun or moon.

The Lights are toggled on and off with the Function panel Scene settings.

Directional Light



Load the original lighting settings from the application settings file.

Save the current lighting settings to the application settings file.

Reset the lighting to the default settings.

Show the directional light indicator gizmo in the viewport.

Direction – The world direction that the directional light is facing, in degrees from 0 to 359.

Angle – The pitch angle that the directional light is facing, in degrees from -90 (straight down) to 0 (horizontal).

Ambient Color – Specify the ambient color of the directional light. Use this to set a base shadow color.

Diffuse Color – Specify the diffuse color of the directional light. Use yellows for sunlight and white-violet for moonlight.

Specular Color – Specify the specular color of the directional light. Use this for flat or shiny lighting.

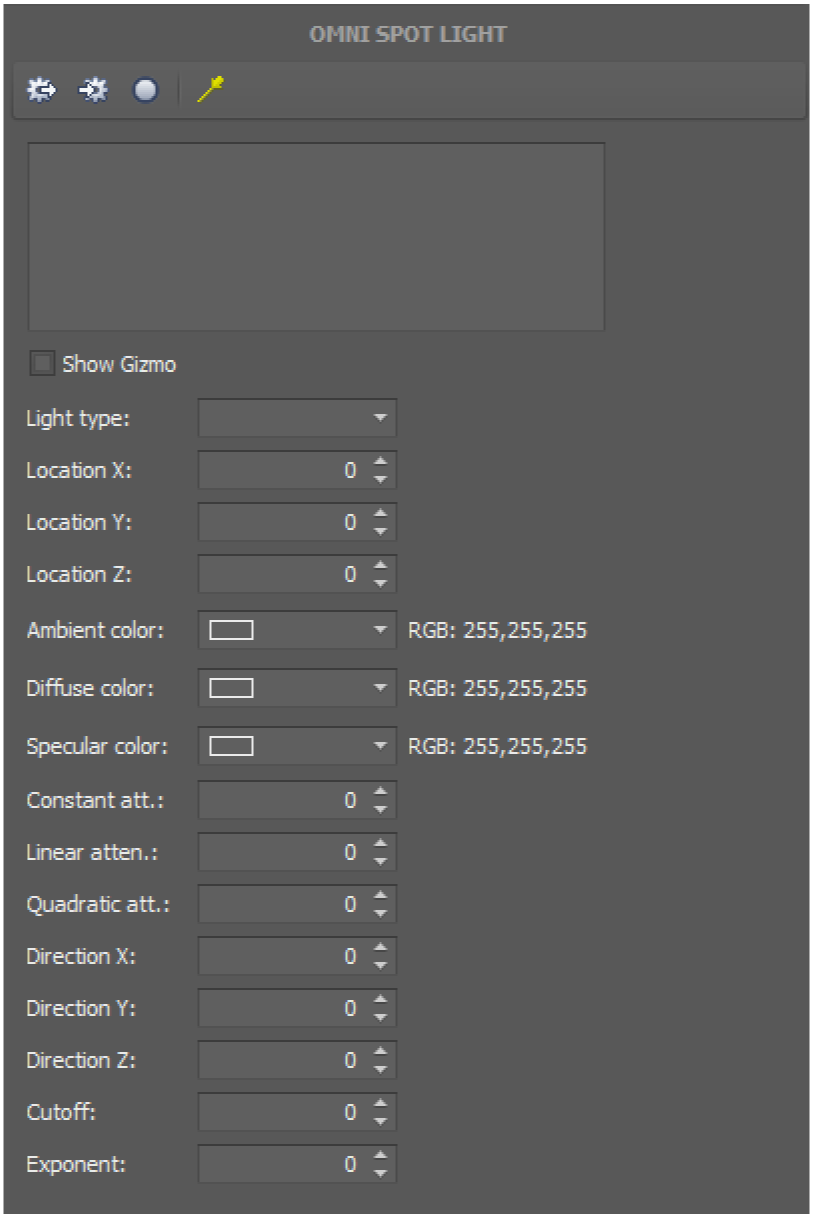
Gizmo length – Specify the length of the directional light indicator from the world origin.

Lights: Omni Spot

The world scene includes additional Omni and Spot light sources.

The Lights are toggled on and off with the Function panel Scene settings.

Omni Spot Lights



Load the original lighting settings from the application settings file.

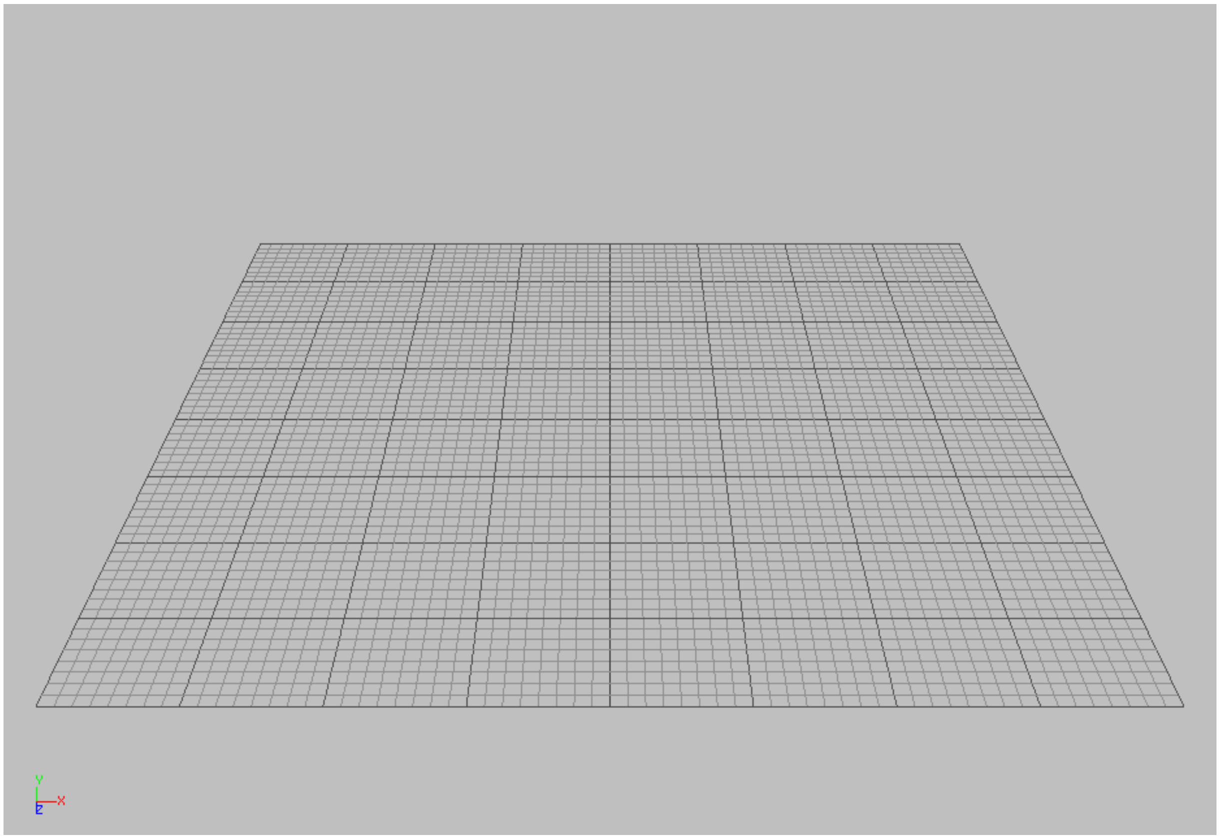
Save the current lighting settings to the application settings file.

Reset the lighting to the default settings.

Show the spot light indicator gizmo in the viewport.

These lights are currently under development.

Grids: Home Grid



The home grid that you see in the viewport represents one of three planes that intersect at right angles to one another at a common point called the *origin*. Intersection occurs along three lines which are the world coordinate X, Y, and Z axes in the geometric Cartesian coordinate system.

The plane based on the world coordinate XZ axis is called the *home grid plane*, which is the base reference system of the 3D world.

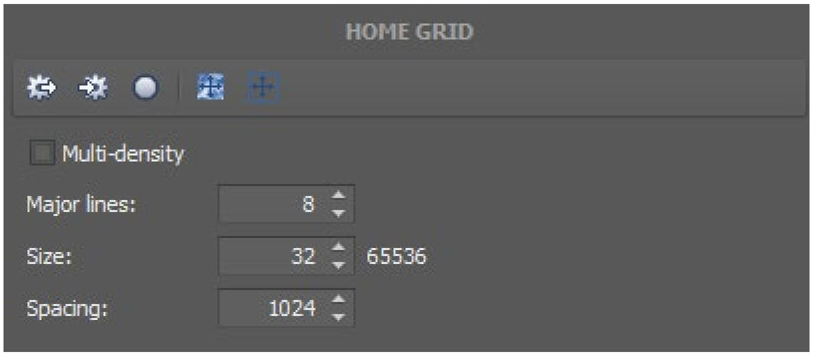
Two axes define the plane of the home grid. In the perspective viewport, you are looking across the XZ plane, with the X axis running left-to-right, and the Z axis running front-to-back. The third axis, Y, runs vertically through this plane up-and-down.

The home grid is always aligned with the world XZ coordinate axes. It can be turned on and off in each viewport view, but its orientation cannot be changed. The center of the home grid plane is always located at the world origin X,Y,Z of 0,0,0.

The home grid is not used for object snapping since all objects in the scene are always aligned on integer digit values on all three world axes.

Choose the Home Grid item on the Function panel Scene settings to toggle the visibility of the home grid.

The home grid properties are set on the Grids tab of the Function panels.



Load the original home grid settings from the application settings file.

Save the current home grid settings to the application settings file, making them the startup settings.

Reset the home grid to the default settings.

Set the home grid spacing × size to the current terrain dimensions.

Set the home grid spacing × size to the world extents.

Multi-density – Toggle the home grid between standard constant-spaced lines and a multiple density grid.

Multi-density is useful for reducing “grid line aliasing clutter” that occurs when viewing the scene from oblique or shallow angles, as the further out the grid is from the center origin, fewer lines are rendered.

Major lines – Sets every *n*th line to be a bolder line color.

Size – Specifies the number of grid lines in each of the axis directions – and + from the center origin.

The numeric value to the right of the Size control is the current home grid full extents along the X and Z axes. For example, a Size value of 32 grid lines on each side of the origin multiplied by a Spacing of 1024 world units equals: (32 × 2) × 1024 = a 65536 world units home grid size.

Spacing – Specifies the world units spacing between each grid line.

The size and spacing of the home grid can be set larger than the world extents, however, the size will be clamped back to the world extents on either a home grid re-creation or when a world file is loaded.

Options

The home grid startup and line coloring settings are located on the Settings dialog’s Grid and Snap tab. See the Settings dialog chapter for information on these settings.

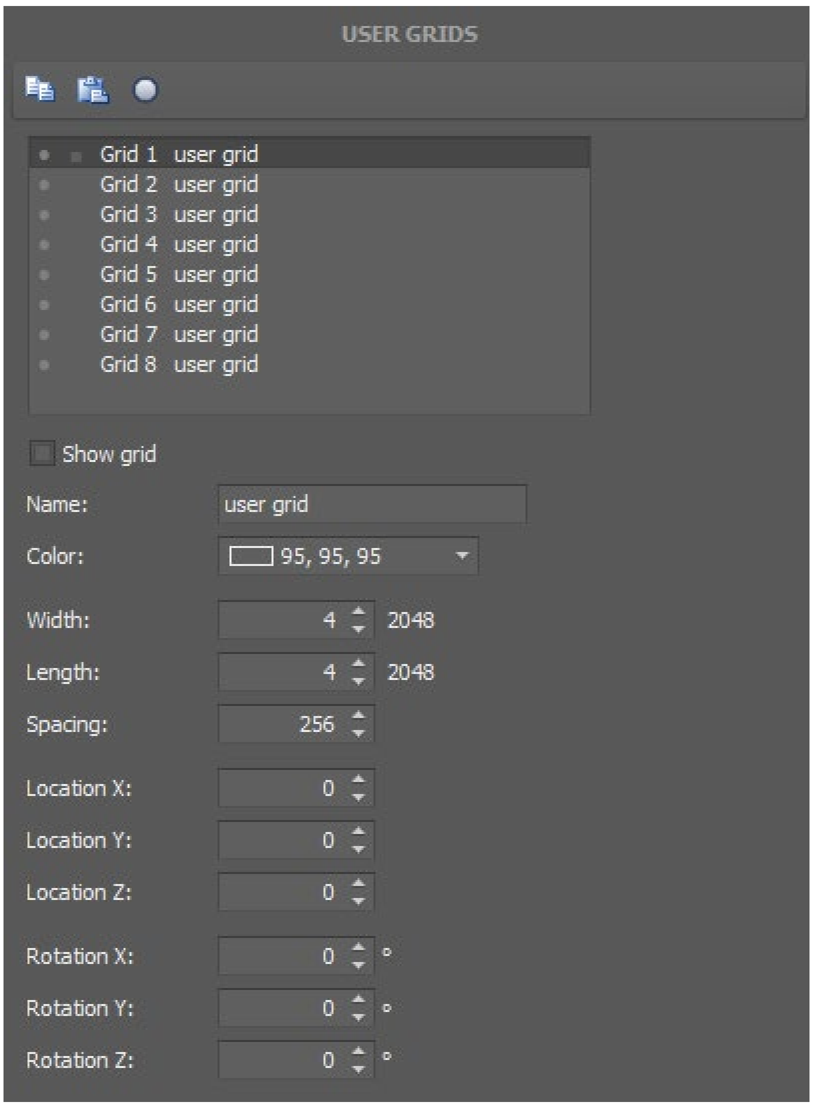
Grids: User Grids

The home grid is supplemented with eight user grids. User grids are independent grids that can be placed anywhere in the scene and rotated to any angle. User grids cannot be snapped to directly but provide a visual grid system only.

User grids can also be used to provide visual grids in the main viewport orthographic views for front, back, left and right, which only see the home grid on its flat edge axis.

To display a user grid in the scene, select one of the eight grids in the list, and check its *Show grid* option.
You can then:

- Assign a custom name to the grid by typing in the Name textbox.
- Change its grid line color by clicking on the Color button and choosing another color.
- Change its size by modifying the values of its width and length and the spacing between each grid line.
- Change its location on the X, Y, and Z axes.
- Change its rotation on the X, Y, and Z axes.



 Copy the current grid settings to the clipboard.

 Paste the clipboard settings to the current grid.

Reset the grid to the default settings.

Displays a grey or green light depending on whether the grid is currently invisible or visible.

Reflects the current color of the grid.

Name – Specify the name of the grid.

Color – Specify the color of the grid lines.
The grid origin lines will always be colored using the default origin line color specified in the Options.

Width – Specify the width in world unit of the grid.

Length – Specify the length in world units of the grid.

Spacing – Specify the spacing in world units between grid lines.

Location X – Specify the grid world location on the X axis plane.

Location Y – Specify the grid world location on the Y axis plane.

Location Z – Specify the grid world location on the Z axis plane.

Rotation X – Specify the grid rotation in degrees around the X axis.

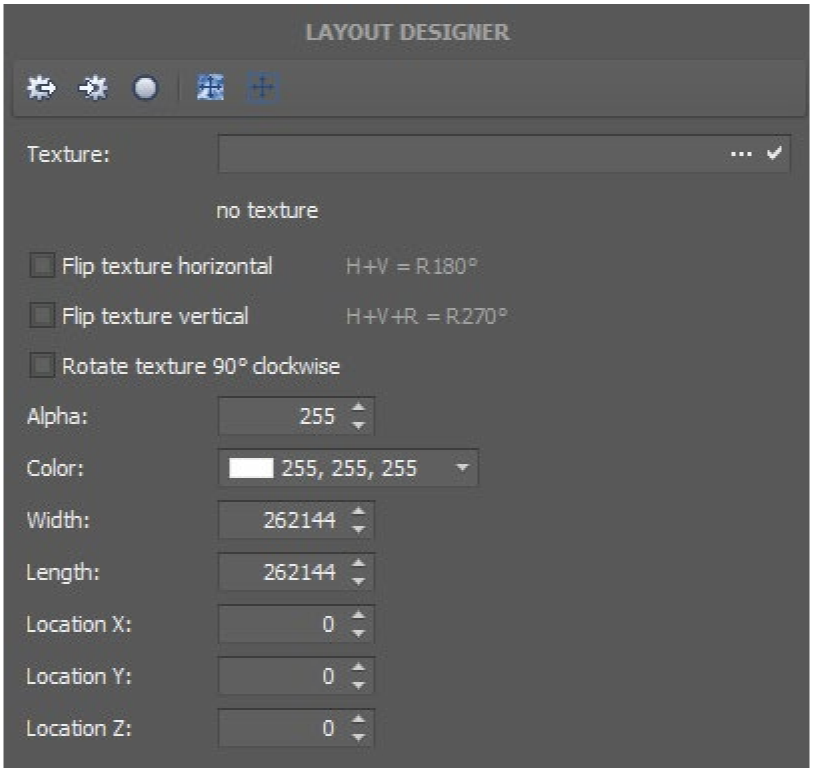
Rotation Y – Specify the grid rotation in degrees around the Y axis.

Rotation Z – Specify the grid rotation in degrees around the Z axis.

Layout: Designer

The scene designer provides a textured plane mesh that is used for displaying an overhead design map of the terrain layout. Overheads are commonly used in video game level design to depict the layout of map objects and storyboard scene events. The Designer can be used with Planner primitives and shapes to create a complete proxy layout of the final level design.

The Designer is toggled on and off with the Function panel Scene settings.



Load the original designer settings from the application settings file.

Save the current designer settings to the application settings file.

Reset the designer to the default settings.

Set the designer spacing × size to the current terrain dimensions.

Set the designer spacing × size to the world extents.

Texture – Specify the texture file to display on the designer plane mesh.
The designer supports square-aspect, 2:1 and 1:2 width:height ratio textures only.
32-bit textures with alpha are supported.
See the chapter on Texture Support for a list of supported texture formats and sizes.

Browse for a texture file.

Load or re-load the specified texture file.

Flip texture horizontal – Flip the texture horizontally.

Flip texture vertical – Flip the texture vertically

Rotate texture 90º clockwise – Rotate the texture 90 degrees clockwise.

Alpha – Specify the alpha transparency of the design plane mesh. This is additive with any texture alpha.

Color – Specify the designer plane mesh color. Typically this will be white but other colors will tint the texture.

Width – Specify the designer plane mesh width in world units.

Length – Specify the designer plane mesh length in world units.

Location X – Specify the designer plane mesh location along the x axis in world units.

Location Y – Specify the designer plane mesh location along the y axis in world units.

Location Z – Specify the designer plane mesh location along the z axis in world units.

Creating Designer Textures

Designer textures are a square or rectangular aspect image that is typically the same dimensions or aspect as the heightmap. The texture is applied using planar UV mapping coordinates that are configured as full planar 1:1 with edge clamping. The designer Width and Length properties should be set to match the texture aspect ratio.

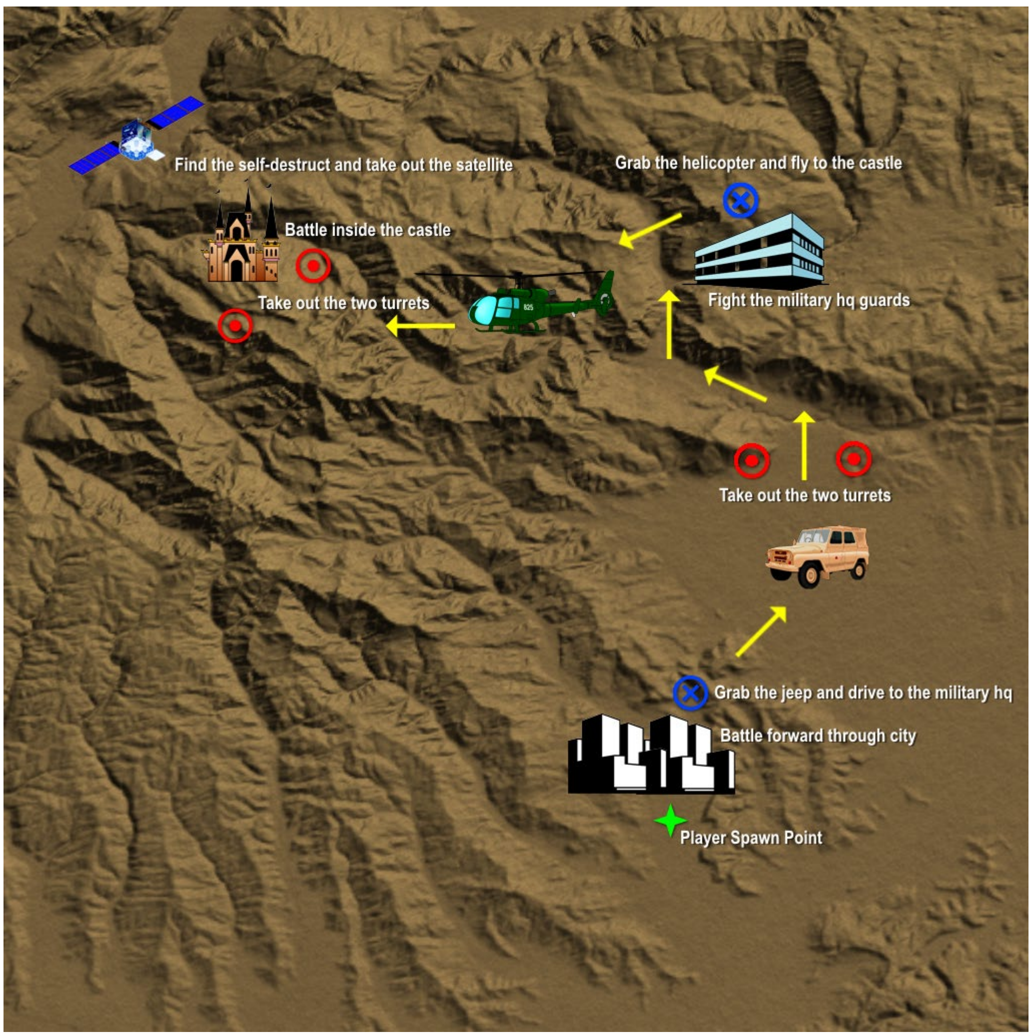
The texture is applied to both the top and the bottom of the designer plane mesh, with the bottom UV mapping set to mirror the top so that it appears like looking through the plane mesh.

The texture may contain alpha channel information to provide areas of translucency or transparency.

Designer textures are typically used for level designer storyboard overheads and map layout guidelines. The information contained on the texture can be used to determine heightmap design layout, such as where mountains or rivers are located, or to depict the storyboard events and their locations on the terrain.

A top view screenshot of the terrain can be saved to use as a reference guide for placing the various storyboard elements. The completed designer texture can be checked against the final heightmap, and all terrain assets passed to the level design department.

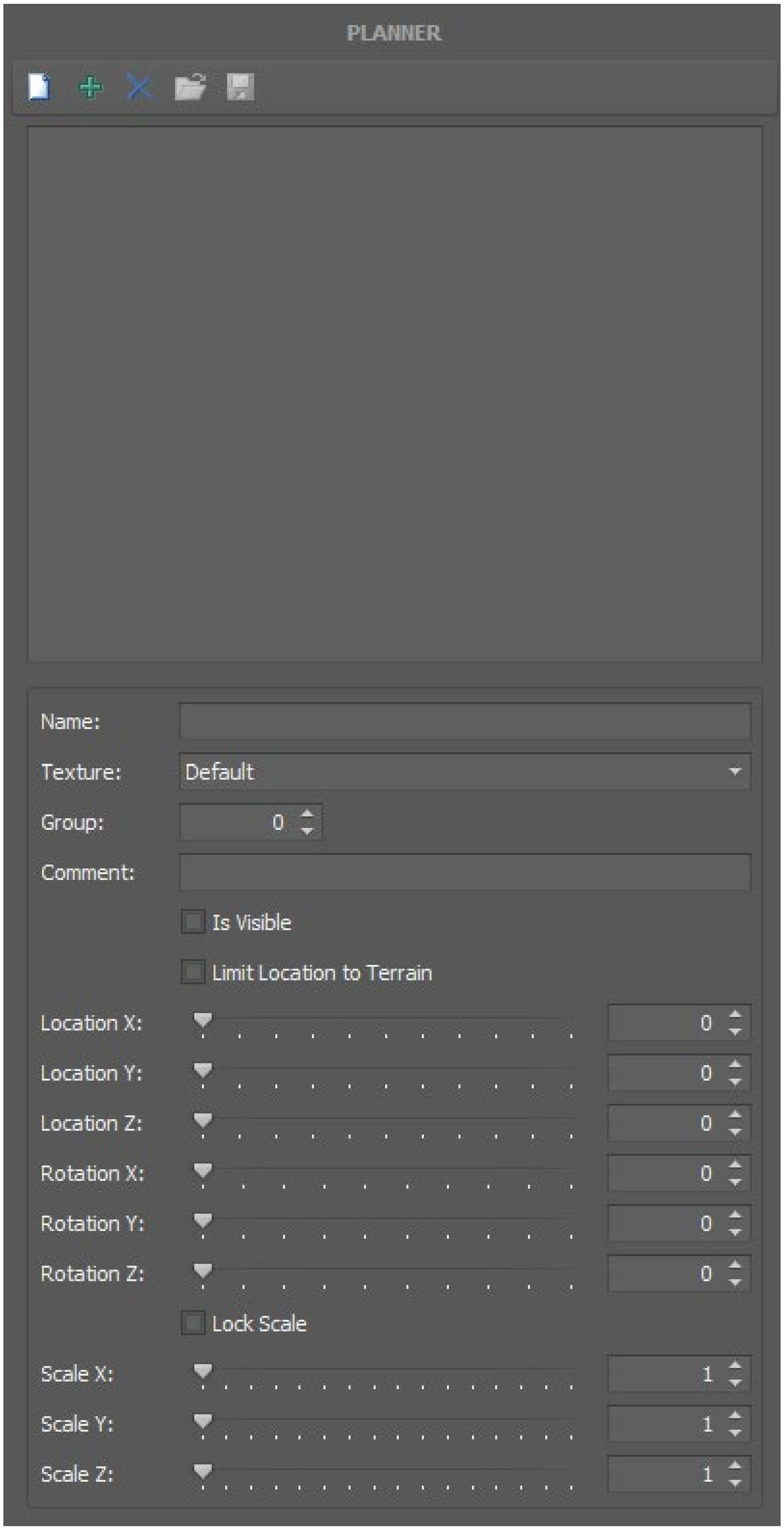
An example designer storyboard texture.



Layout: Planner

The scene planner provides a list of textured cards that are used for displaying notes about future development goals with the terrain system, such as future sculpting or item placement.

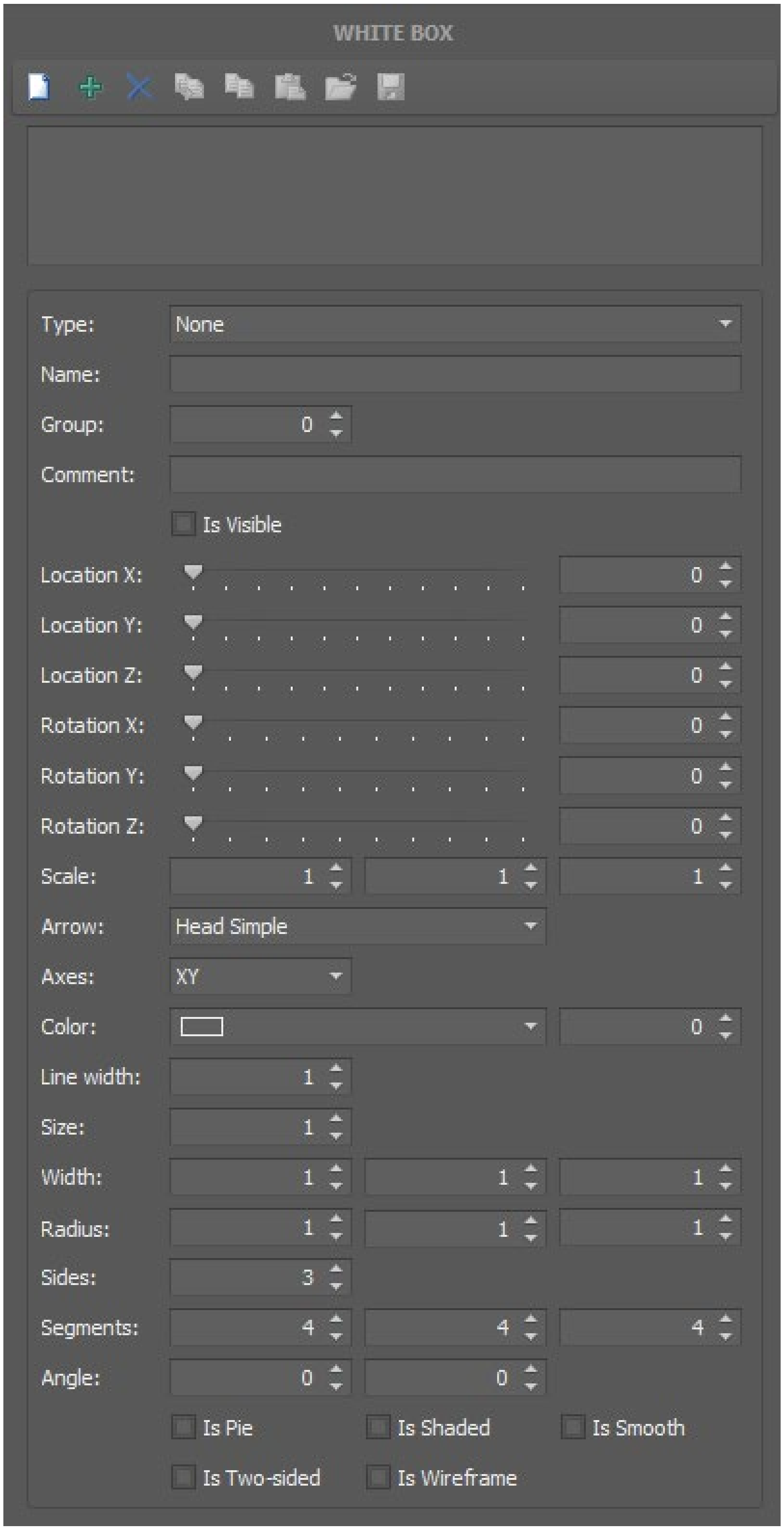
The Planner is toggled on and off with the Function panel Scene settings.



Layout: WhiteBox

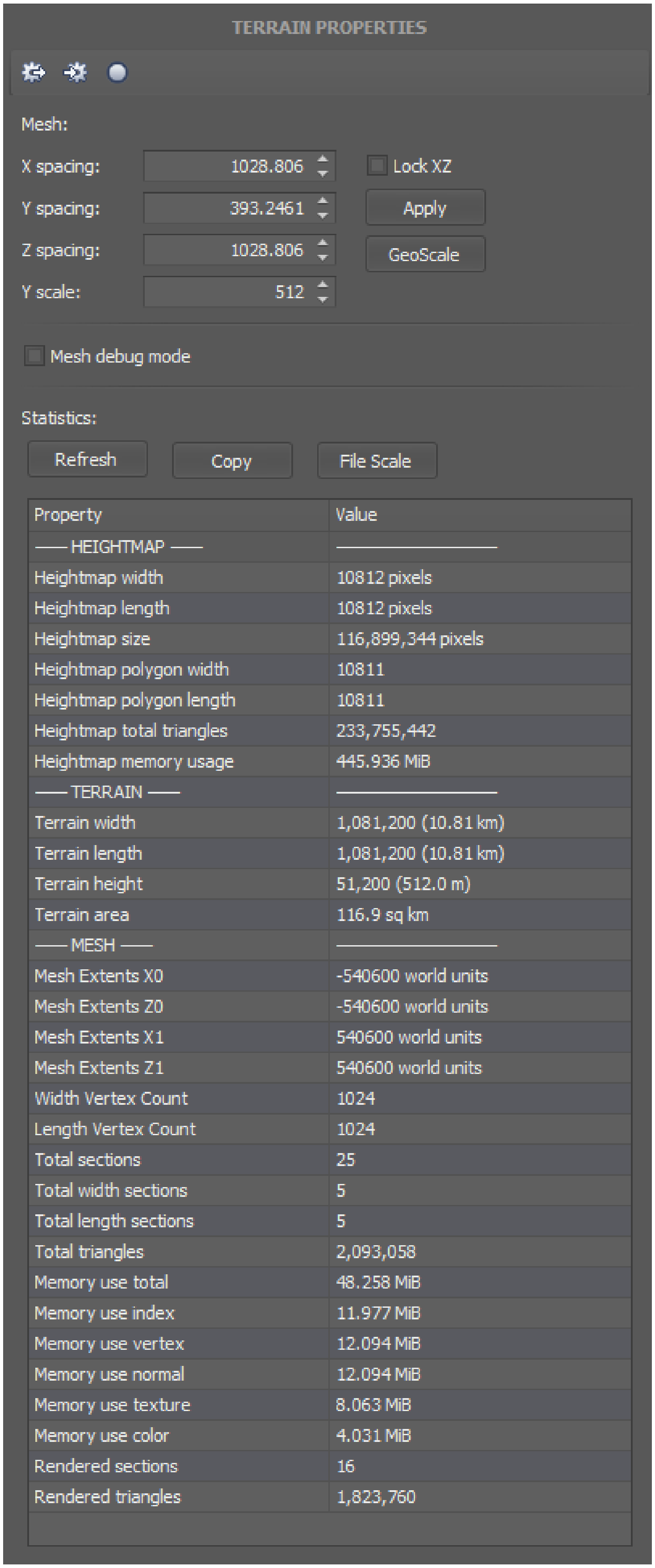
The scene whitebox provides a list of meshes and shapes that are used for displaying whitebox layout of buildings and other featured meshes on the terrain.

The WhiteBox is toggled on and off with the Function panel Scene settings.



Terrain: Properties

The terrain properties panel contains terrain mesh rendering properties and terrain statistics.



Property	Value
HEIGHTMAP	
Heightmap width	10812 pixels
Heightmap length	10812 pixels
Heightmap size	116,899,344 pixels
Heightmap polygon width	10811
Heightmap polygon length	10811
Heightmap total triangles	233,755,442
Heightmap memory usage	445.936 MiB
TERRAIN	
Terrain width	1,081,200 (10.81 km)
Terrain length	1,081,200 (10.81 km)
Terrain height	51,200 (512.0 m)
Terrain area	116.9 sq km
MESH	
Mesh Extents X0	-540600 world units
Mesh Extents Z0	-540600 world units
Mesh Extents X1	540600 world units
Mesh Extents Z1	540600 world units
Width Vertex Count	1024
Length Vertex Count	1024
Total sections	25
Total width sections	5
Total length sections	5
Total triangles	2,093,058
Memory use total	48.258 MiB
Memory use index	11.977 MiB
Memory use vertex	12.094 MiB
Memory use normal	12.094 MiB
Memory use texture	8.063 MiB
Memory use color	4.031 MiB
Rendered sections	16
Rendered triangles	1,823,760

Load the original settings from the application settings file.

Save the current settings to the application settings file.

Reset the properties to the default settings.

X spacing – The terrain mesh X axis vertex spacing, in world units.

Y spacing – The terrain mesh Y axis vertex spacing, in world units.

Z spacing – The terrain mesh Z axis vertex spacing, in world units.

Y scale – The terrain mesh Y axis vertex scale, this is fixed to the value in the Settings, Ruler and Units, Units.

Lock XZ – Lock the X and Z axis to the same value.

Apply – Apply the new spacing values and render the main viewport terrain mesh.

GeoScale – Calculate the spacing values based on real-world measurements such as meters.

Mesh debug mode – Renders each terrain section in a different tinted color.

Statistics – Displays the terrain statistics.

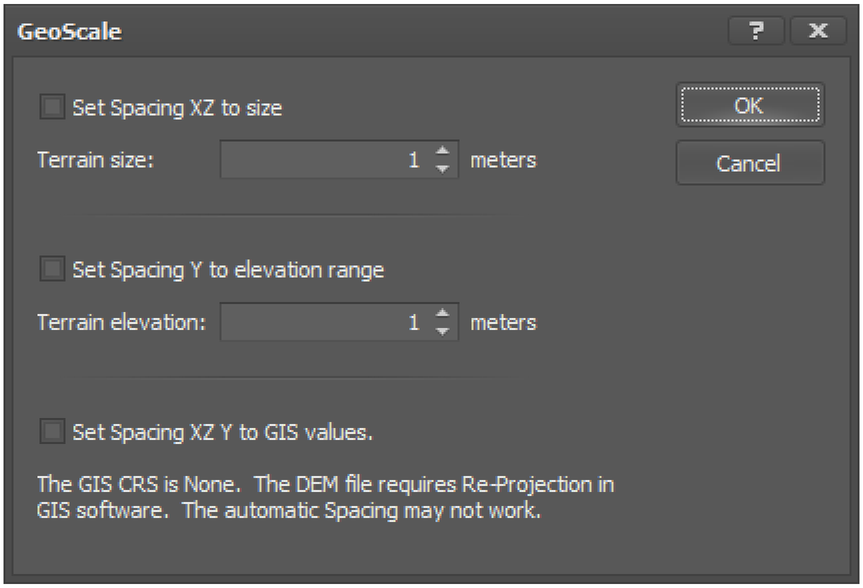
Refresh – Click on the Refresh button to update the statistics information.

Copy – Copy the statistics information to the clipboard.

File Scale – View the DEM Import Export file scale property values.
File Scale is a method of recording the imported DEM elevation range and using that to export it out.
This maintains elevation range through the software pipeline.

GeoScale

The GeoScale dialog allows for setting the Terrain Mesh XZ Spacing and Y Spacing values to real-world values such as meters. Currently this dialog assumes that the editor Settings Units are centimeters, which is the most common units.

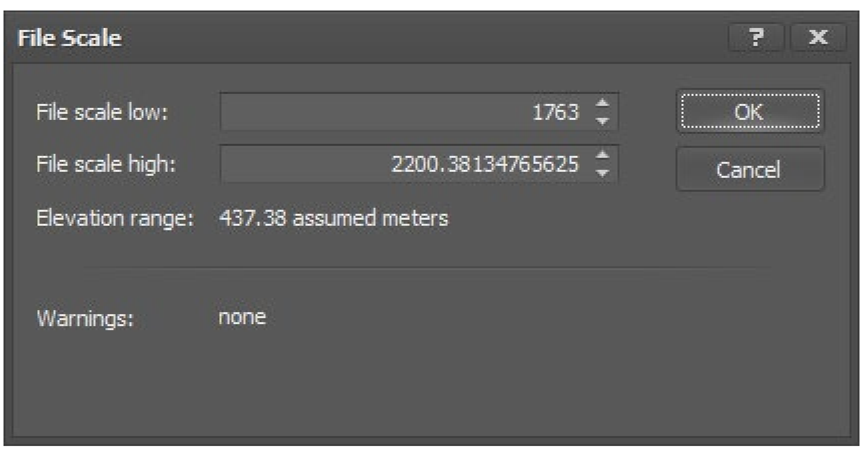


Enable the checkbox for the Spacing XZ and/or Y value that you would like to set and enter in the number of meters. For example, if you want the Spacing XZ to be 5 meters, enter 5 into the Terrain size numeric control. If you are using a download from Mapper, then the Spacing XZ is 3.0 meters.

Enabling the “Set Spacing XZ Y to GIS values” checkbox will automatically determine the Spacing XZ and Spacing Y value from an imported Digital Elevation Model that supports CRS (Coordinate Reference System) meta data, or from the Mapper downloaded tile set.
A warning will be given if the DEM file does not have a CRS or uses an unsupported CRS.

File Scale

The File Scale dialog allows for viewing the Elevation Range on imported Digital Elevation Model files that support that system, or from a Mapper tile set download.



File scale low -- the lowest elevation value of the imported file or Mapper tile download.
File scale high -- the highest elevation value of the imported file or Mapper tile download.
Elevation range -- the high minus low value (High - Low = Range).
Warnings -- will display if the imported file has voids or other issues as to whether the file scale data is accurate.

When you import a Digital Elevation Model file, or perform a Mapper tile download, you can check the File Scale dialog to make sure that all of the information looks correct and there are no warnings, then display the GeoScale dialog and enable the “Set Spacing XZ Y to GIS values” checkbox to set the Spacing XZ Y value to the correct real-world elevation range of the imported file or Mapper download.

File Scale can also be used to maintain the fixed elevation range of an imported Digital Elevation Model when exporting it back out. This allows TerreSculptor to maintain the elevation range of a DEM file throughout the editing process workflow.
When exporting to any of the compatible DEM file formats, on the Export dialog, set the File Scale option to Scale to have the file saved with the File Scale low through high range.

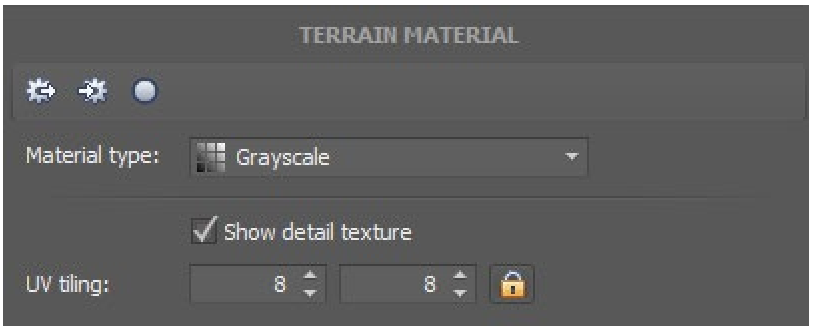
Terrain Material

The terrain material panel contains settings for setting the main viewport terrain mesh render material. The material determines the coloring of the main viewport terrain mesh.

There are currently six Material Types.

Material Type Grayscale

Render the viewport terrain mesh using a grayscale black-to-white color ramp.



 Load the original settings from the application settings file.

 Save the current settings to the application settings file.

 Reset the properties to the default settings.

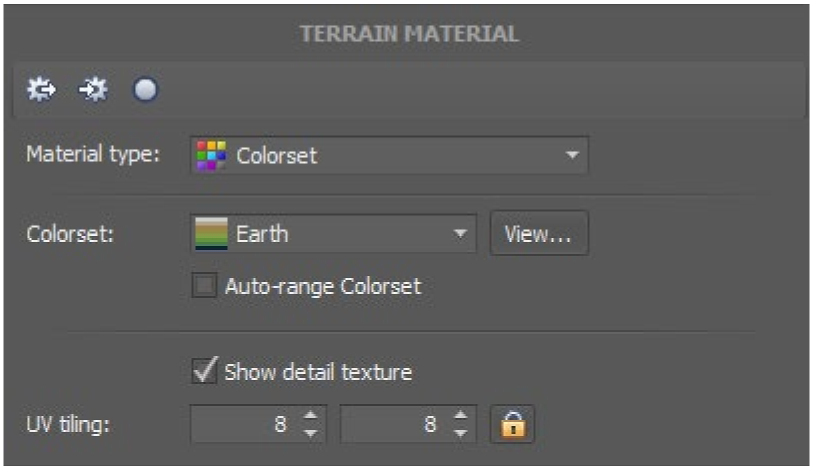
Material Type: Grayscale – Choose the material type.

Show detail texture – Whether the detail texture is rendered on the terrain mesh.

UV tiling – The UV tiling of the detail texture. Use the lock button to lock the U and V values.

Material Type Colorset

Render the viewport terrain mesh using a 48-bit gradient color ramp.
The colorset gradients simulate many real-world color schemes such as arctic and desert.



 Load the original settings from the application settings file.

 Save the current settings to the application settings file.

 Reset the properties to the default settings.

Material Type: Colorset – Choose the material type.

Colorset – Choose the colorset gradient from the drop-down list.

View – View the colorset gradient in the Colorset Viewer dialog.

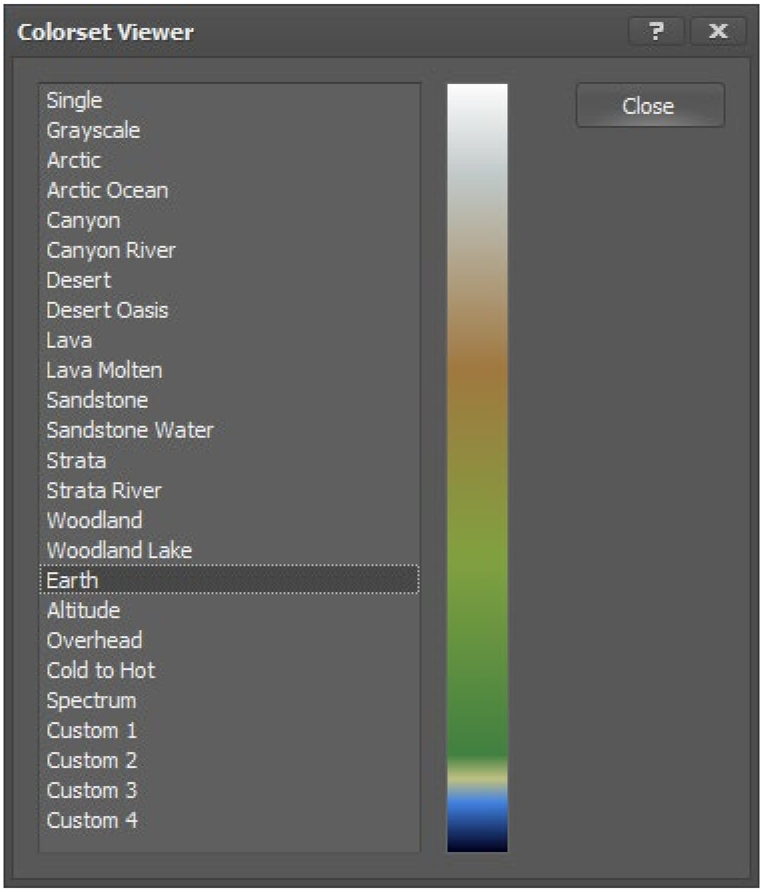
Auto-range Colorset – Whether the colorset gradient automatically scales its range to the terrain mesh range.

Show detail texture – Whether the detail texture is rendered on the terrain mesh.

UV tiling – The UV tiling of the detail texture. Use the lock button to lock the U and V values.

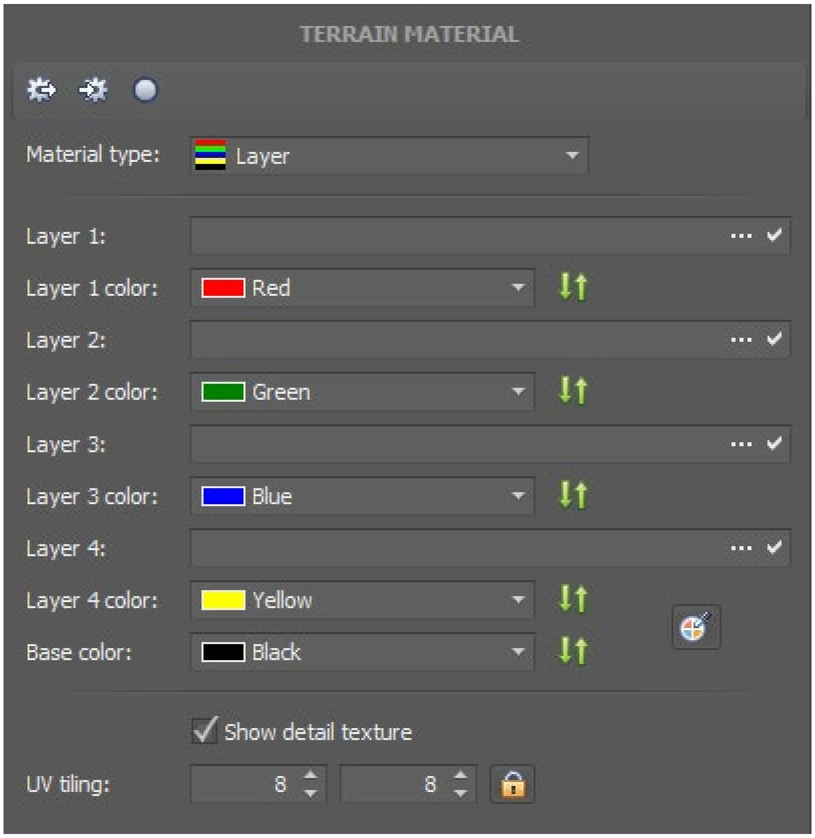
See the Colorset Creator for the ability to create custom colorsets.

The Colorset Material Colorset Viewer (click on the View button to display this dialog).



Material Type Layer

Render the viewport terrain mesh using up to 4 Weightmap textures.



 Load the original settings from the application settings file.

 Save the current settings to the application settings file.

 Reset the properties to the default settings.

Material Type: Layer – Choose the material type.

Layer 1 – The layer 1 weightmap texture.

Layer 1 color – The terrain color for layer 1 texture.

Layer 2 – The layer 2 weightmap texture.

Layer 2 color – The terrain color for layer 2 texture.

Layer 3 – The layer 3 weightmap texture.

Layer 3 color – The terrain color for layer 3 texture.

Layer 4 – The layer 4 weightmap texture.

Layer 4 color – The terrain color for layer 4 texture.

Base color – The terrain color for the base non-weightmap pixels.

Layer 1 color re-order – Drag-and-drop on the arrows to re-order the color palette entries.

Layer 2 color re-order – Drag-and-drop on the arrows to re-order the color palette entries.

Layer 3 color re-order – Drag-and-drop on the arrows to re-order the color palette entries.

Layer 4 color re-order – Drag-and-drop on the arrows to re-order the color palette entries.

Base color re-order – Drag-and-drop on the arrows to re-order the color palette entries.

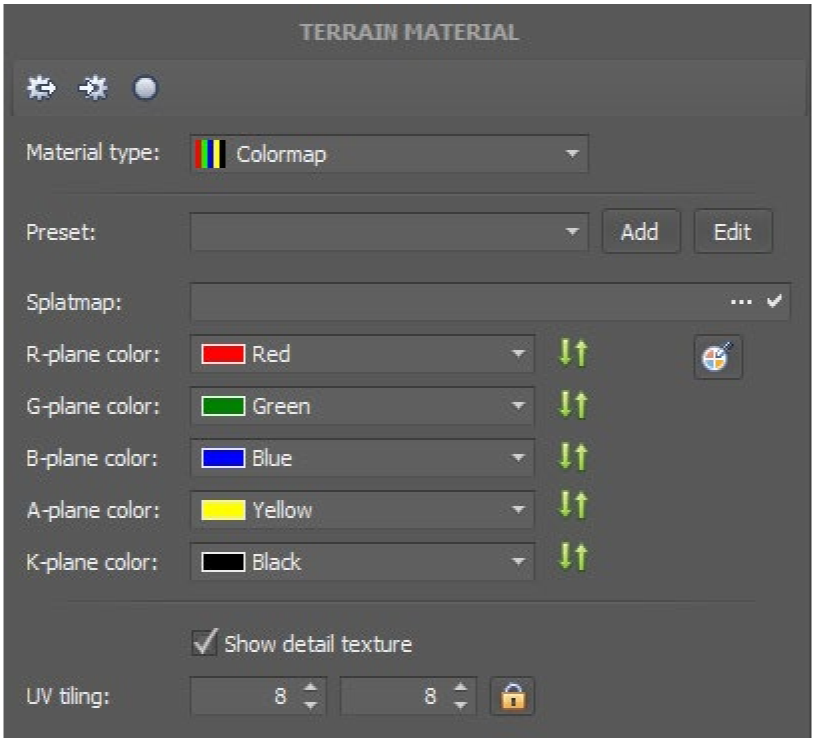
Image Color Picker – Choose colors from an image file. See the Image Color Picker chapter.

Show detail texture – Whether the detail texture is rendered on the terrain mesh.

UV tiling – The UV tiling of the detail texture. Use the lock button to lock the U and V values.

Material Type Splatmap

Render the viewport terrain mesh using an RGB, RGBA, or RGBAK Splatmap texture material.



Load the original settings from the application settings file.

Save the current settings to the application settings file.

Reset the properties to the default settings.

Material Type: Splatmap – Choose the material type.

Preset – Choose a preset color palette.

Add – Add the current color palette to the User Color Presets.

Edit – Edit the User Color Presets.

Splatmap – The splatmap texture. Supports RGB, RGBA, RGBAK splatmap texture.
The texture will be resampled to the size of the viewport terrain mesh.

R-plane color – The terrain color for the splatmap texture red plane.

G-plane color – The terrain color for the splatmap texture green plane.

B plane color – The terrain color for the splatmap texture blue plane.

A-plane color – The terrain color for the splatmap texture alpha plane.

K-plane color – The terrain color for the splatmap black plane.

R-plane color re-order – Drag-and-drop on the arrows to re-order the color palette entries.

G-plane color re-order – Drag-and-drop on the arrows to re-order the color palette entries.

B-plane color re-order – Drag-and-drop on the arrows to re-order the color palette entries.

A-plane color re-order – Drag-and-drop on the arrows to re-order the color palette entries.

K-plane color re-order – Drag-and-drop on the arrows to re-order the color palette entries.

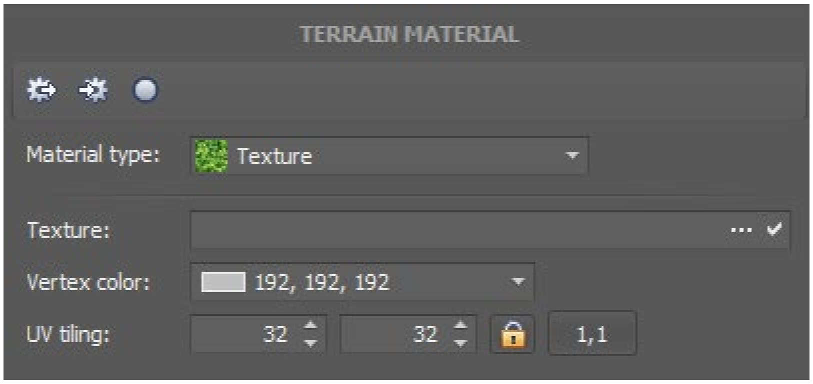
Image Color Picker – Choose colors from an image file. See the Image Color Picker chapter.

Show detail texture – Whether the detail texture is rendered on the terrain mesh.

UV tiling – The UV tiling of the detail texture. Use the lock button to lock the U and V values.

Material Type Texture

Render the viewport terrain mesh using a single UV Planar mapped texture.



 Load the original settings from the application settings file.

 Save the current settings to the application settings file.

 Reset the properties to the default settings.

Material Type: Texture – Choose the material type.

Texture – The texture file. Textures should normally be power-of-two resolutions from 256x256 to 16384x16384.

 Browse for a texture file.

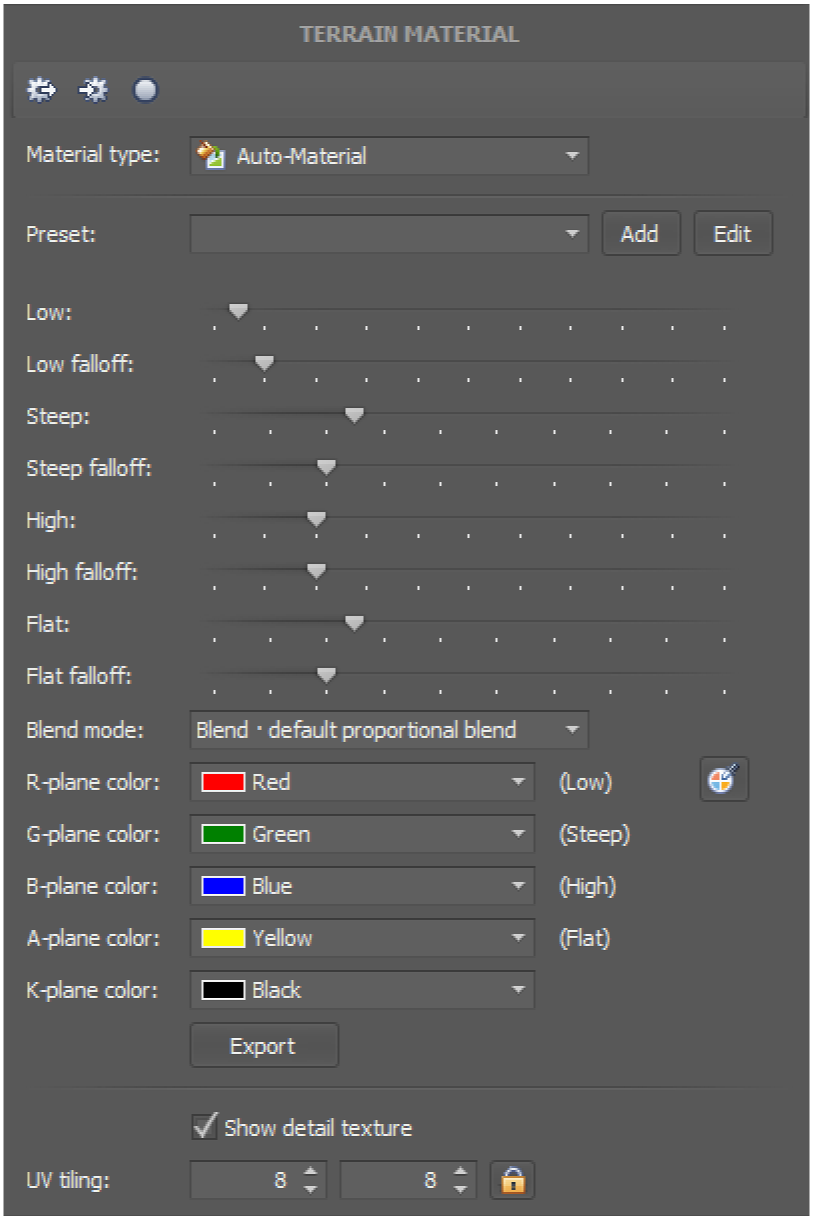
 Load or re-load the specified texture file.

Vertex color – The terrain mesh vertex color. This can be changed to tint the texture. The default color is white.

UV tiling – The UV tiling of the texture. Use the lock button to lock the U and V values.

Material Type Auto-Material

Render the viewport terrain mesh using an auto-generated RGBAK splatmap colormap.



 Load the original settings from the application settings file.

 Save the current settings to the application settings file.

 Reset the properties to the default settings.

Material Type: Auto-Material – Choose the material type.

Preset – Choose a preset color palette.

Add – Add the current color palette to the User Color Presets.

Edit – Edit the User Color Presets.

Low – Adjust the Low Altitude weightmap value.

Low Falloff – Adjust the Low Altitude weightmap falloff.

Steep – Adjust the Steep Slope weightmap value.

Steep Falloff – Adjust the Steep Slope weightmap falloff.

High – Adjust the High Altitude weightmap value.

High Falloff – Adjust the High Altitude weightmap falloff.

Flat – Adjust the Flat Slope weightmap value.

Flat Falloff – Adjust the Flat Slope weightmap falloff.

Blend Mode – Choose the Blend or Priority RGBAK Blend Mode.

R-plane color – The terrain color for the splatmap texture red plane.

G-plane color – The terrain color for the splatmap texture green plane.

B plane color – The terrain color for the splatmap texture blue plane.

A-plane color – The terrain color for the splatmap texture alpha plane.

K-plane color – The terrain color for the splatmap black plane.

Image Color Picker – Choose colors from an image file. See the Image Color Picker chapter.

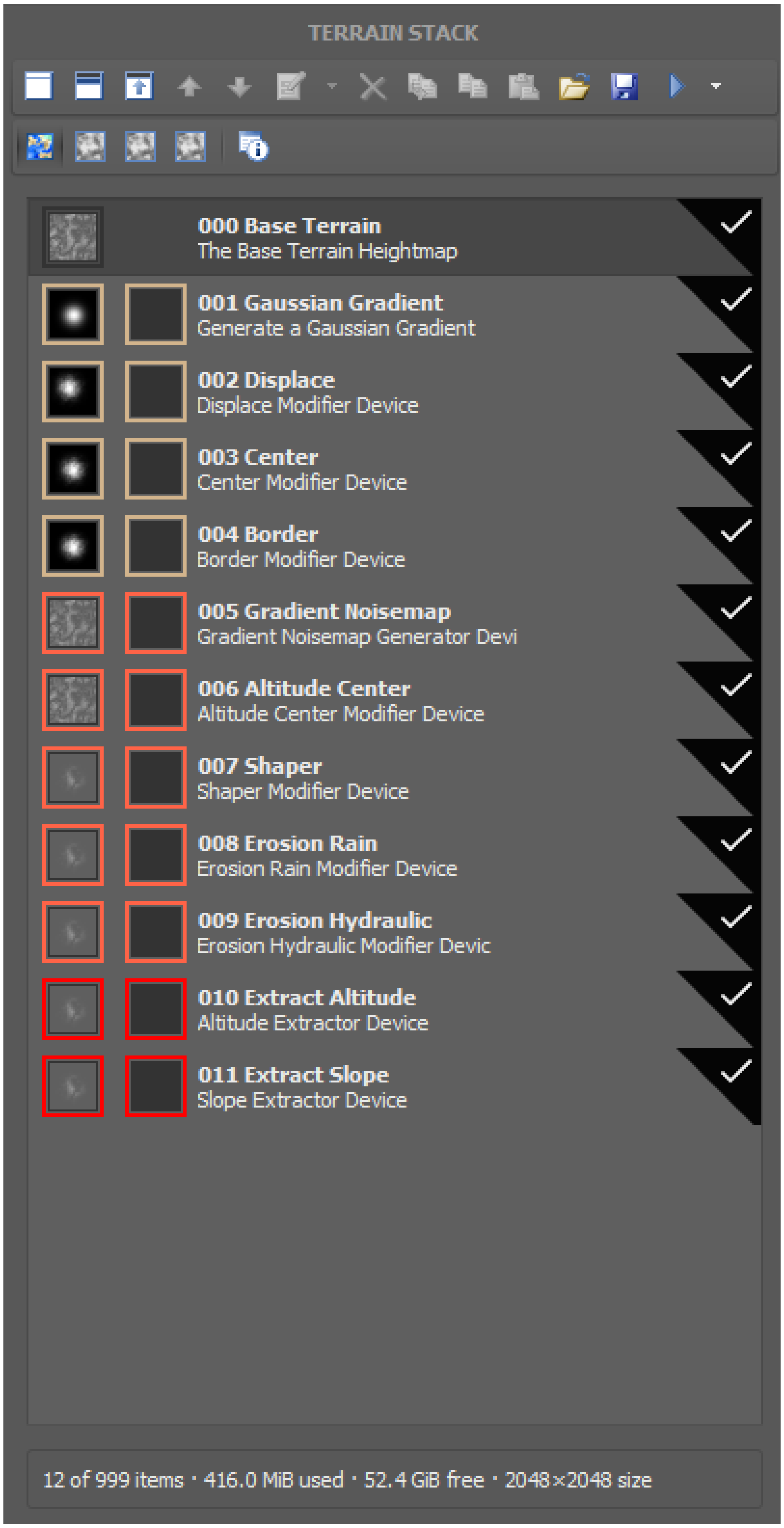
Export – Export the four RGBAK Auto-material weightmaps to files.

Show detail texture – Whether the detail texture is rendered on the terrain mesh.

UV tiling – The UV tiling of the detail texture. Use the lock button to lock the U and V values.

Terrain Stack

The Terrain Stack is used to create non-destructive complex terrain systems that include more than 100 Devices, individual masks per Device item, plus much more.
See the examples later in this manual for how to use the terrain stack.



Terrain Stack Main Toolbar

New stack – Create a new terrain stack.
New device – Add a new device to the terrain stack.
Collapse stack – Collapse the terrain stack to the base terrain.
Move device up – Move the device up the terrain stack list.
Move device down – Move the device down the terrain stack list.
Edit device – Display the device edit dialog.
Edit mask – Display the device mask edit dialog.
Delete device – Delete the device from the terrain stack list.
Duplicate device – Duplicate the device in the terrain stack list.
Copy device – Copy the selected device properties to the clipboard.
Paste device – Paste the clipboard to the selected device properties.
Load terrain stack – Load a terrain stack file from disk.
Save terrain stack – Save the current terrain stack to a file on disk.
Build device – Build the currently selected device.
Build to device – Build from the base terrain to the currently selected device.
Build from device – Build from the currently selected device to the end of the terrain stack.
Build all – Build all device in the terrain stack in order of the Groups.

Terrain Stack Tools Toolbar

View Datamap – View the terrain stack item datamap in the viewport.
View Mask – View the terrain stack item mask in the viewport.
View ResultMaskA – View the terrain stack item result mask A in the viewport.
View ResultMaskB – View the terrain stack item result mask B in the viewport.
Information – View the terrain stack items information dialog.

Terrain Stack List

000 Base Terrain – This is always the first item in the terrain stack and is the default terrain in the viewport.

New devices are always added to the end of the terrain stack list.

The first thumbnail is the device datamap. Double-click the thumbnail to edit the device.
The second thumbnail is the device mask. Double click the thumbnail to edit the device mask.

Double-click on the item text to display the device properties dialog.

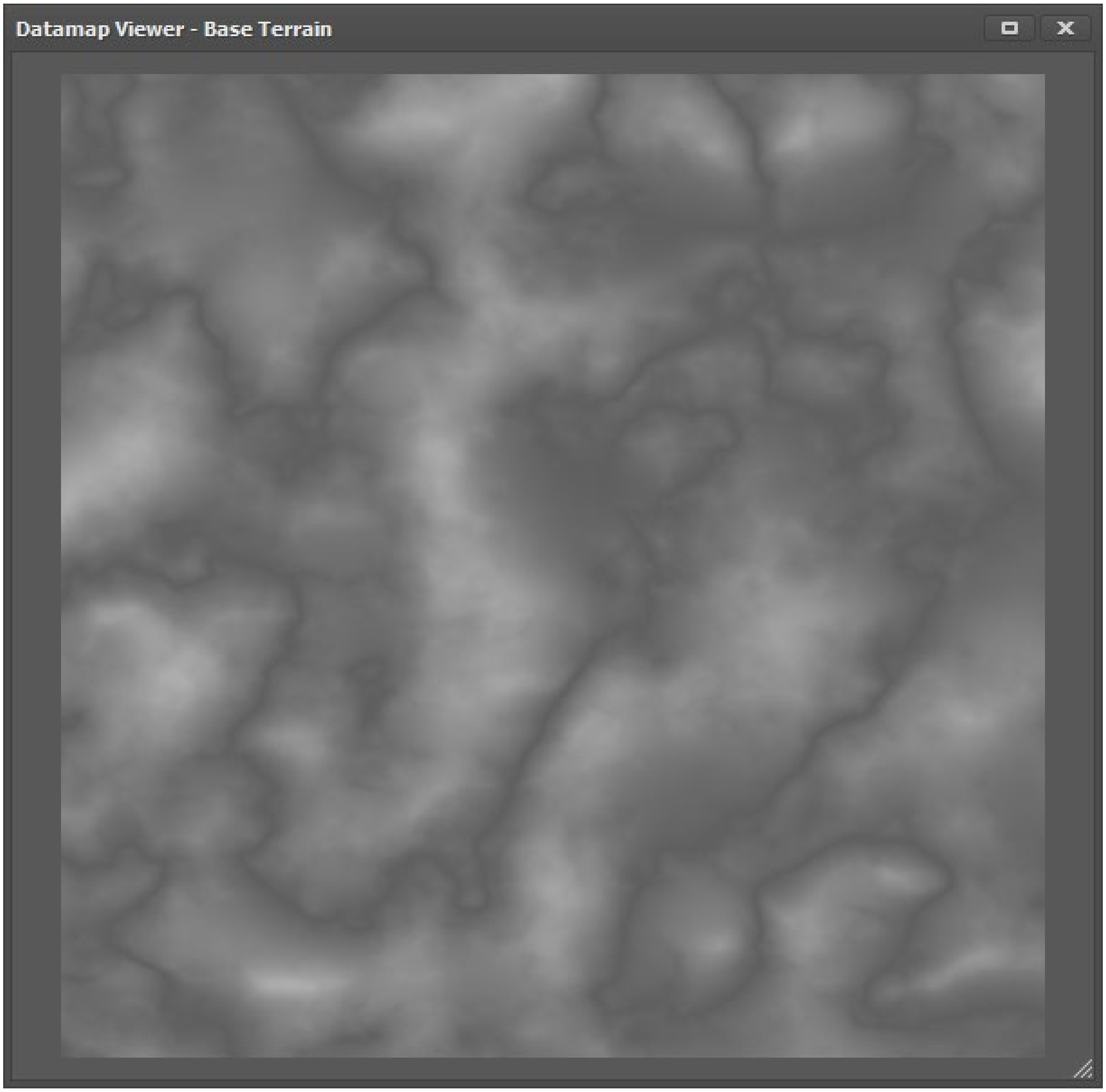
Double-click on the check mark to enable and disable the item from the build list.

Terrain Stack Statusbar

The terrain stack statusbar contains the number of items in the terrain stack; the approximate amount of memory used by all terrain stack items; the approximate amount of free system memory; and the size of the datamap on the terrain stack.

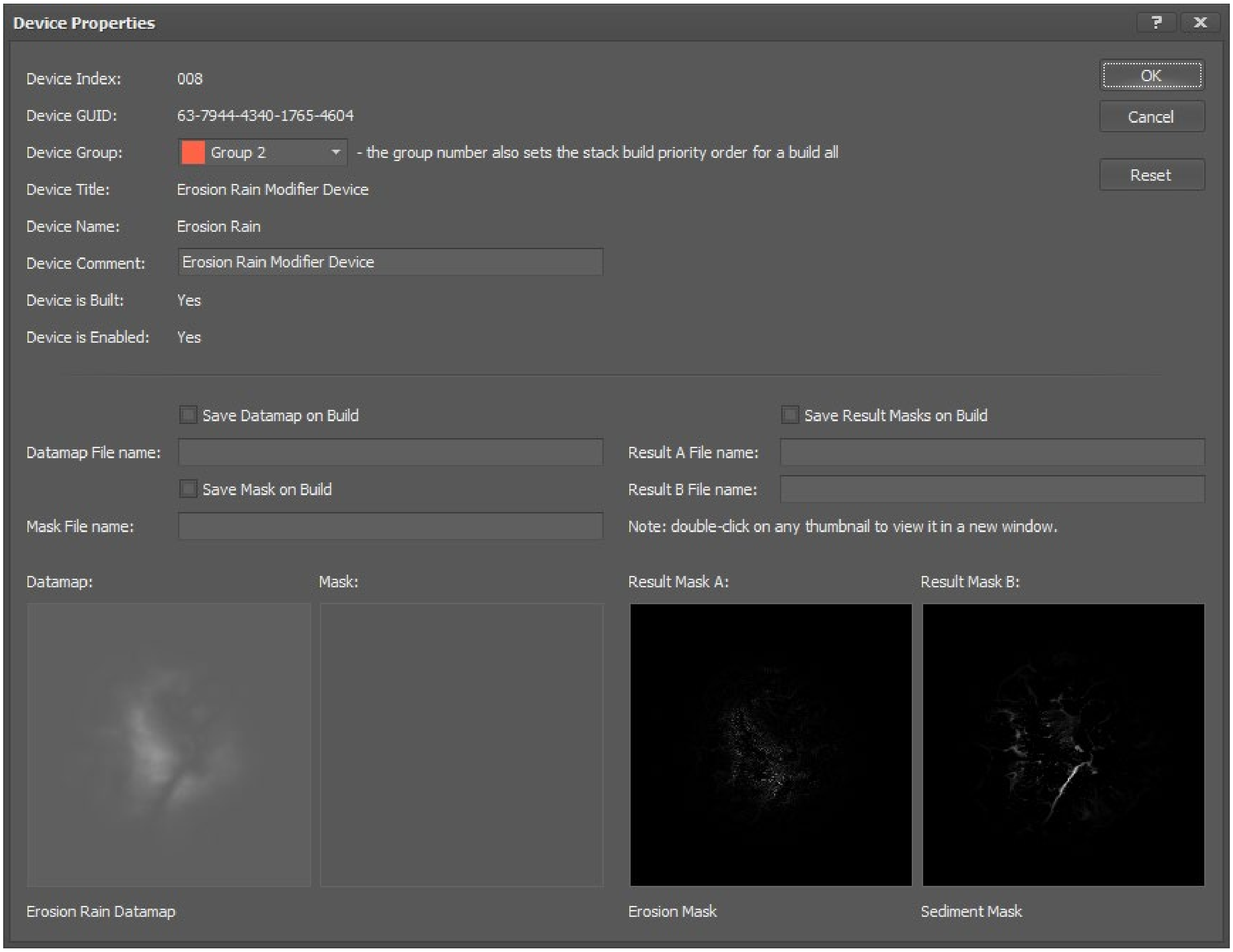
Terrain Stack Datamap Viewer

Double click on the base terrain item, or on any thumbnail on the Device Properties dialog to display the Datamap Viewer.
This viewer can be resized to the full size of the computer screen and the datamap in the viewer will resize to fit.



Terrain Stack Device Properties

Double click the text area of any terrain stack item to display the Device Properties dialog.



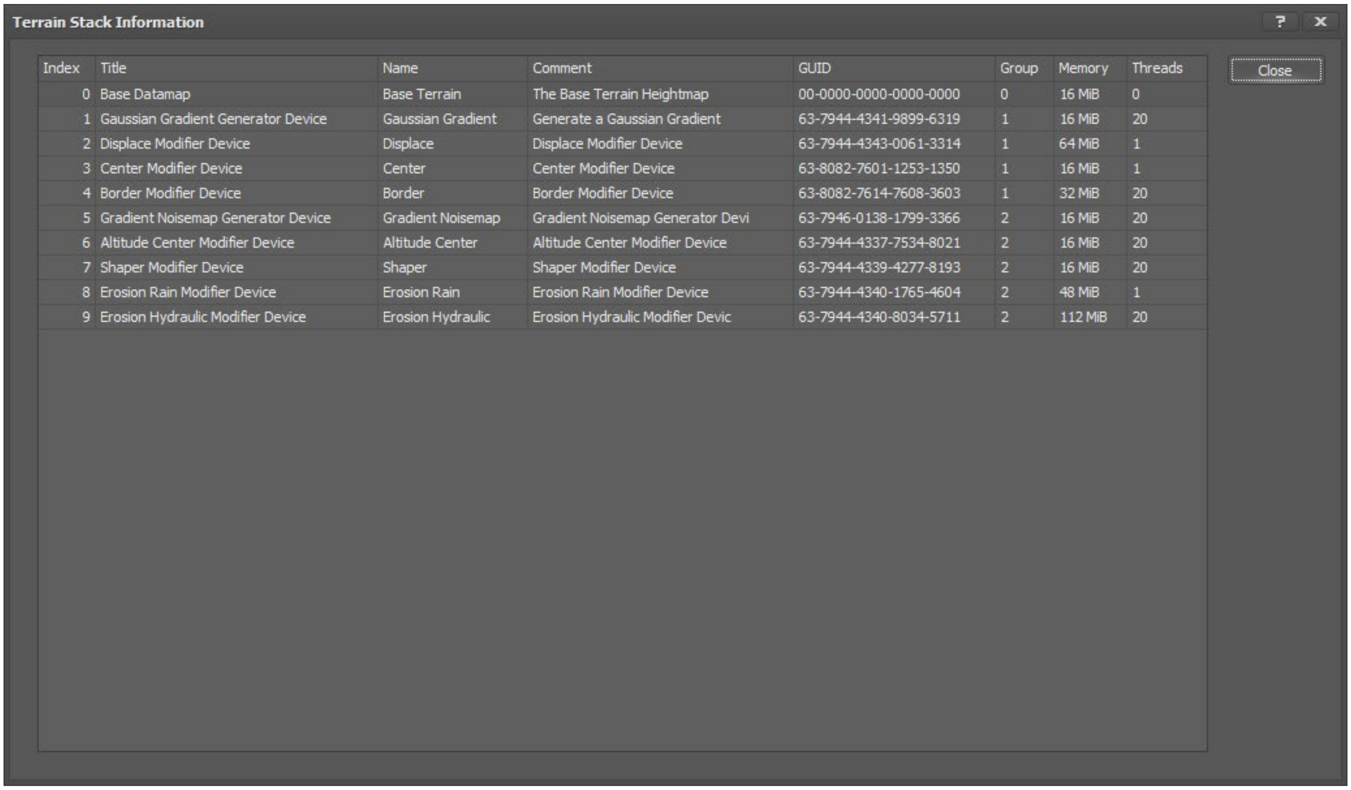
Device Properties – The list of properties for the selected terrain stack device.
Device Group – The group number that the terrain stack item belongs to, items are built in group order.
Device Comment – A user editable comment regarding the terrain stack device item.

Save options – Select any checkbox to save the terrain stack item to disk after a build all.
File names – The file names for the terrain stack items to be saved to disk after a build all.

Thumbnails – Thumbnail images of the terrain stack item datamaps.

Terrain Stack Items Information

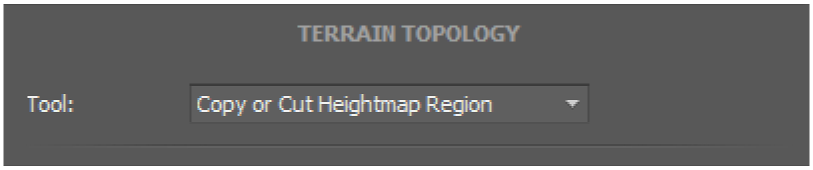
Click on the terrain stack toolbar Information button to display the Items Information dialog.



Index	Title	Name	Comment	GUID	Group	Memory	Threads
0	Base Datamap	Base Terrain	The Base Terrain Heightmap	00-0000-0000-0000-0000	0	16 MiB	0
1	Gaussian Gradient Generator Device	Gaussian Gradient	Generate a Gaussian Gradient	63-7944-4341-9899-6319	1	16 MiB	20
2	Displace Modifier Device	Displace	Displace Modifier Device	63-7944-4343-0061-3314	1	64 MiB	1
3	Center Modifier Device	Center	Center Modifier Device	63-8082-7601-1253-1350	1	16 MiB	1
4	Border Modifier Device	Border	Border Modifier Device	63-8082-7614-7608-3603	1	32 MiB	20
5	Gradient Noisemap Generator Device	Gradient Noisemap	Gradient Noisemap Generator Devi	63-7946-0138-1799-3366	2	16 MiB	20
6	Altitude Center Modifier Device	Altitude Center	Altitude Center Modifier Device	63-7944-4337-7534-8021	2	16 MiB	20
7	Shaper Modifier Device	Shaper	Shaper Modifier Device	63-7944-4339-4277-8193	2	16 MiB	20
8	Erosion Rain Modifier Device	Erosion Rain	Erosion Rain Modifier Device	63-7944-4340-1765-4604	2	48 MiB	1
9	Erosion Hydraulic Modifier Device	Erosion Hydraulic	Erosion Hydraulic Modifier Devic	63-7944-4340-8034-5711	2	112 MiB	20

Terrain: Topology

The Terrain Topology tools are main viewport editing tools that use advanced features to modify the current editor heightmap terrain.



These tools use the main viewport's 3D Selection Cube Gizmo and 3D Terrain Brush Gizmo, along with the Terrain Brush clipboard, to manipulate the current editor heightmap terrain using the method determined by each individual tool.

The Copy, Deform, and Merge Topology Tools also fully support the Gizmo Widgets, for translation, rotation, and scale of the Gizmos using the viewport mouse to transform the Gizmos on the selected X,Y,Z axis.

Use "Copy or Cut Heightmap Region" to select any region on the current editor heightmap terrain and copy or cut then paste it at another location. This tool is suited for duplicating terrain features such as mountains around the heightmap.

Use "Deform the Heightmap Region" to select and deform any region on the current editor heightmap terrain. This tool is designed to provide localized deformation of terrain features.

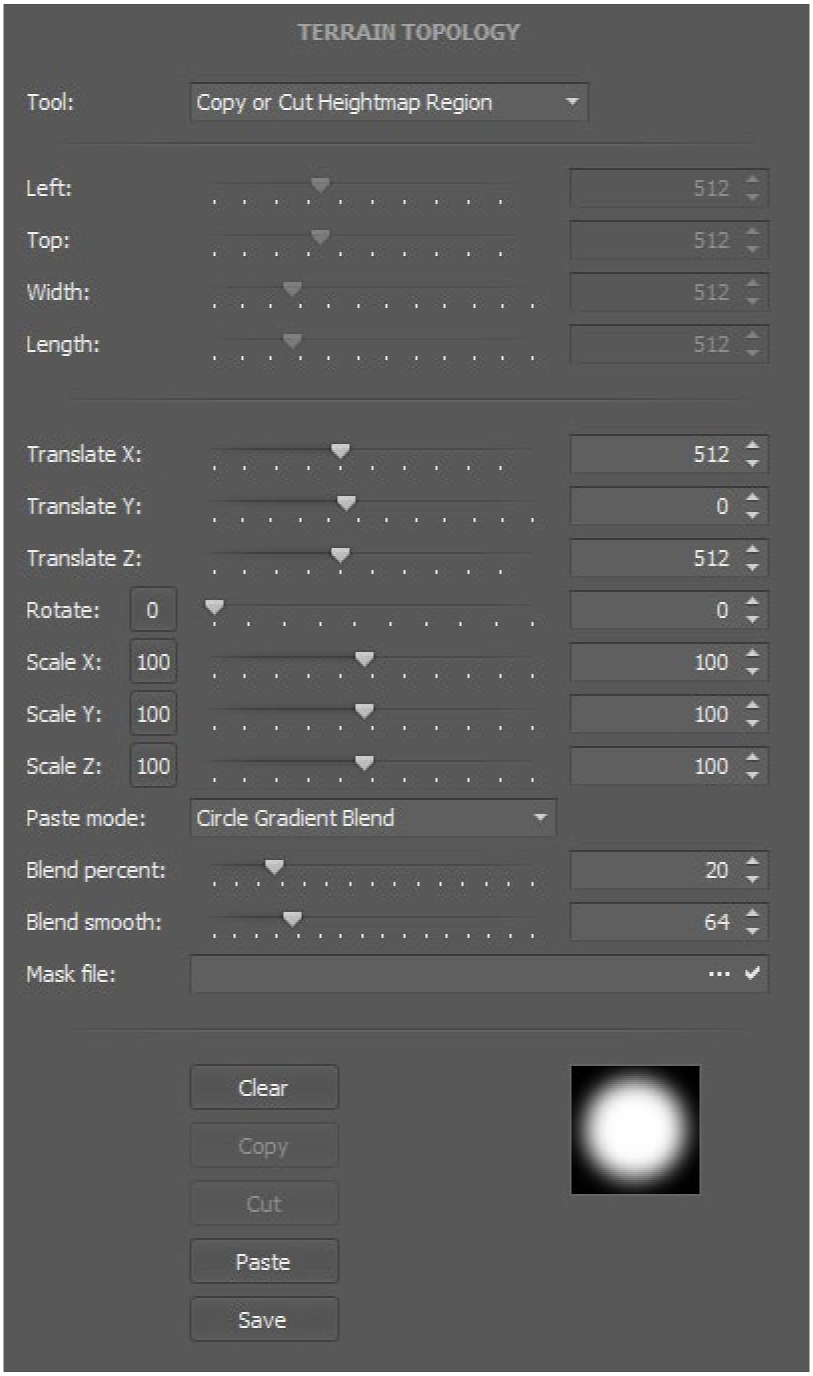
Use "Extend Heightmap using Tiles" to load a set of heightmap tiles and assemble them into a final editor heightmap terrain. This tool is designed for working with PNG-16, TIF-16 and TSmap tile file sets.

Use "Merge a File with Heightmap" to load a heightmap file and paste it at any location on the editor heightmap terrain. This tool is designed for pasting Terrain Brushes on the heightmap. This tool is designed for working with PNG-16, TIF-16 and TSmap files.

These tools fully support the editor Undo system, so it is possible to undo a paste function and retry.

Copy or Cut Heightmap Region

This Topology tool copies or cuts a region on the current editor heightmap terrain to be pasted at a new location.



Tool	The selected Topology tool.
Left	The copy region left coordinate.
Top	The copy region top coordinate.
Width	The copy region width.
Length	The copy region length.
Translate X	The paste translation on the X axis.
Translate Y	The paste translation on the Y axis.
Translate Z	The paste translation on the Z axis.
Rotate	The paste rotation. This set of controls includes a reset to 0 button.

Scale X	The paste scale on the X axis. This set of controls includes a reset to 100% button.
Scale Y	The paste scale on the Y axis. This set of controls includes a reset to 100% button.
Scale Z	The paste scale on the Z axis. This set of controls includes a reset to 100% button.
Paste mode	The paste blend mode.
Blend percent	The paste blend percent.
Blend smooth	The paste blend smooth (Circle and Rectangle only).
Mask file	The paste blend external mask file.
Clear	Clear the current copy operation.
Copy	Copy the current region to the terrain brush clipboard.
Cut	Cut the current region to the terrain brush clipboard.
Paste	Paste the terrain brush clipboard at the current location.
Save	Save the terrain brush clipboard to a heightmap file.
Mask Preview	A thumbnail preview of the current mask shape and alpha blend.

To select this tool, click on the Terrain Topology function button, and select the Copy item on the Tool drop-down combobox control.

To use the Copy tool, use the Left, Top, Width, and Length controls to move and size the Selection Cube gizmo to the desired location and region, click on the Copy button to copy that region to the Terrain Brush clipboard, then use the Translate, Rotate, Scale controls to adjust the Terrain Brush gizmo, then select the desired Paste Mode and Blend settings, and click on the Paste button to paste the Terrain Brush clipboard onto the editor heightmap terrain.
Click on the Clear button to reset the controls to defaults and clear the current copy operation.

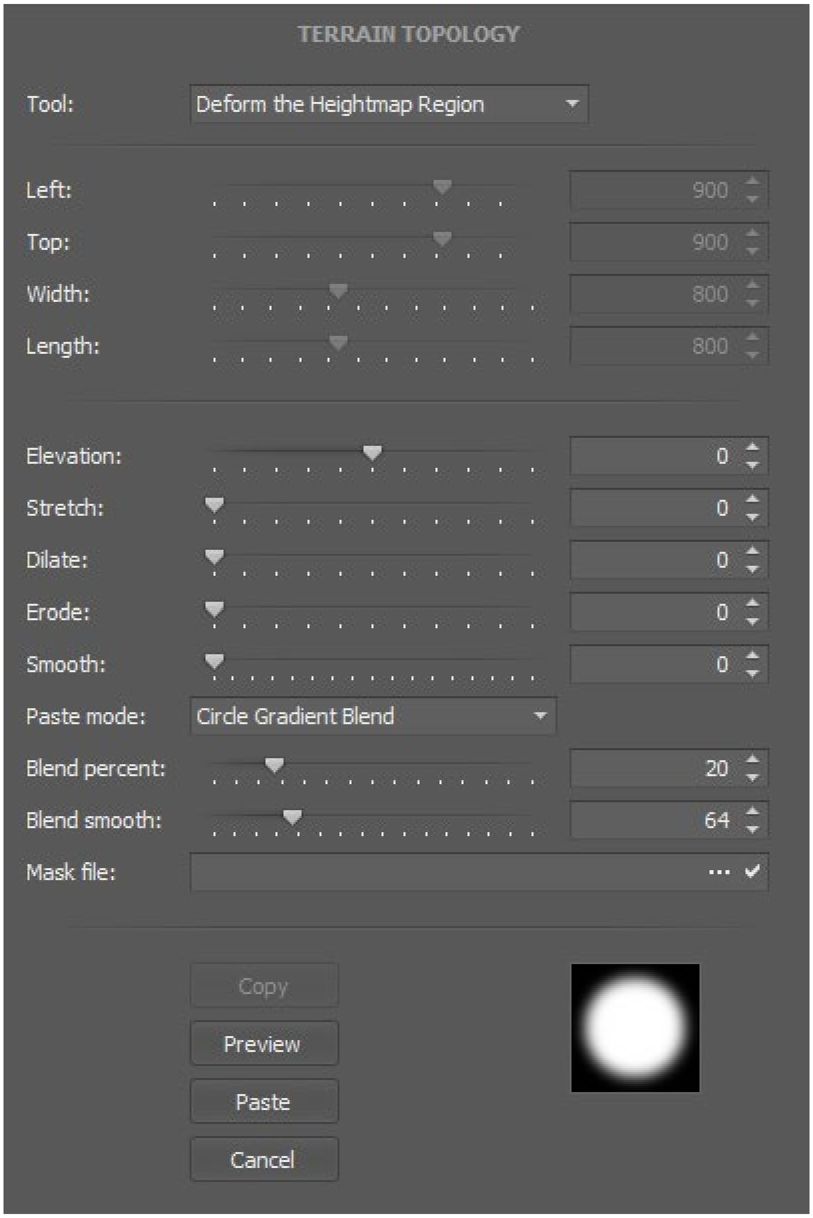
The main editor must already contain a heightmap terrain to copy and paste regions around the heightmap.

This Topology tool uses the main editor viewport's Selection Cube gizmo and Terrain Brush gizmo. Those gizmos will be visible in the main viewport when the tool is selected.

When finished using this tool, the Clear button should be clicked on to make sure that all resources including clipboard memory used by the tool are freed up.

Deform the Heightmap Region

This Topology tool deforms a region of the heightmap with a number of deform tools.



Tool	The selected Topology tool.
Left	The copy region left coordinate.
Top	The copy region top coordinate.
Width	The copy region width.
Length	The copy region length.
Elevation	Change the heightmap region elevation.
Stretch	Stretch or flatten the heightmap region elevation.
Dilate	Dilate (enlarge) the heightmap region.
Erode	Erode (shrink) the heightmap region.
Smooth	Smooth the heightmap region.
Paste mode	The paste blend mode.
Blend percent	The paste blend percent.
Blend smooth	The paste blend smooth (Circle and Rectangle only).
Mask file	The paste blend external mask file.

Copy	Copy the current region to the terrain brush clipboard.
Preview	Preview the deformation result.
Paste	Paste the terrain brush clipboard at the current location.
Cancel	Cancel the current copy process and restore the original terrain.
Mask Preview	A thumbnail preview of the current mask shape and alpha blend.

To select this tool, click on the Terrain Topology function button, and select the Deform item on the Tool drop-down combobox control.

To use the Deform tool, use the Left, Top, Width, and Length controls to move and size the Selection Cube gizmo to the desired location and region, click on the Copy button to copy that region to the Terrain Brush clipboard, then use the Elevation, Smooth, Dilate, Erode controls to adjust the terrain deformation, selecting the Preview button to preview it, then select the desired Paste Mode and Blend settings, and click on the Paste button to paste the Terrain Brush clipboard onto the editor heightmap terrain.
Click on the Clear button to reset the controls to defaults and clear the current copy operation.

The deformation tools work from the top down, in other words, Elevation occurs before Stretch, etc.

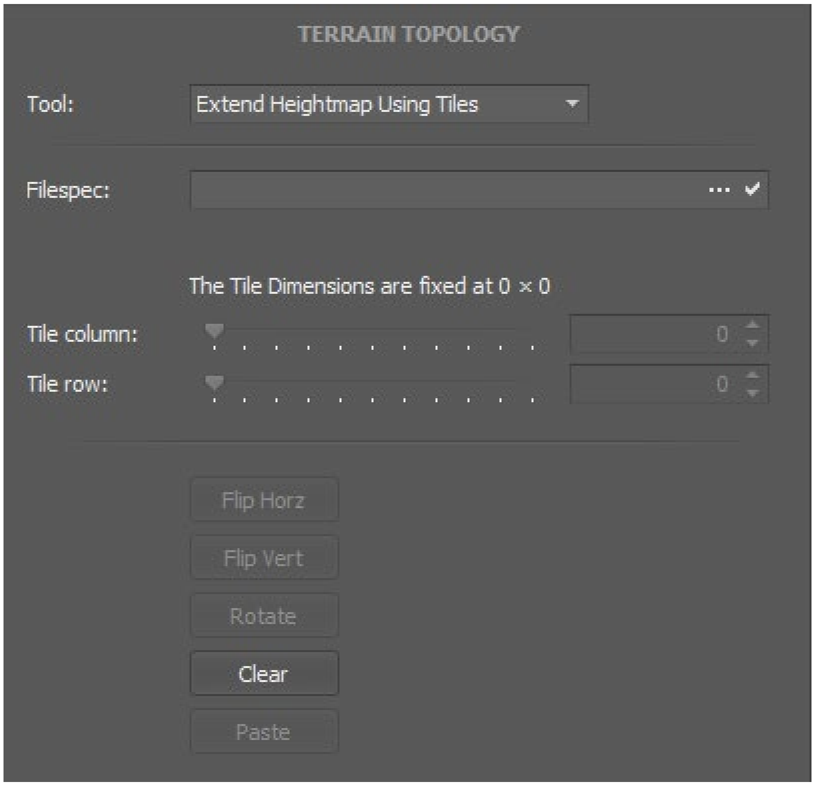
The main editor must already contain a heightmap terrain to deform regions on the heightmap.

This Topology tool uses the main editor viewport’s Selection Cube gizmo. That gizmo will be visible in the main viewport when the tool is selected.

When finished using this tool, if Paste is not chosen, the Cancel button should be clicked on to make sure that all resources including clipboard memory used by the tool are freed up.

Extend Heightmap using Tiles

This Topology tool extends the current editor heightmap terrain with additional loaded tile files.



Tool	The selected Topology tool.
Filespec	Select the tile file to load to the Terrain Brush gizmo clipboard.
Tile column	Selects the Selection Cube and Terrain Brush gizmo tile column.
Tile row	Selects the Selection Cube and Terrain Brush gizmo tile row.
Flip Horz	Flip the current clipboard tile horizontally.
Flip Vert	Flip the current clipboard tile vertically.
Rotate	Rotate the current clipboard tile clockwise, the tile must be square aspect.
Clear	Clear the current tile and all controls.
Paste	Paste the current Terrain Brish gizmo clipboard to the selected column and row.

To select this tool, click on the Terrain Topology function button, and select the Extend item on the Tool drop-down combobox control.

To use the Extend tool, use the Filespec control to open and load a tile file, then use the Tile Column and Tile Row controls to move the Selection Cube and Terrain Brush gizmos to the desired location, optionally Flip or rotate the Terrain Brush, then click on the Paste button to paste the tile, and move onto the next tile in the sequence.
Click on the Clear button to reset the controls to defaults and clear the current tile operation.

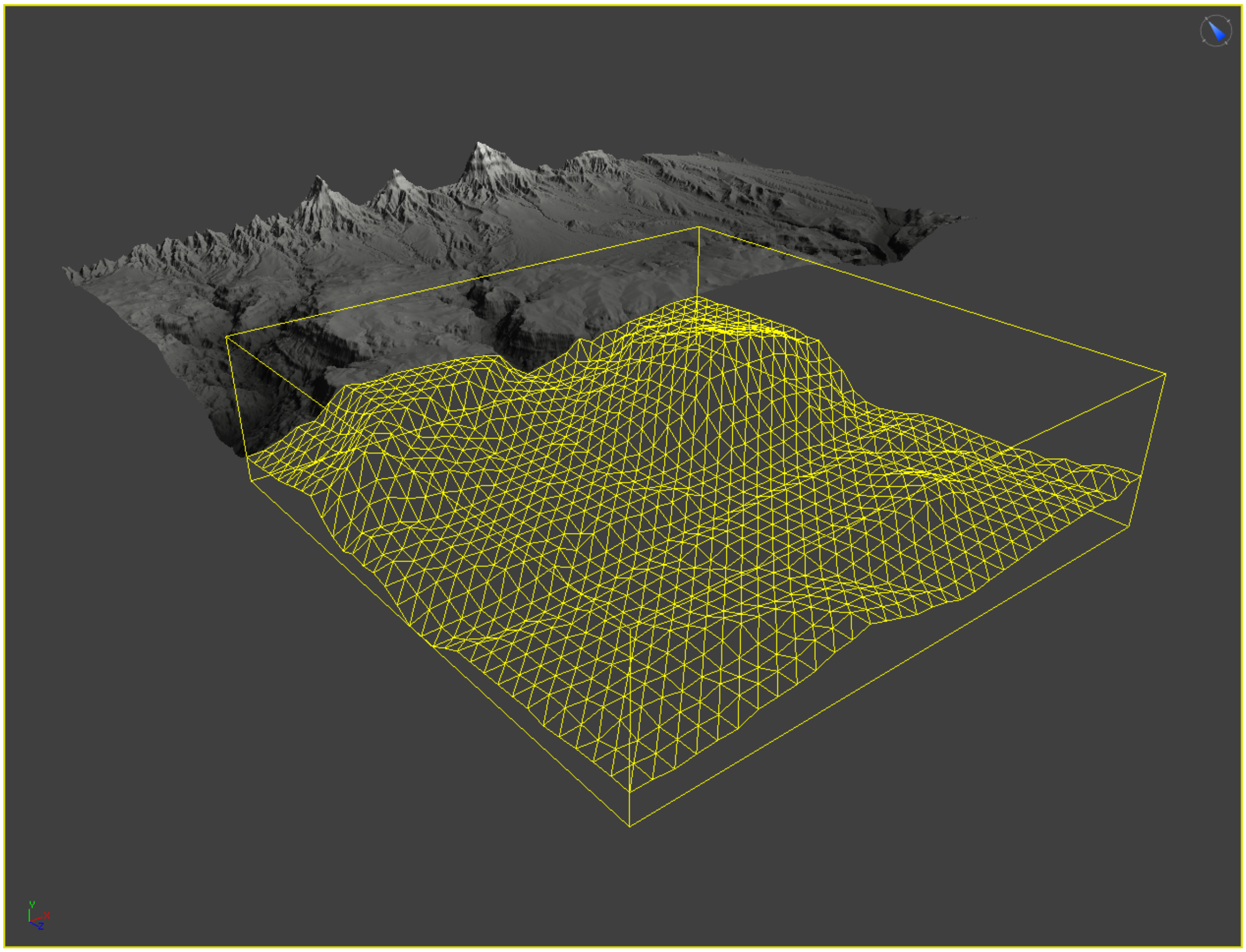
The main editor must already contain a heightmap terrain to be extended.
The Tile dimensions will then be fixed at the current editor heightmap terrain dimensions during the duration of using this tool, and any loaded tiles will be resampled to this fixed tile size. Therefore, this tool is usually used to stitch together existing sets of tiles of all the same dimensions, such as a 1024x1024 4-tile set that gets extended into a 2048x2048 final heightmap terrain.

This Topology tool uses the File menu Import Terrain Read Method of Scale to maintain the elevations of the tiles correctly.
This means that the only supported File Formats are PNG 16-bit Grayscale, TIF 16-bit Grayscale, and Terresculptor TSmap format. All other file formats are normalized on import and cannot be used with the Topology Extend tool.
When importing the first tile into the editor using the File Import Terrain menu item, be sure to choose the PNG [new] or TIF [new] file type as those are the only formats supported, then set the Read Method option on the import dialog to "Scale" before importing. The TSmap file format is also supported and is imported using the File menu Open Terrain item.

This Topology tool uses the main editor viewport's Selection Cube gizmo and Terrain Brush gizmo. Those gizmos will be visible in the main viewport when the tool is selected.

When finished using this tool, the Clear button should be clicked on to make sure that all resources including clipboard memory used by the tool are freed up.

In this example image here, two tiles have already been stitched, and a third tile is being extended on the lower left corner, where the Selection Cube and Terrain Brush gizmos are located.



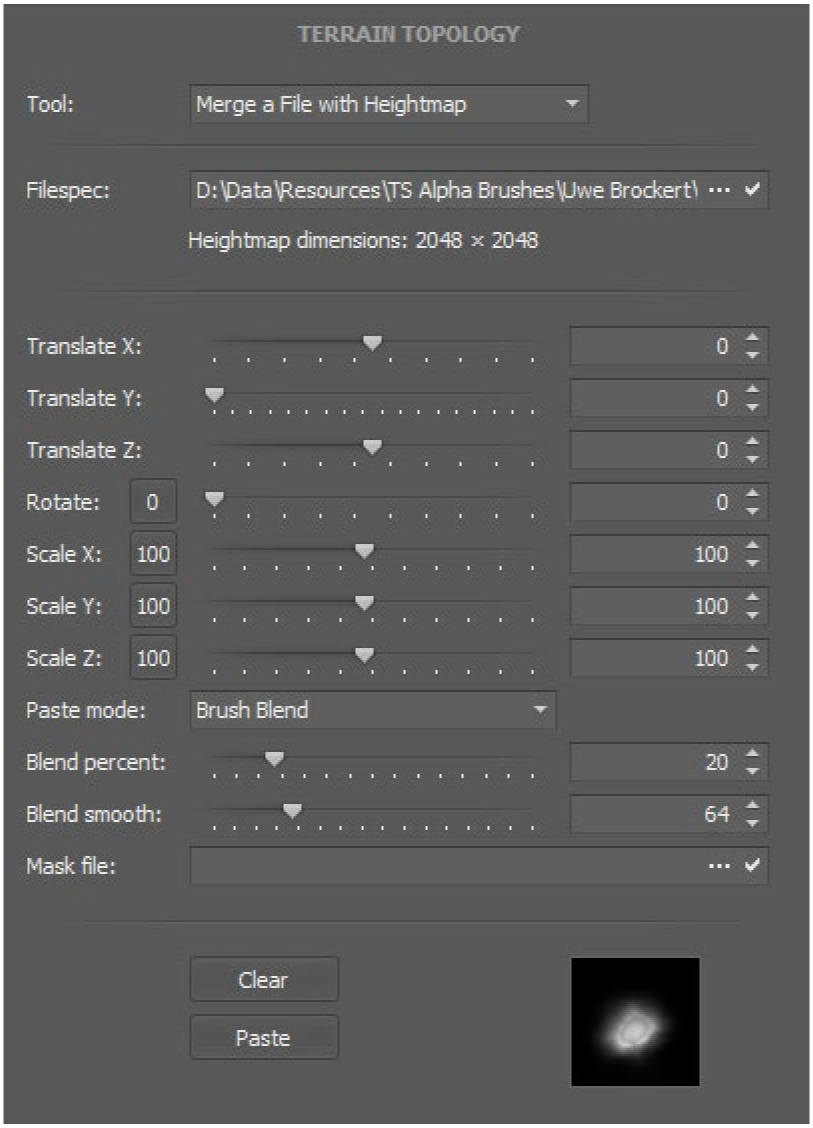
When a tile file is loaded using the Filespec control, the Tile Column and Tile Row controls are then used to position the gizmos for where the tile is to be pasted.

The columns are numbered left to right as -1 to Total Columns +1.
The rows are numbered top to bottom as -1 to Total Rows + 1.

Note that it is possible to paste anywhere on the current editor heightmap terrain, or to extend out past any edge to extend the editor heightmap terrain to a new larger size.

Merge a File with Heightmap

This Topology tool merges an external file with the current editor heightmap terrain.



Tool	The selected Topology tool
Filespec	The file to load and merge.
Translate X	The paste translation on the X axis.
Translate Y	The paste translation on the Y axis.
Translate Z	The paste translation on the Z axis.
Rotate	The paste rotation. This set of controls includes a reset to 0 button.
Scale X	The paste scale on the X axis. This set of controls includes a reset to 100% button.
Scale Y	The paste scale on the Y axis. This set of controls includes a reset to 100% button.
Scale Z	The paste scale on the Z axis. This set of controls includes a reset to 100% button.
Paste mode	The paste blend mode.
Blend percent	The paste blend percent.
Blend smooth	The paste blend smooth (Circle and Rectangle only).
Mask file	The paste blend external mask file.
Clear	Clear the current merge operation.
Paste	Paste the terrain brush clipboard at the current location.

Mask Preview	A thumbnail preview of the current mask shape and alpha blend.
To select this tool, click on the Terrain Topology function button, and select the Merge item on the Tool drop-down combobox control.

To use the Merge tool, use the Filespec control to select a heightmap file to load and merge, then use the Translate, Rotate, Scale controls to adjust the Terrain Brush gizmo, then select the desired Paste Mode and Blend settings, and click on the Paste button to paste the Terrain Brush clipboard onto the editor heightmap terrain.
Click on the Clear button to reset the controls to defaults and clear the current merge operation.

The main editor must already contain a heightmap terrain to paste the external heightmap file to.

This Topology tool uses the main editor viewport's Selection Cube gizmo and Terrain Brush gizmo. Those gizmos will be visible in the main viewport when the tool is selected.

Copy and Merge Blend Masks

The Copy and Merge tools have a set of Blend Masks that are used to blend the Terrain Brush with the current editor heightmap terrain. These Blend Masks provide a variety of blending shapes, including circles and rectangles.

The Blend Mask types are:

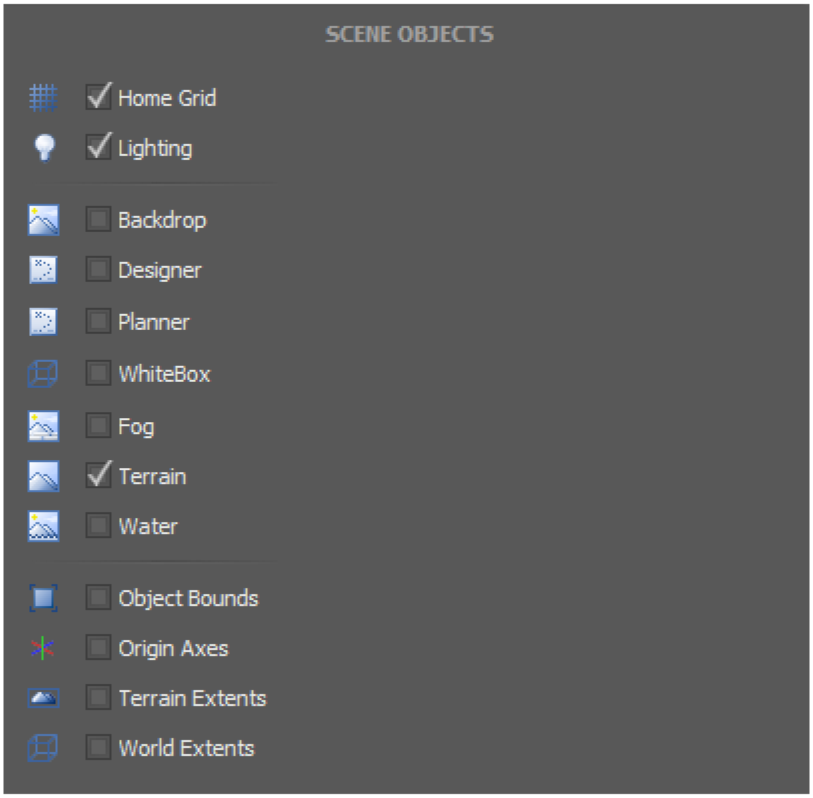
No Blending	No edge blending will be performed, the Terrain Brush is simply pasted as is.
Brush Blend	Alpha Brush blending, the blend is the brush itself, this is on the Merge tool only.
Border Gradient Blend	A hard gradient border blend.
Circle Gradient Blend	A soft circle gradient blend, supports Blend Smooth.
Gaussian Gradient Blend	A gaussian gradient bump blend.
Rectangle Gradient Blend	A soft rectangle gradient blend, supports Blend Smooth.
Blend Mask File	An external blend mask file, this should be an 8/16-bit grayscale image.

Blend values in the mask that are white will be the Clipboard Terrain Brush pixel while values that are black will be the source Editor Heightmap Terrain pixel. Gray values between black and white will be gradient blends of the two pixels.

The Blend Mask File should be an 8-bit or 16-bit grayscale image, with the value white where the Terrain Brush pixels are to be selected. 16-bit grayscale images will typically provide smoother blending. An example soft edge island shape mask file is shown here:

Scene: Objects

The function panel scene objects allows for showing and hiding a variety of main viewport scene objects.
All of these scene objects are available at all times, including when a terrain is not loaded.
See the *Scene Objects and Helpers* chapter for information on each tool.



Home Grid – Toggle the visibility of the home grid.

Lighting – Toggle the scene lighting.

Backdrop – Toggle the visibility of the scene backdrop.

Designer – Toggle the visibility of the scene designer plane.

Planner – Toggle the visibility of the scene planner cards.

WhiteBox – Toggle the visibility of the scene whitebox meshes and shapes.

Fog – Toggle the visibility of the scene fog effect.

Terrain – Toggle the visibility of the scene terrain.

Water – Toggle the visibility of the scene water.

Object Bounds – Toggle the visibility of the object bounding boxes.

Origin Axes – Toggle the visibility of the colored origin axes lines.

Terrain Extents – Toggle the visibility of the terrain extents bounding box.

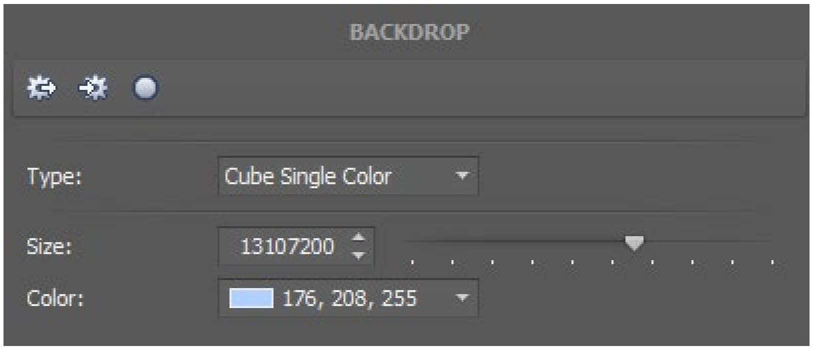
World Extents – Toggle the visibility of the world extents bounding box.

Scene: Backdrop

The scene backdrop is an optional visualization mesh that is used to simulate a sky surrounding the terrain mesh.

 The Backdrop is toggled on and off with the Function panel Scene objects.

The following are the properties common to all Backdrop types:



 Load the original backdrop settings from the application settings file.

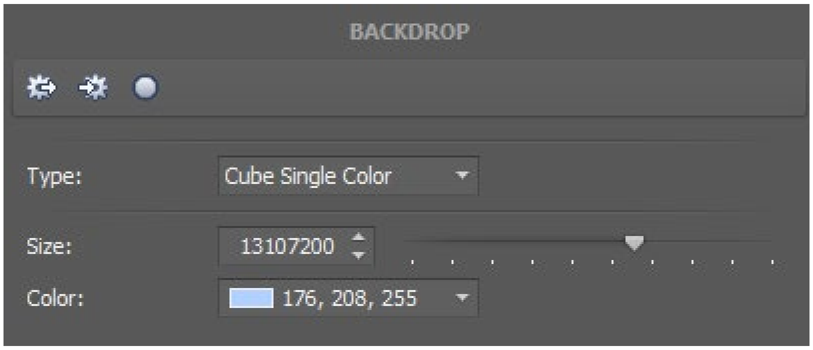
 Save the current backdrop settings to the application settings file.

 Reset the backdrop to the default settings.

Type – Specify the scene backdrop type.
There are five different backdrop types.

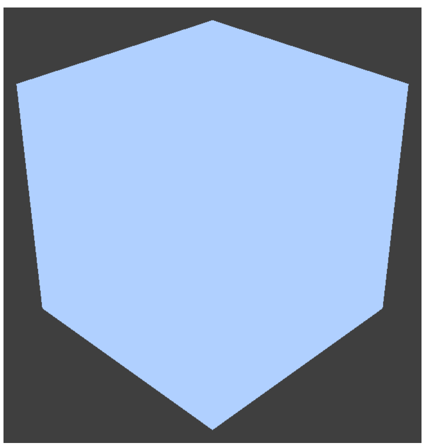
Scene: Backdrop: Cube

The Cube Single Color backdrop is a single color six-sided cube.



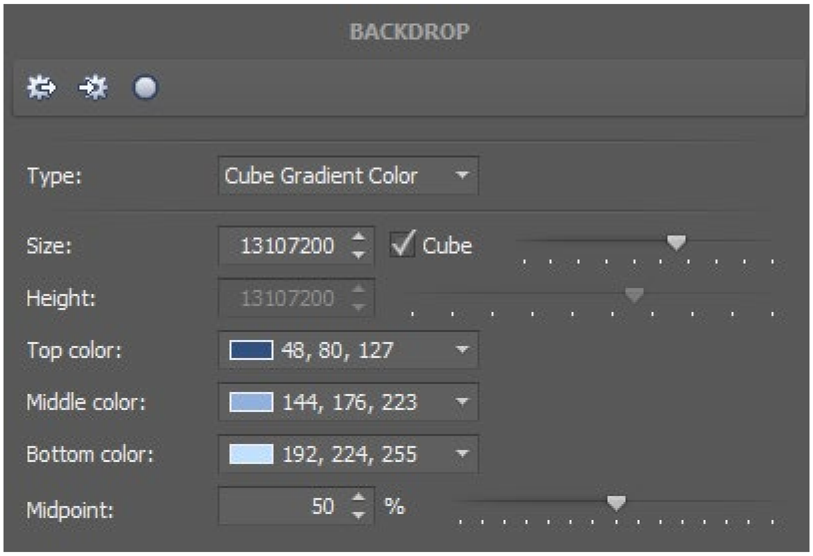
Size – Specify the size of the cube in world units.

Color – Specify the color of the cube.
The pop-up Color Dialog also includes common sky color presets.



Scene: Backdrop: Cube Gradient

The Cube Gradient Color backdrop is a three color six-sided cube with the color gradient along the Y axis.



Size – Specify the size or width/length size of the cube in world units.

Cube – Maintains a cubic height-to-width/length size shape when checked.

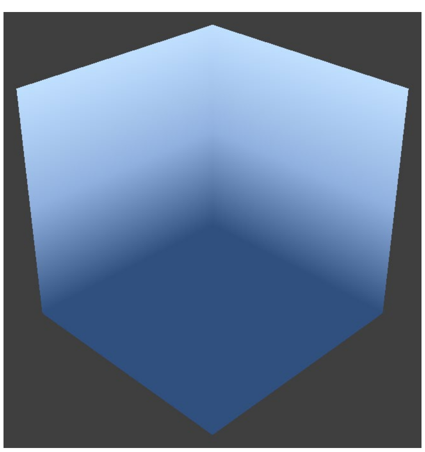
Height – Specify the height of the cube when the Cube checkbox is not checked.

Top Color – Specify the top color of the cube.
The pop-up Color Dialog also includes 16 common sky color presets.

Middle Color – Specify the middle color of the cube.
The pop-up Color Dialog also includes 16 common sky color presets.

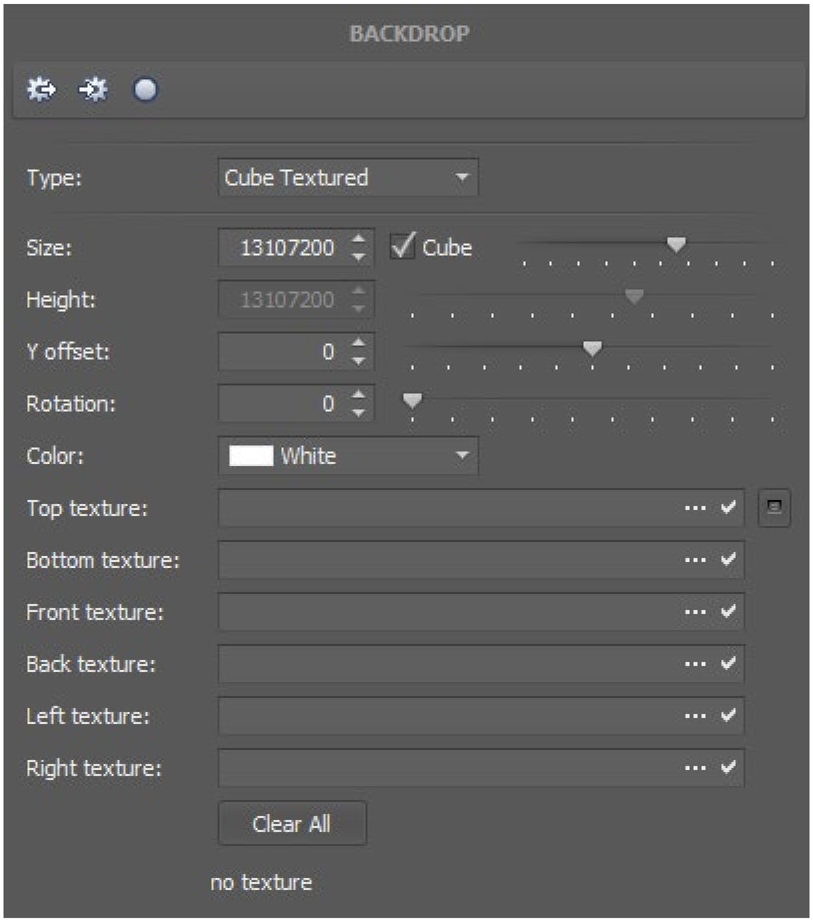
Bottom Color – Specify the bottom color of the cube.
The pop-up Color Dialog also includes 16 common sky color presets.

Midpoint – Specify the midpoint percent where the middle color is located along the cube height.
A midpoint of 0 is the bottom of the cube, a midpoint of 100 is the top of the cube.



Scene: Backdrop: Cube Textured

The Cube Textured backdrop is a six texture six-sided cube.



Size – Specify the size or width/length size of the cube in world units.

Cube – Maintains a cubic height-to-width/length size shape when checked.

Height – Specify the height of the cube when the Cube checkbox is not checked.

Y offset – Specify the world Y-axis offset for the center of the cube.

Rotation – Specify the world Y-axis rotation around the center of the cube.

Textures

The textured cube backdrop supports square-aspect or 2:1 width:height textures only.
See the chapter on Texture Support for a list of supported texture formats and sizes.

 Browse for a texture file.

 Load or re-load the specified texture file.

Top texture – Specify the texture file to display on the cube top surface.

The auto-fill textures button will automatically fill the Bottom, Front, Back, Left, and Right textures based on the Top texture file name.

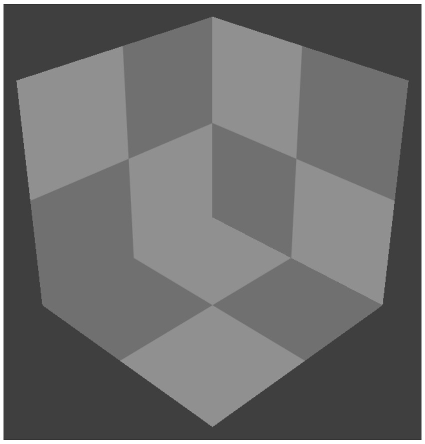
Bottom texture – Specify the texture file to display on the cube bottom surface.

Front texture – Specify the texture file to display on the cube front surface.

Back texture – Specify the texture file to display on the cube back surface.

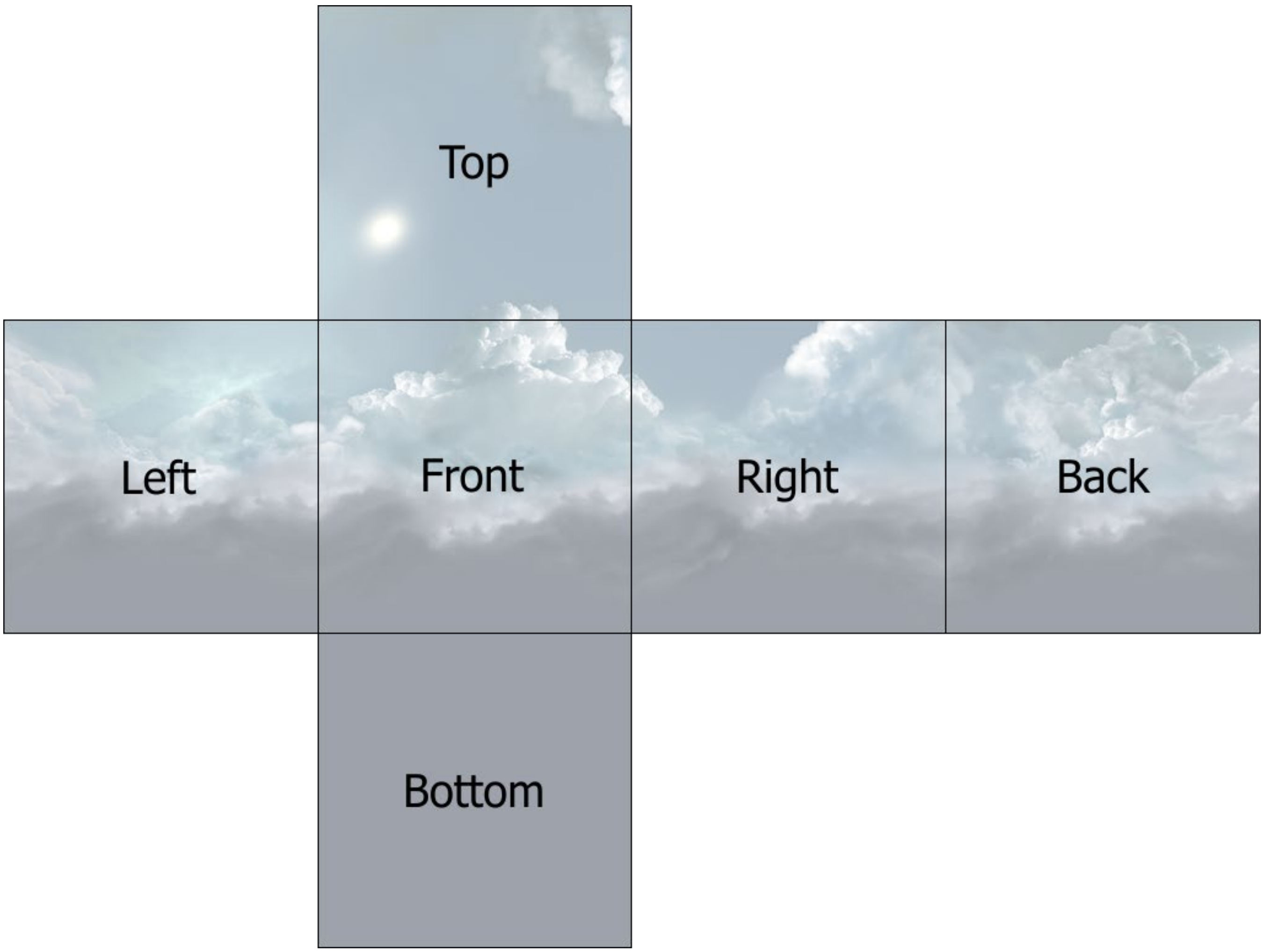
Left texture – Specify the texture file to display on the cube left surface.

Right texture – Specify the texture file to display on the cube right surface.



Creating Cube Textures

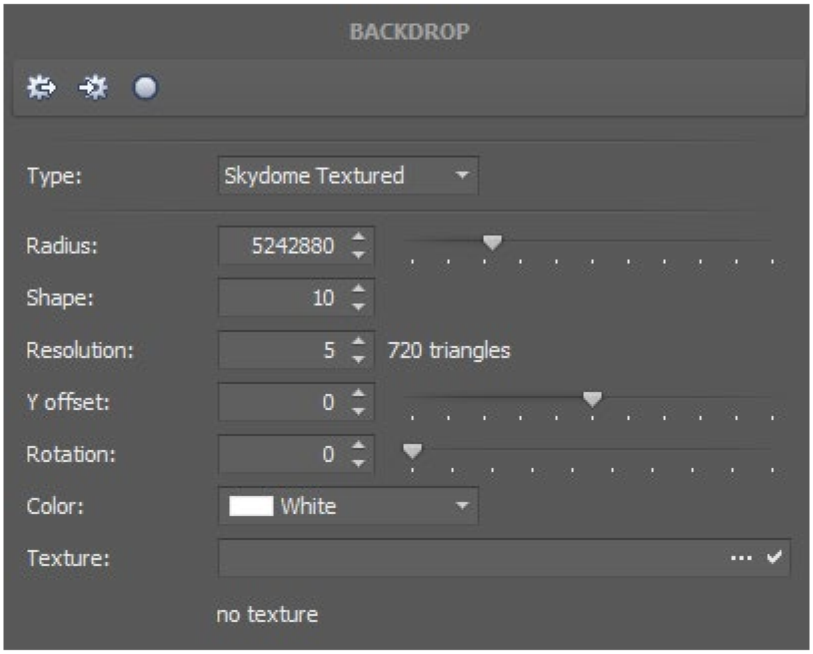
Cube textures are a set of six square-aspect images that are applied to each side of the backdrop cube using planar UV mapping coordinates.
The mapping coordinates are configured for 1:1, 1:2 or 2:1 aspect support.
The 1:2 aspect requires setting the Height property to 2× the Size property.
The 2:1 aspect requires setting the Height property to ½ of the Size property.
The textures must be seamless on all edges.
The six texture images are laid out as a cube that has been folded out and flattened.
The textures should not include any alpha channel information.



Note: the black lines are to visually depict the texture borders and would not be included in the actual textures.

Scene: Backdrop: Skydome

The Skydome backdrop is a textured variable shape hemisphere.



Radius – Specify the radius of the dome in world units.

Shape – Specify the shape of the dome. The shape range determines the flatness of the hemisphere.

Resolution – Specify the dome mesh resolution.

Y offset – Specify the world Y-axis offset for the base-center of the dome.

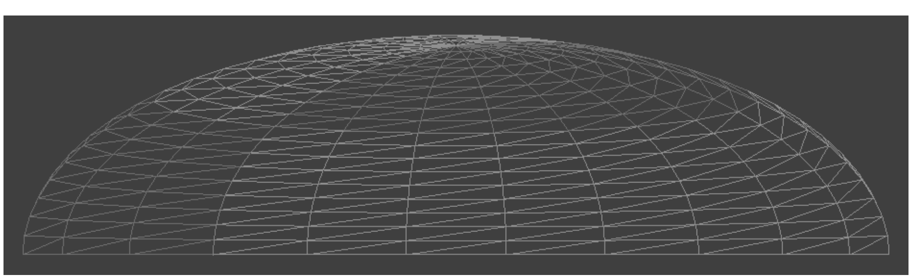
Rotation – Specify the world Y-axis rotation around the center of the dome.

Color – The mesh vertex color, this is to tint the texture. Default color is white.

Texture – Specify the texture file to display on the dome surface.
The skydome backdrop supports 4:1 ratio width:height textures only.
See the chapter on Texture Support for a list of supported texture formats and sizes.

 Browse for a texture file.

 Load or re-load the specified texture file.



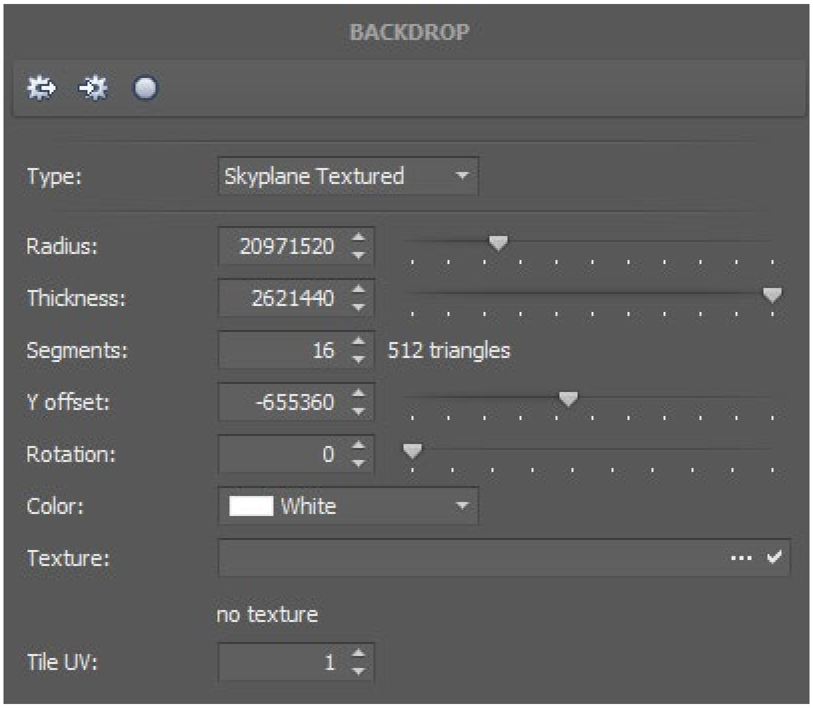
Creating Skydome Textures

Skydome textures are panorama images that are applied using spherical UV mapping coordinates.
The mapping coordinates are configured for 4:1 aspect support. 2:1 and 1:1 aspect textures will be stretch-distorted along the texture U (width).
The texture must be seamless on all edges.
The texture top 50 to 100 pixels should be blurred to a single color to prevent visible UV coordinate compression at the dome top.
The texture should not include any alpha channel information.

Note: the black lines are to visually depict the texture border and would not be included in the actual texture.

Scene: Backdrop: Skyplane

The Skyplane backdrop is a textured variable shape draped plane.
The plane is effectively the sheared top section of an imaginary bounding sphere.



Radius – Specify the equivalent radius of the imaginary bounding sphere in world units.

Thickness – Specify the thickness of the plane slice from the top of the imaginary bounding sphere.

Segments – Specify the plane width and length segments resolution.

Y offset – Specify the world Y-axis offset for the base-center of the plane.

Rotation – Specify the world Y-axis rotation around the center of the plane.

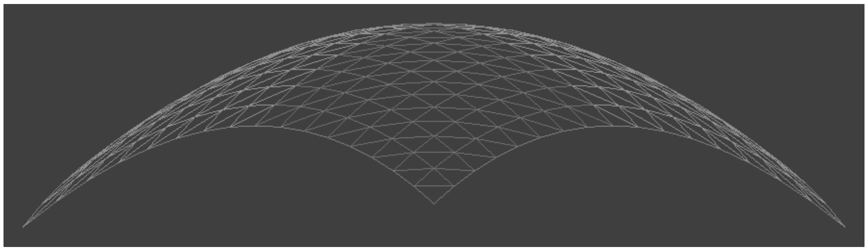
Color – The mesh vertex color, this is to tint the texture. Default color is white.

Texture – Specify the texture file to display on the plane surface.
The skyplane backdrop supports square-aspect textures only.
See the chapter on Texture Support for a list of supported texture formats and sizes.

 Browse for a texture file.

 Load or re-load the specified texture file.

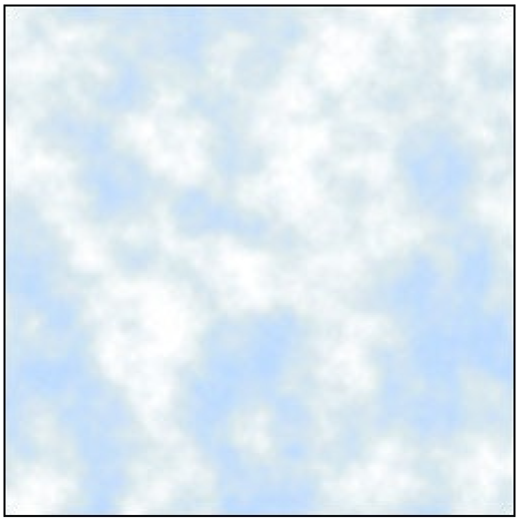
Tile UV – Specify the texture tiling along the width and length of the plane.



Creating Skyplane Textures

Skyplane textures are square aspect images, optionally seamlessly tileable, that are applied using planar UV mapping coordinates.
The mapping coordinates are configured for 1:1 aspect (square) texture support.
The texture must be seamlessly tileable on all edges if the Tile XY property is set to any value other than 1.
The texture should not include any alpha channel information.
The texture can be either planar or spherical content design.

Planar texture:



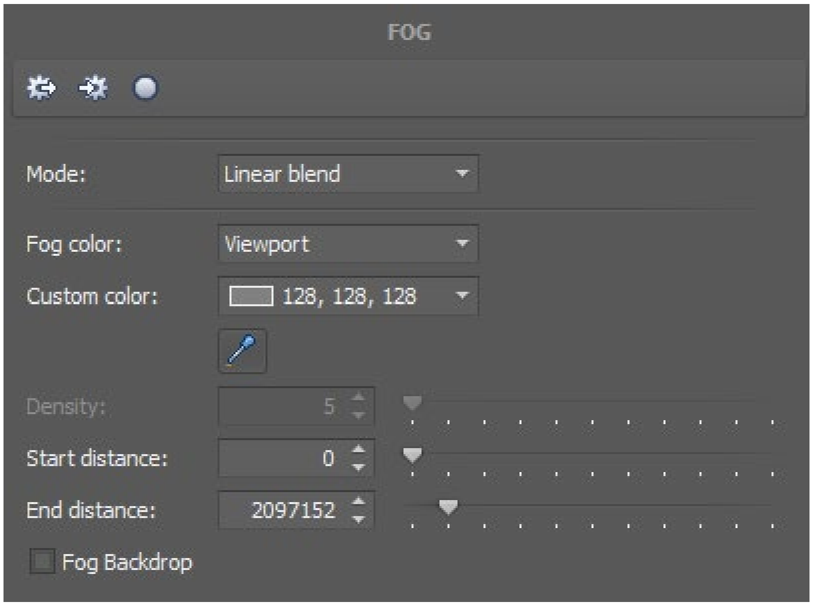
Note: the black lines are to visually depict the texture border and would not be included in the actual texture.

Spherical texture:

Scene: Fog

Scene fog adds a distance fogging effect to the 3D editor scene, which provides a pleasing real-world effect of haze or fog.

Fog is toggled on and off with the Function panel Scene objects.



Load the original fog settings from the application settings file.

Save the current fog settings to the application settings file.

Reset the fog to the default settings.

Mode – Specifies the fog blending factor mode.

Linear: performs a linear blend from the Start distance to the End distance.
Exponential: performs an exponential distance blend of Density fog thickness.
Exponential 2: performs an exponential-squared distance blend of Density fog thickness.

Fog Color – Specifies the color of the fog. The fog color is typically set to the color of the scene background.

Viewport: the fog is the color of the viewport background.
Custom: the fog is the specified custom color. See the Custom Color property.

Custom Color – Specifies the custom fog color. This is relevant for Fog Color Custom only.

Custom Color Picker – Pick a color from the current active viewport. Click this button then click on the viewport.

Density – Specifies the fog density. This is relevant for Exponential and Exponential 2 modes only.

Start distance – Specifies the fog start distance in world units. This is relevant for Linear mode only.
Lower values pull the fog start closer to the camera.
The Start distance value should always be less than the End distance value.

End distance – Specifies the fog end distance in world units. This is relevant for Linear mode only.
Any objects in the scene that are End distance from the camera will be solid fog color.

Lower values pull the fog end closer to the camera.
The End distance value should always be greater than the Start distance value.

Fog Backdrop – Specifies whether the scene Backdrop is affected by Fog.
When this property is false, the scene backdrop will not be included in the scene fog. The chosen Fog Color should match with the backdrop color to provide proper visual blending. Backdrop textures may include a solid color band along their bottom edge in order to facilitate better scene blending with the terrain.
When this property is true, the scene backdrop will be included in the scene fog. The backdrop will be fogged according to the fog properties, which may cause the backdrop to fade or to be hidden by the fog.

Fog Mode Equations

The fog mode and its fog equation determine the fog *factor* at specific distances from the scene camera.
In simple terms, the fog factor is each rendered pixel's original color to fog color ratio. Typically, pixels on scene objects that are close to the camera are rendered at their original color, while pixels on scene objects that are far from the camera are rendered with the fog color.
In technical terms, fogging is accomplished by blending the fog color $Cfog$ with the scene fragments' color $Cfrag$ using a fog blending factor f using the formula $C = f * Cfrag + (1 - f) * Cfog$

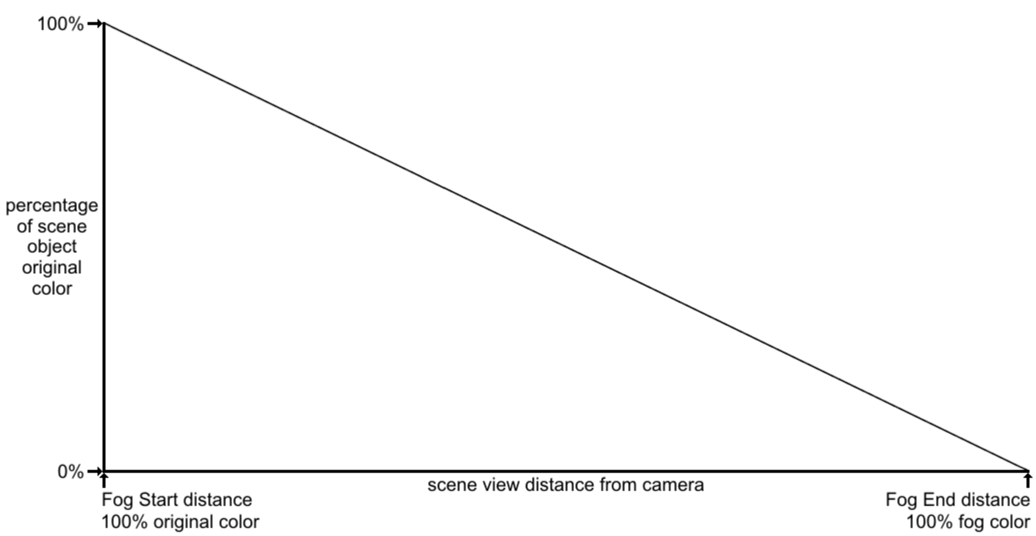
Linear Fog Mode

Linear fog mode uses the Fog Start Distance and Fog End Distance properties to determine the two distances from the camera where the fog begins and ends. Linear fog mode will color with 100% solid fog color any scene object pixels that are at or beyond the fog end distance value. The Fog Density property value is ignored.

The blending factor for linear fog mode is calculated using the equation $f = (end - z) / (end - start)$, where:

f	= fog blending factor
$start$	= fog start distance value
end	= fog end distance value
z	= the distance between the camera and the fragment center

When plotted as a graph, linear fog mode appears as follows.



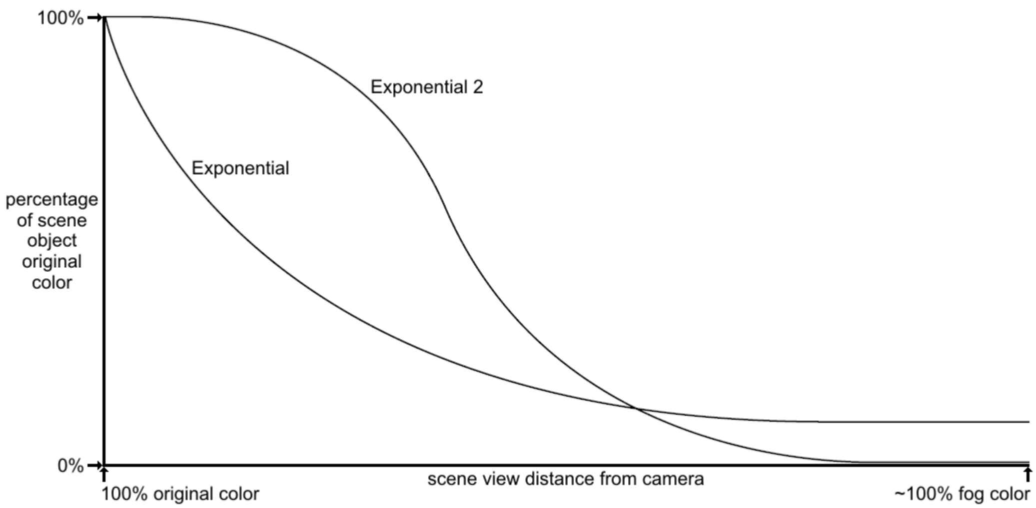
Exponential Fog Modes

Exponential fog modes use the Fog Density property to determine the fog density over distance from the camera. Exponential fog modes do not color the most distant pixels at 100% solid fog color. The Fog Start Distance and Fog End Distance property values are ignored.

The blending factors for the exponential fog modes are calculated using the equations $f = exponent(-d * z)$, and $f = exponent(-d * z)^2$ where:

f	= fog blending factor
d	= fog density value
z	= the distance between the camera and the fragment center

When plotted as a graph, the exponential fog modes appear as follows when Fog Density is at 50% of its value range.

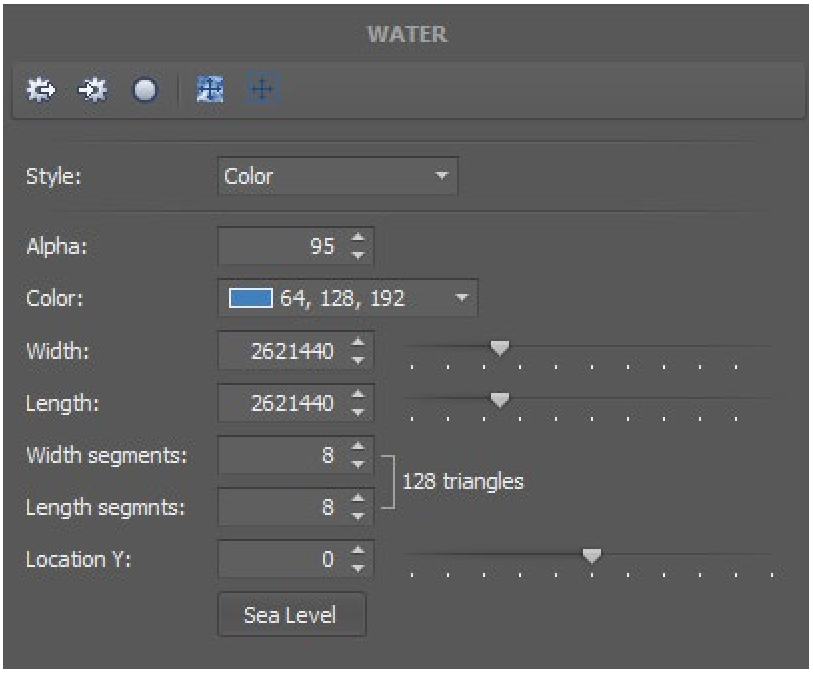


Scene: Water

Scene water is a flat plane mesh that is used to simulate sea-level and is typically located at the center of the world Y axis, which in world units is a Y of 0. The center of the world Y axis is also the heightmap altitude value 50.0.

Water is toggled on and off with the Function panel Scene objects.

Color Style



Load the original water settings from the application settings file.

Save the current water settings to the application settings file.

Reset the water to the default settings.

Set the water spacing*size to the current terrain dimensions.

Set the water spacing*size to the world extents.

Style – Specifies the water rendering style.
Color: a single specified color.
Texture: a specified texture.

Alpha – Specifies the water plane mesh transparency alpha color. 0 is transparent, 255 is opaque.

Color – Specifies the water plane mesh color. This will tint the texture color for a texture style water.

Width – Specifies the water plane mesh width along the world X axis in world units.

Length – Specifies the water plane mesh length along the world Z axis in world units.

Width segments – Specifies the number of water plane mesh quad segments along the plane width.

Length segments – Specifies the number of water plane mesh quad segments along the plane length.

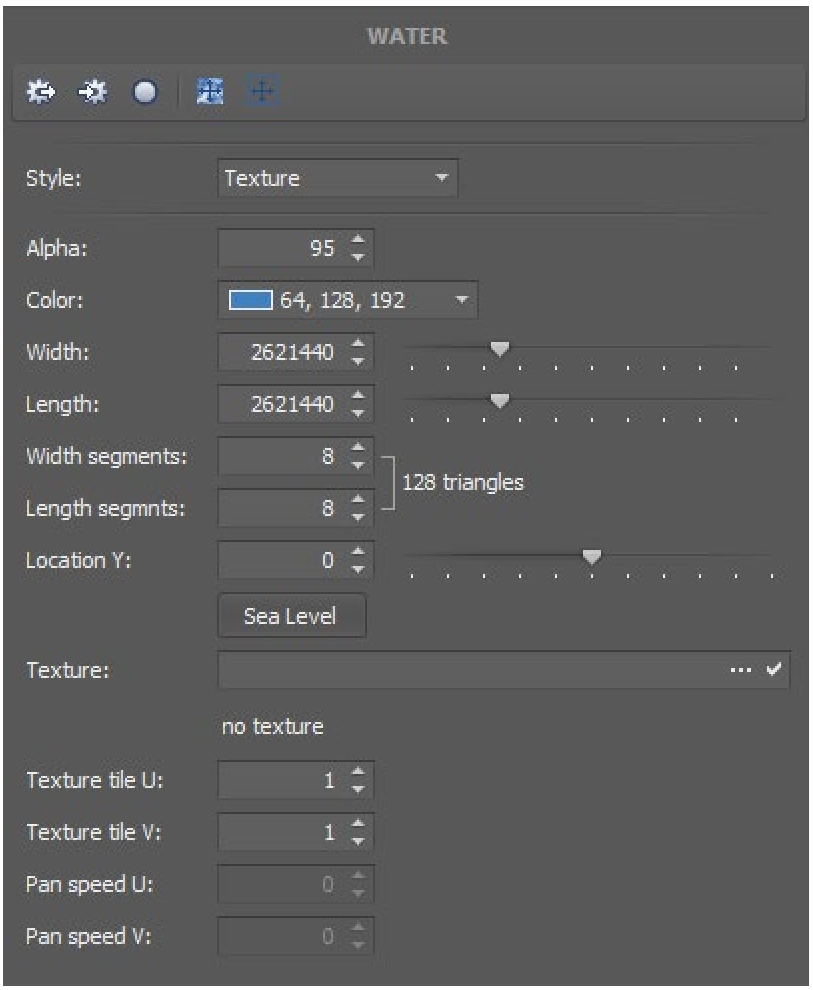
Faces – Displays the total number of water plane mesh triangles, the plane (width × length) × 2.

Location Y – Specify the water plane mesh location along the y axis in world units.

Sea Level – Set the Water 3D plane to the sea level elevation of an imported Digital Elevation Model file.

The Editor Sea Level value can be found on the GIS panel.

Texture Style



Texture – Specify the texture file to display on the water plane mesh.
The water supports square-aspect textures only.
32-bit textures with alpha are supported.
See the chapter on Texture Support for a list of supported texture formats and sizes.

 Browse for a texture file.

 Load or re-load the specified texture file.

Texture tile U – Specify the number of times to tile the texture along the texture x axis.

Texture tile V – Specify the number of times to tile the texture along the texture y axis.

Pan speed U – *Under development.*

Pan speed V – *Under development.*

Creating Water Textures

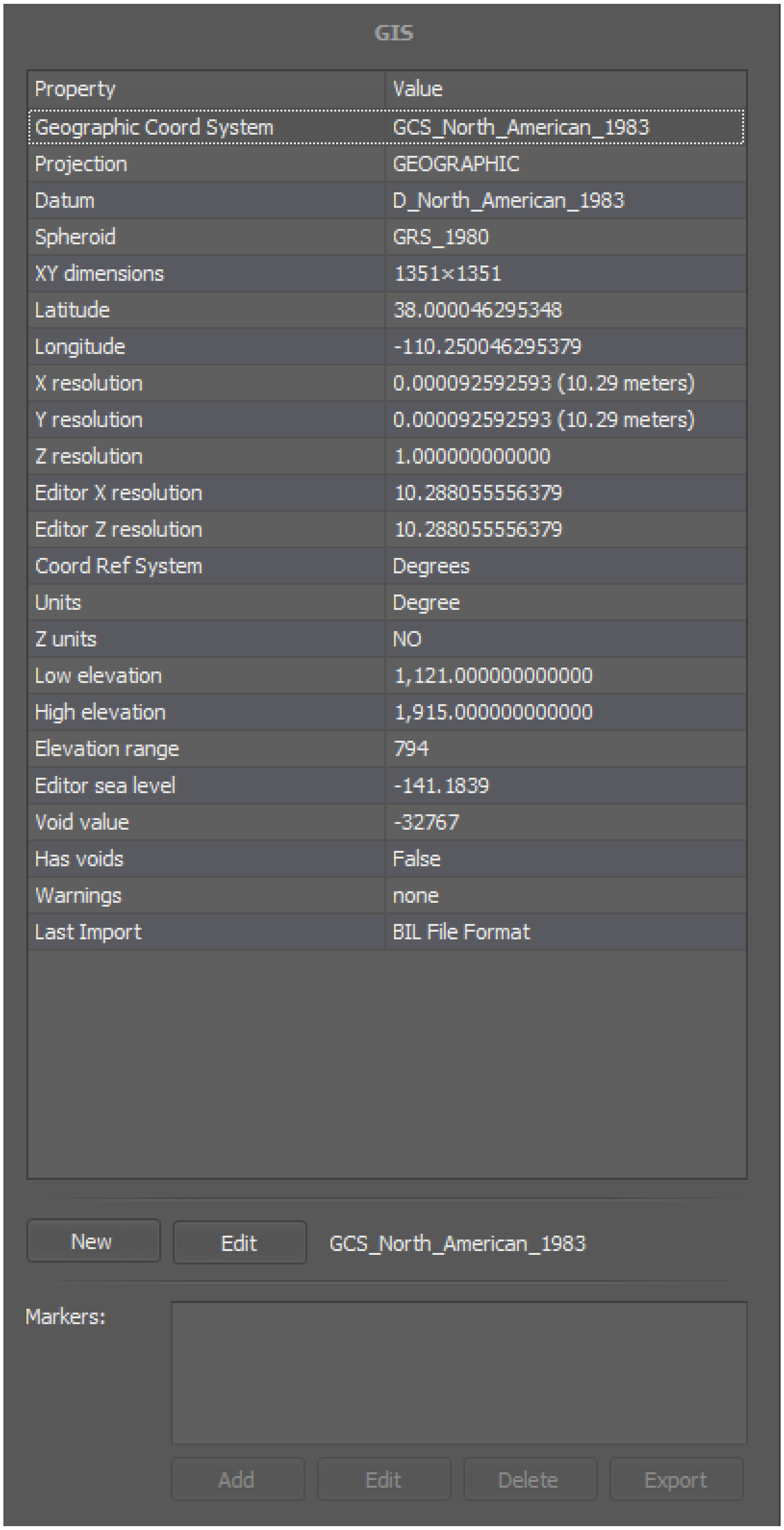
Water textures are a square or rectangular aspect image that is applied using planar UV mapping coordinates. The mapping coordinates are configured for any aspect support. The Tile U and Tile V properties should be set to match the texture aspect.

The texture must be seamlessly tileable on all edges if the Tile U / Tile V properties are set to any value other than 1.

The texture may support alpha channel information for translucency.

Tools: GIS

The GIS panel contains properties and tools for Digital Elevation Model files when they are imported.



The top grid on the GIS panel displays all of the properties determined from the Digital Elevation Model file header and projection files when available, or from GeoTIFF file property tags when available.

Note that many of the properties may be blank or default values depending on the DEM file imported, and the data that it contains.

The Coordinate Reference Systems supported by TerreSculptor include Degrees, Feet, and Meters. All other Coordinate Reference Systems will require re-projection in third-party GIS software, to convert the data to Meters, and then import it into TerreSculptor.

DEM Property Editors

New	Create a new GIS Tag property set for the current editor terrain heightmap.
Edit	Edit the currently selected GIS Tag.
Tag Label	Displays the value of the currently selected GIS Tag.

Markers

Markers List	The current list of Latitude, Longitude markers on the heightmap (*under development*).
Add	Add a new marker (*under development*).
Edit	Edit the selected marker (*under development*).
Delete	Delete the selected marker (*under development*).
Export	Export the markers (*under development*).

Header, Projection, World, and Tag Cloning

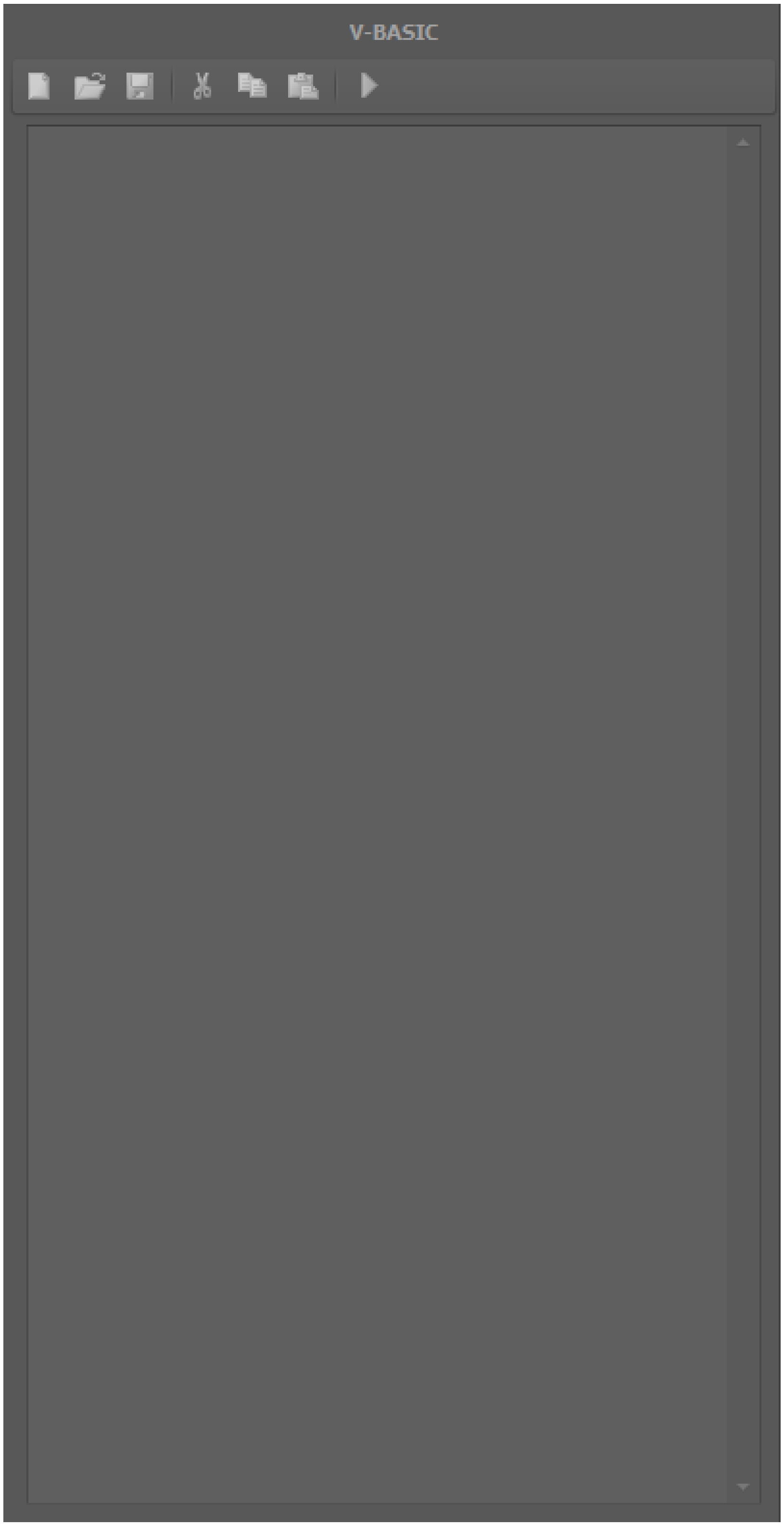
When importing a DEM file using the Terrain Import feature, and then exporting it back out to file using the Terrain Export feature, the Header, Projection, World, and Tags are retained, so that DEM geolocation information is carried through the software pipeline.

When creating a new heightmap from the noisemap generators, or by importing an image file, a DEM header, projection, and world tag set can be created by clicking on the New button. TerreSculptor will fill in as much tag information as possible, while the remaining tags can be edited with the Tag Editor. This allows for saving non-DEM files as DEM formats, while creating new header, projection, and world tags for the file.

Tools: V-BASIC

Under Development!

The V-BASIC scripting language provides a powerful method for automating the operation of the TerreSculptor software.



The Main Statusbar

Located at the bottom of the application window is the main Statusbar.
The statusbar displays a variety of relevant information for the current scene and terrain.

Press F1 for help – The current application information and status line.

0 × 0 – The current terrain datamap dimensions, width × length.

0 – The current terrain datamap low value.

0 – The current terrain datamap middle value.

0 – The current terrain datamap high value.

0 – The current terrain datamap range value.

0 MB – The current terrain datamap memory requirement.

256 – The current home grid spacing.

Initial Application Settings

After installing the software onto a computer, the initial application settings should be set to the desired defaults.
Choose the *Settings* item on the *Tools* menu to display the Settings dialog.
Only the most common settings are covered here.

General tab:

- Choose whether to create a backup file on every save.
- Choose whether to display the Welcome dialog whenever the application is started.
- Choose whether to disable the Undo system, and specify the default Undo temporary file folder.

Dimensions tab:

- Choose the desired terrain heightmap range to show in the New dialog etc.
- Choose which of the dimensions sizes sets to display.

Formats tab:

- Select the default heightmap, image, and mask file formats.

Preferences tab:

- Choose whether to enable or disable the Center altitude, Zoom extents, Design and Water auto-size options.

Units tab:

- Specify the default heightmap sample point (vertex) spacing according to the target rendering engine.
  Unreal Engine 3 has a default terrain DrawScale3D XYZ of 256,256,256 and Scale of 512.
  Unreal Engine 4/5 have a default terrain DrawScale3D XYZ of 100,100,100 and Scale of 512.
- Specify the world-units to real-world-units ratio.
  Most Unreal Engine 4/5 games use a default measurement system of 1 unreal unit = 1 centimeter.

The other Settings dialog tabs can be adjusted as required, however they contain more advanced settings.
See the Settings chapter of this document for additional information on all of the settings.

Colorsets

Standard computer monitors are capable of displaying 24-bit color, which is comprised of 8-bits of red, 8-bits of green, and 8-bits of blue. When summed together as a grayscale, standard monitors can display 8-bits or 256 levels of gray starting from black and continuing up to white.

The heightmaps created and edited by TerreSculptor use a floating-point altitude range from 0.0 to 100.0, which literally has millions of values. For terrain vertex color rendering purposes, the floating-point altitude values are converted to a 16-bit value from 0 to 65535. This 16-bit value cannot be displayed as a 1:1 color or grayscale match on a standard 8-bit grayscale capable monitor.

Colorsets provide a method for displaying 48-bit simulated color on standard 24-bit color computer displays. This is equivalent to displaying 16-bits per pixel on 8-bits per pixel displays. Colorsets are created by deriving linear-interpolated gradient ranges of color starting at color value 0 and ending at color value 65535.

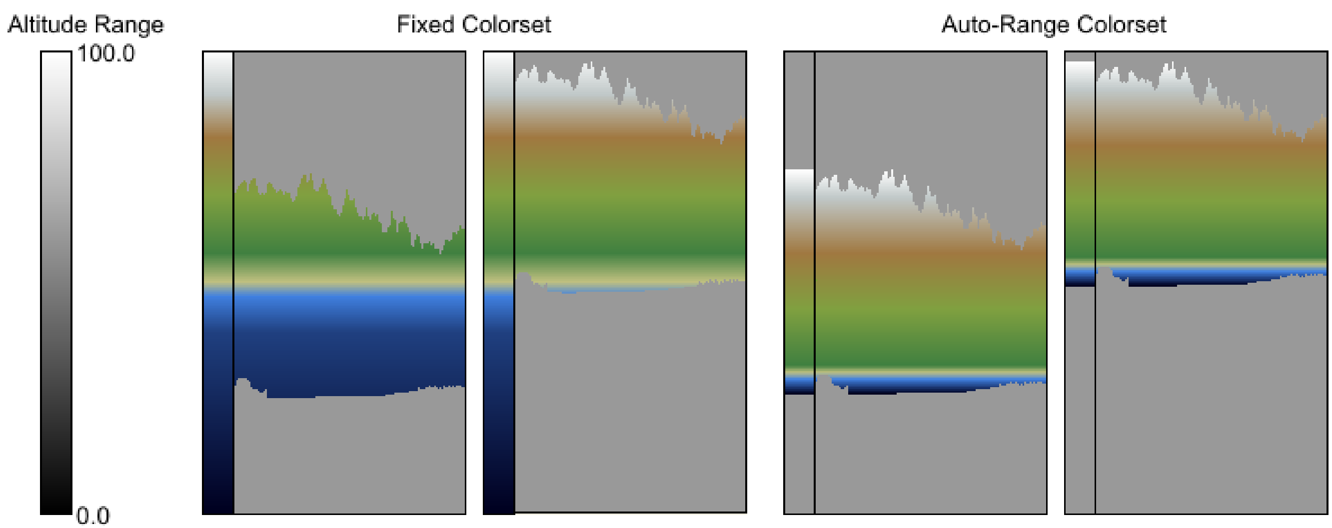
A wide variety of Colorsets are included in TerreSculptor. Many of the Colorsets are designed to simulate real-world terrain coloring such as sandy deserts and green lush forests.

Auto-Range Colorsets

The Auto-Range Colorsets differ from standard fixed Colorsets in that they are always rendered following the current altitude range of the heightmap. If the heightmap altitude range is changed, the auto-range colorset will automatically map itself correctly to the new heightmap range.

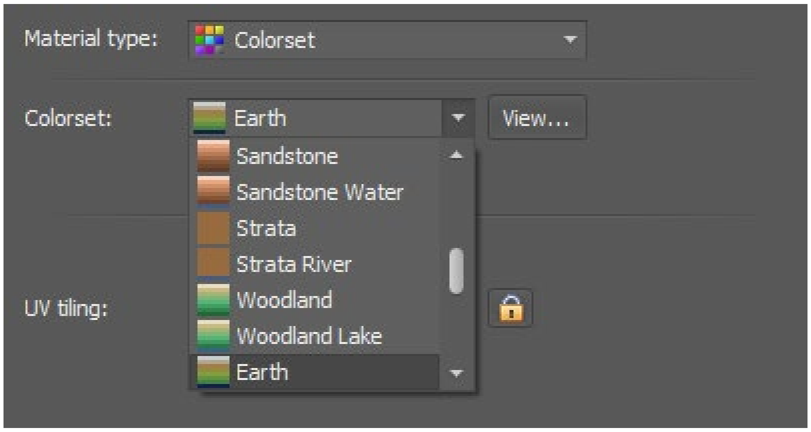
The Auto-Range Colorsets provide a closer simulation of real-world terrain coloring, while the fixed Colorsets provide a better visual representation of the heightmap range's position in the overall available 16-bit range.

In this diagram of a heightmap front view, notice that for the fixed Colorset, the heightmap coloring follows the Colorset colors. While for the Auto-Range Colorset, the Colorset colors follow the heightmap.

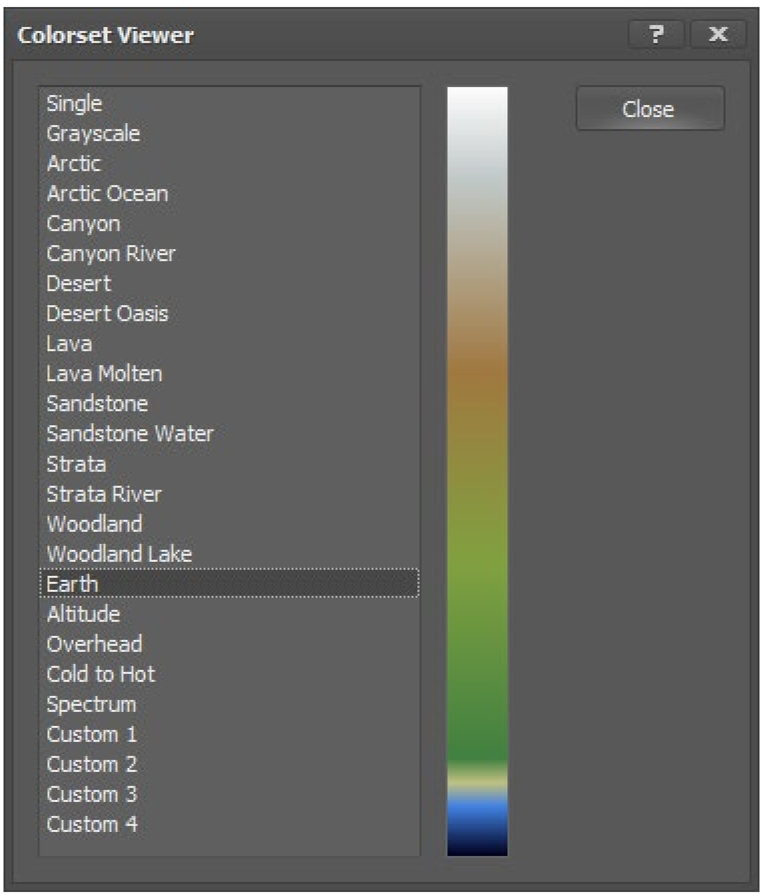


Colorset Material and Menu

The colorset material contains the available render color sets.
Most of the color sets are designed to simulate various earth or planetary geological region colorings.



Use the View button to view the colorset in the Colorset Viewer.



Custom colorsets can be created with the Colorset Creator.

Many Devices that support 2D and 3D Previews include a Colorset drop-down menu to allow choosing the colorset for preview rendering.

The colorsets include:

Single – A single color as defined in the Options. Typically used when painting the terrain.

Grayscale – Grayscale from black to white. This colorset is unaffected by the Auto-Range Colorset setting.

Arctic – Blue arctic winter.

Arctic Ocean – Blue arctic winter with water.

Canyon – Red striped canyon.

Canyon River – Red striped canyon with water.

Desert – Sandy desert.

Desert Oasis – Sandy desert with water.

Lava – Black earth with red hot lava.

Lava Molten – Black earth with red hot lava.

Sandstone – Red sandstone.

Sandstone Water – Red sandstone with water.

Strata – Striped sandstone.

Strata River – Striped sandstone with water.

Woodland – Green trees.

Woodland Lake – Green trees with water.

Earth – Multi-colored from water to sandy beaches to white snowcaps.

Altitude – Multi-colored water to snow with evenly spaced ranges.

Overhead – Multi-colored to simulate contour maps.

Cold to Hot – Blue to red.

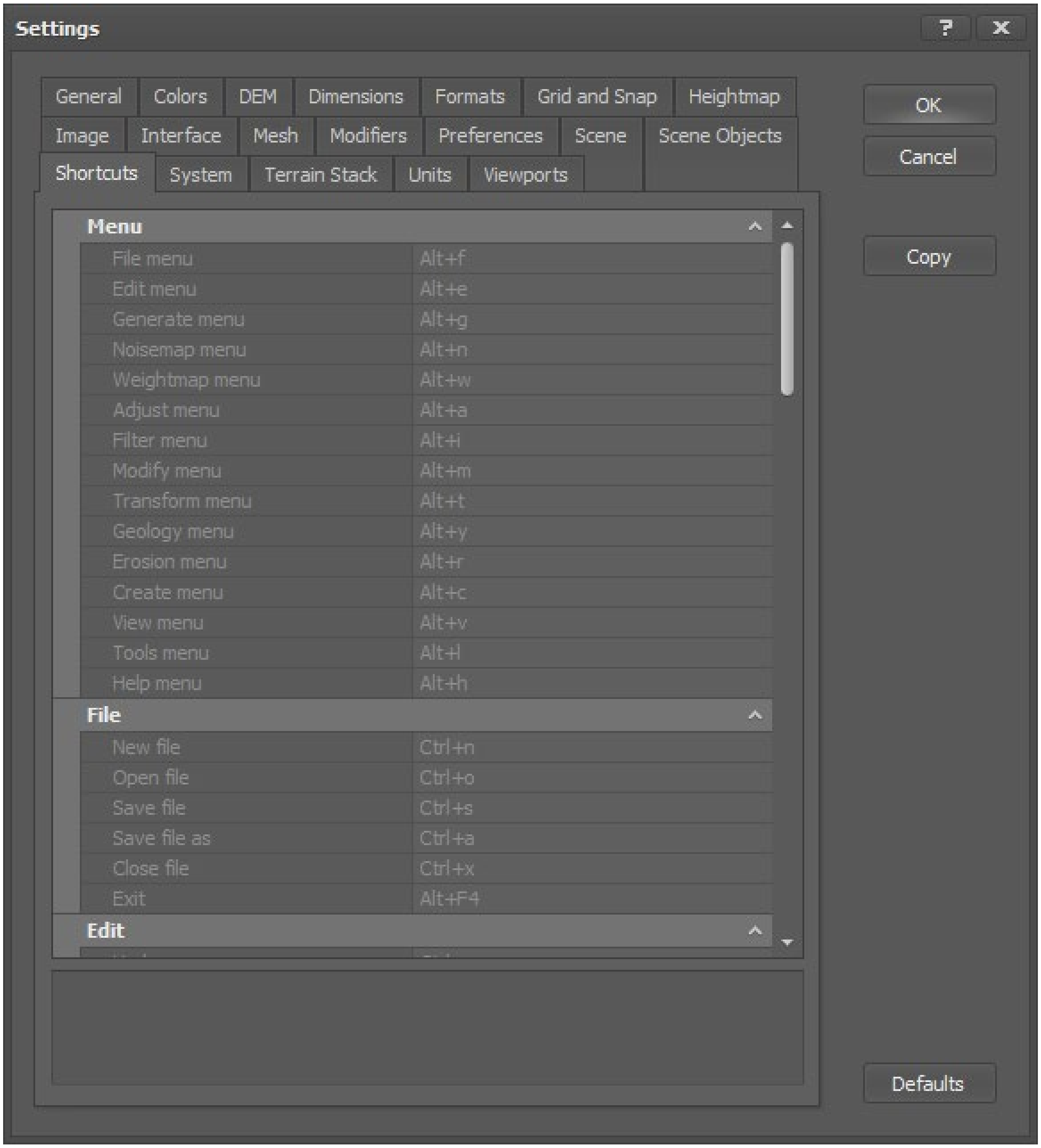
Spectrum – Multi-colored.

Custom 1 to 4 – Four custom colorsets that can be created with the Colorset Creator.

Shortcut Accelerator Keys

TerreSculptor provides a number of keyboard shortcut accelerator keys for single-key access to a number of the application features.
The shortcut accelerators are a combination of standard Windows shortcuts such as *Ctrl+n* = *New* and *Ctrl+o* = *Open*, plus a number of shortcuts that are similar in functionality to Autodesk 3DS Max such as *g* = *toggle grid* and *p* = *perspective view*, along with custom shortcuts specific to TerreSculptor.

See the Settings dialog Shortcuts tab for a complete list of shortcuts, or the Shortcuts Appendix in this document.



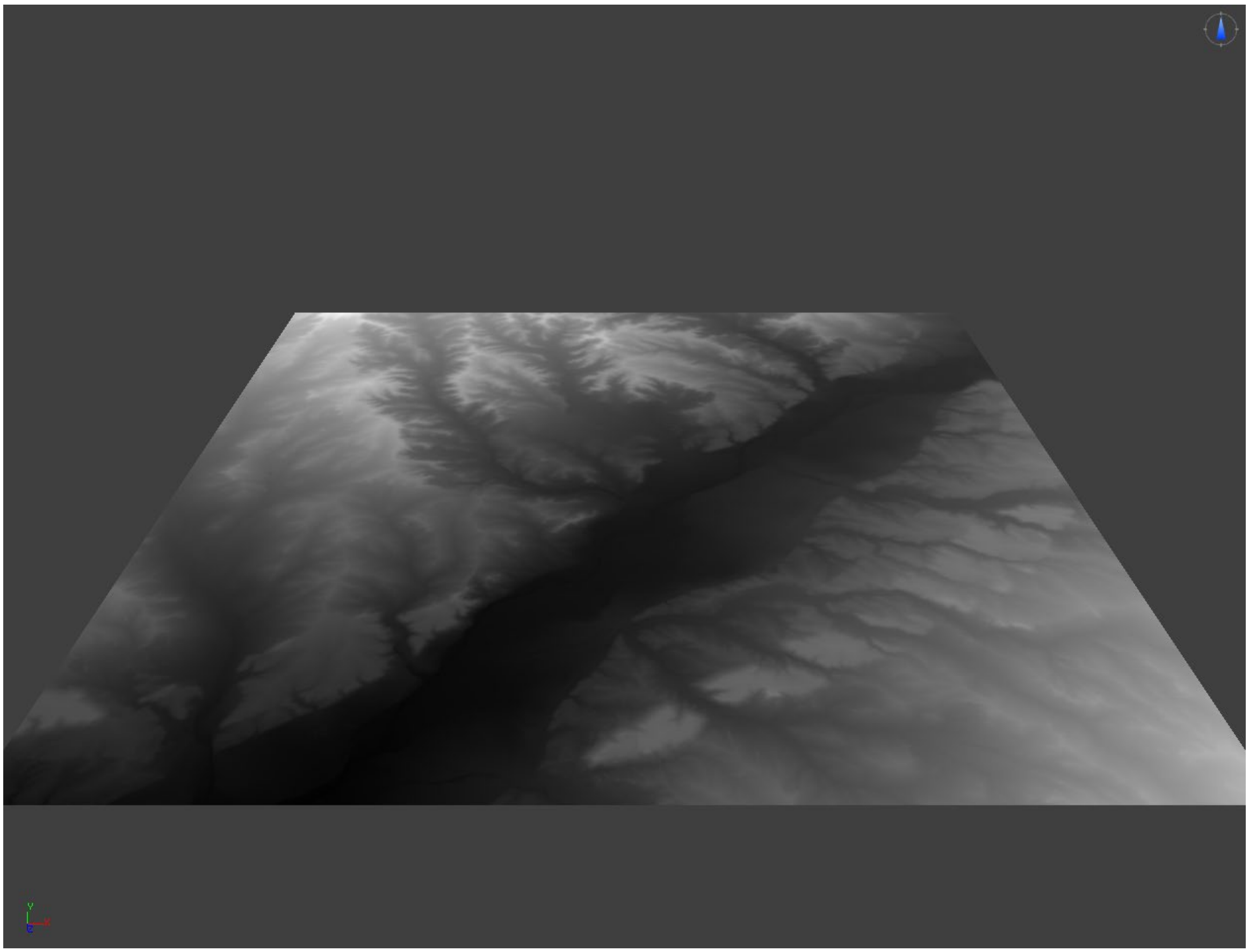
Terrain 2D and 3D View Modes

The 3D Editor terrain mesh renderer includes two view modes for greater flexibility.

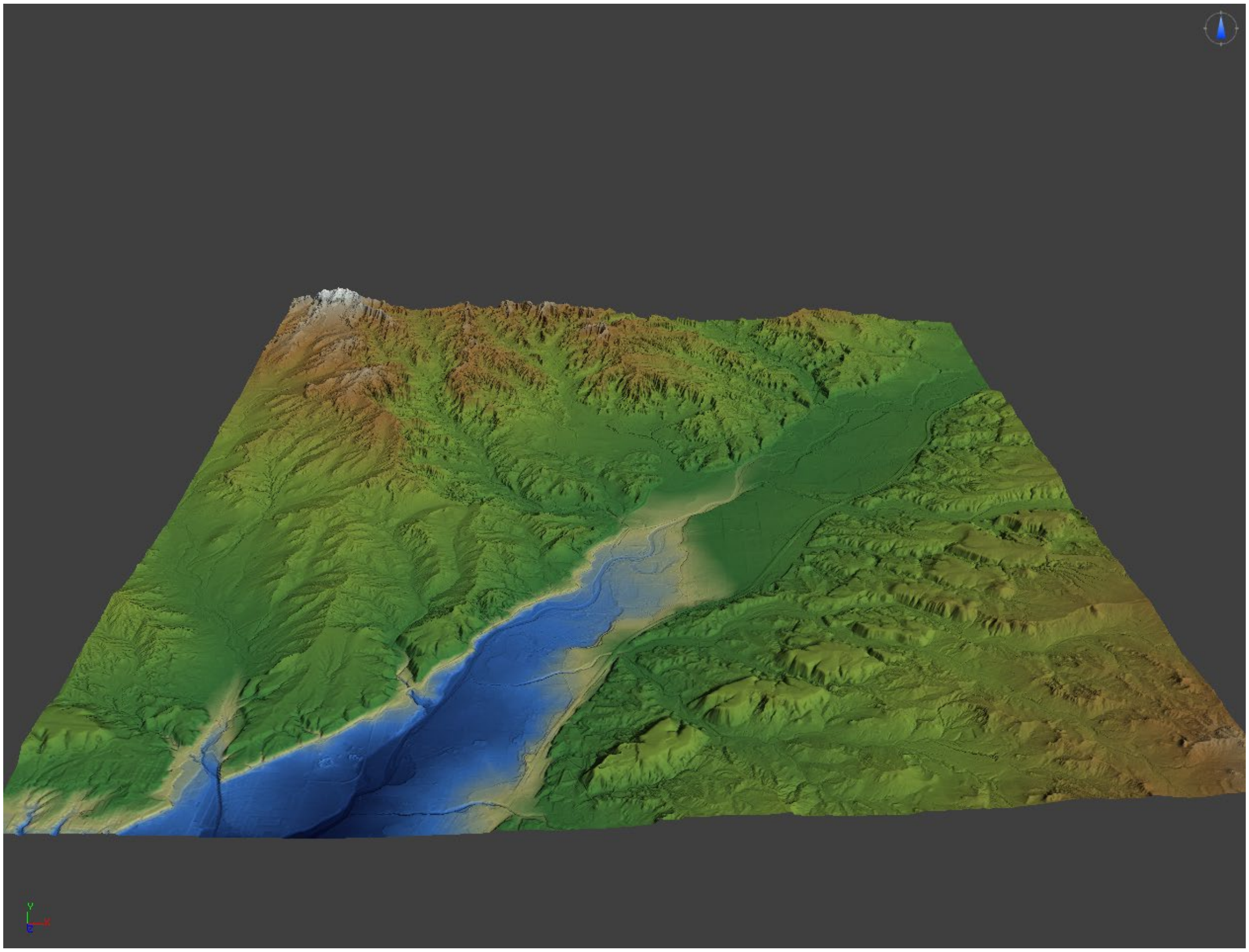
The 2D texture plane view mode is typically used for viewing masks and weightmaps.
The 3D triangle mesh view mode is typically used for viewing heightmaps.

The current view mode is chosen by clicking on the 2D button or 3D button on the main toolbar.
The 2D view mode texture resolution can also be specified.

2D Texture Plane Mode



3D Triangle Mesh Mode



Terrain 3D LOD Modes

The 3D Editor terrain mesh renderer supports multiple Level of Detail (LOD) modes to enhance render performance and system CPU and GPU memory requirements.

The LOD modes can lower render cost and memory requirements by reducing the number of terrain mesh sections and triangles that are rendered in the viewport.

TerreSculptor's terrain rendering system splits the heightmap into square chunks called sections. These sections are used for enhancing performance through frustum culling.
Additional performance enhancing is performed by LOD'ing the heightmap data used for the sections.

The Aggressive and Normal LOD modes effectively specify a fast low resolution and a slower maximum resolution terrain mesh.

Aggressive LOD

This is the default terrain rendering LOD mode.
This mode is well suited for general terrain visualization, and to conserve on GPU memory.

Aggressive LOD reduces the heightmap resolution to the *Aggressive LOD resolution* (ALODR) value specified in the application Settings. Heightmap resolutions below the ALODR value will be rendered normally; heightmap resolutions above the ALODR value will be reduced to the ALODR value prior to rendering. The ALODR resolution reduction respects the original heightmap aspect ratio.

For example, with an ALODR value of 1024 and a heightmap of 2048 × 2048:
- The rendered heightmap resolution will be 1024 × 1024 with 2× vertex spacing to maintain the same area.
- The GPU memory requirements for the LOD mesh data will be 48.26MB versus the non-LOD of 193.08MB.

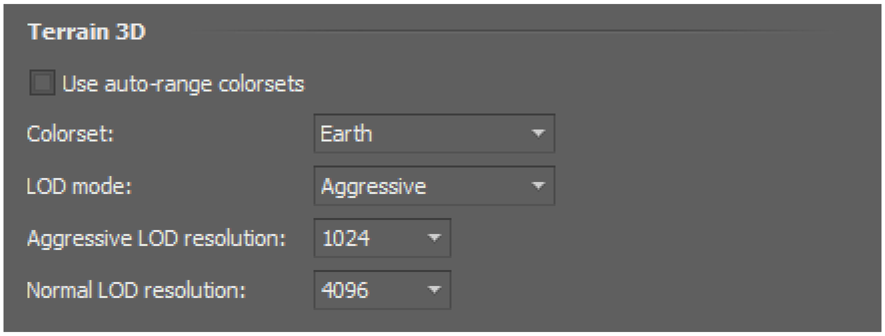
Normal LOD

The Normal LOD mode renders the full heightmap terrain mesh with no level of detail reduction, up to the maximum resolution specified in the settings.
This mode should only be used when necessary and only if the system GPU has sufficient video memory.

For large heightmaps the amount of required GPU memory can be high. A 4096 × 4096 terrain will require 772.42 MB of video memory to render the 33 million triangles. This is approximately three-quarters of a GB. Additional GPU memory will be required on top of the terrain for the other scene objects. For a Normal LOD of 4096, a GPU with 2GB of memory would be a minimum system requirement.

Terrain LOD Settings

The Terrain Settings for the LOD modes can be found on the Settings dialog, Scene Objects tab, Terrain group.



LOD mode:	The default terrain LOD mode. The current LOD mode can also be changed at any time on the main toolbar.
Aggressive LOD resolution:	The maximum dimensions of the terrain heightmap in aggressive LOD mode.
Normal LOD resolution:	The maximum dimensions of the terrain heightmap in normal LOD mode.

Undoing Changes

You can easily undo changes that you have made to your scene or terrain heightmap. TerreSculptor manages individual undo buffers for the Base Heightmap modification tools, and for the various textbox and numeric input controls on the dialogs and Function panels.

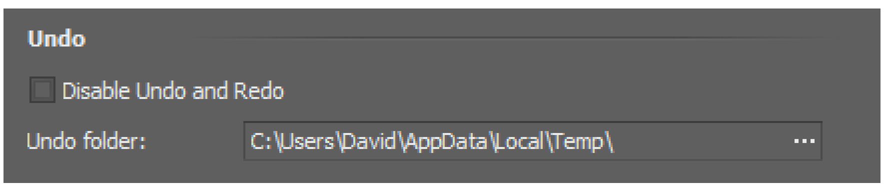
Setting the Undo Settings

The Settings dialog contains Undo preferences that can be set by the user. These Undo preferences relate to the Undo menu and toolbar items only, which are for the Base Heightmap modification tools' Undo system.

To set the Undo preferences:

1. Choose the Settings item on the Tools menu.
2. Click on the General tab.
3. Change the Undo options as preferred.

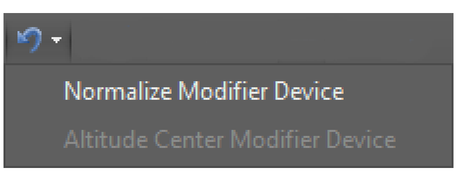
You can:
- Disable the Undo.
- Specify the Undo folder.
  The undo folder drive should have at least 1GB or more of free space.
  A fast hard drive or SSD will make the Undo system perform quicker.



Undoing changes to the Base Heightmap

Use the Undo toolbar buttons or Undo commands in the Edit menu to reverse the effect of any of the Base Heightmap modification devices. The Base Heightmap modification undo system has 10 levels of undo.

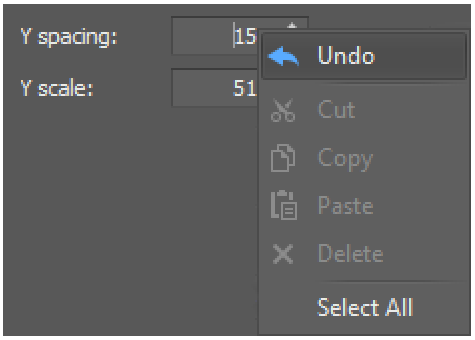
The Undo toolbar buttons include a drop-down menu that displays the current modification devices that are on the Undo buffer stack. These are for reference only, choosing the Undo will always undo the top-most item on the undo stack list.



Undoing changes to the Input Controls

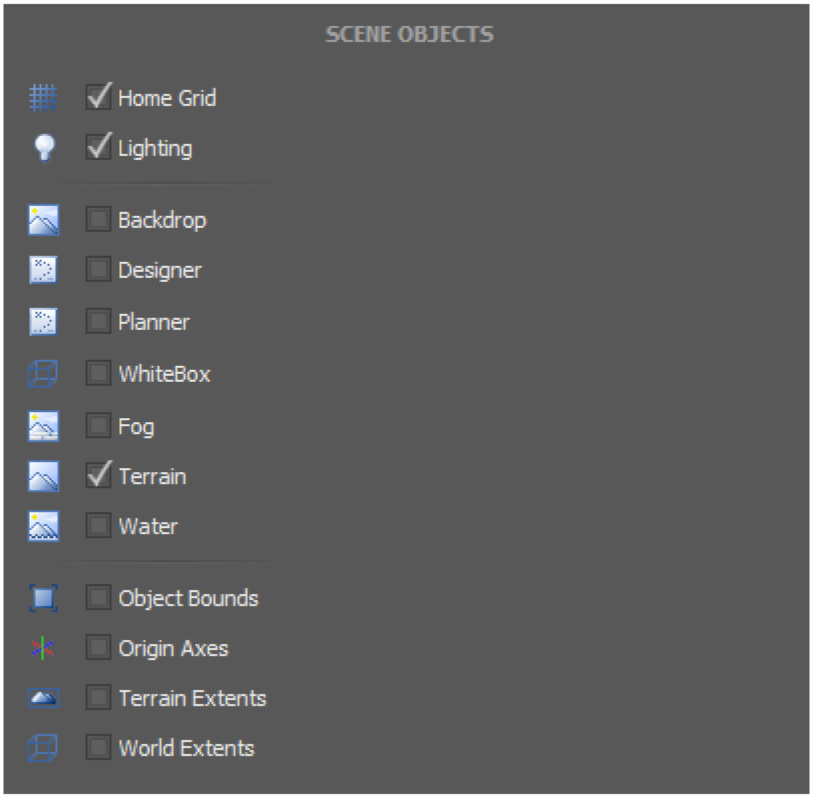
Most of the input controls found throughout the application include a single-level Undo. These input controls include text boxes and numeric entry controls.

Right-click the mouse on any supported input control to display its pop-up menu. Choose Undo on the pop-up menu to reverse the last change to the input control. Choosing Undo again will redo the change (undoing the undo).



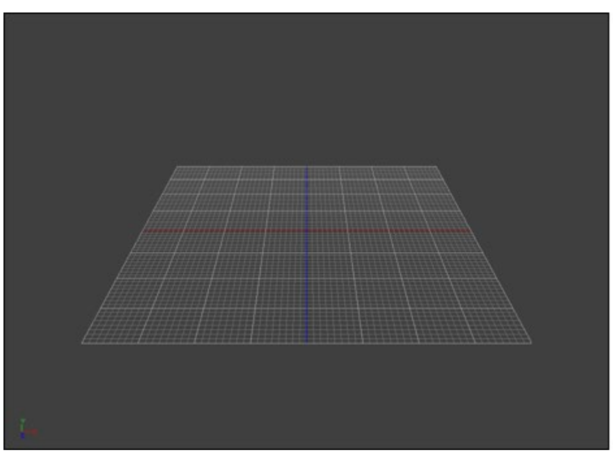
Scene Objects and Helpers

A variety of objects and helpers are available in the Editor Scene.
These objects and helpers can be turned on and off, or hidden and shown, using the Function panel Scene objects.
The Scene Objects typically have editable properties, whereas the Scene Helpers are typically fixed in their function.



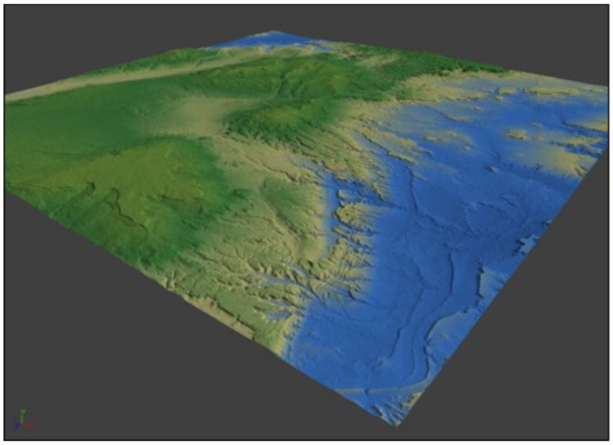
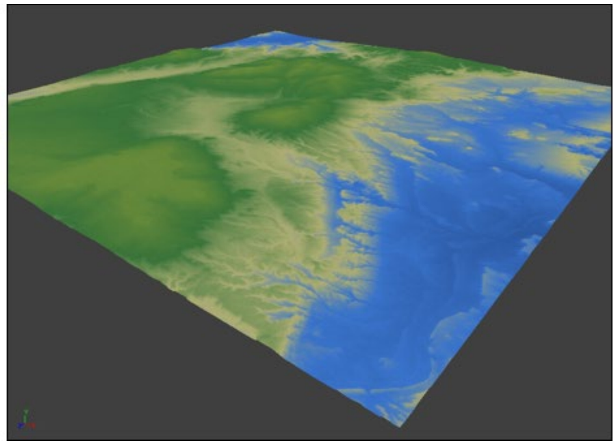
Home Grid

The scene Home Grid visible and hidden.
The Home Grid properties are available on the Function panel.



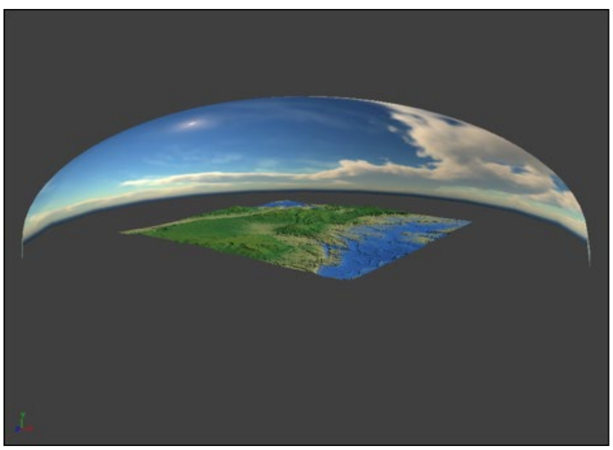
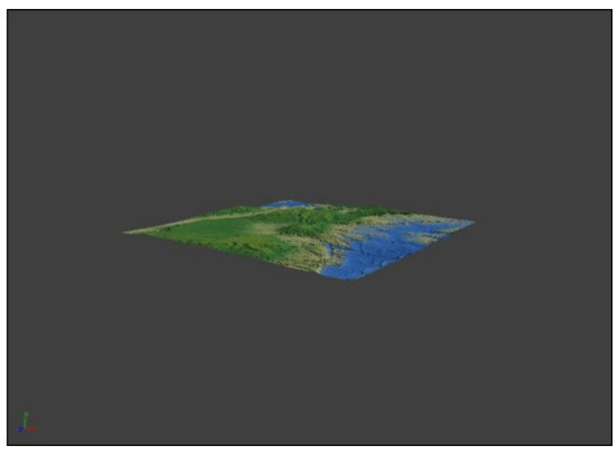
Lighting

The scene Lighting on and off.
The Lights properties are available on the Function panel.

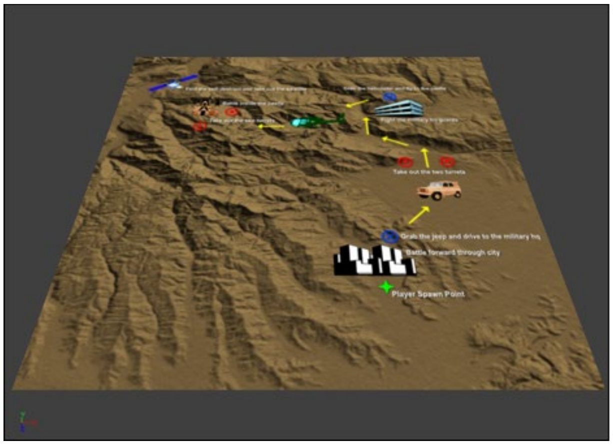
Backdrop

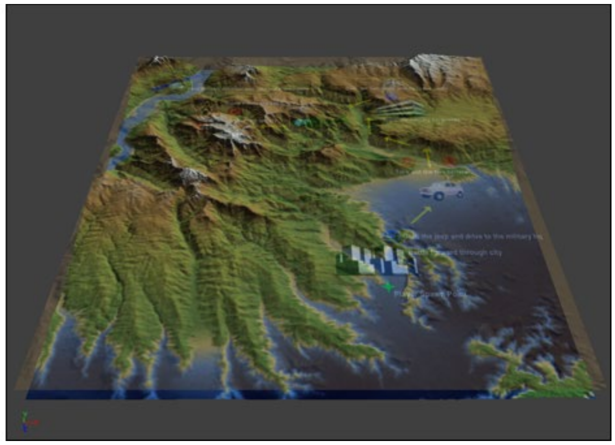
The scene Backdrop visible and hidden.
The Backdrop properties are available on the Function panel.
The skydome backdrop is shown in the image below.

Designer

The scene Designer with an example storyboard, and placed at 40% transparency over the terrain.
The Designer properties are available on the Function panel.





Planner

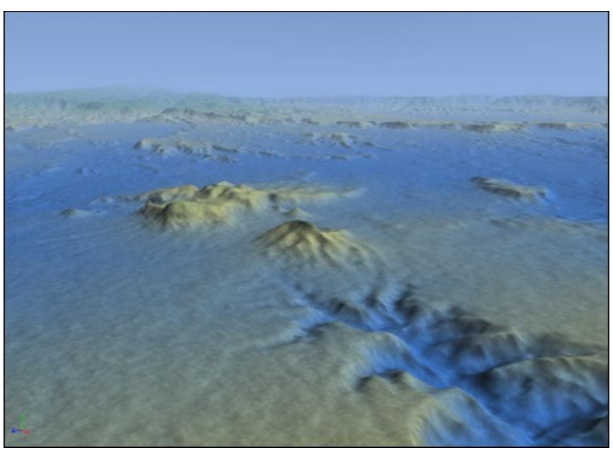
To be completed…

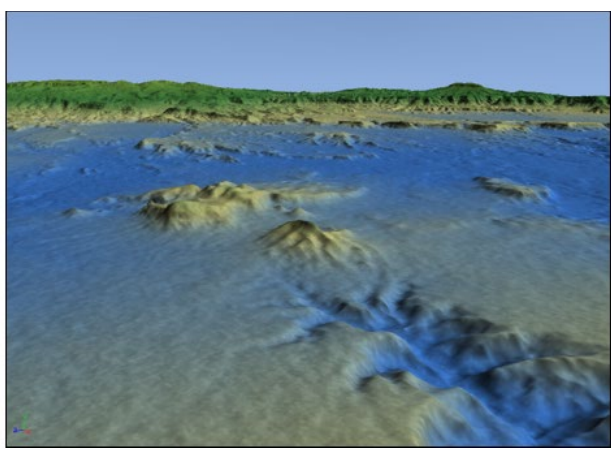
WhiteBox

To be completed…

Fog

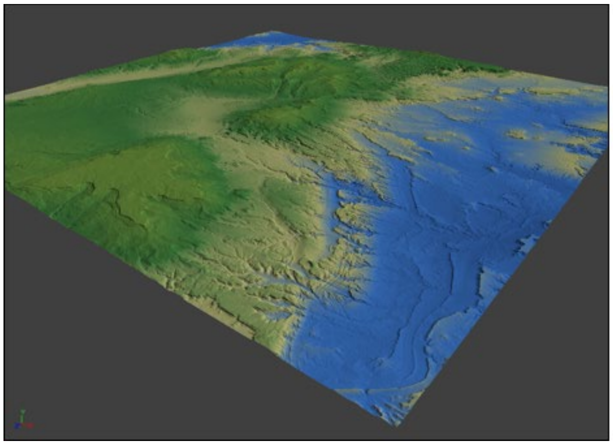
The scene Fog on and off.
The Fog properties are available on the Function panel.





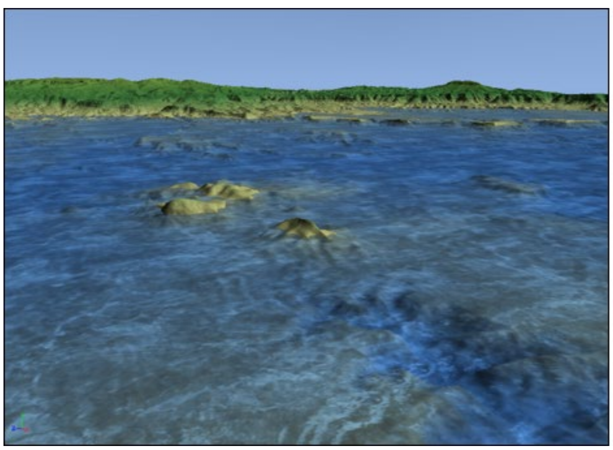
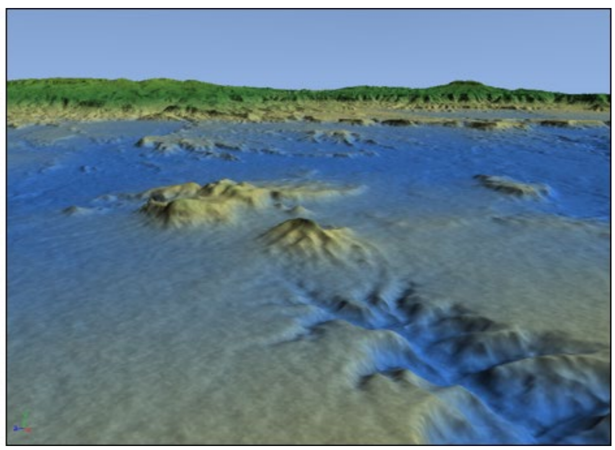
Terrain

The scene Terrain visible and hidden.
The Terrain properties are available on the Function panel.



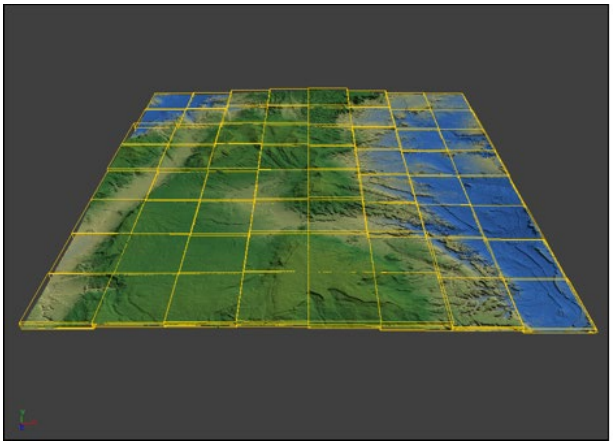
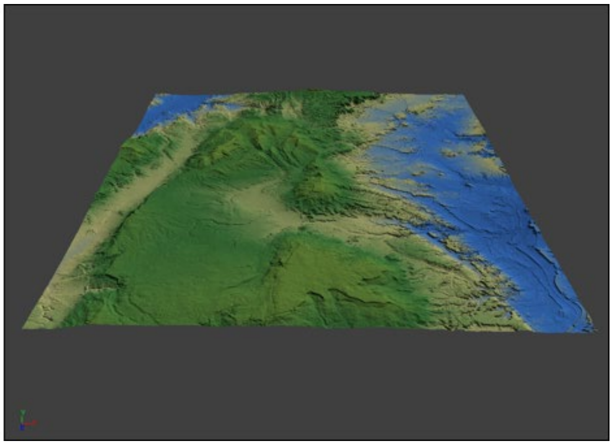

Water

The scene Water visible and hidden.
The Water properties are available on the Function panel.
The textured water is shown in the image below.

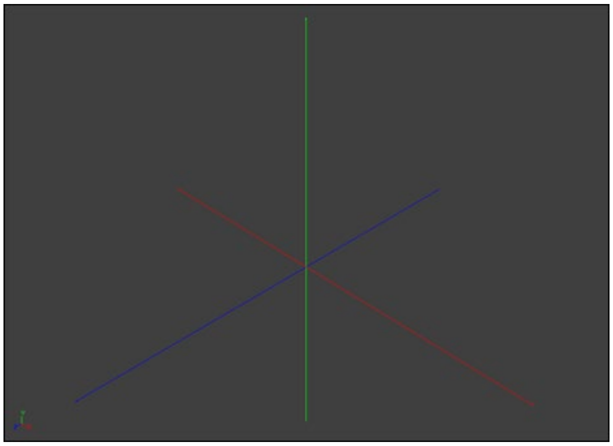
Object Bounds

The scene Object Bounds visible and hidden.
The Object Bounds do not have any editable properties.
The Object Bounds depict the cubic or spherical volume that totally encompasses a single specific scene object.

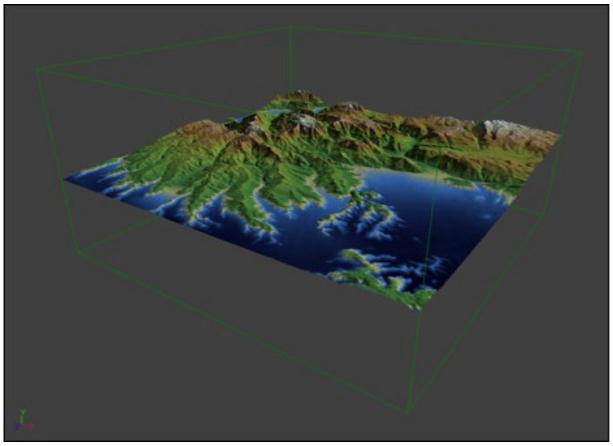
Origin Axes

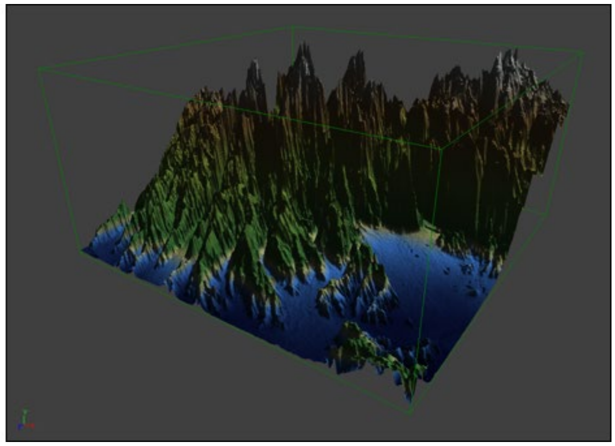
The scene Origin Axes.
The Origin Axes do not have any editable properties.
The Origin Axes extend from the world origin along each axis plane.
The Origin Axes lines are colored for each of the XYZ planes and include an arrow depicting the axis positive direction.



Terrain Extents

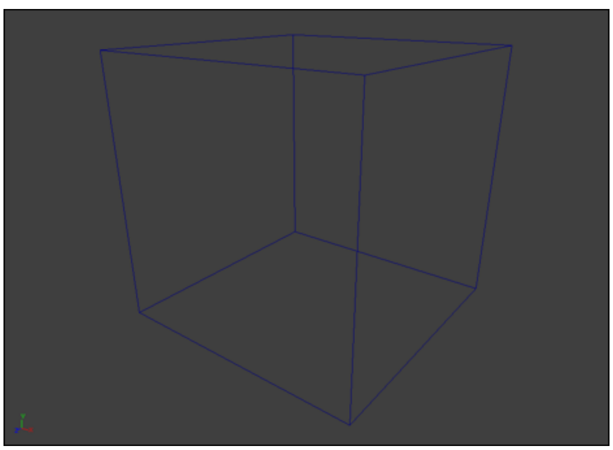
The scene Terrain Extents, with a terrain at default design and then normalized to fill the entire extents volume.
The Terrain Extents do not have any editable properties.
The Terrain Extents depict the maximum volume that the terrain can fill, which is the current width and length of the terrain and the maximum altitude height available for the terrain if it utilized the entire 0.0 to 100.0 value range.
The terrain width and length extents are calculated from the heightmap dimensions × the Units XZ Spacing value.
The maximum terrain altitude height extents are calculated from the maximum 100.0 value range × the Y Scaling factor value × the Units Y Spacing value.





World Extents

The scene World Extents.
The World Extents has only one editable property, Segments, located in the Settings.
The World Extents depict the maximum world volume width, length, and height.
The Backdrop is the only object that should ever extend beyond the world extents.

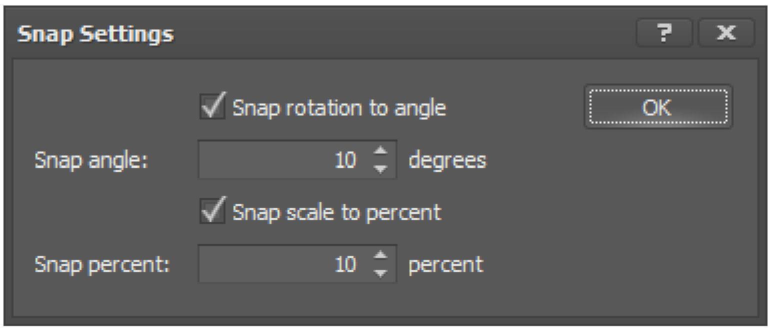


Snap: Angle and Percent

TerreSculptor has built-in Snap features that snap the gizmo and object rotation by a specified angle, and snap the gizmo and object scale by a specified percent.

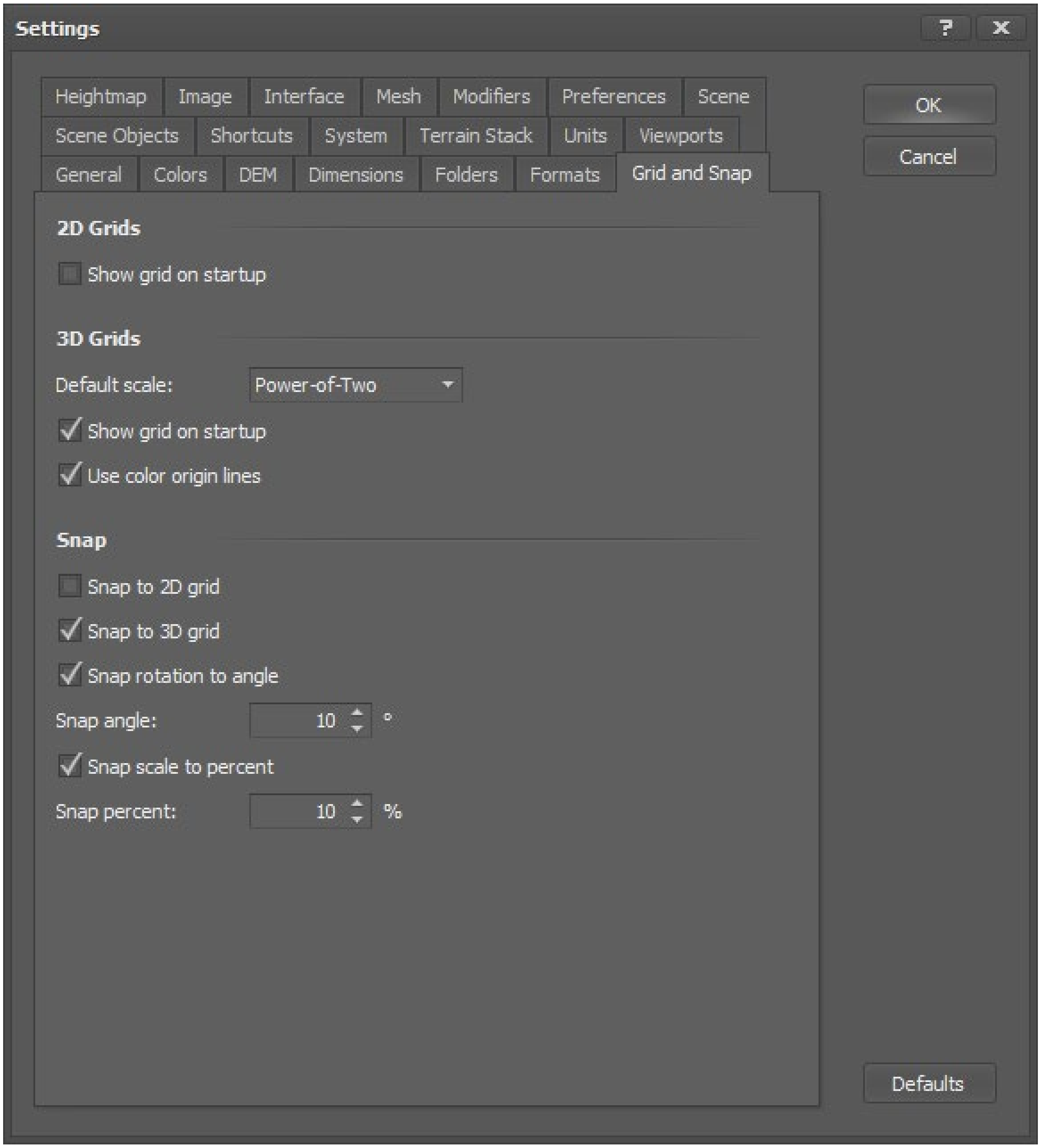
Object rotation is from 0 degrees to 360 degrees, with a snap value such as every 10 degrees.
Object scale is from 1 percent to 1000 percent, with a snap value such as every 10 percent.

To change the current snap angle and/or percent values, and to enable or disable each snap type, click on the main toolbar button Snap Settings button. This will display the Snap Settings dialog that can be adjusted as required. These settings can be changed at any time, and they become effective immediately on the tools.



Snap angle and percent is currently supported on the Copy and Merge Topology Tools and the 3D Gizmos, including the Selection Gizmo and Terrain Brush Gizmo. See the chapters on the Topology Tools and the Gizmos and Widgets.

The default Snap settings are specified on the Settings Grid and Snap tab. Choose Settings on the Tool menu. Every time TerreSculptor is launched, these default settings will be used.



Gizmos and Widgets

Gizmos

A Gizmo is a viewport scene 3D object that is used for selecting and manipulating data in the scene such as the heightmap terrain elevation data.

Gizmos are typically controlled by a set of sliders and numeric controls related to the tool that is currently being used, such as the Left and Top controls on a Function Panel Topology Tool.

Gizmos currently include the Selection Cube, and the Terrain Brush.

Widgets

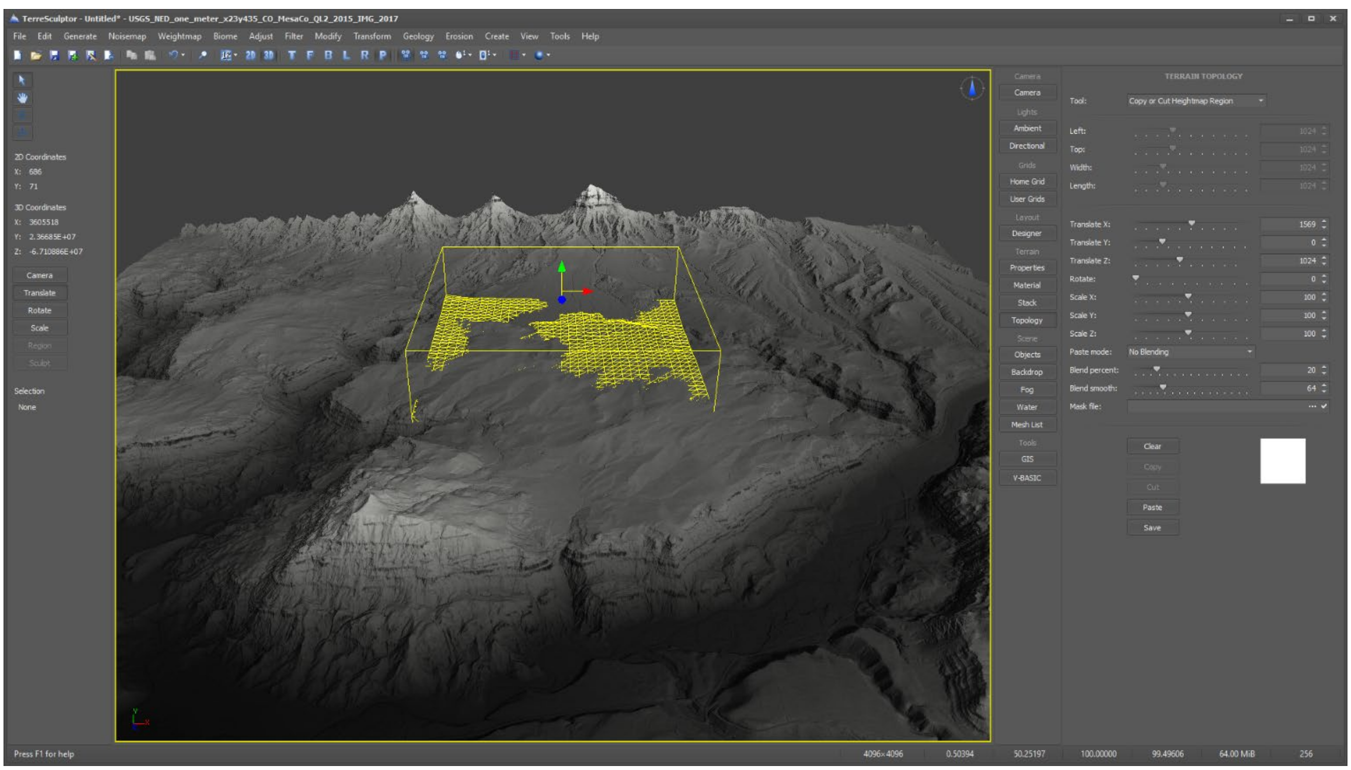
A Widget is a viewport scene 3D object that displays a Tripod Axis shape with Red, Green, Blue, or Grey colored shape nodes on the three ends. The Red node refers to the scene X Axis, the Green node refers to the scene Y Axis, and the Blue node refers to the scene Z Axis. A Grey colored node is a disabled Axis.

There are typically three different Widgets, one for Gizmo Translation that uses colored cones on the three axis nodes, one for Gizmo Rotation that uses colored spheres on the three axis nodes, and one for Gizmo Scale that uses colored cubes on the three axis nodes.

The Widgets are used by clicking the mouse on one of the colored axis nodes, to manipulation the Gizmo on that axis, such as Translating on the X axis, or Scaling on the Z Axis. The Widgets automatically scale in size with the camera distance.

The keyboard shortcut keys for selecting the three Widgets:
Shift+T = Translation
Shift+R = Rotation
Shift+S = Scale

A screenshot of a Topology Tool with the yellow Selection Cube Gizmo, yellow Terrain Brush Gizmo, and a Translate Widget.



World Space

Gizmos and Widgets work in ***World-Space*** in TerreSculptor.

That means Gizmos and Widgets are *absolute* oriented within the main editor world, and that they have a front-side and a back-side, relative to the camera position in the world.
If a Gizmo or Widget is manipulated from the back-side, such as translation with a mouse, the apparent direction of left-to-right is reversed or mirrored.

When viewing the main editor viewport from the front camera in world space, a ruler oriented across the viewport from left to right would appear on screen like this:

When viewing the main editor viewport from the back camera in world space, a ruler oriented across the viewport from left to right would appear on screen like this, and appear to be flipped horizontally:

However, the ruler is absolute positioned with the 0 side always in the same orientation and position in world space. It is simply being viewed from the back.

This absolute world space positioning results in Gizmos and Widgets appearing to move in the opposite direction when viewed from the back-side, but actually they are in fact always moving from a lower world coordinate to a higher world coordinate.

If the world space is thought of as the four directions of a compass, then from the front-side the compass would look like this viewing from above:

And when viewed from the back-side it would look like this, with the East and West sides flipped or mirrored:

So too, the Gizmo and Widget movement would appear to be mirrored from the back-side.

Viewport Concepts

The viewport is a framed two-dimensional window that is used to project the three dimensional scene from the position of the virtual camera. The viewport is a dynamic control with flexible tools for camera and object movement and selection during scene viewing and editing.

Multiple independent cameras are available, each with the ability to move to virtually any scene location, and to move using pan, truck, pedestal, and dolly. Using a few mouse movements and clicks, any level of scene detail can be reached.

Active Viewport

When TerreSculptor is started, the Editor is shown with its main viewport. This is the active viewport, where commands and other scene actions occur. Only one viewport can be in the active state at any time. When a dialog that contains a preview viewport is displayed, its viewport becomes the active viewport.

Orthographic Views

The orthographic views are two-dimensional flat views, each defined by two world coordinate axes with a fixed movement camera. Six different orthographic views are available. Each orthographic view is a combination pair of the three available axes producing the views for top, front, back, left, and right.

The orthographic views and their axes:

Top	XZ
Front	XY
Back	XY
Left	YZ
Right	YZ

To select an orthographic view:

1. Select the viewport orthographic view using the toolbar buttons:

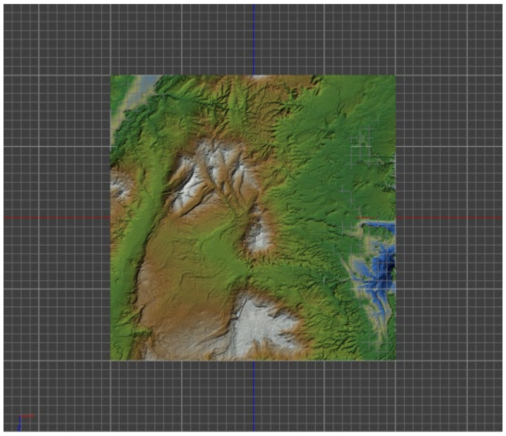
	Top
	Front
	Back
	Left
	Right

2. Select the viewport orthographic view using the keyboard shortcuts:

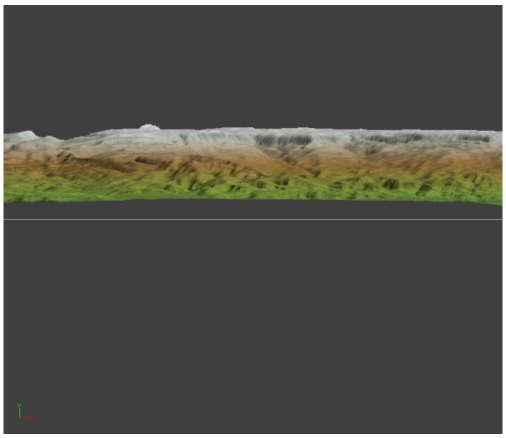
t	Top
f	Front
b	Back
l	Left
r	Right

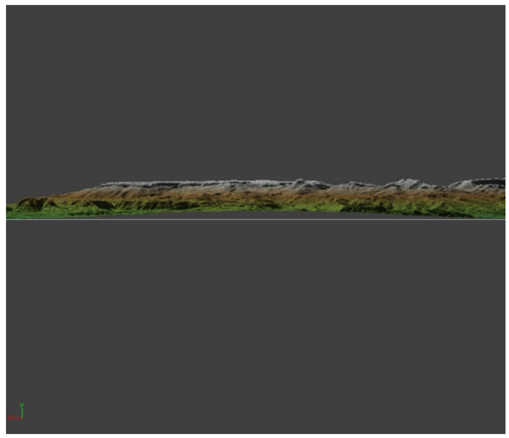
What you see:

In top view, the camera is looking straight down the Y axis at the XZ plane.

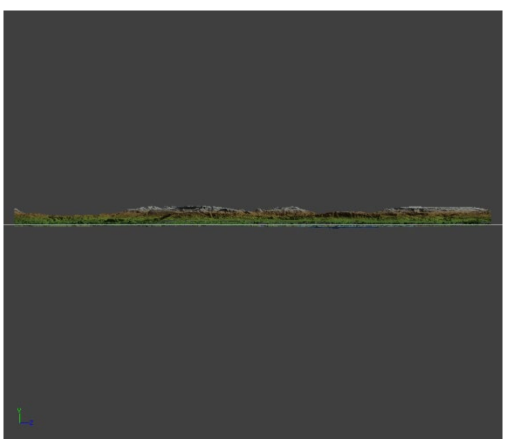


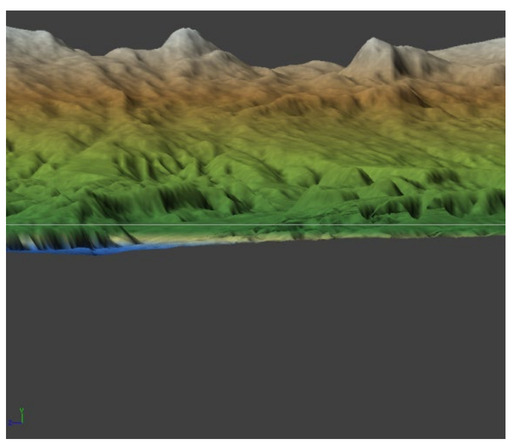
In front and back view, the camera is looking down the Z axis, the X axis runs left and right, the Y axis is vertical.





In left and right view, the camera is looking down the X axis, the Z axis runs left and right, the Y axis is vertical.





Perspective View

Perspective view resembles how humans see the world around them. The scene appears three dimensional, and objects recede into the distance, creating a sense of depth. Perspective view is the typical view used when working in the TerreSculptor Editor.

The cameras in perspective view are capable of virtually any movement, position, and location within the world on the three axes.

The perspective camera's field of view (FOV) can be changed in the application settings, allowing for narrow-angle and wide-angle lens types.

To select perspective view:

1. Select the viewport perspective view using the toolbar button:

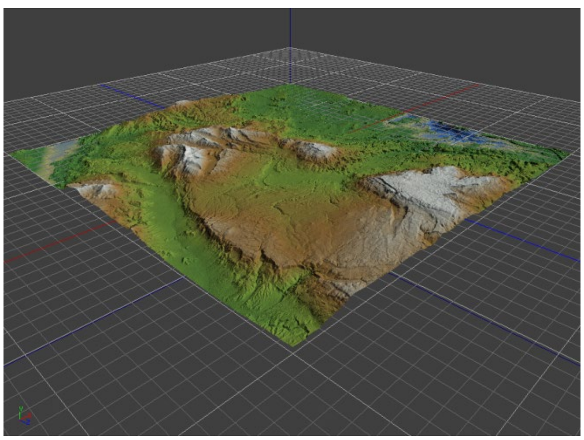
 Perspective

2. Select the viewport perspective view using the keyboard shortcut:

p Perspective

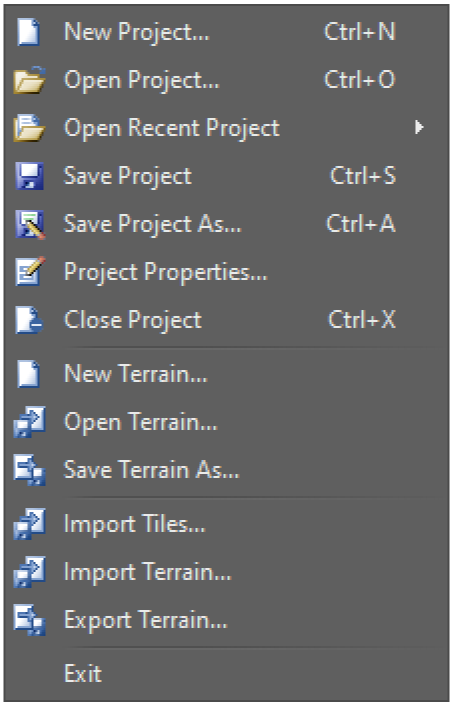
What you see:

In perspective view, the camera can move to virtually any world position and location.



File Menu

Contains the file related items.



New Project

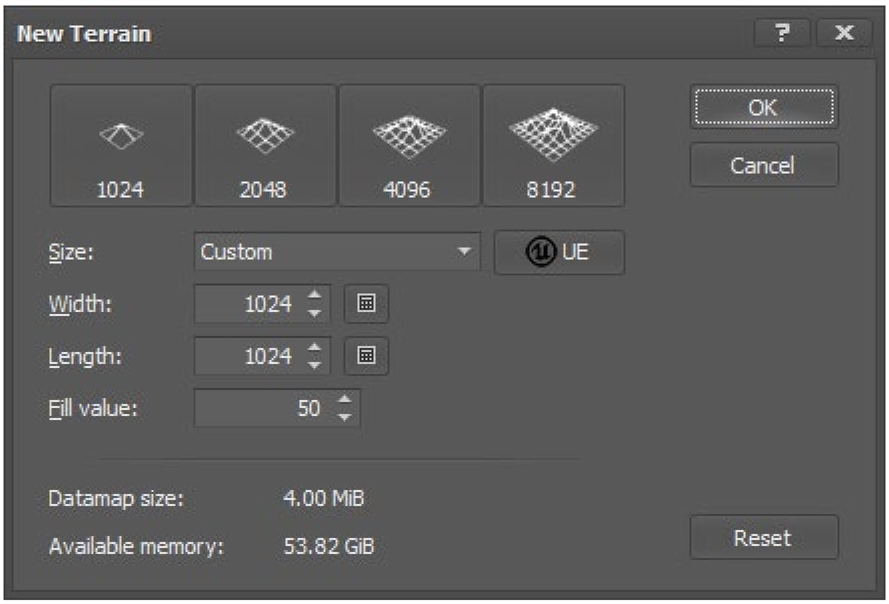
To start a new project and create a new flat heightmap, choose the New Project item on the File menu or the New Project button on the main toolbar. Choosing New Project also resets many of the application settings to defaults.

New Project.

When the New Project item is selected, you will be prompted to save the current project data if it has changed, and then the New Terrain dialog will appear.

Choose the desired heightmap resolution from the preset buttons or Size drop-down of common resolutions, or specify a custom size in the Width and Length numeric controls.
The Fill value numeric control allows you to specify the initial altitude level of the heightmap, which is typically the center altitude 50.0.

Once the new heightmap is created, the various tools can be used on it to create a custom terrain system.



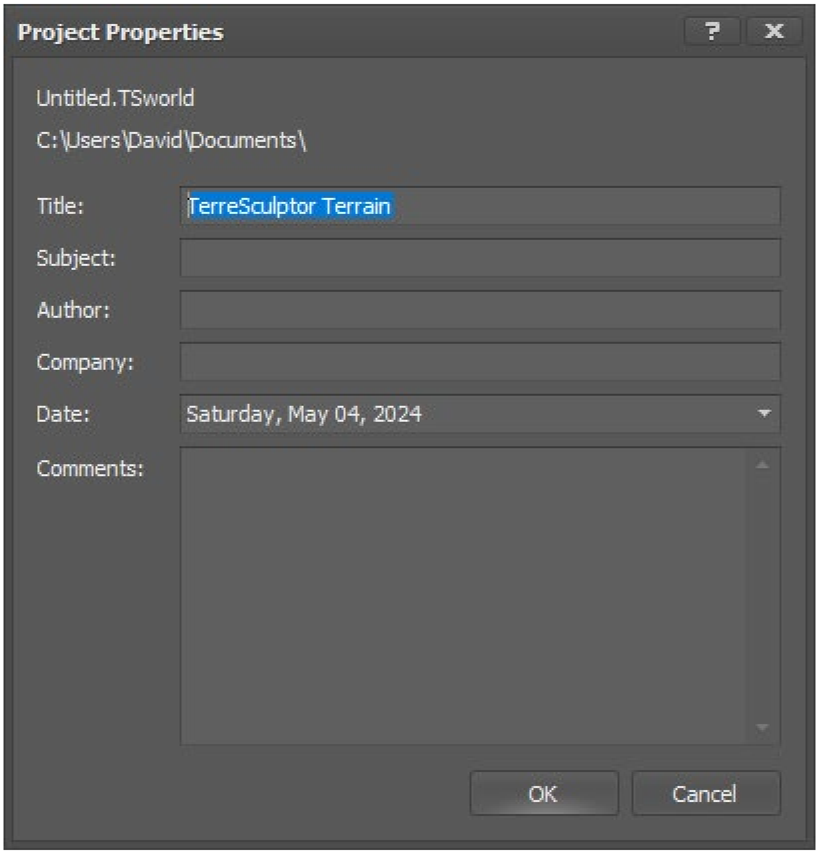
OK	Accept the settings and create a new heightmap.
Cancel	Cancel the dialog.
Reset	Reset the dialog to the default settings.
Preset buttons:	Common square-aspect heightmap sizes.
Size:	Choose a custom size or a common preset resolution.
UE button:	Choosing this button will display the Unreal Engine Landscape Sizes dialog. This button is available only when Unreal Engine is enabled in Settings, Dimensions.
Width:	The heightmap custom width value.
Length:	The heightmap custom length value.
Fill:	The heightmap altitude level.
Datamap size:	The amount of memory required to create the new datamap.
Available memory:	The total amount of available system memory.

Note: the available resolutions will depend on the amount of memory in the computer system. The software supports resolutions up to 1 million × 1 million pixels.

Project Properties

The Project Properties dialog allows for specifying a few optional tags and comments in the Project file.
These properties are typically used for personal or company tracking of projects.
These tags are stored in the Project file and read and written with each open and save.

The dialog also displays the file name of the current project, in addition to the drive path to where the file is stored.



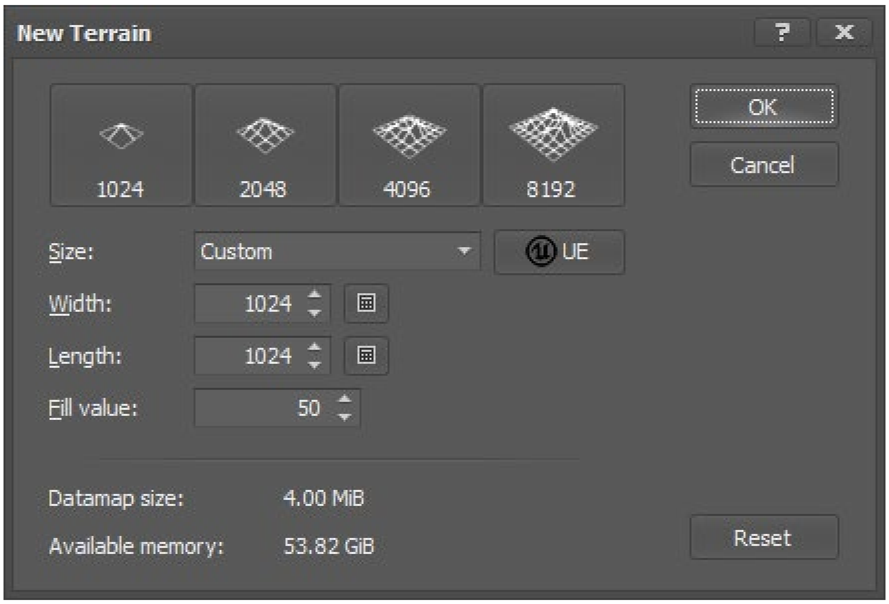
New Terrain

To start a new terrain on an existing project, and create a new flat heightmap, choose the New Terrain item on the File menu. Note that choosing New Terrain retains the current application settings.

When the New Terrain item is selected, you will be prompted to save the current project data if it has changed, and then the New Terrain dialog will appear.

Choose the desired heightmap resolution from the preset buttons or Size drop-down of common resolutions, or specify a custom size in the Width and Length numeric controls.
The Fill value numeric control allows you to specify the initial altitude level of the heightmap, which is typically the center altitude 50.0.

Once the new heightmap is created, the various tools can be used on it to create a custom terrain system.

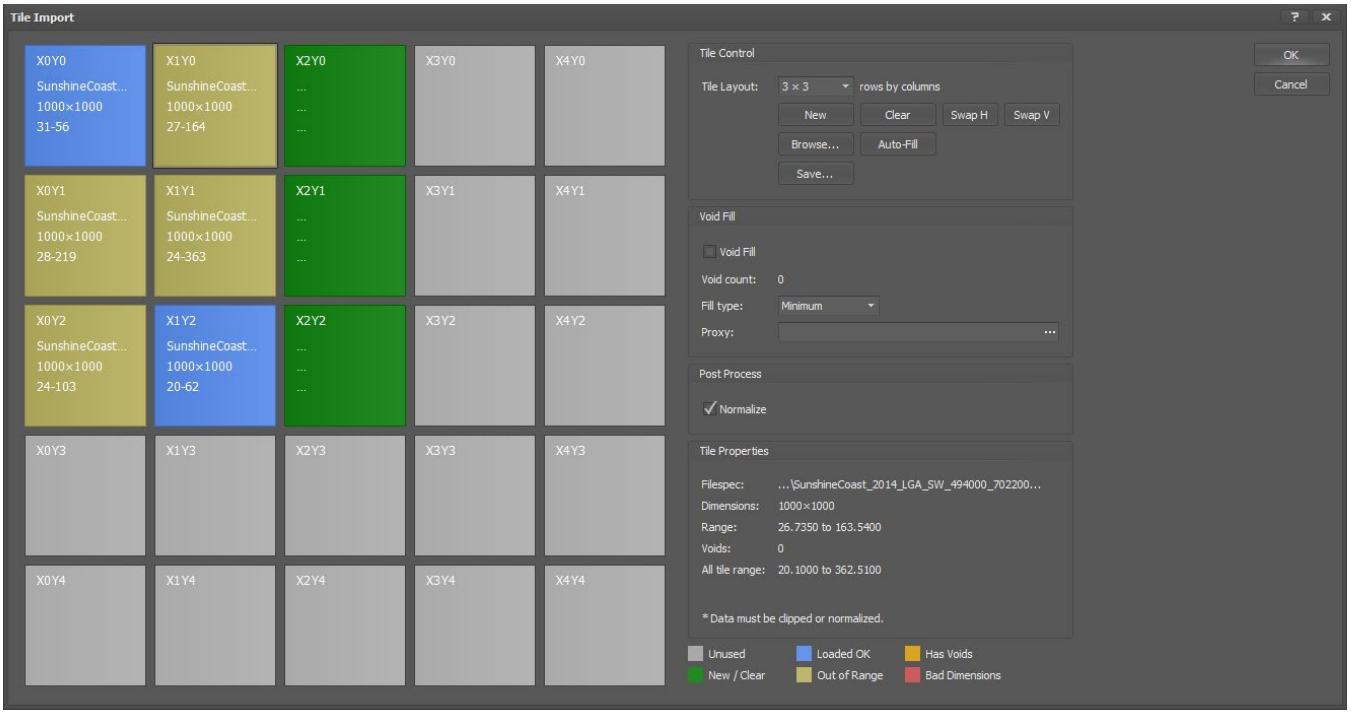


OK	Accept the settings and create a new heightmap.
Cancel	Cancel the dialog.
Reset	Reset the dialog to the default settings.
Preset buttons:	Common square-aspect heightmap sizes.
Size:	Choose a custom size or a common preset resolution.
UE button:	Choosing this button will display the Unreal Engine Landscape Sizes dialog. This button is available only when Unreal Engine is enabled in Settings, Dimensions.
Width:	The heightmap custom width value.
Length:	The heightmap custom length value.
Fill:	The heightmap altitude level.
Datamap size:	The amount of memory required to create the new datamap.
Available memory:	The total amount of available system memory.

Note: the available resolutions will depend on the amount of memory in the computer system. The software supports resolutions up to 1 million × 1 million pixels.

Import Tiles

The Tile Import dialog is used to stitch together Digital Elevation Model tiles into a single terrain heightmap.
The dialog can import up to a 5x5 set of tiles recursively, allowing for any number of tiles to be stitched.
All tiles must be the same width versus length resolution, but any elevation range is supported.
Note that the dialog settings will persist during a session so that you can re-load the DEM if required.



Tile Control

Tile Layout	Choose the tile layout for the tile set that you are planning to stitch together, such as 3x3.
New	Resets the entire dialog to a new state.
Clear	Clears the current set of tiles.
Browse	Browse for a tile file, you can also double-click on each tile to browse.
Auto-Fill	Auto-fill the entire tile set with tiles named such as File_X0, etc.
Save	Save the current stitched tile back as a DEM file so that it can be used recursively.
Swap H	Swap all of the tile columns horizontally.
Swap V	Swap all of the tile rows vertically.

Void Fill

The void fill area allows specifying a void fill parameter set while importing the tiles.
Digital Elevation Model files often have voids, or missing elevation samples.
If the Void Count property shows more than 0 voids in the tiles, the Void Fill checkbox should be enabled.
The most common Fill Type to use is the Fill Holes, which results in the best quality void fix.

Post Process

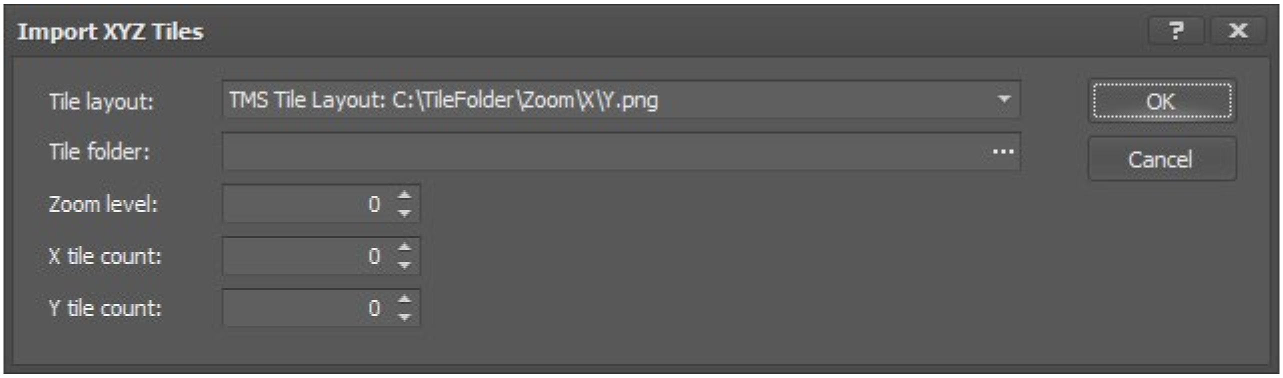
The post process area has one option, to Normalize the final stitched heightmap.
This option should be enabled if there are any tiles that are “Out of Range” colored.
By default this option is always enabled.

Tile Properties

The tile properties area shows basic information on the currently selected tile.

Import XYZ Tiles

The Import XYZ Tiles dialog is used to import and stitch TMS (Tile Map Service) and XYZ (Zoom, X, Y) OSGeo folder sets of tile files. These files are typically PNG or GeoTIF format Digital Elevation Models.



Tile layout	Choose TMS or XYZ tile layout format.
Tile folder	Browse to the root folder of the tile set.
Zoom level	The Zoom Level folder to import, this is always 0, no additional zoom levels are supported.
X tile count	The number of X tiles in the set to import.
Y tile count	The number of Y tiles in the set to import.

TMS Tile Layout

The TMS tiles are typically laid out in the folder arrangement of “C:\TileFolder\Zoom\X\Y.png”.

```
RootFolder
        0       <- zoom level 0
            0   <- tile X0 folder contains the files 0.png, 1.png, 2.png etc for the Y axis
            1   <- tile X1 folder contains the files 0.png, 1.png, 2.png etc for the Y axis
            2   <- tile X2 folder contains the files 0.png, 1.png, 2.png etc for the Y axis
            3   <- tile X3 folder contains the files 0.png, 1.png, 2.png etc for the Y axis
```

XYZ Tile Layout

The XYZ tiles are typically laid out in the folder arrangement of “C:\TileFolder\Zoom\X\Y\TileFile.png”.

```
RootFolder
        0           <- zoom level 0
            0       <- tile X0 folder
                0   <- tile Y0 folder, contains one tilename.png file
                1   <- tile Y1 folder, contains one tilename.png file
                2   <- tile Y2 folder, contains one tilename.png file
                3   <- tile Y3 folder, contains one tilename.png file
            1       <- tile X1 folder
                0   <- tile Y0 folder, contains one tilename.png file
                1   <- tile Y1 folder, contains one tilename.png file
                2   <- tile Y2 folder, contains one tilename.png file
                3   <- tile Y3 folder, contains one tilename.png file
```

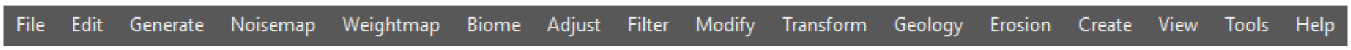
Devices Overview

A *Device* is a module that performs a basic or complex function in TerreSculptor.
Devices include Generators, Extractors, Modifiers, and Control and File objects.

Device Menus

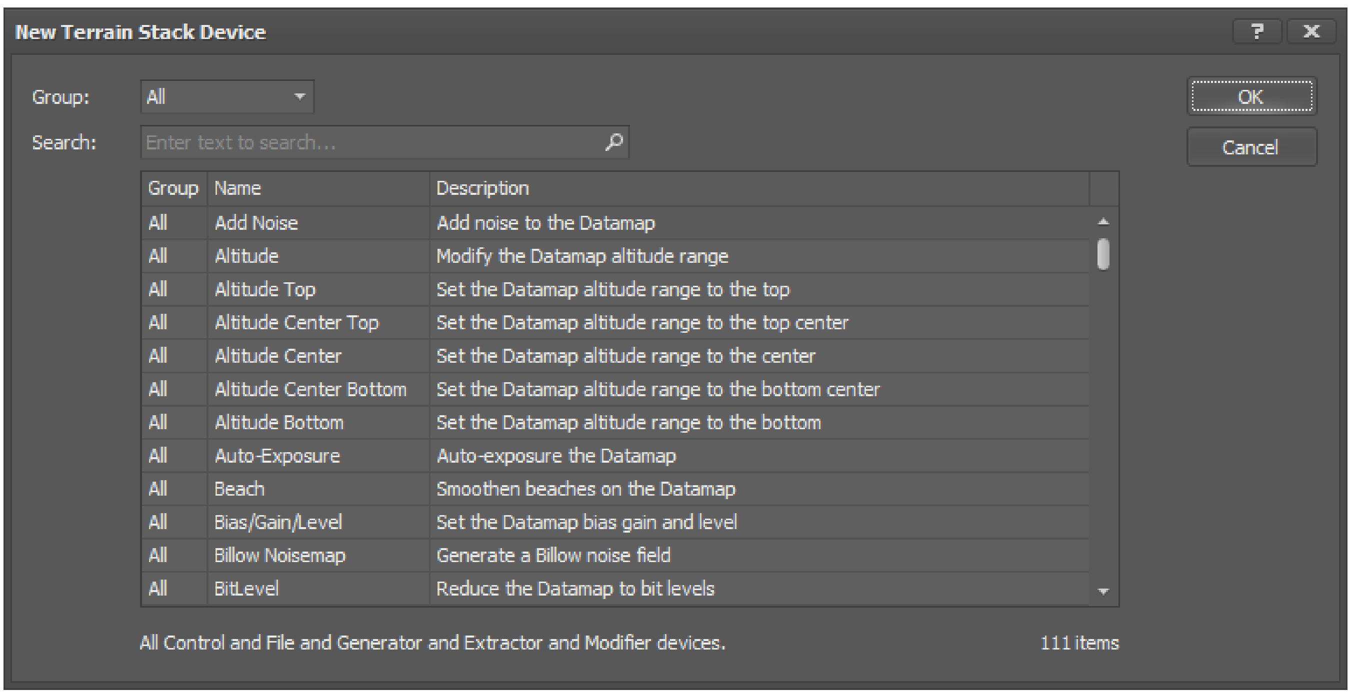
A variety of generators and modification Devices are available that modify the datamap data in a wide number of ways. The Devices are found on the Generate, Noisemap, Weightmap, Adjust, Filter, Modify, Transform, Geology, and Erosion menus.

The Terrain Stack's Base Datamap data can be modified directly and immediately by using the Devices on the menus.



Terrain Stack Devices

Most of the same Devices are also available on the Terrain Stack for non-destructive terrain creation workflow.
The Terrain Stack also includes special Control and File devices not available on the menus.



Dialog Context Help

All of the Device dialogs include instant context-sensitive help for every dialog control (except drop-down boxes). To access the context help, click on the help button on the dialog window title bar right side, then move the help cursor over to the control you wish to get help for, and click again. A context help tooltip will temporarily pop up. Click anywhere on the screen to remove the help tooltip.

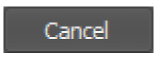
1. Click on this button: 

2. Move the help cursor over a control and click: 

Dialog Command Buttons

Most of the Device dialogs include these command buttons.

Accept the current settings and close the dialog.



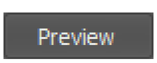
Cancel and close the dialog.

Copy the current Device properties to the clipboard.

Paste the clipboard to the Device properties.

Reset the dialog controls to their original settings before the dialog was opened.

Set the dialog controls to their default settings.

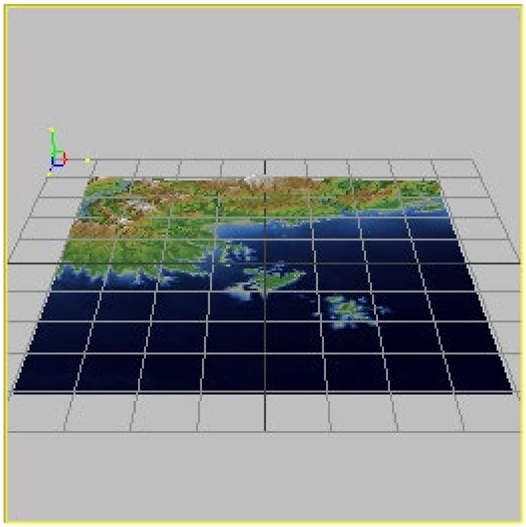


Preview the device results.

Dialog Preview Window

Many of the device dialogs include a real-time preview of their function. This real-time preview window displays a thumbnail version of the current object being adjusted. Depending on the device dialog, the preview window supports one or more views and a number of display options available on the Preview Window Options Menu.

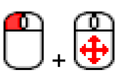
The preview window is often fully interactive with rendering settings and mouse control for panning or camera and light movement.



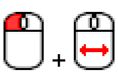
Preview Window Control

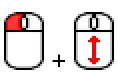
The preview window includes interactive viewing controls for each view mode.

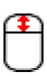
2D View, if available:

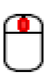
 Pan the datamap in the preview window.

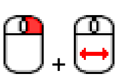
3D View, if available:

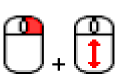
 Camera orbit.

 Camera pitch.

 Camera dolly.

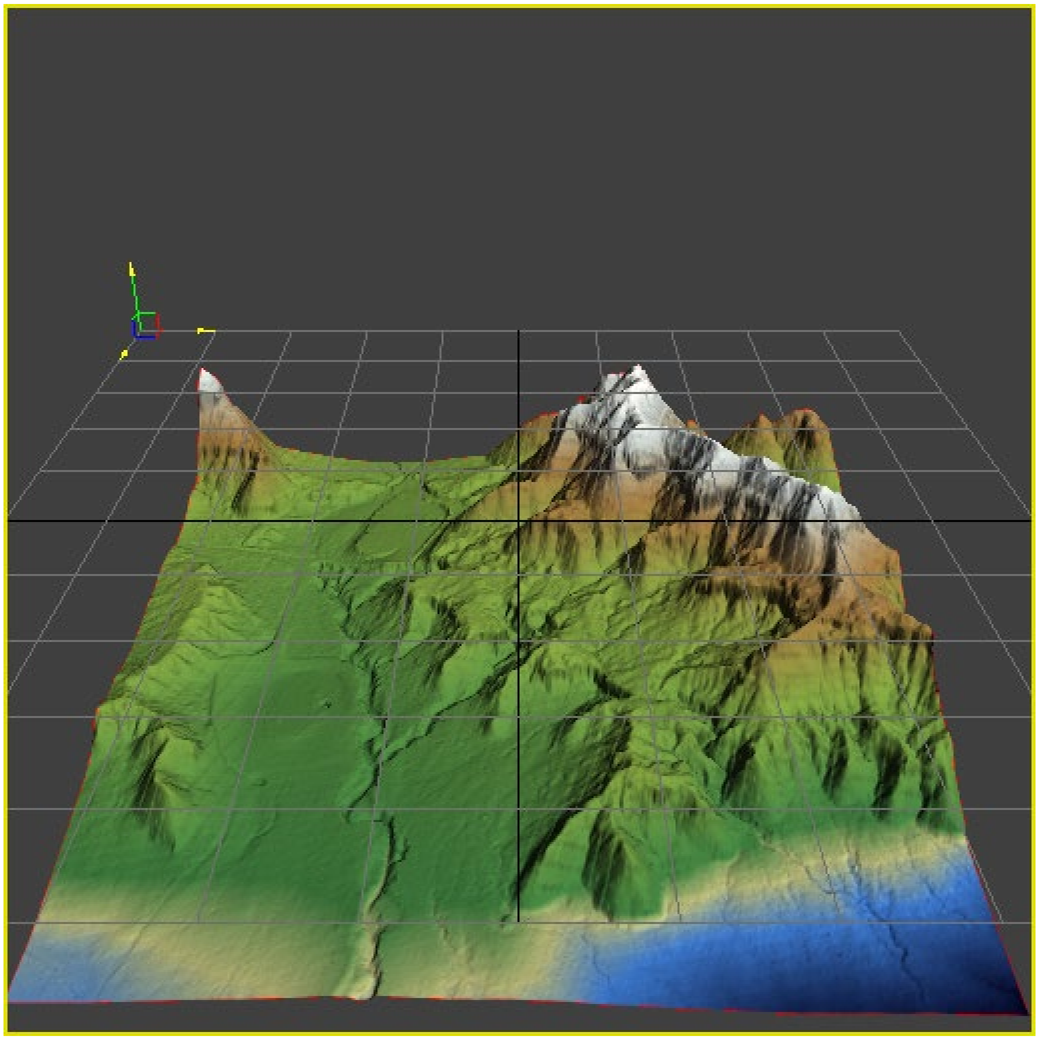
 Cycle between the two camera dolly speeds (1× and 4×).

 Directional Light orbit.

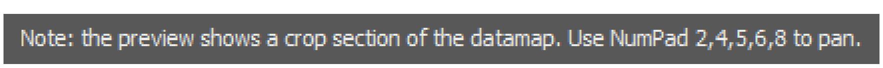
 Directional Light pitch.

Dialog Preview Crop

Some of the devices use a cropped 1-to-1 preview of the datamap for better previewing of the device effect. Previews that are cropped will have a red line border around the preview mesh as seen in this screenshot:



The dialog will also have a cropped note notice text.



Use the NumPad (set Numlock) 2,4,6,8 keys to pan the preview around to find the best datamap region for the device effect preview. Use the NumPad 5 key to center the preview on the heightmap.

Preview Window Toolbar

Many of the Device dialogs include a real-time preview of their function. This real-time preview includes a toolbar that can be used to set many of the preview options such as the view mode, render colorsets, and more. The specific toolbar buttons that are available may vary by the device chosen.

Real-time preview – Toggle real-time preview mode.
When enabled the preview will refresh without having to choose the Preview button.

Top view – Select the preview top 2D or 3D view.

Front view – Select the preview front 2D or 3D view.

Side view – Select the preview left side 2D or 3D view.

Perspective view – Select the preview 3D perspective view.

View datamap – View the mask overlaid on the heightmap.

View mask – View the mask overlaid on the heightmap.

View overlay – View the mask overlaid on the heightmap.

Pointer mode – Pointer mode.

Pan mode – 1:1 Pan mode.

Zoom to fit – View zoom-to-fit size.

Zoom 100% – View zoom 1:1 100% size.

Reset pan to origin – Reset the 1:1 pan view to the top-left edge of the preview.

Reset pan to center – Reset the 1:1 pan view to the center of the preview.

Show axis icon – Toggle the visibility of the XYZ tripod axis icon.

Show grid – Toggle the visibility of the grid.

Show water plane – Toggle the visibility of the water plane. The water plane is always at a world Y of 0.

Auto-range Colorset – Render the preview using the auto-range version of the specified colorset.
See the chapter on Colorsets.

Colorset – Render the preview using the specified colorset.
See the chapter on Colorsets.

Reset camera – Reset the orbit camera to its default position.

Reset lights – Reset the directional light to its default position.

Screenshot – Save a screenshot of the current preview viewport.

Modified/Original – Toggle the modified or original terrain heightmap view.

Preview Window Statusbar

Many of the Device dialogs include a real-time preview of their function. This real-time preview includes a statusbar that displays status information for the device preview. The specific statusbar content that is available may vary by the Device chosen.

Preview build time – The time in hours:minutes:seconds.milliseconds to build the preview noisemap.

Estimated build time – The estimated time in hours:minutes:seconds.milliseconds to build the full noisemap.

X coordinate – 2D Top view heightmap X coordinate located under the mouse cursor.

Y coordinate – 2D Top view heightmap Y coordinate located under the mouse cursor.

XY Value – 2D Top view heightmap altitude value at the XY coordinates.

Datamap XY value – The datamap altitude value at the XY coordinates.

Mask XY value – The weightmap mask altitude value at the XY coordinates.

Datamap size – The source heightmap dimensions.

Mouse wheel speed – the mouse wheel speed.

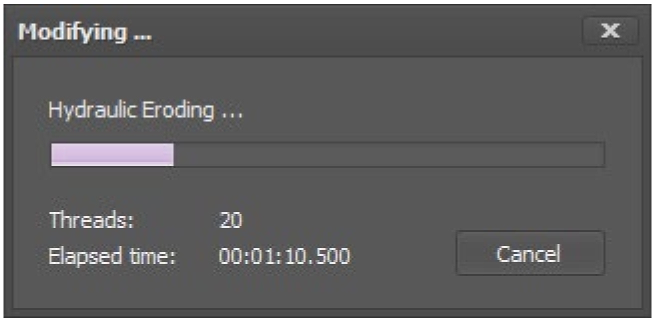
View mode – the preview window view mode.

Preview render performance – 3D scene frames per second.

Device thread count – the number of processor threads that the device supports.

Device Progress

While a Device is performing its function on the datamap, the progress dialog will be displayed.



The progress dialog displays the following information:

- The Device function type that is executing.
- A progress meter bar that graphically depicts the current progress completion percentage.
- The number of processor threads used to perform the function.
- The elapsed execution time.

The Cancel button is available on some Devices during long execution times to allow cancelling of the function. Note that it can take a few seconds before the execution is cancelled.

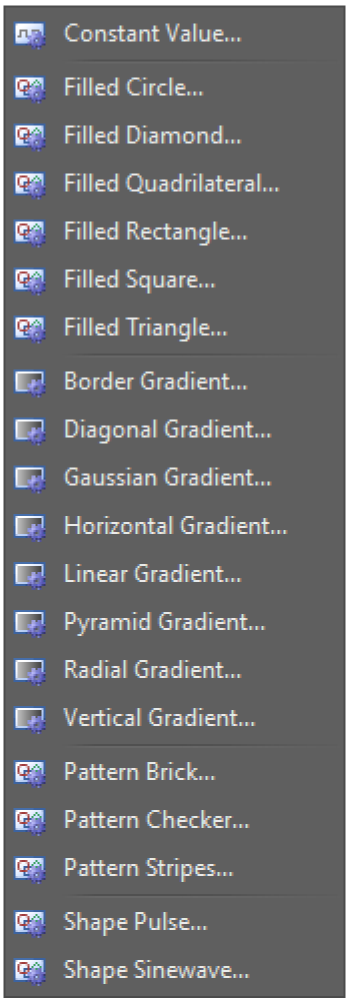
Generator Menu: Devices

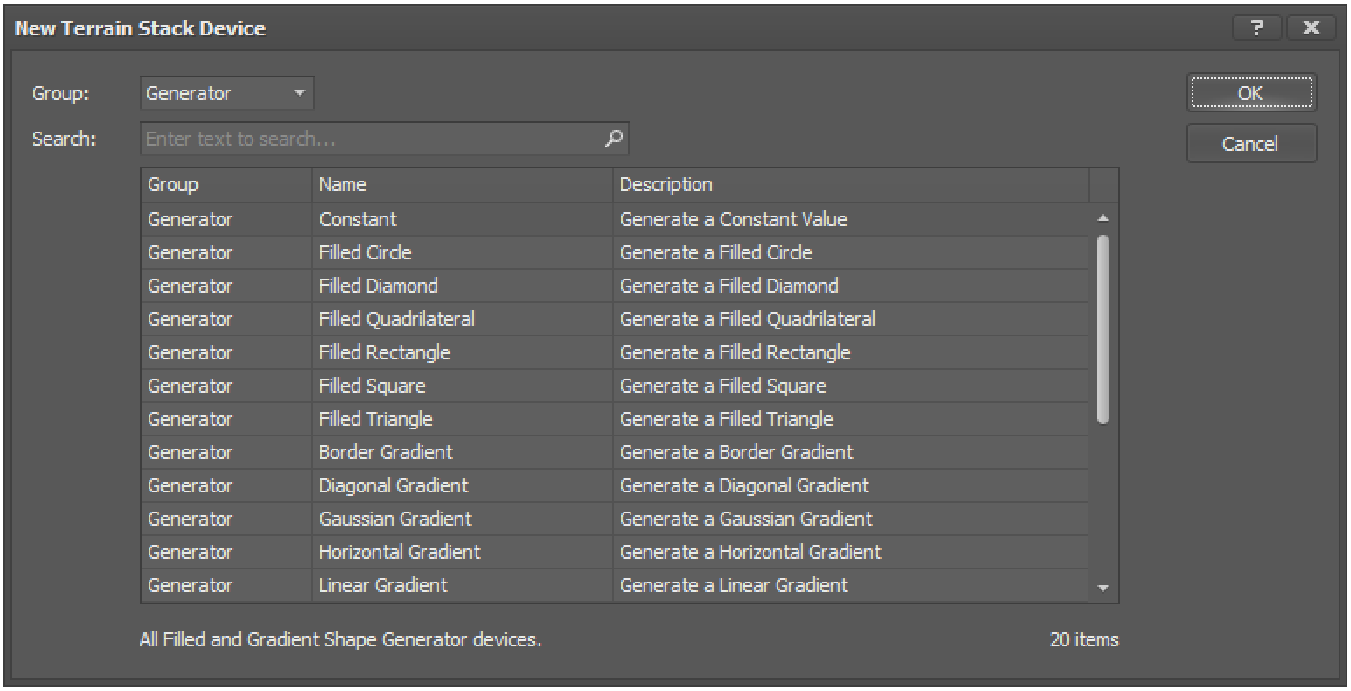
The Generate menu contains devices that create fills, gradients, and complex shapes.

The Generator devices are typically used for creating masks that can be used on the Terrain Stack for masking the results of other devices.

Most of the Generator devices can be cropped on their edges for masks such as the edge of a semi-circle.

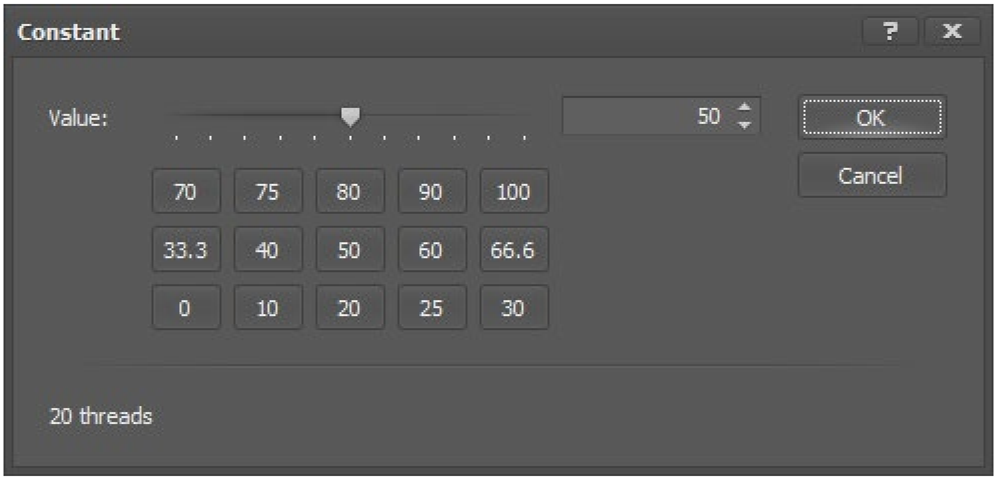
The Generator devices can also be embedded onto the current datamap by not using the Fill Outside option. This allows for generating shapes onto the terrain for such things as bases and platforms.




New Terrain Stack Device
Group: Generator
Search: Enter text to search...
OK
Cancel
Group | Name | Description
Generator | Constant | Generate a Constant Value
Generator | Filled Circle | Generate a Filled Circle
Generator | Filled Diamond | Generate a Filled Diamond
Generator | Filled Quadrilateral | Generate a Filled Quadrilateral
Generator | Filled Rectangle | Generate a Filled Rectangle
Generator | Filled Square | Generate a Filled Square
Generator | Filled Triangle | Generate a Filled Triangle
Generator | Border Gradient | Generate a Border Gradient
Generator | Diagonal Gradient | Generate a Diagonal Gradient
Generator | Gaussian Gradient | Generate a Gaussian Gradient
Generator | Horizontal Gradient | Generate a Horizontal Gradient
Generator | Linear Gradient | Generate a Linear Gradient
All Filled and Gradient Shape Generator devices.
20 items

Generate: Constant Value

Generate a constant single value.



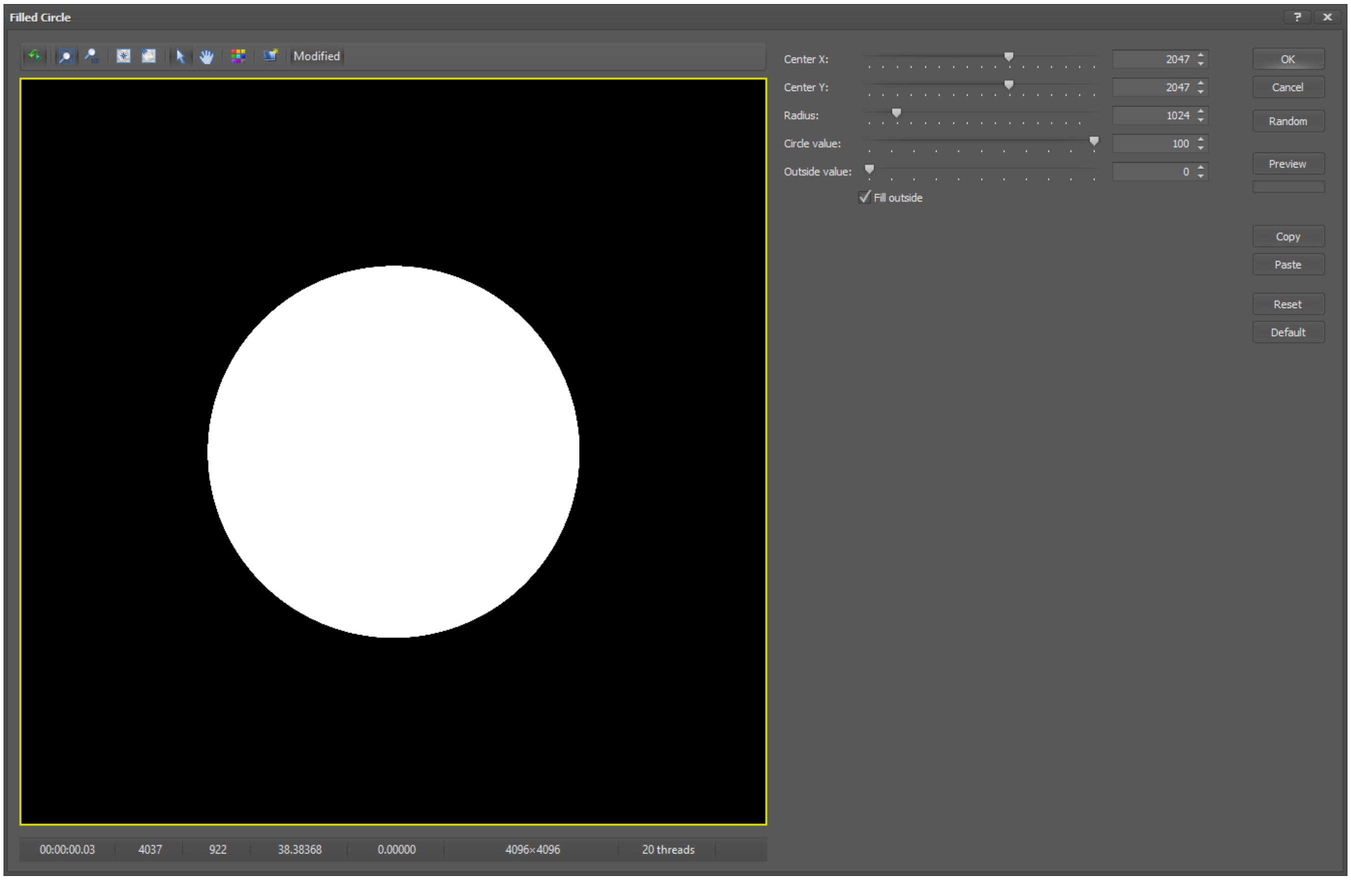
Value	The value to generate.
Value Preset Buttons	Common values.

Notes

This device is partially multi-threaded.
This device requires zero additional datamap allocations.

Generate: Filled Circle

Generate a filled circle.



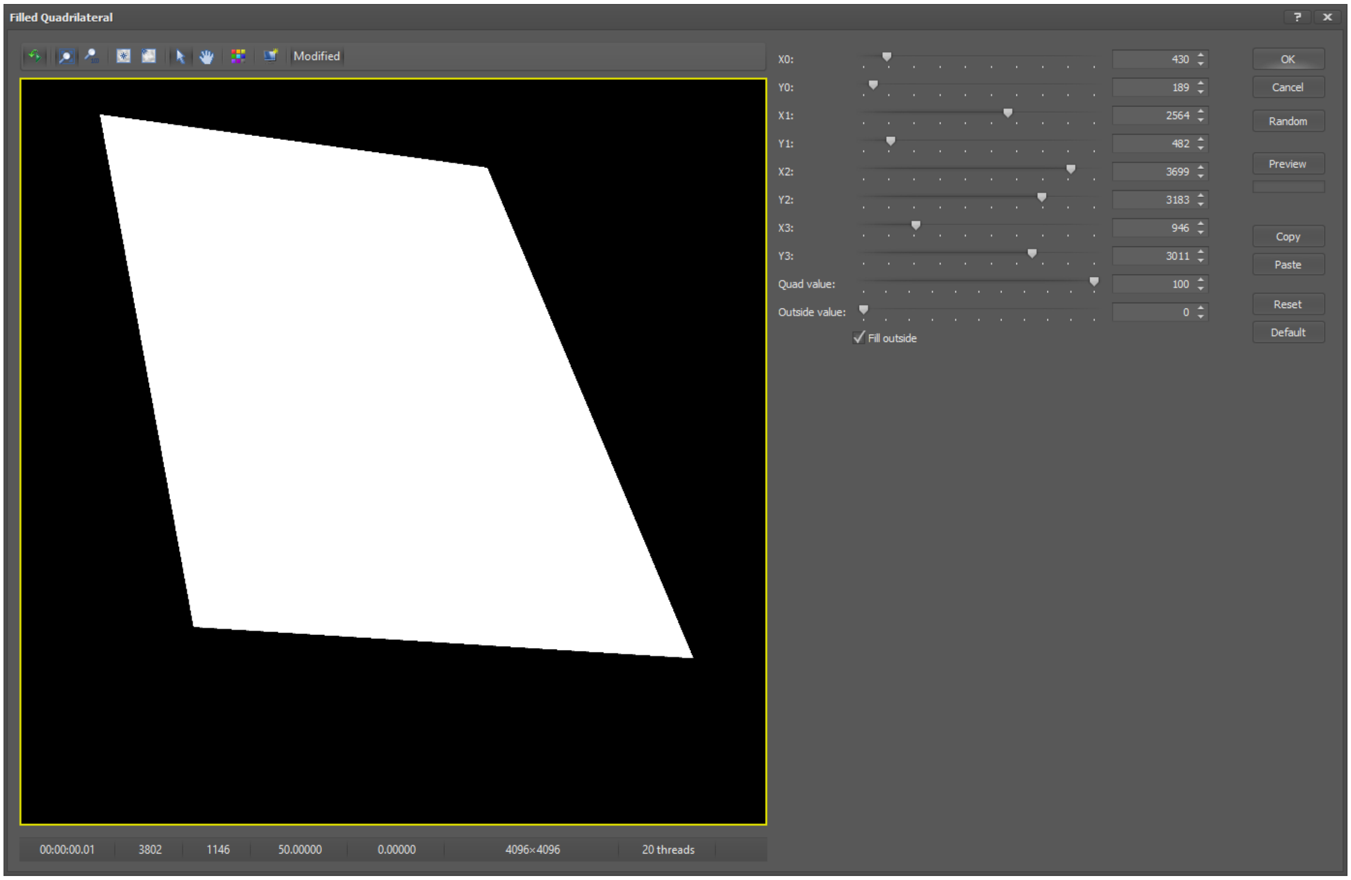
Center X	The center X coordinate.
Center Y	The center Y coordinate.
Radius	The circle radius.
Circle value	The circle fill value.
Outside value	The fill value outside of the circle.
Fill outside	Whether to fill the outside.

Notes

This device is partially multi-threaded.
This device requires zero additional datamap allocations.

Generate: Filled Quadrilateral

Generate a four-coordinate filled quadrilateral.



X0	Coordinate X 0.
Y0	Coordinate Y 0.
X1	Coordinate X 1.
Y1	Coordinate Y 1.
X2	Coordinate X 2.
Y2	Coordinate Y 2.
X3	Coordinate X 3.
Y3	Coordinate Y 3.

Quad value	The quadrilateral fill value.
Outside value	The fill value outside of the quadrilateral.
Fill outside	Whether to fill the outside.

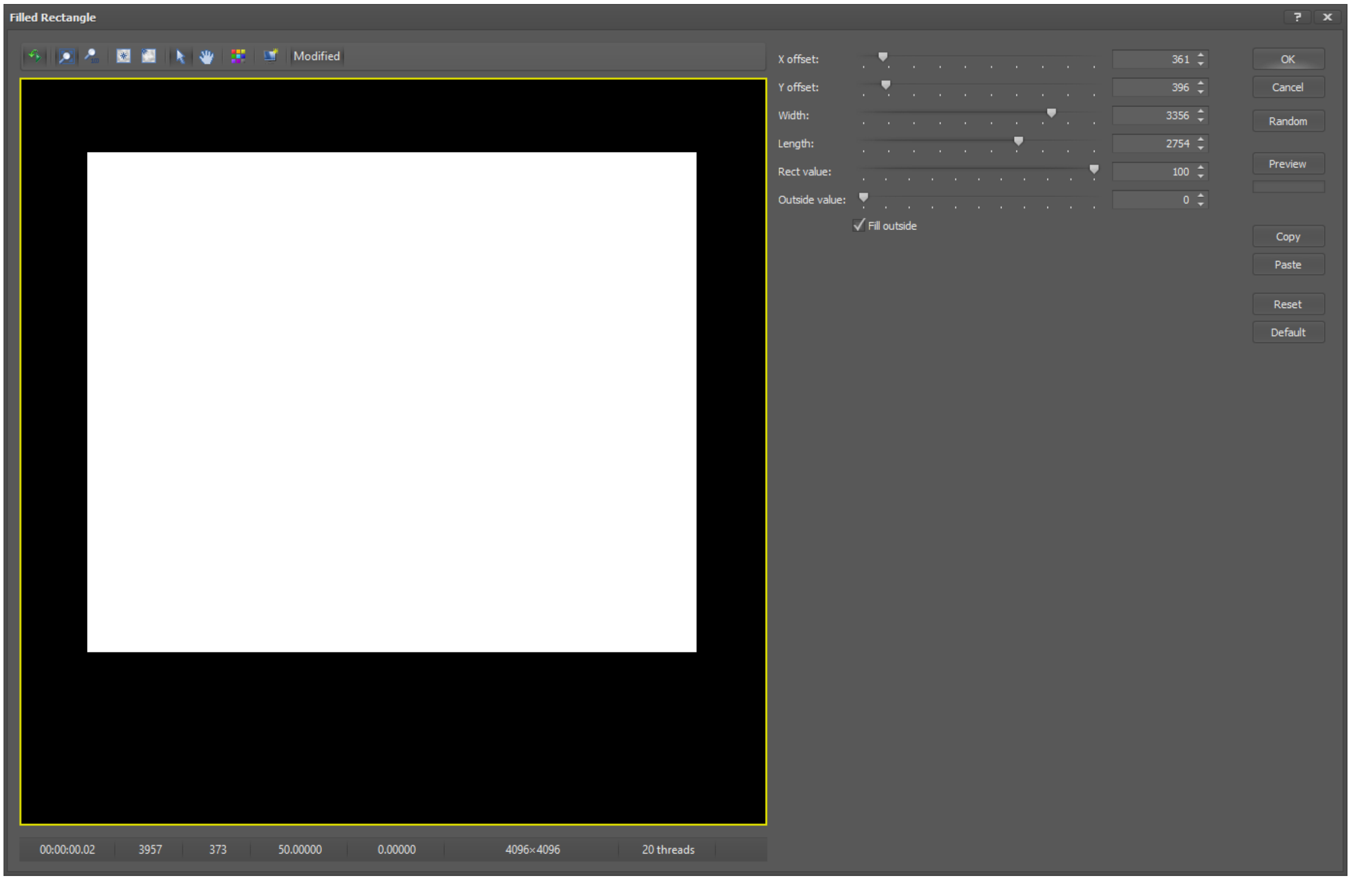
Notes:

The coordinates cannot be overlapping and must be a convex shape.

This device is partially multi-threaded.
This device requires zero additional datamap allocations.

Generate: Filled Rectangle

Generate a filled rectangle.



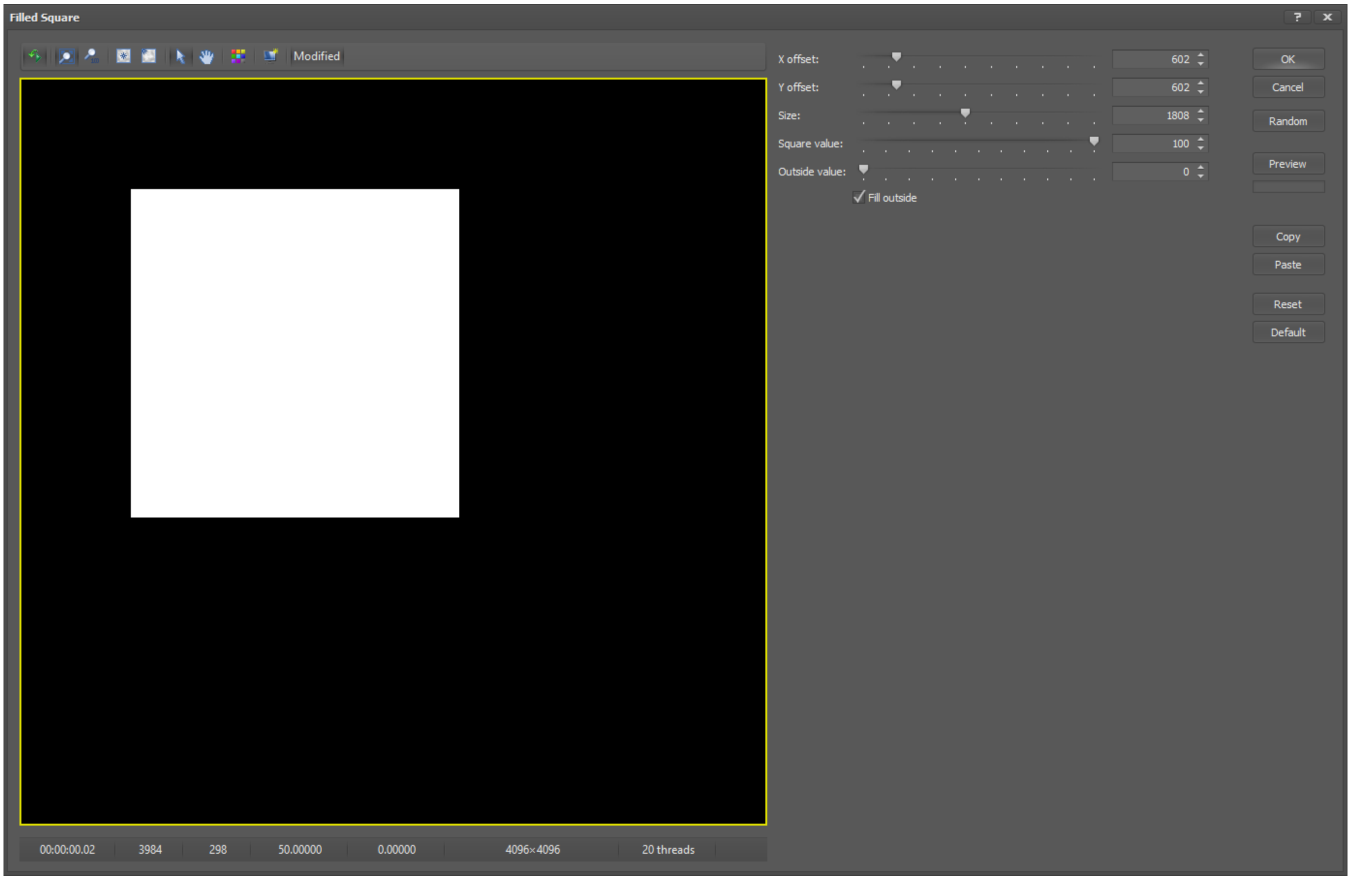
X offset	The top-left X offset.
Y offset	The top-left Y offset.
Width	The rectangle width.
Length	The rectangle length.
Rect value	The rectangle fill value.
Outside value	The fill value outside of the rectangle.
Fill outside	Whether to fill the outside.

Notes

This device is partially multi-threaded.
This device requires zero additional datamap allocations.

Generate: Filled Square

Generate a filled square.



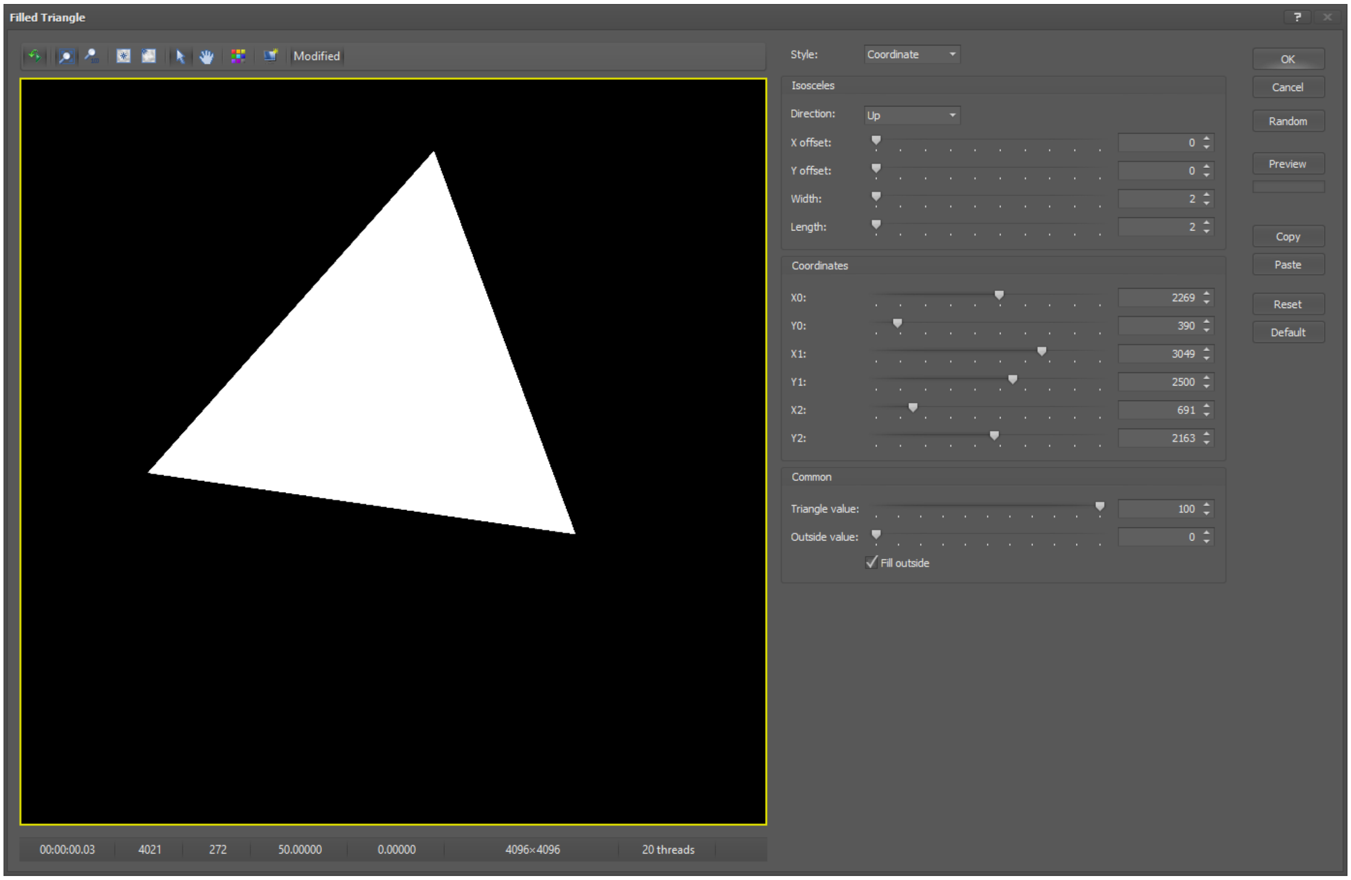
X offset	The top-left X offset.
Y offset	The top-left Y offset.
Size	The square size. The width and length are the same value.
Square value	The square fill value.
Outside value	The fill value outside of the square.
Fill outside	Whether to fill the outside.

Notes

This device is partially multi-threaded.
This device requires zero additional datamap allocations.

Generate: Filled Triangle

Generate a filled triangle.



Style	The triangle style. Coordinate: generate a triangle using three coordinates. Isosceles: generate a triangle within a rectangular bounds.

Isosceles

Direction	The triangle direction.
X offset	The top-left X offset.
Y offset	The top-left Y offset.
Width	The triangle width.
Length	The triangle length.

Coordinates

X0	Coordinate X 0.
Y0	Coordinate Y 0.
X1	Coordinate X 1.
Y1	Coordinate Y 1.
X2	Coordinate X 2.
Y2	Coordinate Y 2.

Triangle value	The triangle fill value.
Outside value	The fill value outside of the triangle.
Fill outside	Whether to fill the outside.

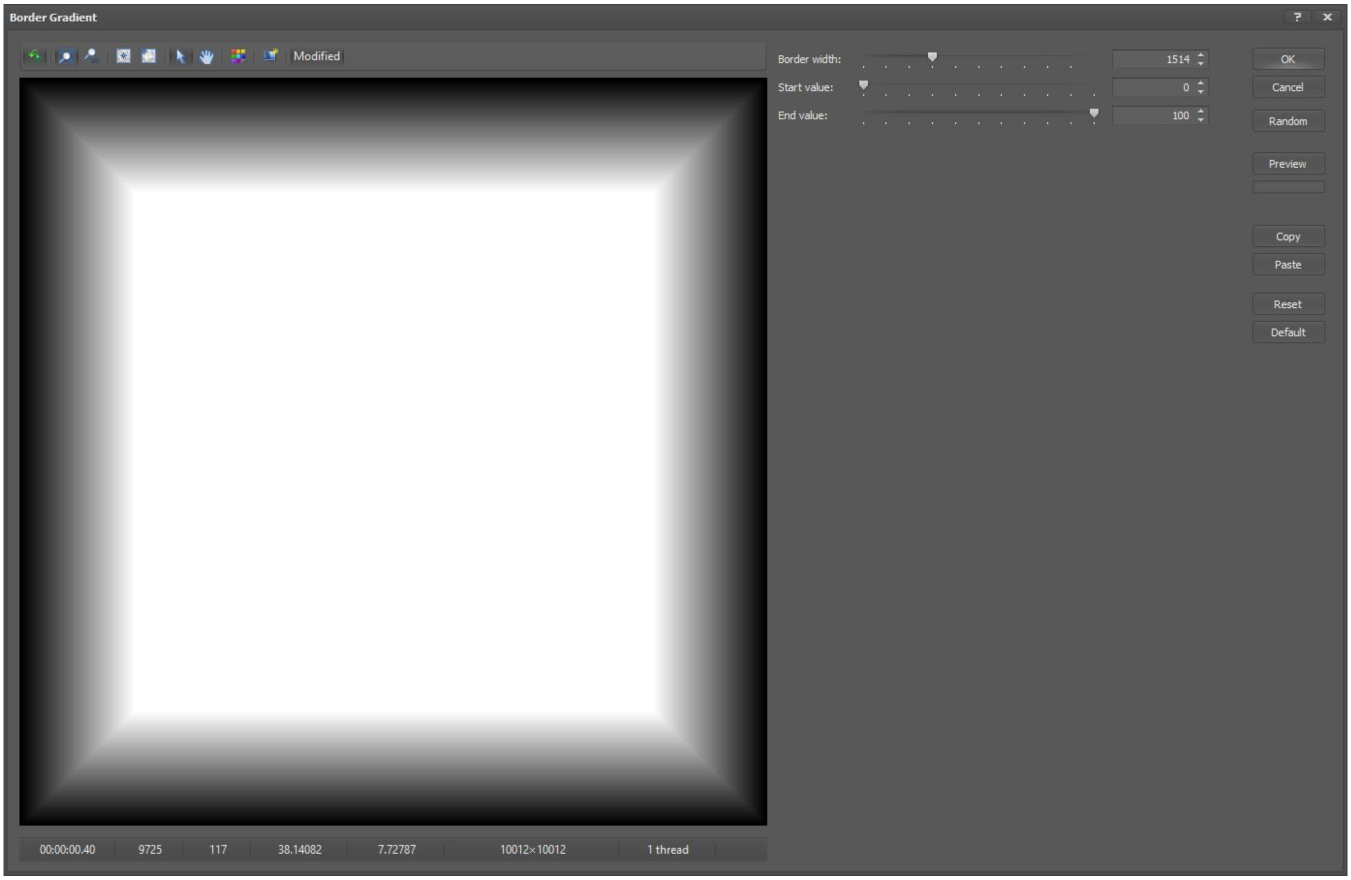
Notes:

The coordinates cannot be overlapping and must be a convex shape.

This device is partially multi-threaded.
This device requires zero additional datamap allocations.

Generate: Border Gradient

Generate a gradient around the border.



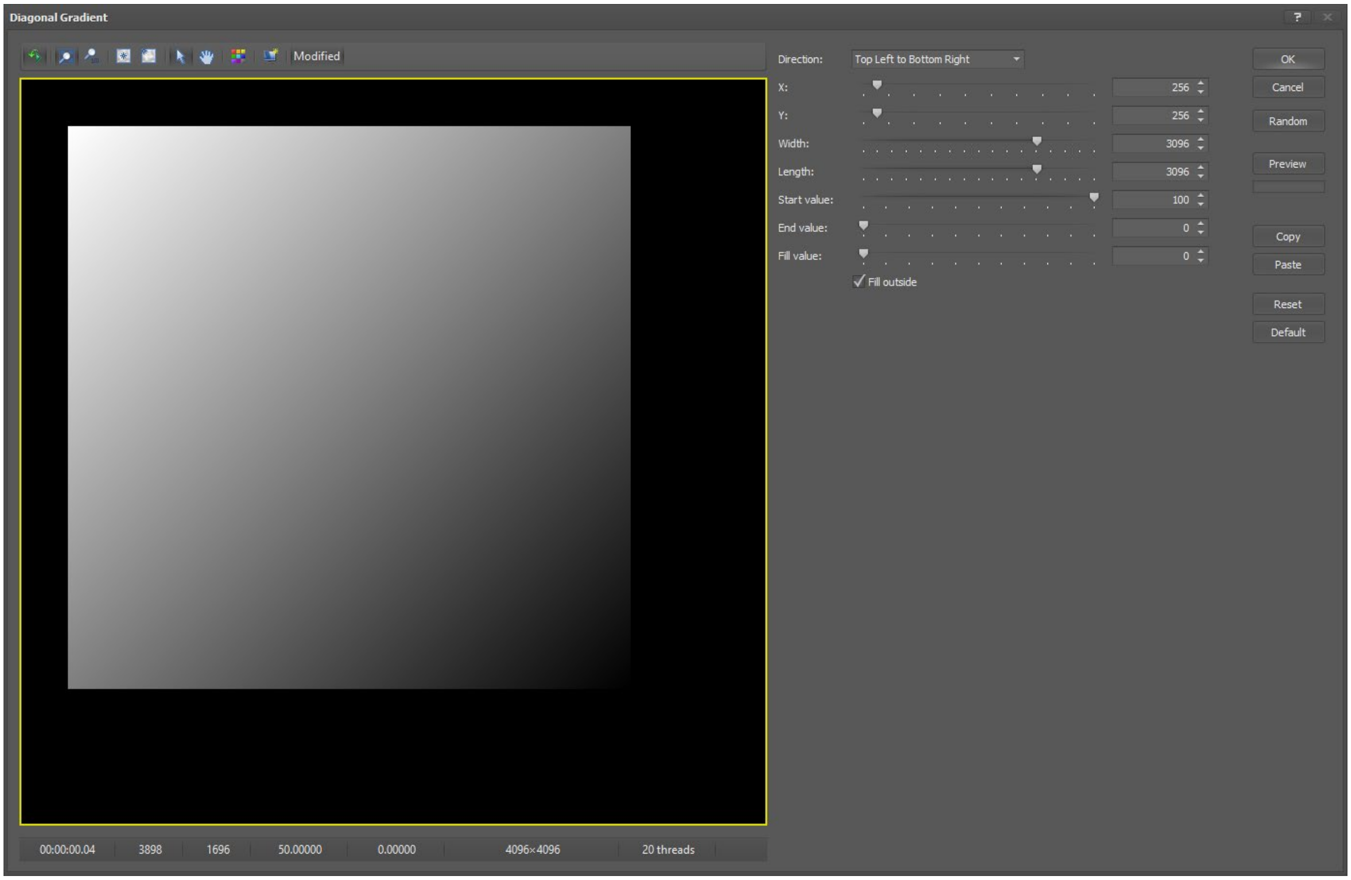
Border width	The width of the gradient border.
Start value	The gradient start value.
End value	The gradient end value.

Notes

This device is single-threaded.
This device requires zero additional datamap allocations.

Generate: Diagonal Gradient

Generate a diagonal rectangular gradient from corner to corner.



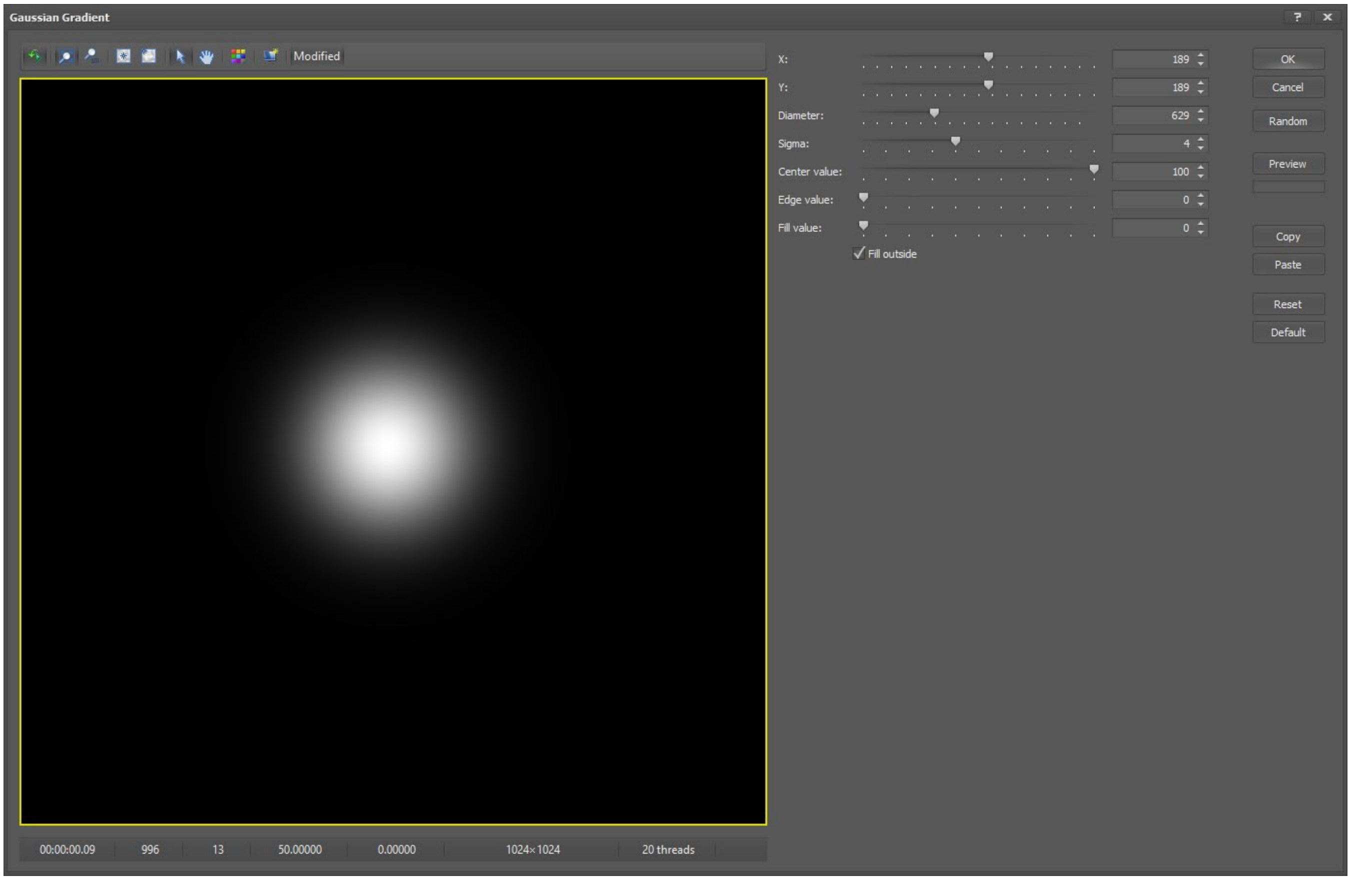
Direction	The gradient direction. - Top Left to Bottom Right. - Top Right to Bottom Left. - Bottom Left to Top Right. - Bottom Right to Top Left.
X	The top-left X coordinate of the gradient rectangle.
Y	The top-left Y coordinate of the gradient rectangle.
Width	The width of the gradient rectangle.
Length	The length of the gradient rectangle.
Start value	The gradient start value.
End value	The gradient end value.
Fill value	The fill value outside of the rectangle.
Fill outside	Whether to fill the outside.

Notes

This device is partially multi-threaded.
This device requires zero additional datamap allocations.

Generate: Gaussian Gradient

Generate a circular gaussian gradient.



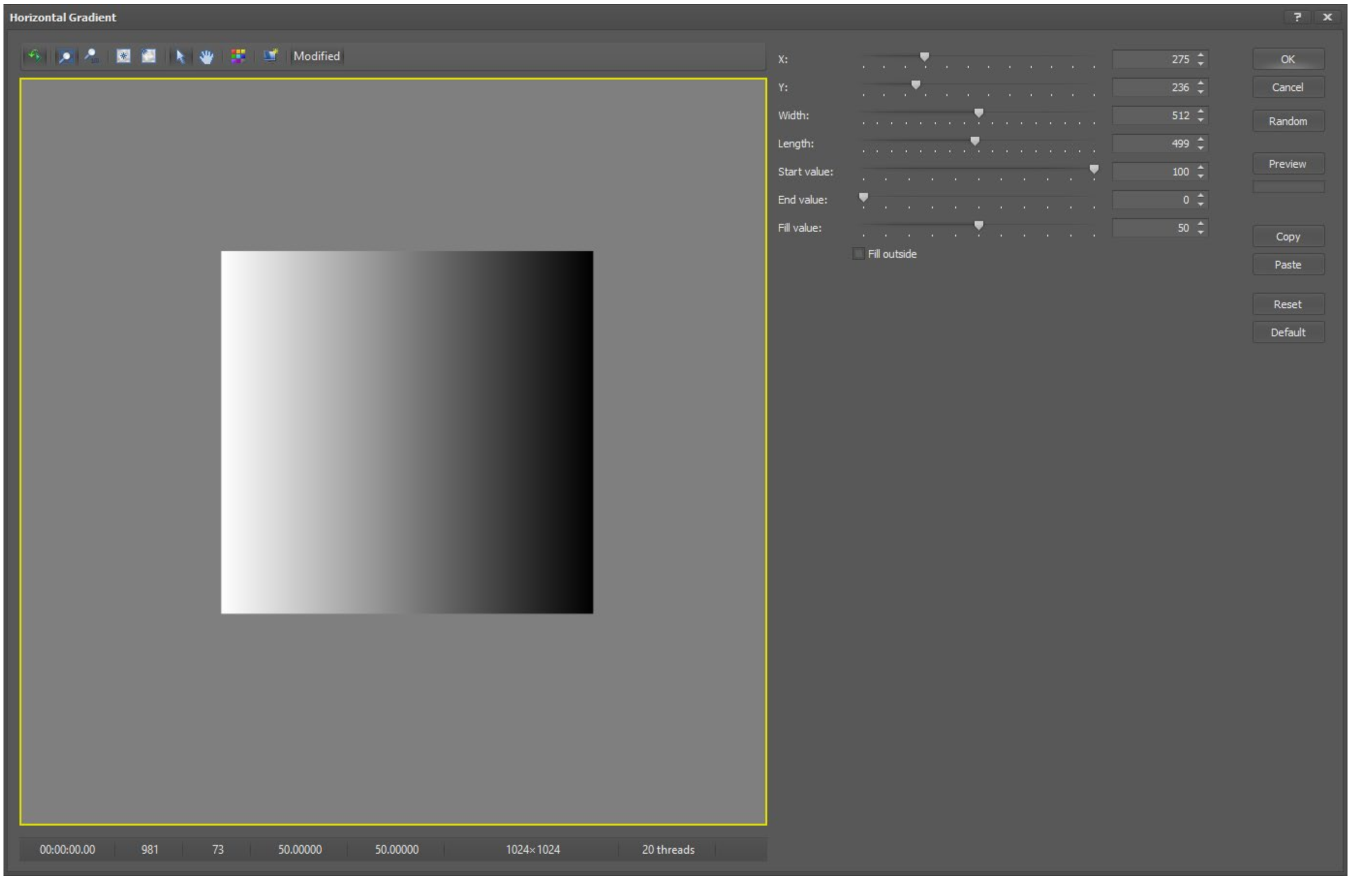
X	The top-left X coordinate of the gradient circle.
Y	The top-left Y coordinate of the gradient circle.
Diameter	The diameter of the circle.
Sigma	The slope of the gaussian circle, larger values are a steeper circle.
Center value	The circle center value.
Edge value	The circle edge value.
Fill value	The fill value outside of the circle.
Fill outside	Whether to fill the outside.

Notes

This device is partially multi-threaded.
This device requires zero additional datamap allocations.

Generate: Horizontal Gradient

Generate a horizontal rectangular gradient.



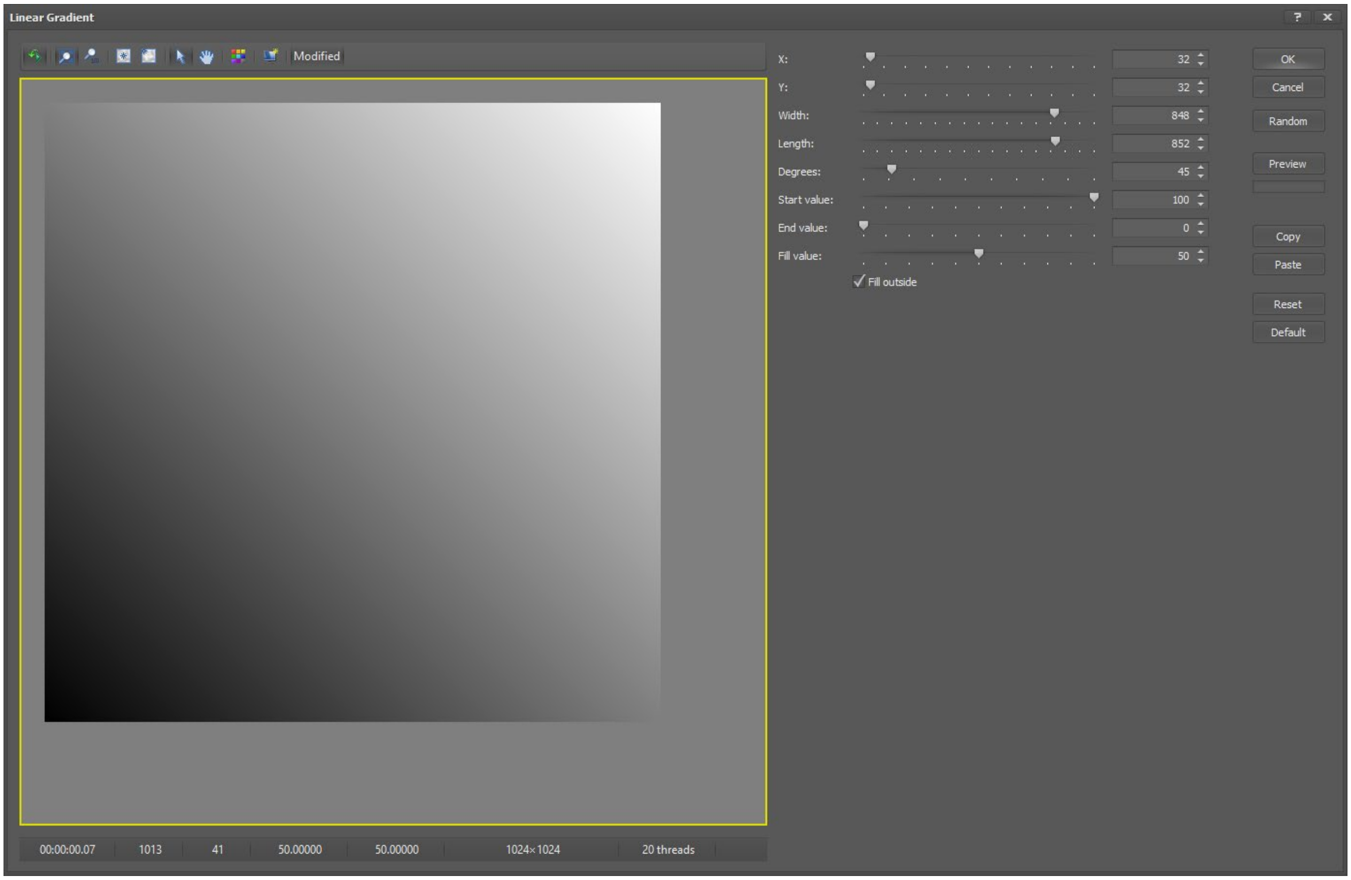
X	The top-left X coordinate of the gradient rectangle.
Y	The top-left Y coordinate of the gradient rectangle.
Width	The width of the gradient rectangle.
Length	The length of the gradient rectangle.
Start value	The gradient start value.
End value	The gradient end value.
Fill value	The fill value outside of the rectangle.
Fill outside	Whether to fill the outside.

Notes

This device is partially multi-threaded.
This device requires zero additional datamap allocations.

Generate: Linear Gradient

Generate a rotated linear rectangular gradient.



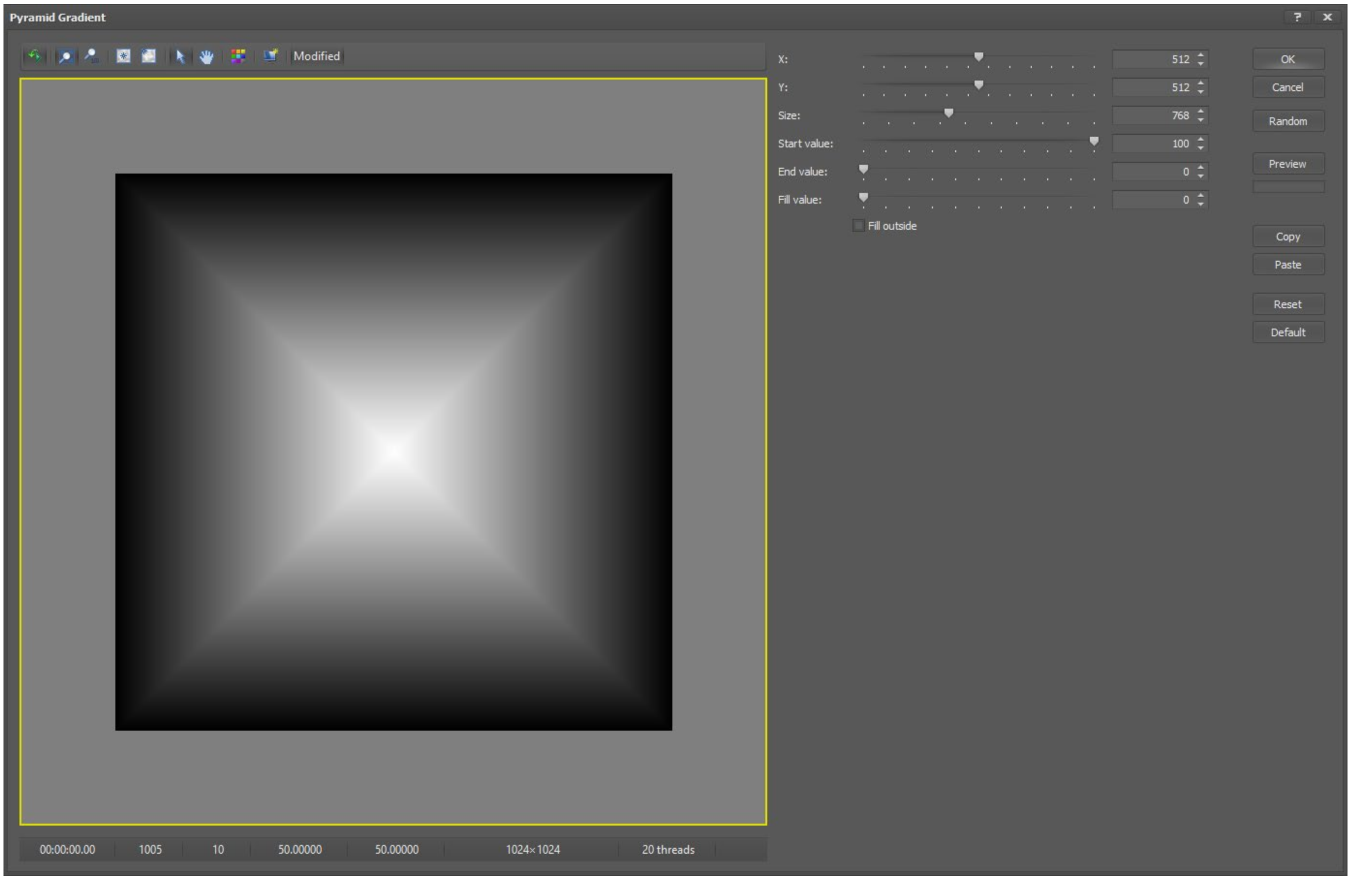
X	The top-left X coordinate of the gradient rectangle.
Y	The top-left Y coordinate of the gradient rectangle.
Width	The width of the gradient rectangle.
Length	The length of the gradient rectangle.
Degrees	The rotation degrees of the gradient.
Start value	The gradient start value.
End value	The gradient end value.
Fill value	The fill value outside of the rectangle.
Fill outside	Whether to fill the outside.

Notes

This device is partially multi-threaded.
This device requires zero additional datamap allocations.

Generate: Pyramid Gradient

Generate a pyramid cone gradient.



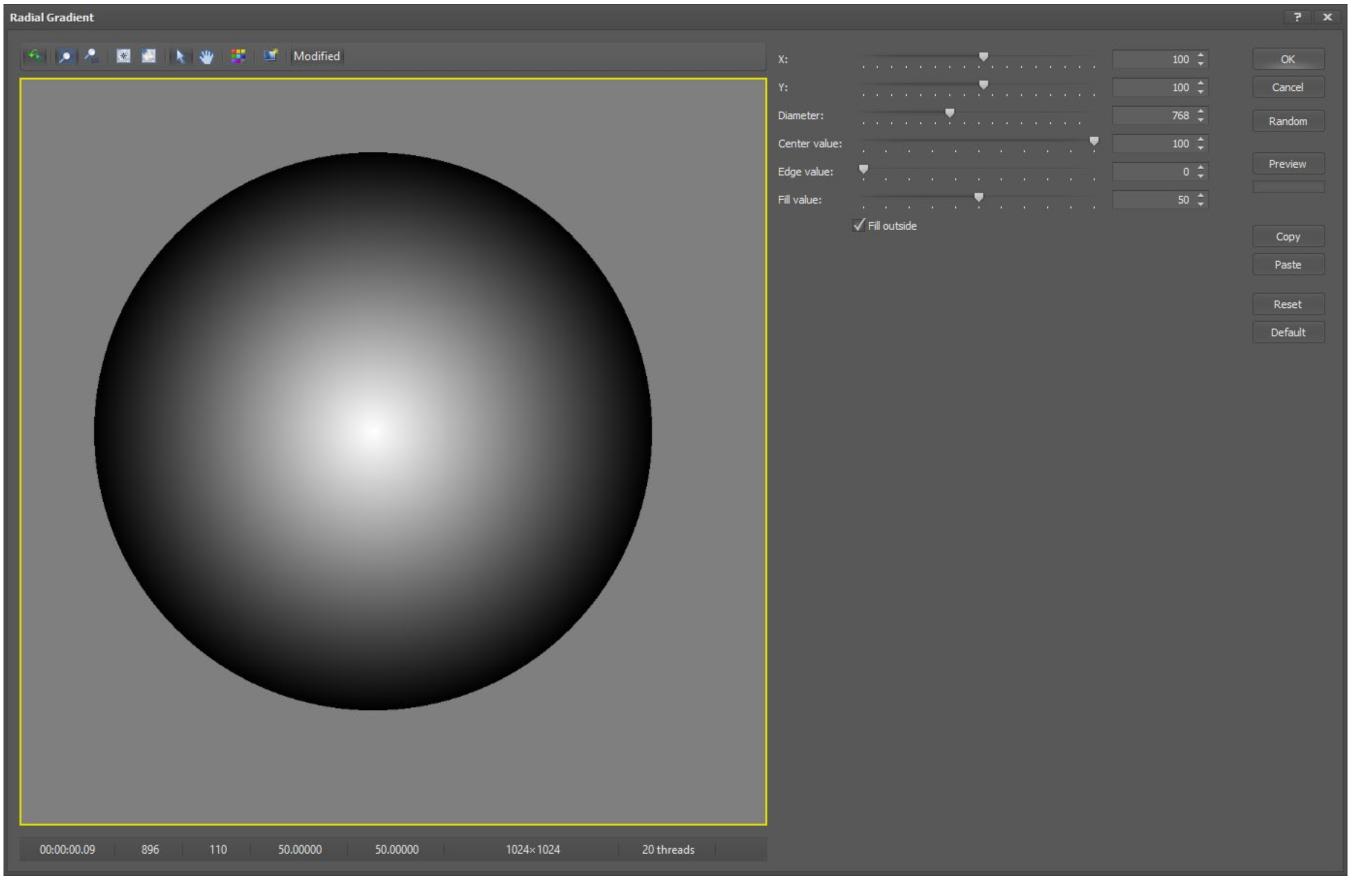
X	The pyramid cone center X coordinate.
Y	The pyramid cone center Y coordinate.
Size	The size of the gradient pyramid.
Start value	The gradient pyramid center value.
End value	The gradient pyramid edge value.
Fill value	The fill value outside of the pyramid.
Fill outside	Whether to fill the outside.

Notes

This device is partially multi-threaded.
This device requires zero additional datamap allocations.

Generate: Radial Gradient

Generate a radial cone gradient circle.



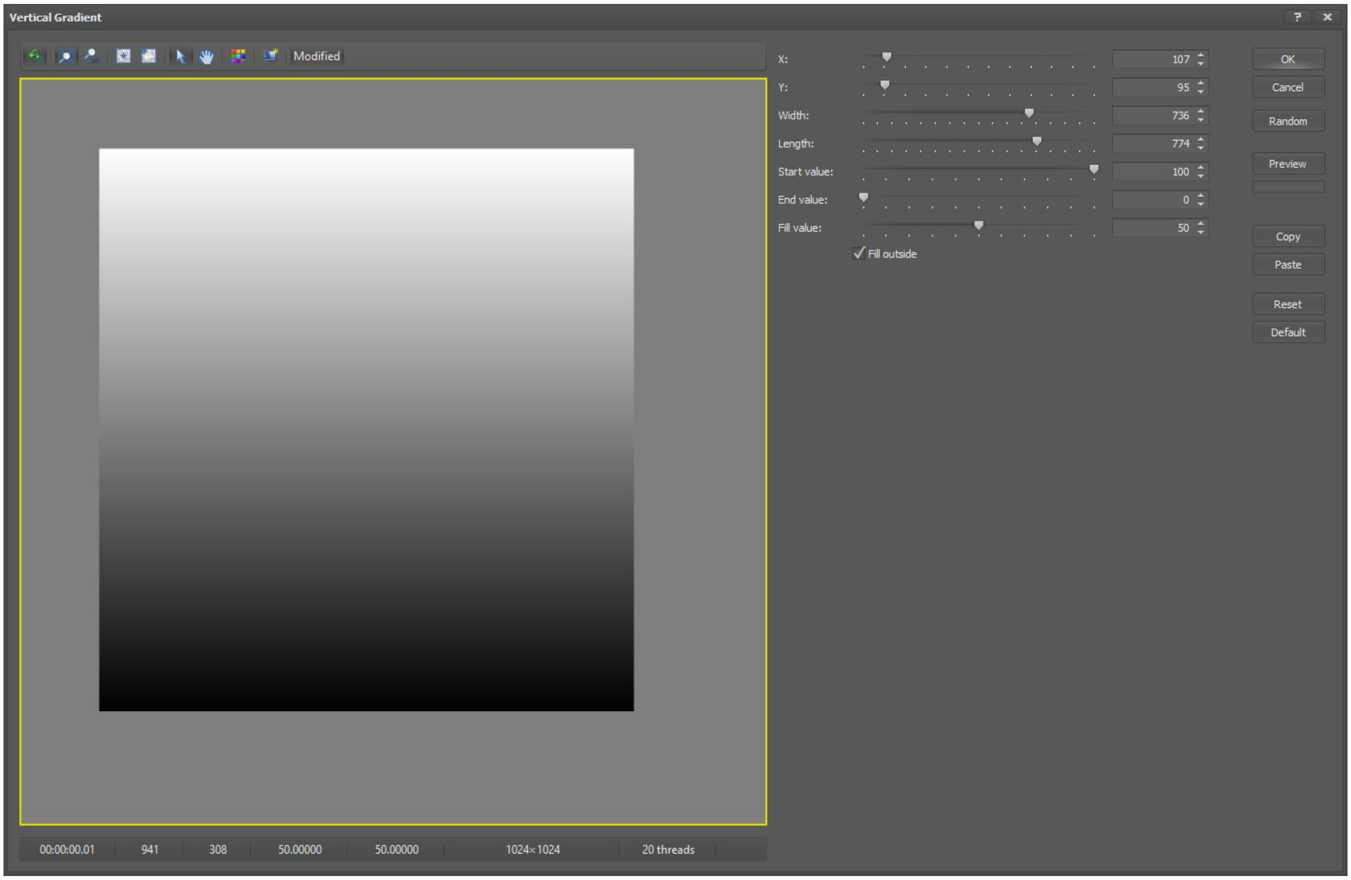
X	The top-left X coordinate of the gradient circle.
Y	The top-left Y coordinate of the gradient circle.
Diameter	The diameter of the gradient circle.
Center value	The gradient circle center value.
Edge value	The gradient circle edge value.
Fill value	The fill value outside of the rectangle.
Fill outside	Whether to fill the outside.

Notes

This device is partially multi-threaded.
This device requires zero additional datamap allocations.

Generate: Vertical Gradient

Generate a vertical rectangular gradient.



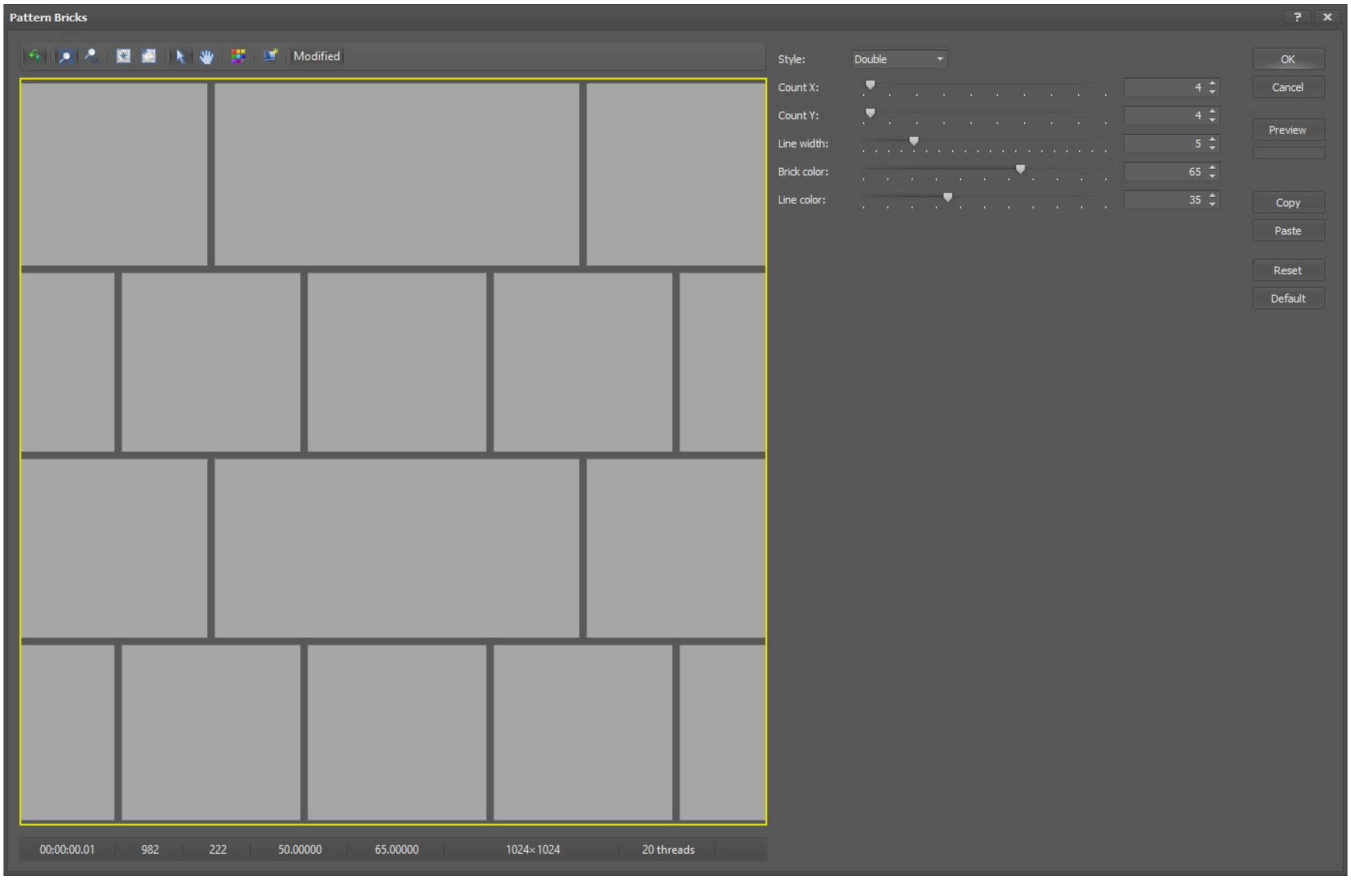
X	The top-left X coordinate of the gradient rectangle.
Y	The top-left Y coordinate of the gradient rectangle.
Width	The width of the gradient rectangle.
Length	The length of the gradient rectangle.
Start value	The gradient rectangle start value.
End value	The gradient rectangle end value.
Fill value	The fill value outside of the rectangle.
Fill outside	Whether to fill the outside.

Notes

This device is partially multi-threaded.
This device requires zero additional datamap allocations.

Generate: Pattern Brick

Generate a brick pattern.



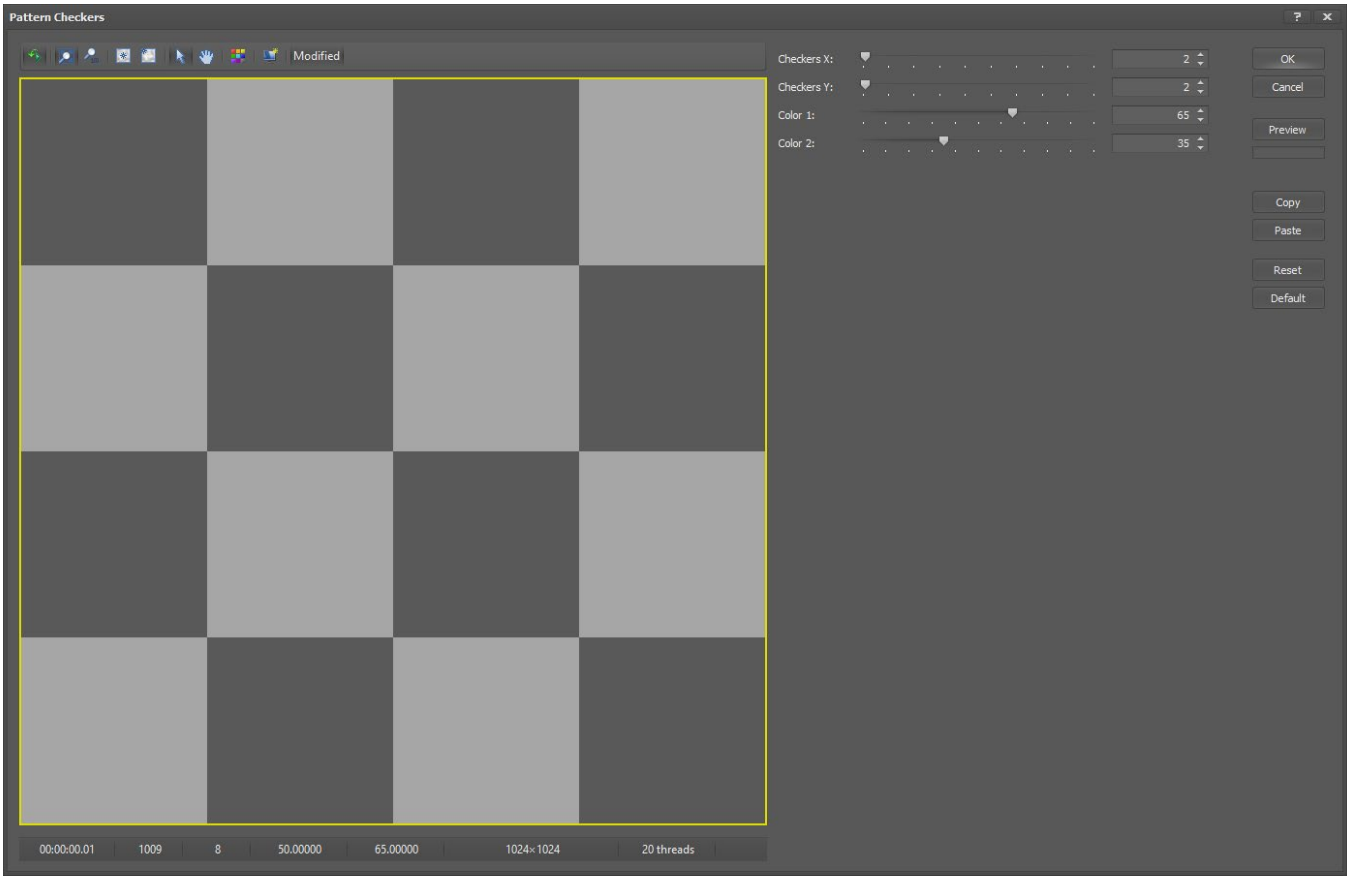
Style	The Brick Style: Line, Single, Double.
Count X	The number of bricks along the X coordinate.
Count Y	The number of bricks along the Y coordinate.
Line Width	The width of the line between bricks.
Brick color	The color of the brick.
Line Color	The color of the line between bricks.

Notes

This device is partially multi-threaded.
This device requires zero additional datamap allocations.

Generate: Pattern Checkers

Generate a checkers pattern.



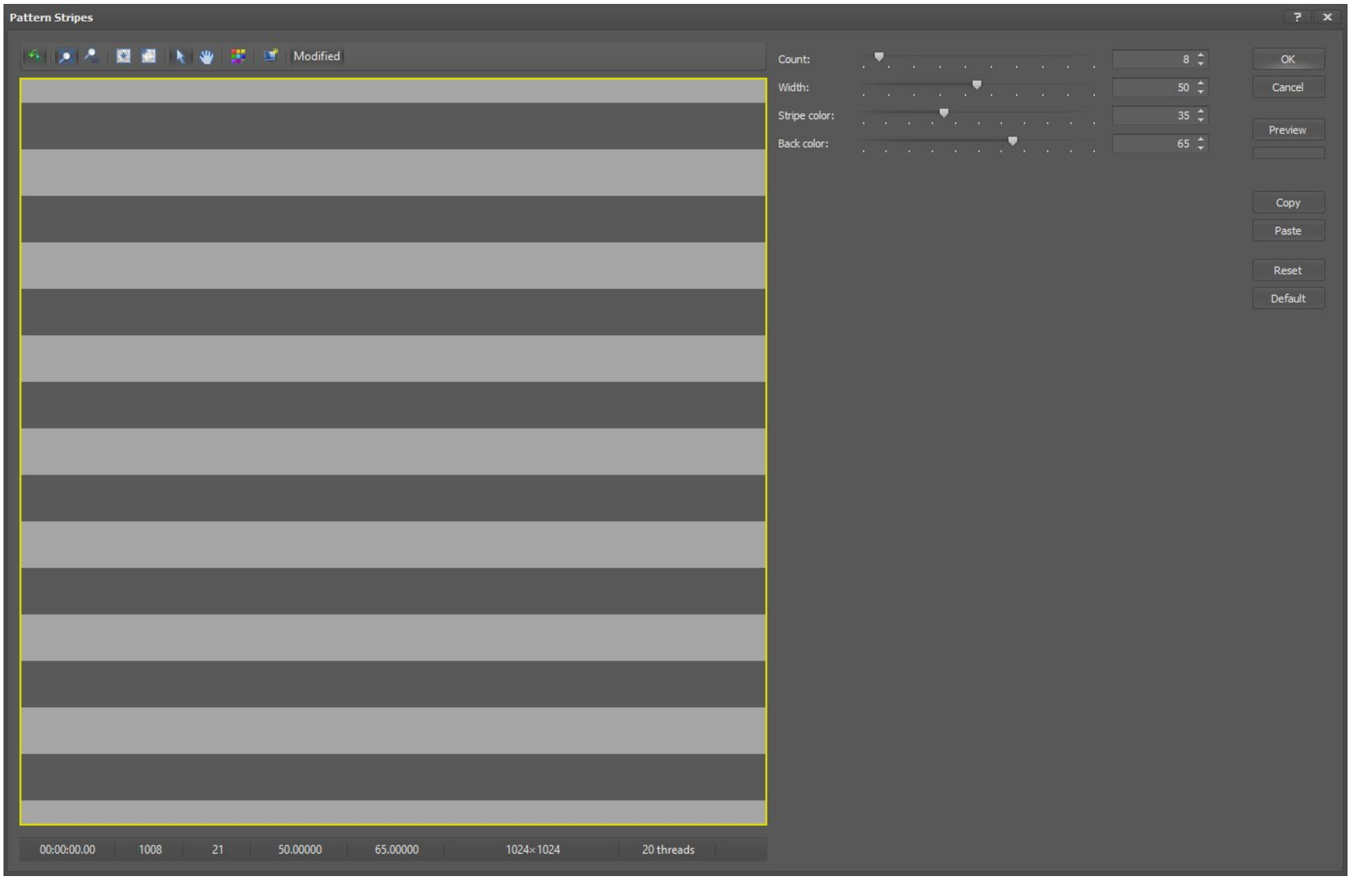
Checkers X	The number of checkers along the X coordinate.
Checkers Y	The number of checkers along the Y coordinate.
Color 1	The checkers color 1.
Color 2	The checkers color 2.

Notes

This device is partially multi-threaded.
This device requires zero additional datamap allocations.

Generate: Pattern Stripes

Generate a stripes pattern.



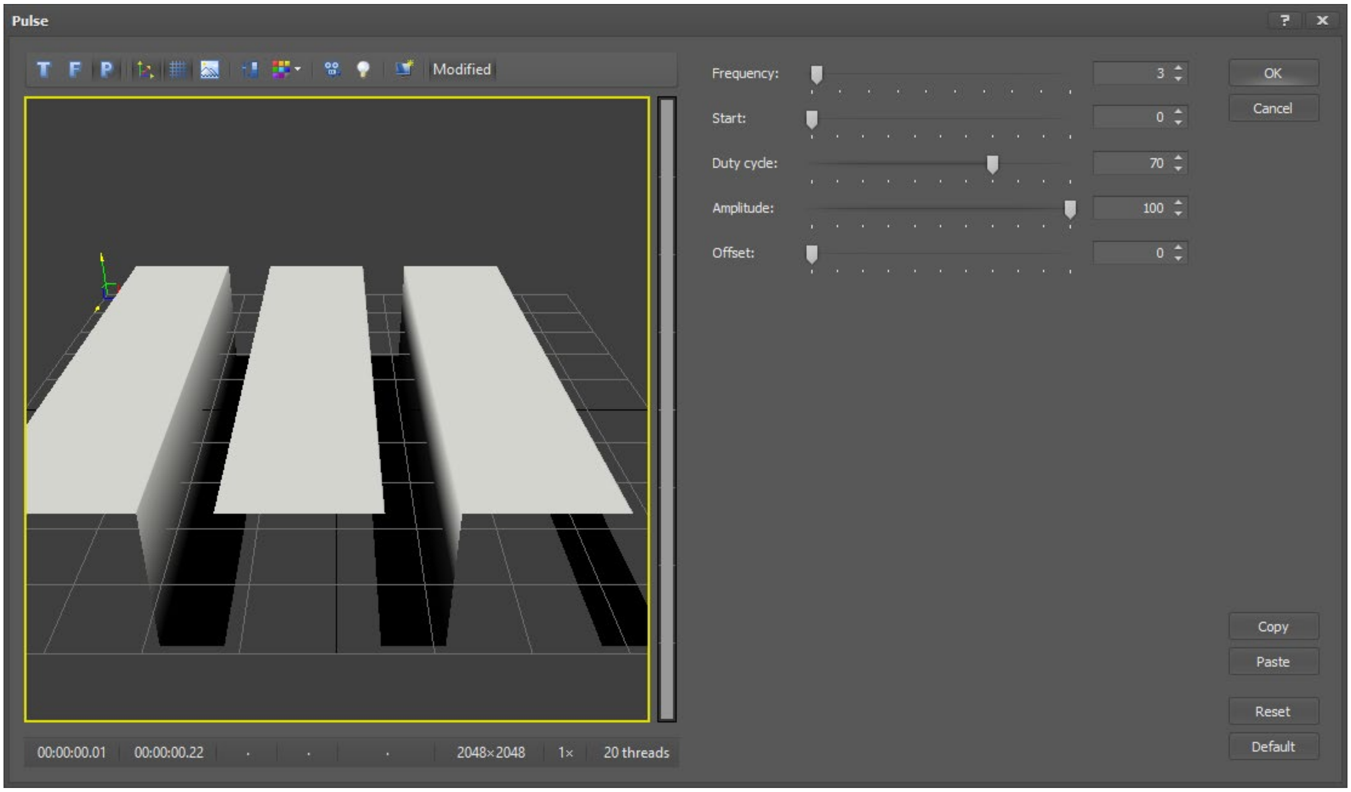
Count	The number of stripes.
Width	The stripe width.
Stripe color	The stripe color.
Back color	The background color.

Notes

This device is partially multi-threaded.
This device requires zero additional datamap allocations.

Generate: Shape Pulse

Generate a pulse waveform shape.



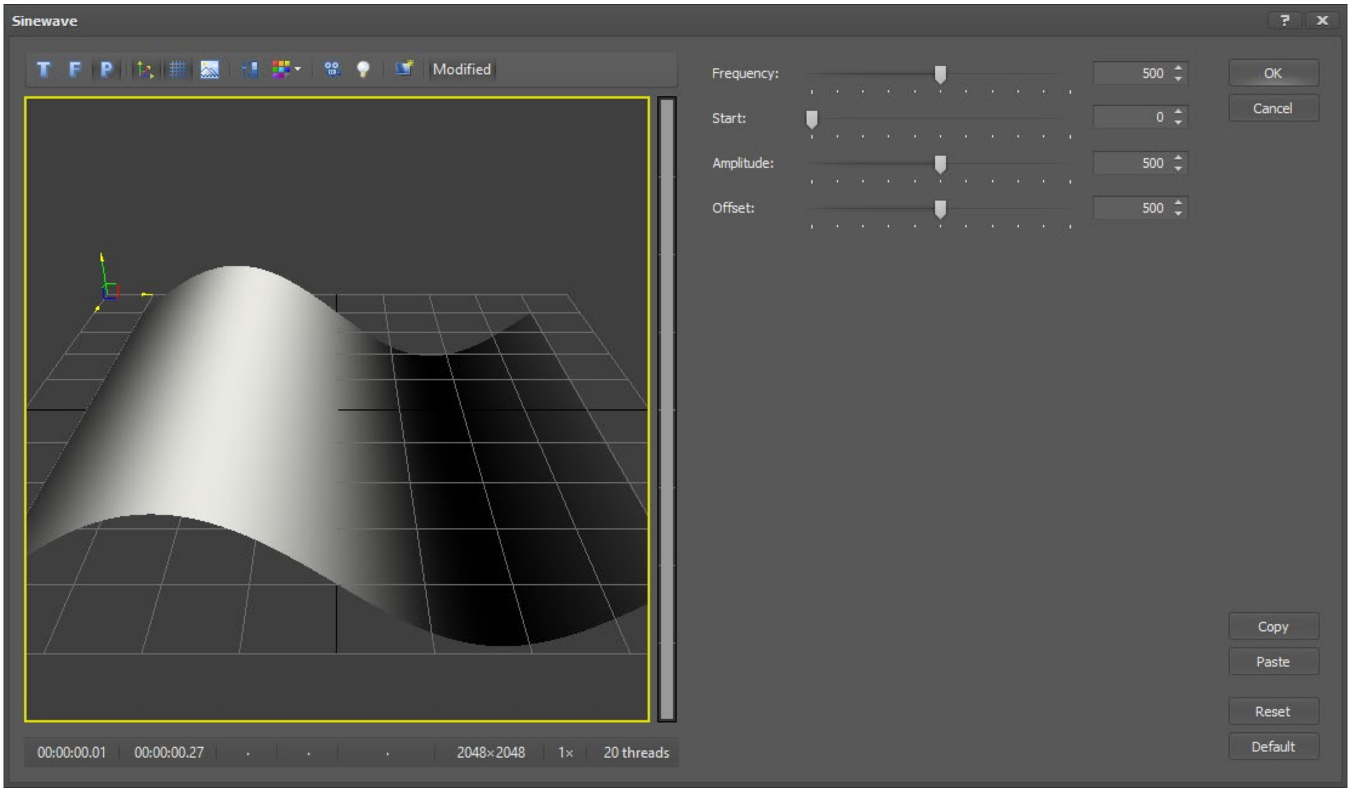
Frequency	The number of pulse waves across the datamap.
Start	The starting offset for the pulse waveform.
Duty cycle	The percentage of positive and negative waveform.
Amplitude	The amplitude level of the waveform.
Offset	The waveform vertical Y offset.

Notes

This device is partially multi-threaded.
This device requires zero additional datamap allocations.

Generate: Shape Sinewave

Generate a sinewave waveform shape.



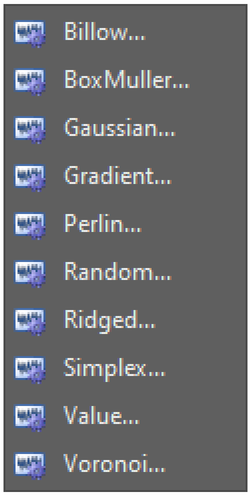
Frequency	The number of sine waves across the datamap.
Start	The starting offset for the sine waveform.
Amplitude	The amplitude level of the waveform.
Offset	The waveform vertical Y offset.

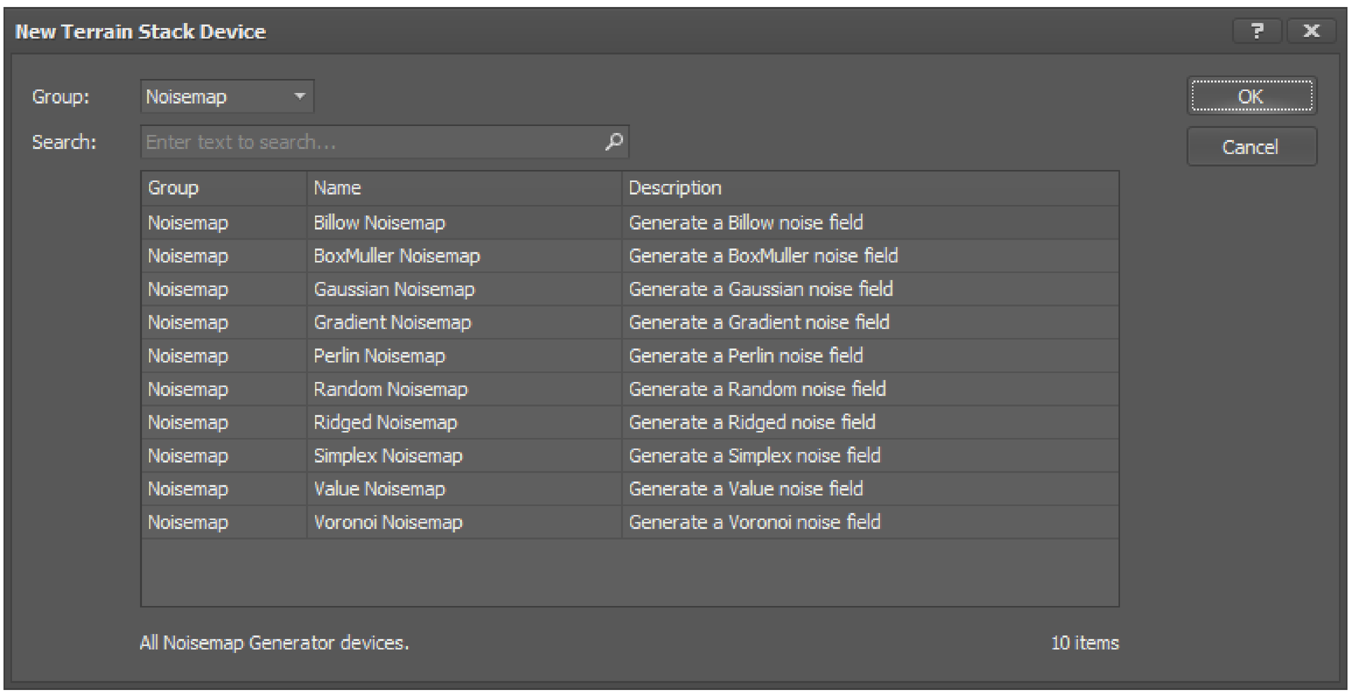
Notes

This device is partially multi-threaded.
This device requires zero additional datamap allocations.

Noisemap Menu: Devices

The Noisemap menu contains devices that create procedural gradient noise and random noise.
The Noisemap devices are typically used for creating terrain heightmaps or masks.





Noisemap Overview

The noisemap generator devices provide a wide variety of procedural gradient and random noise patterns in both 2D and 3D fields. The typical uses for the noisemap generator devices are to create basic heightmap designs that can be modified with other devices and tools, and to create random detailing effects that can be added to other heightmaps.

The noisemap generator devices can be used in immediate mode from the menus and on the terrain stack.

Each noisemap generator dialog provides a centralized area for controlling all of the noisemap parameters. The dialog includes a large 3D preview window, a toolbar and information status bars, and a set of sliders and numeric controls to set the current noise type layout.

Most of the noisemap generators create Perlin-style procedurally generated gradient noise, combining multiple octaves, or frequencies, of that noise to generate pseudo-realistic terrain heightmaps.

Some of the noisemap generation algorithms do not use fully stabilized noise in order to provide a wider range of noise effects. This can sometimes result in noise spikes or other irregularities with specific combinations of property settings.

Noisemap Toolbar

All of the noisemap generator devices include a toolbar for managing the device.

Randomize – Randomize the noisemap parameters.
This may generate a set of random numbers that creates unusable terrain.

Hold – Hold current parameters, save them to the swap buffer.

Swap – Swap the current parameters with the previous saved parameters.

Open – Open a noisemap parameters file.

Save – Save the noisemap parameters to a file.

Copy – Copy the noisemap parameters to the clipboard.

Paste – Paste the noisemap parameters from the clipboard.

Reset – Reset the noisemap parameters to the initial values.

Defaults – Set the noisemap parameters to the default values.

The Hold and Swap buffers allow the visualization of two simultaneous different sets of noisemap parameters in order to be able to compare them for quality and desirability.
The buffer that is current when the accept button is clicked on the dialog becomes the datamap noisemap.

Noisemap Common Properties

Noisemap Group

Toolbar See the page on the *Noisemap Toolbar* for a description of the buttons.

Presets: Select the preset noisemap from the drop-down list.

Generator Group

Offset X: The noisefield offset along the local X axis.

Offset Y: The noisefield offset along the local Y axis.

x10 The noisefield offset X/Y values increment by 10's.

Zero Zero (0) the noisefield offset X/Y values.

Seed: The noise seed number. Different numbers generate different noisefields.

Randomize Randomly generate a seed number.

Re-seed each detail level Re-seed the noise generator on each successive detail level. This results in a more random noisemap.

Type: The noisefield generator type. Not all generators include this property.

Size Group

The Size slider and numeric control specify the size of the noisefield geological structures.

Heightfield Group

See each individual noisemap generator description.

Smooth Group

Style: The smooth style.
- Average
- Conservative
- Gaussian
- Median
- Middle
- Radial

Size: The smooth kernel size. Larger numbers provide greater smoothening.

Strength: The smooth strength.

Warp Group

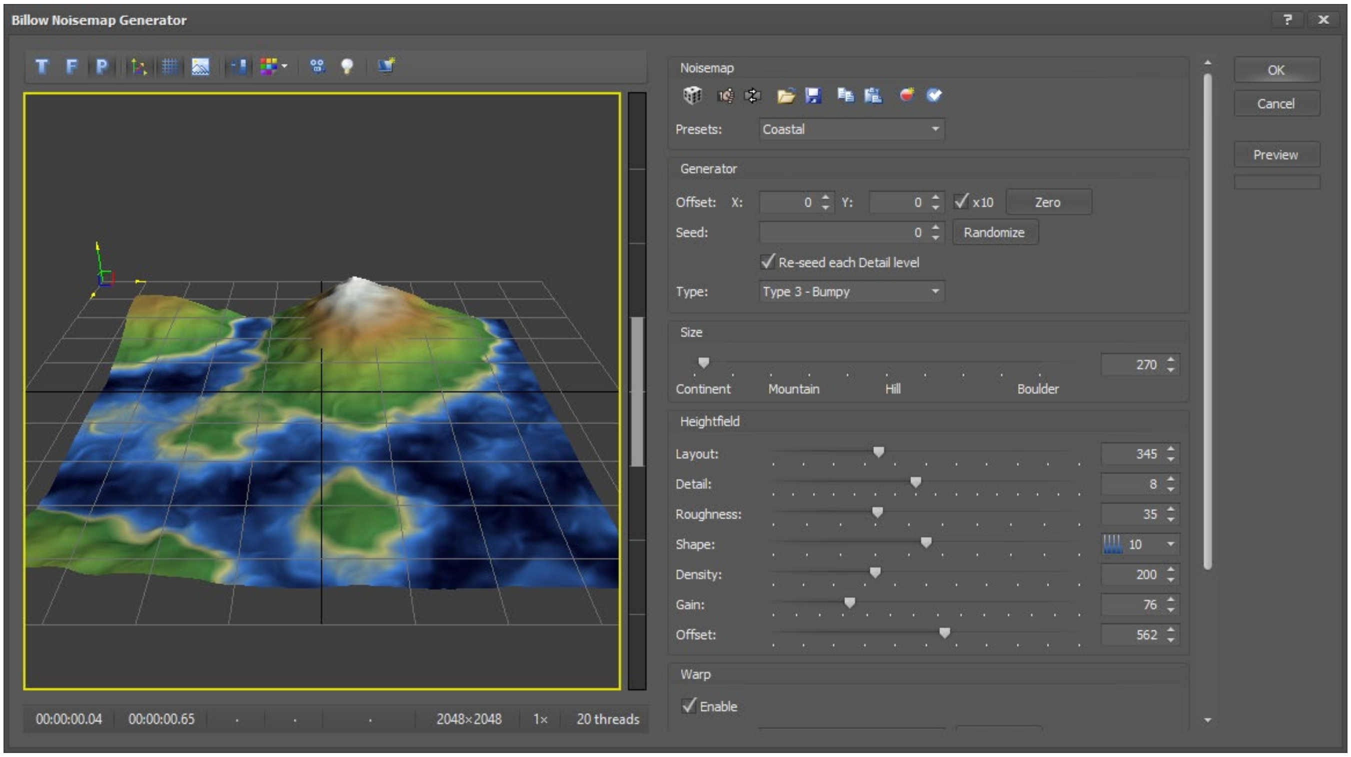
Enable:	Enable noisemap warping. This applies a second noisemap for displacement.
Seed:	The warp noise seed number. Different numbers generate different noisefields.
Interpolate:	The warp displacement interpolation mode: Linear, Hermite, and Quintic.
Frequency:	The frequency of the displacement noisemap warping.
Gain:	The amplitude of the displacement noisemap warping.

Statistics Group

High:	The noisefield high value.
Low:	The noisefield low value.
Range:	The noisefield value range.

Noisemap: Billow

Generate a procedural gradient noisemap that is mainly positive numbers and creates cloud like noisefields.



Heightfield Group

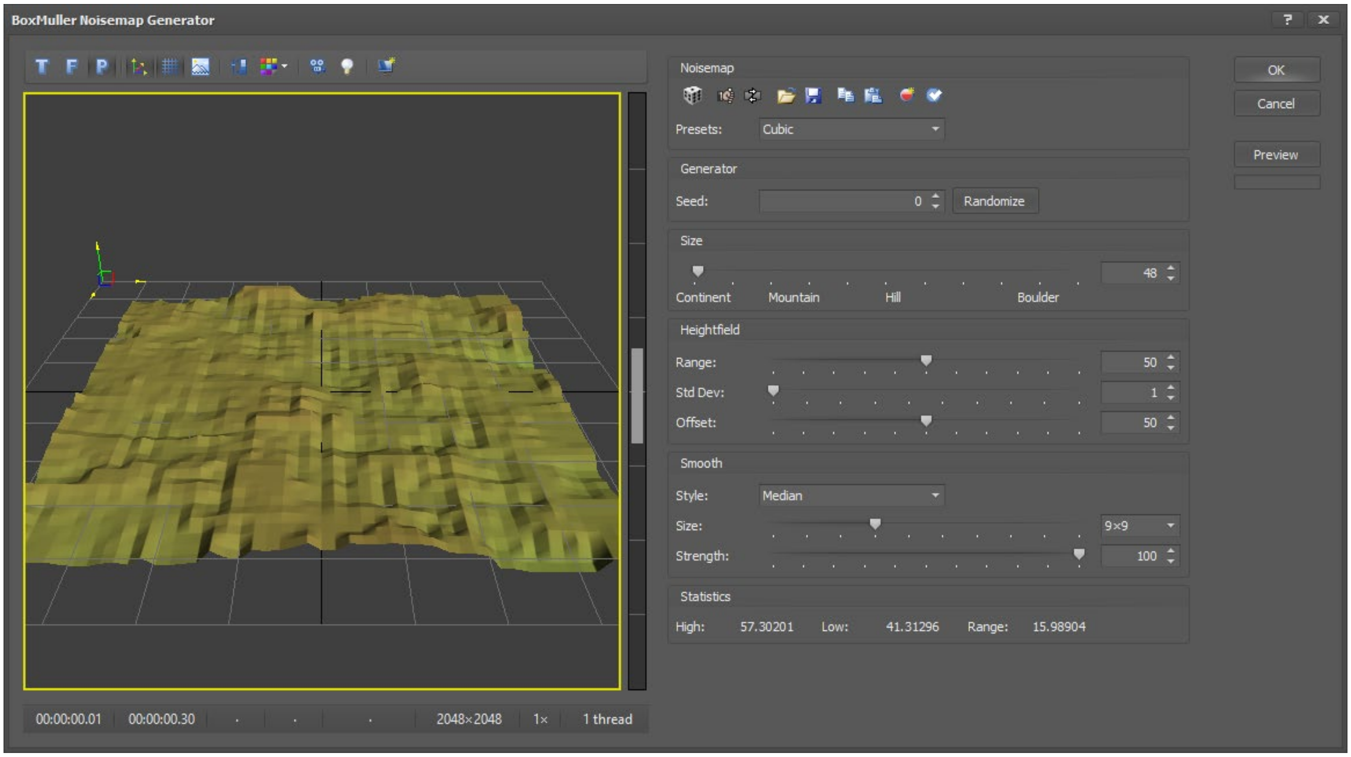
Layout:	The noisefield layout. This is essentially moving the noisemap slices along the 3D Y axis.
Detail:	The amount of noisefield detail. This is the number of noise octaves.
Roughness:	The roughness of the noisefield surface. This is the amplitude of the noise octaves.
Shape:	Adds a specific shape to the noisefield roughness by varying the noise octave levels.
Density:	The density of the noisefield detail.
Gain:	The overall amplitude of the noisefield.
Offset:	The noisefield 3D Y value offset.

Notes

This device is multi-threaded.
This device requires zero additional datamap allocations.

Noisemap: BoxMuller

Generate a pseudo-random box muller normal distribution noisemap.



Heightfield Group

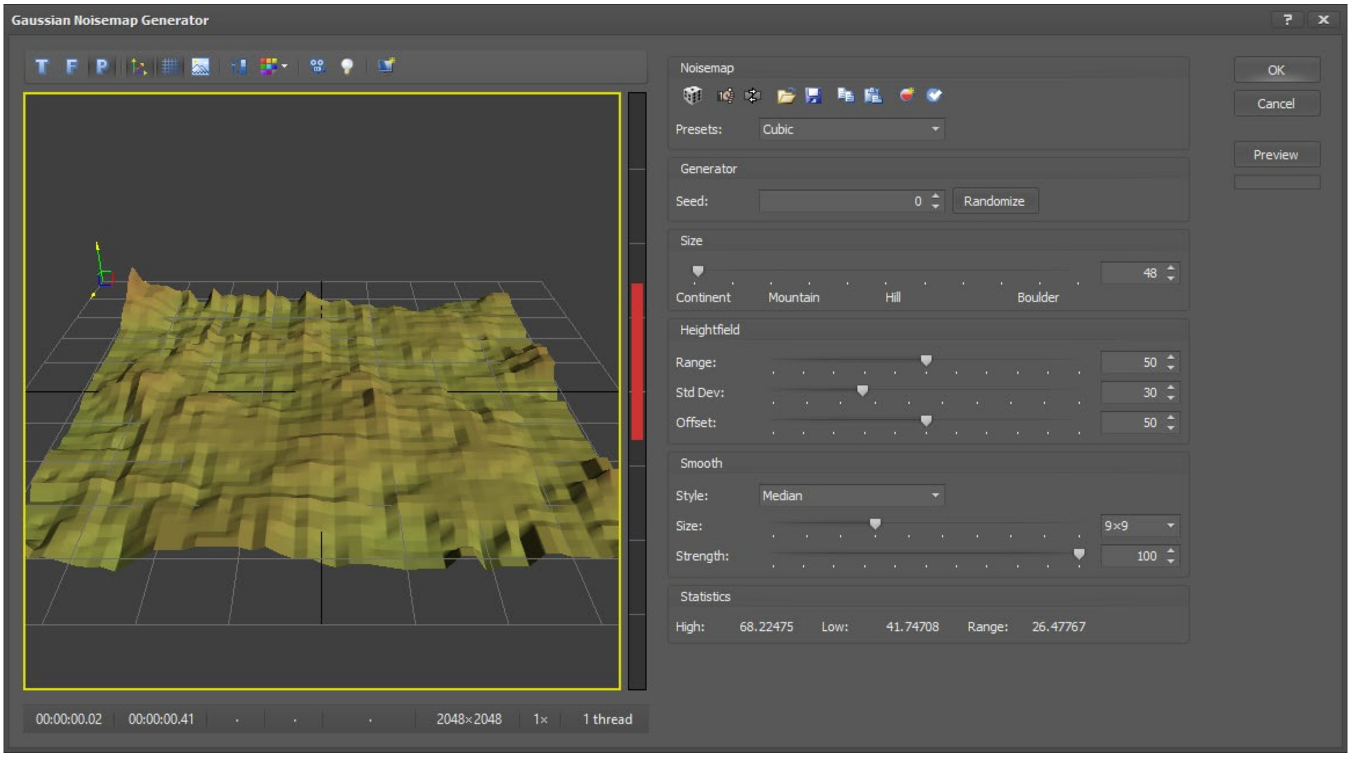
Range:	The noisefield altitude range.
Std Dev:	The random noise standard deviation, or variability.
Offset:	The noisefield 3D Y value offset.

Notes

This device is single-threaded.
This device requires zero additional datamap allocations.

Noisemap: Gaussian

Generate a pseudo-random gaussian normal distribution noisemap.



Heightfield Group

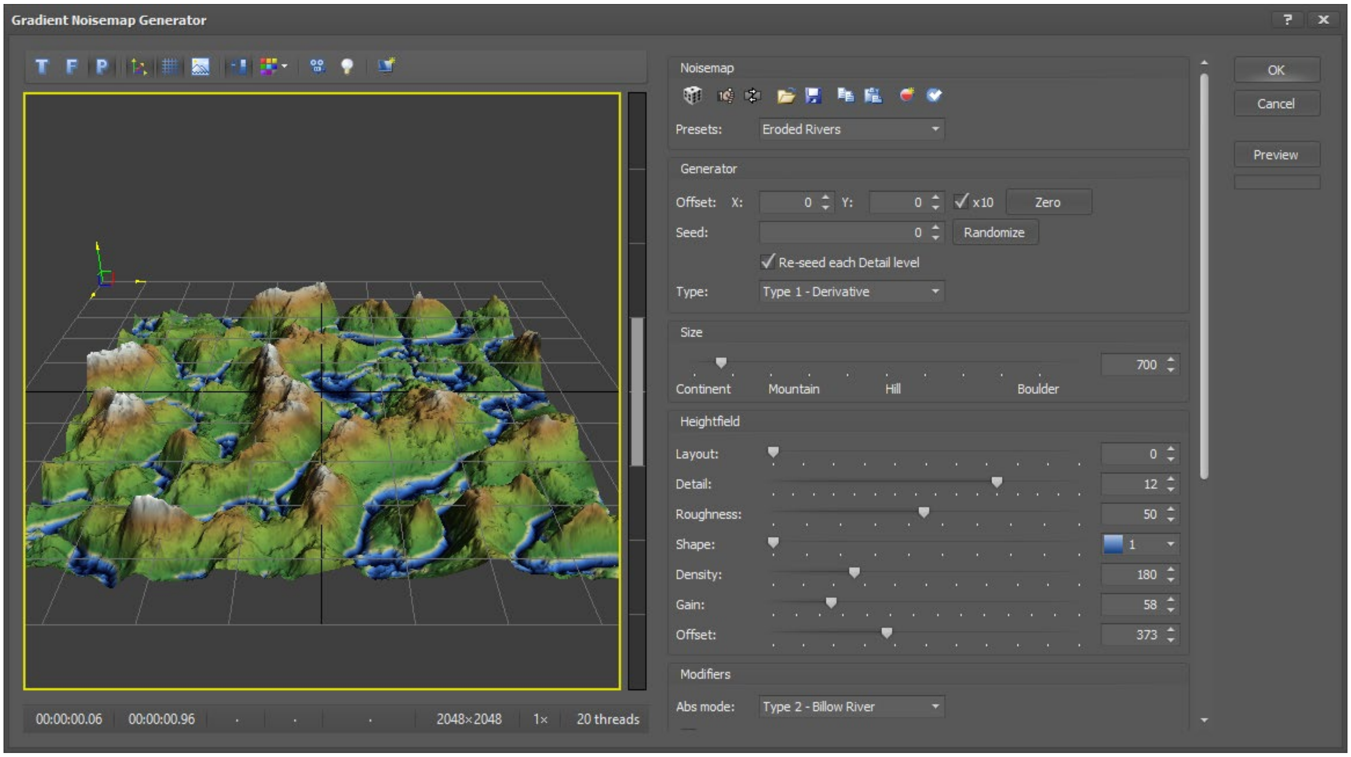
Range:	The noisefield altitude range.
Std Dev:	The random noise standard deviation, or variability.
Offset:	The noisefield 3D Y value offset.

Notes

This device is single-threaded.
This device requires zero additional datamap allocations.

Noisemap: Gradient

Generate a procedural gradient noisemap that has extended gradient parameters.



Heightfield Group

Layout:	The noisefield layout. This is essentially moving the noisemap slices along the 3D Y axis.
Detail:	The amount of noisefield detail. This is the number of noise octaves.
Roughness:	The roughness of the noisefield surface. This is the amplitude of the noise octaves.
Shape:	Adds a specific shape to the noisefield roughness by varying the noise octave levels.
Density:	The density of the noisefield detail.
Gain:	The overall amplitude of the noisefield.
Offset:	The noisefield 3D Y value offset.

Modifiers Group

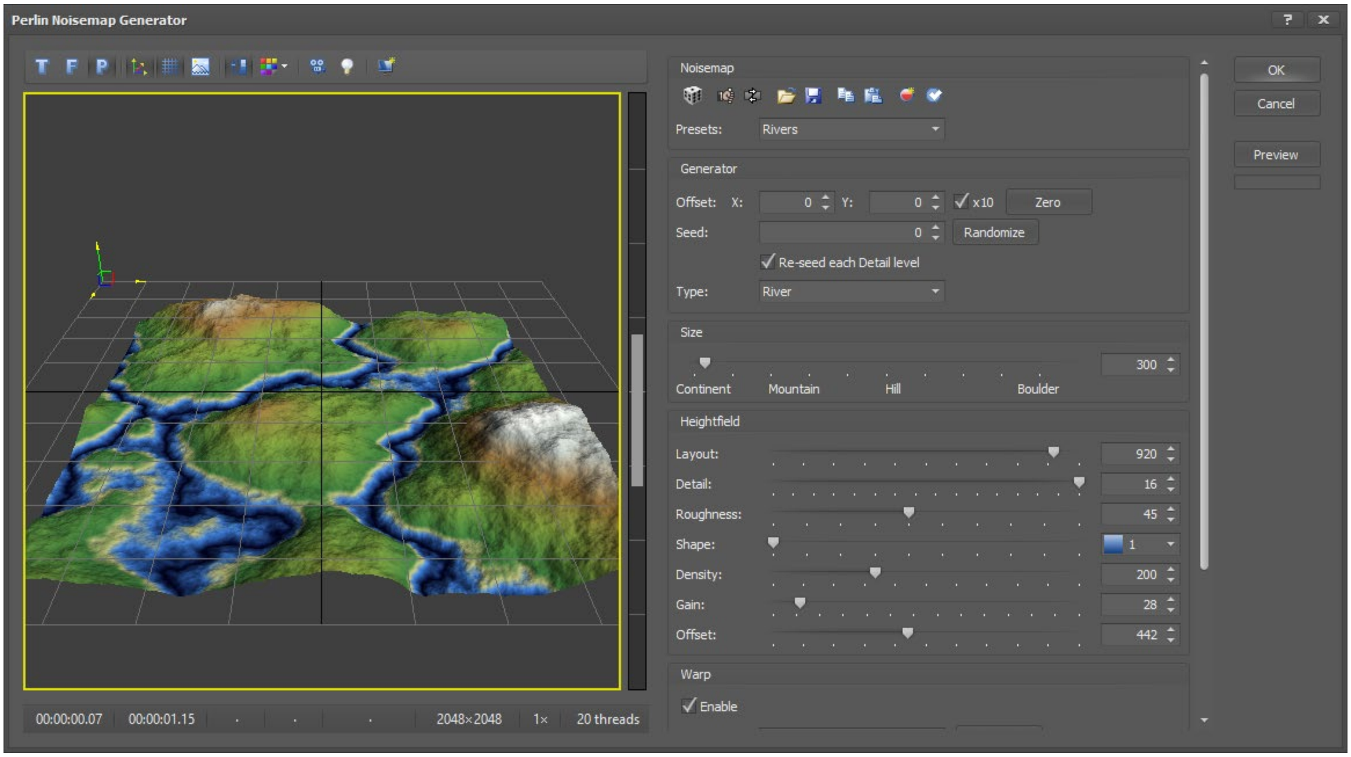
Abs mode:	The mathematical Absolute value algorithm.
Derivative X:	Use the mathematical derivative X.
Derivative Y:	Use the mathematical derivative Y.
Dampen:	future feature.
Displace:	future feature.

Notes

This device is multi-threaded.
This device requires zero additional datamap allocations.

Noisemap: Perlin

Generate a procedural gradient noisemap using the standard Perlin algorithm.



Heightfield Group

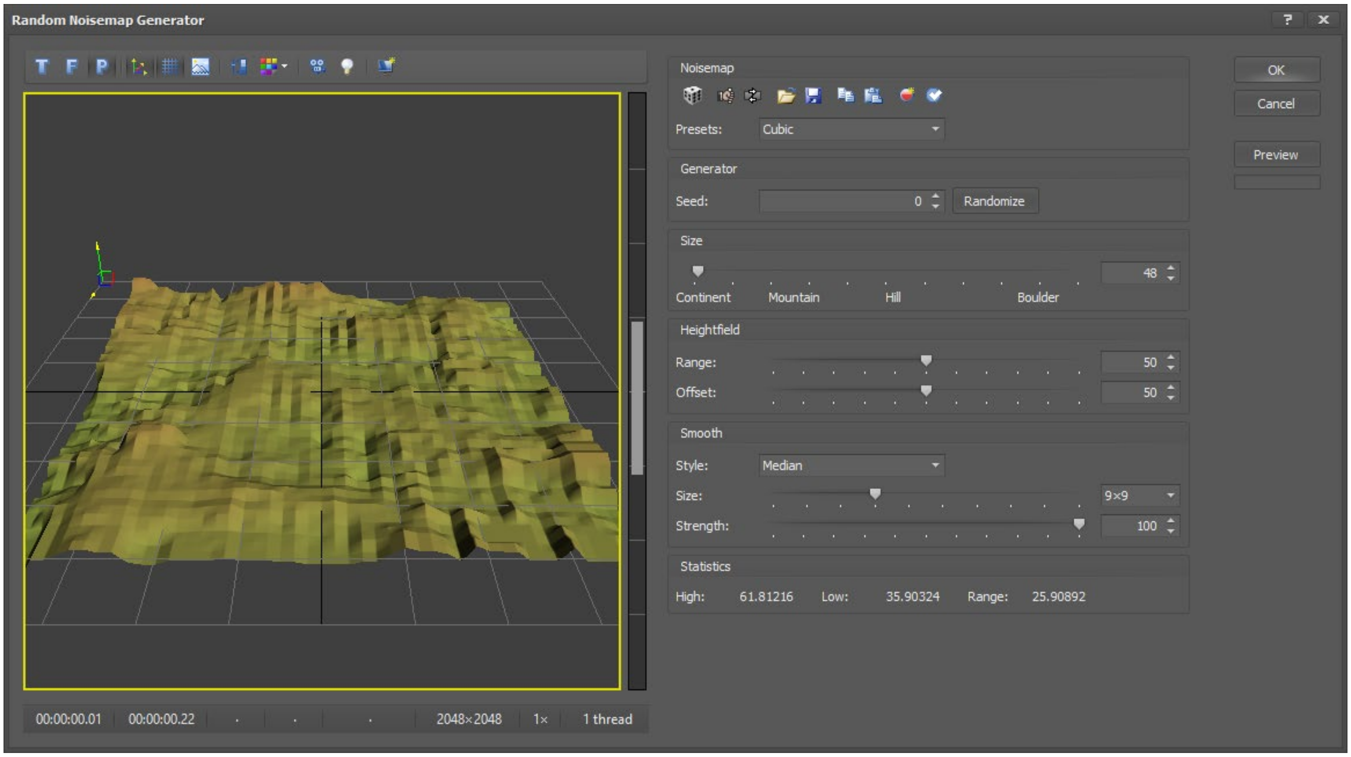
Layout:	The noisefield layout. This is essentially moving the noisemap slices along the 3D Y axis.
Detail:	The amount of noisefield detail. This is the number of noise octaves.
Roughness:	The roughness of the noisefield surface. This is the amplitude of the noise octaves.
Shape:	Adds a specific shape to the noisefield roughness by varying the noise octave levels.
Density:	The density of the noisefield detail.
Gain:	The overall amplitude of the noisefield.
Offset:	The noisefield 3D Y value offset.

Notes

This device is multi-threaded.
This device requires zero additional datamap allocations.

Noisemap: Random

Generate a pseudo-random noisemap.



Heightfield Group

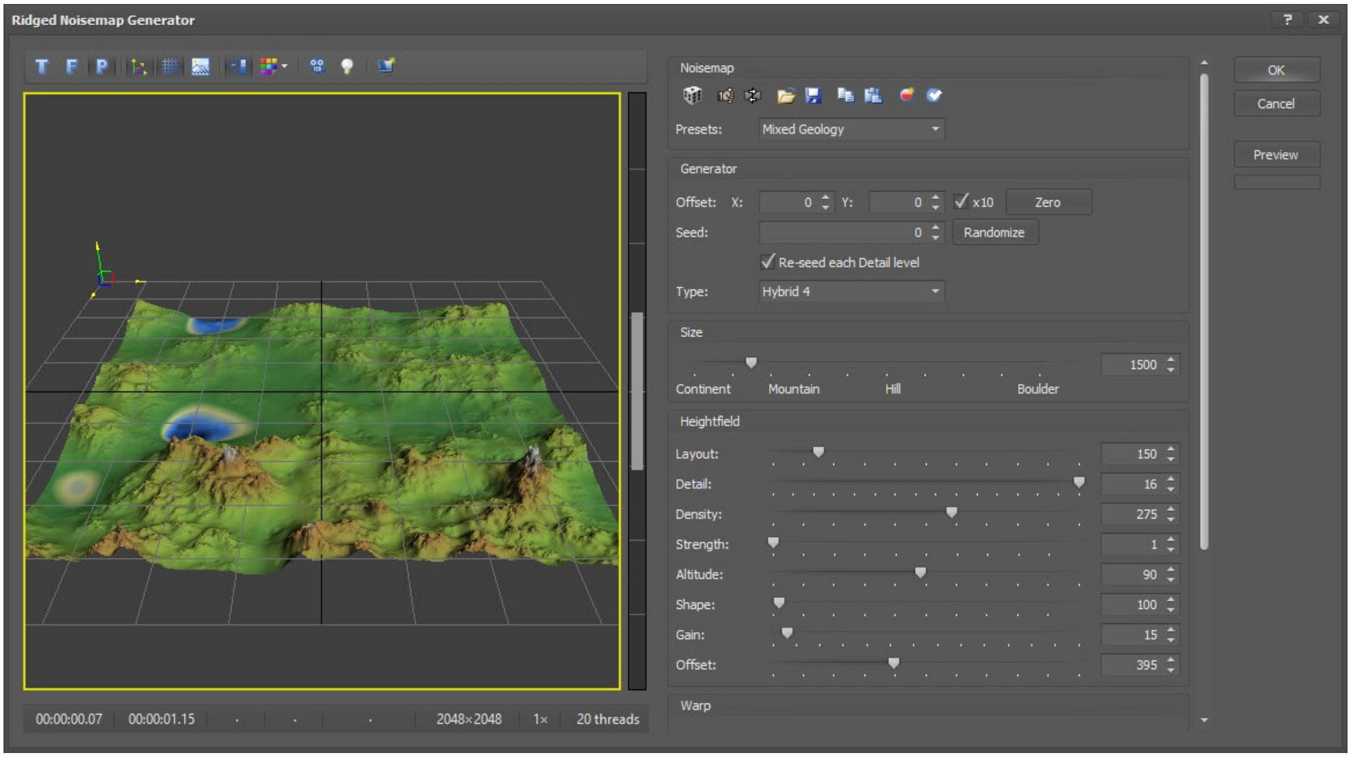
Range: . The random noise overall amplitude range.
Offset: The noisefield 3D Y value offset.

Notes

This device is single-threaded.
This device requires zero additional datamap allocations.

Noisemap: Ridged

Generate a procedural gradient noisemap that produces spiked mountain-like noisefields.



Heightfield Group

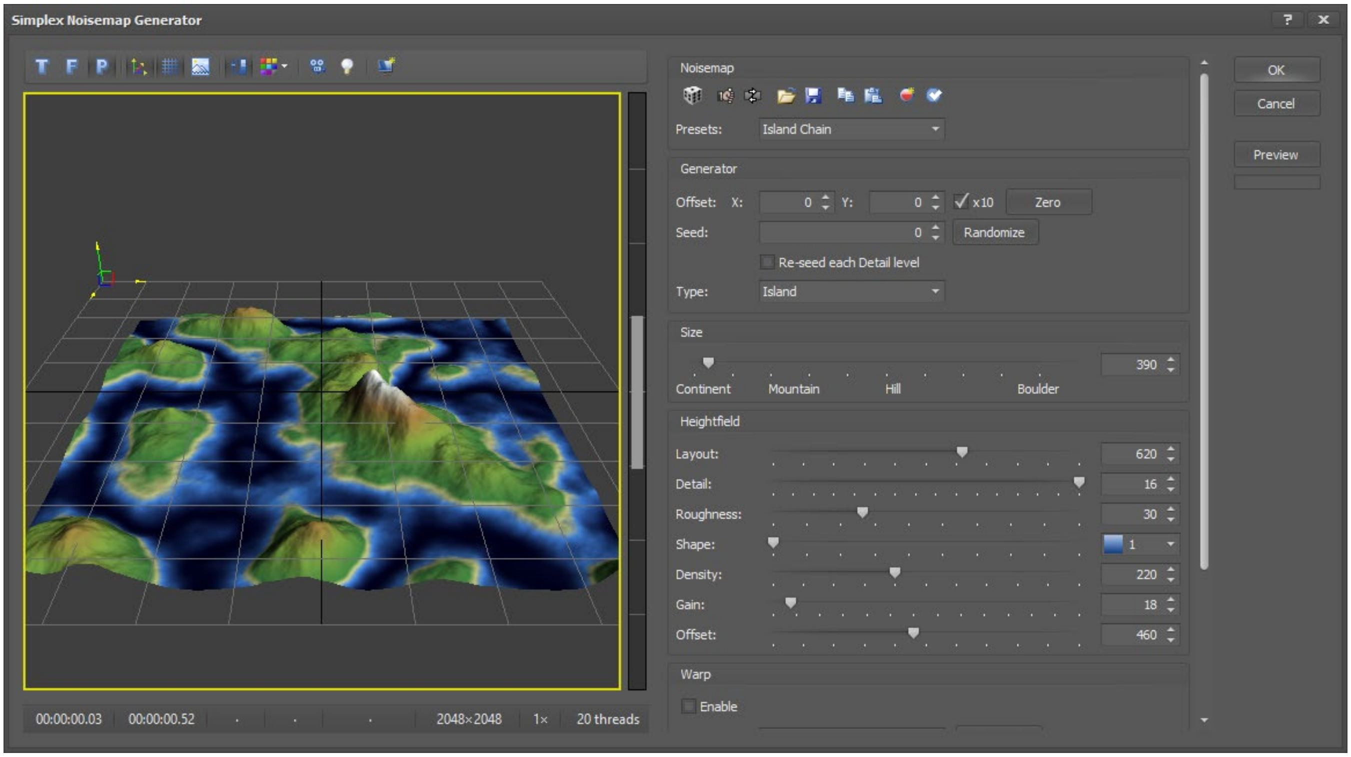
Layout:	The noisefield layout. This is essentially moving the noisemap slices along the 3D Y axis.
Detail:	The amount of noisefield detail. This is the number of noise octaves.
Density:	The density of the noisefield detail.
Strength:	The ridge strength.
Altitude:	The ridge altitude.
Shape:	The ridge shape.
Gain:	The overall amplitude of the noisefield.
Offset:	The noisefield 3D Y value offset.

Notes

This device is multi-threaded.
This device requires zero additional datamap allocations.

Noisemap: Simplex

Generate a procedural gradient noisemap using the Simplex algorithm.



Heightfield Group

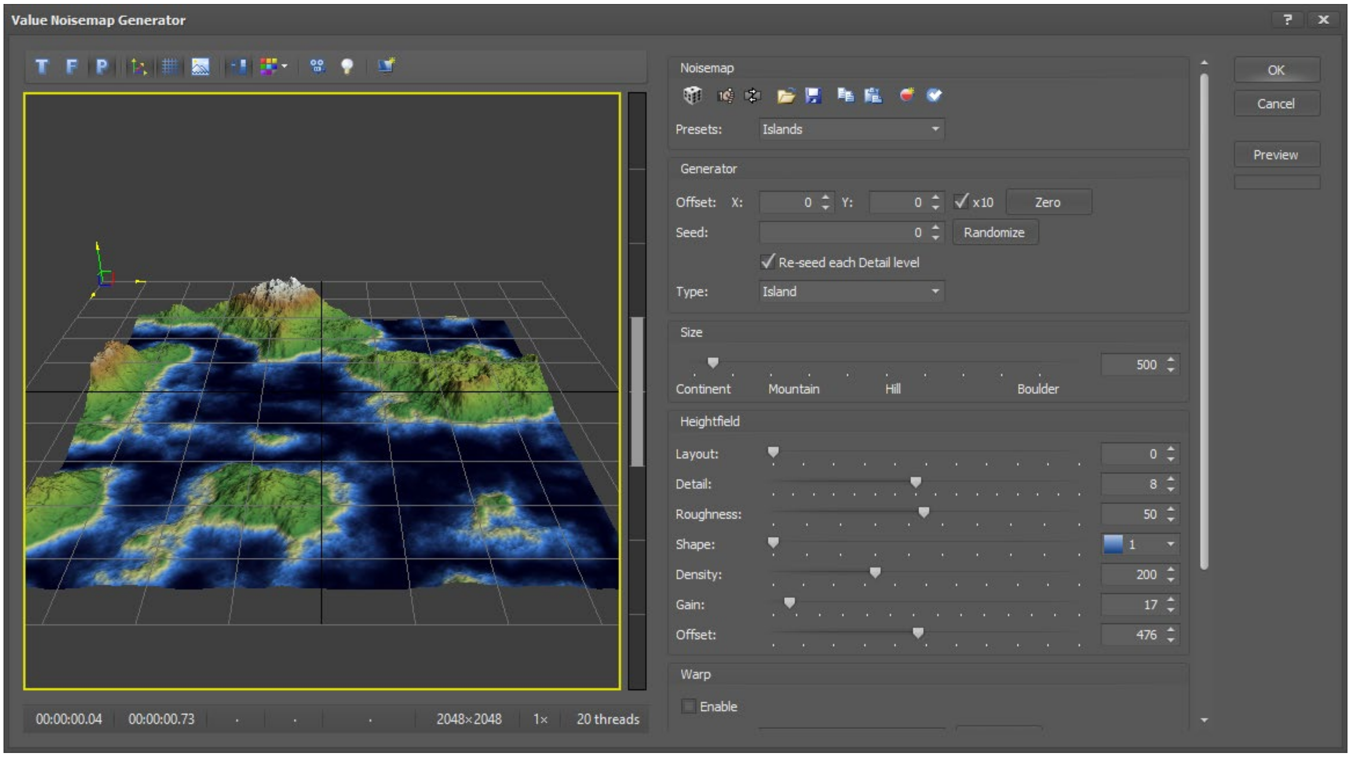
Layout:	The noisefield layout. This is essentially moving the noisemap slices along the 3D Y axis.
Detail:	The amount of noisefield detail. This is the number of noise octaves.
Roughness:	The roughness of the noisefield surface. This is the amplitude of the noise octaves.
Shape:	Adds a specific shape to the noisefield roughness by varying the noise octave levels.
Density:	The density of the noisefield detail.
Gain:	The overall amplitude of the noisefield.
Offset:	The noisefield 3D Y value offset.

Notes

This device is multi-threaded.
This device requires zero additional datamap allocations.

Noisemap: Value

Generate a procedural gradient noisemap using the Value algorithm.



Heightfield Group

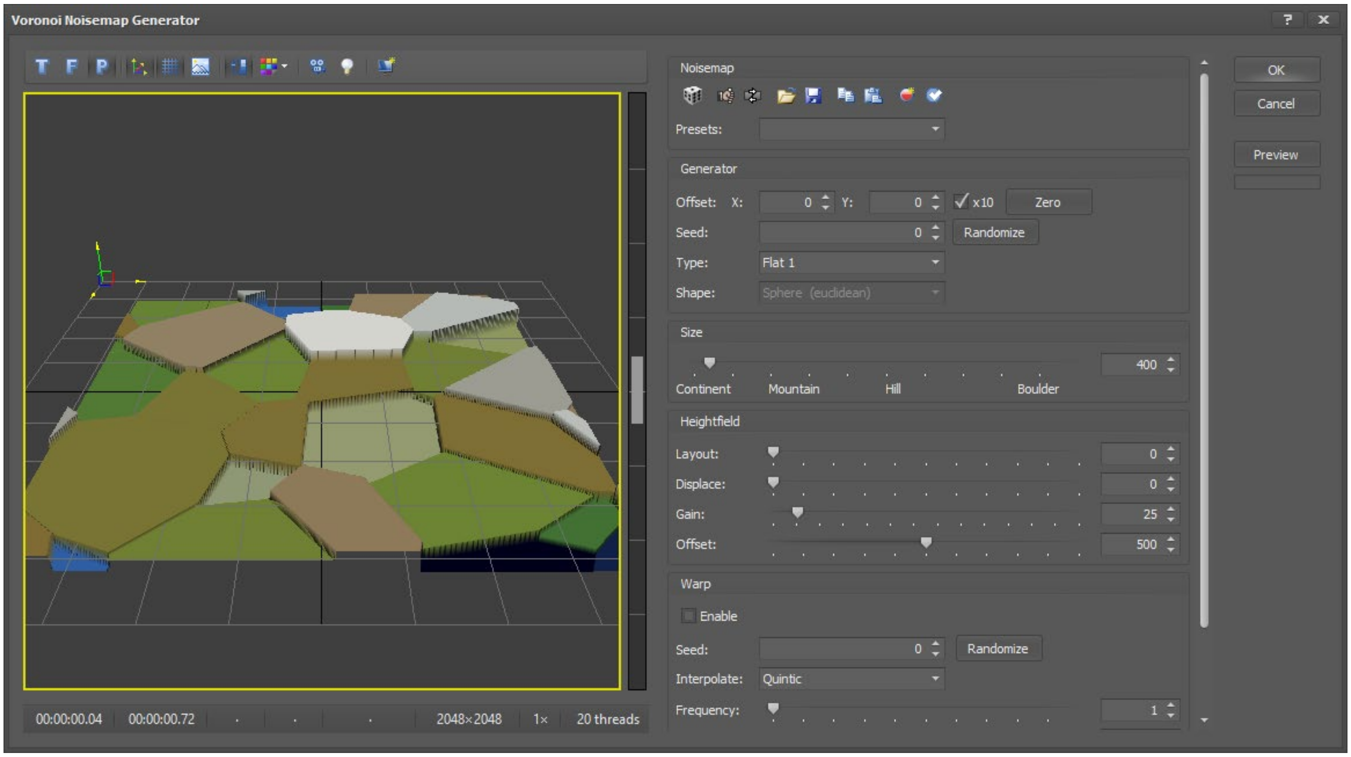
Layout:	The noisefield layout. This is essentially moving the noisemap slices along the 3D Y axis.
Detail:	The amount of noisefield detail. This is the number of noise octaves.
Roughness:	The roughness of the noisefield surface. This is the amplitude of the noise octaves.
Shape:	Adds a specific shape to the noisefield roughness by varying the noise octave levels.
Density:	The density of the noisefield detail.
Gain:	The overall amplitude of the noisefield.
Offset:	The noisefield 3D Y value offset.

Notes

This device is multi-threaded.
This device requires zero additional datamap allocations.

Noisemap: Voronoi

Generate a procedural noisemap using the Voronoi algorithm.



Generator Group

Shape: The voronoi cell shape.

Heightfield Group

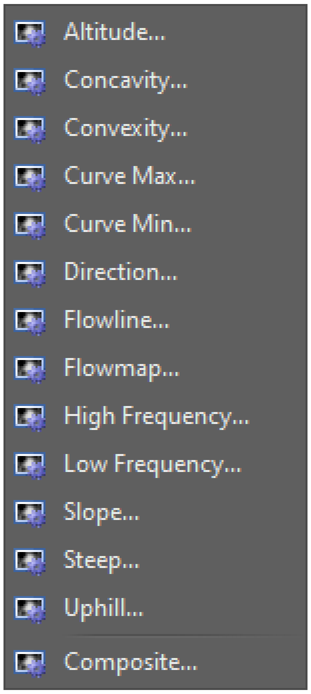
Layout: The noisefield layout. This is essentially moving the noisemap slices along the 3D Y axis.
Displace: The voronoi cell feature displacement.
Gain: The overall amplitude of the noisefield.
Offset: The noisefield 3D Y value offset.

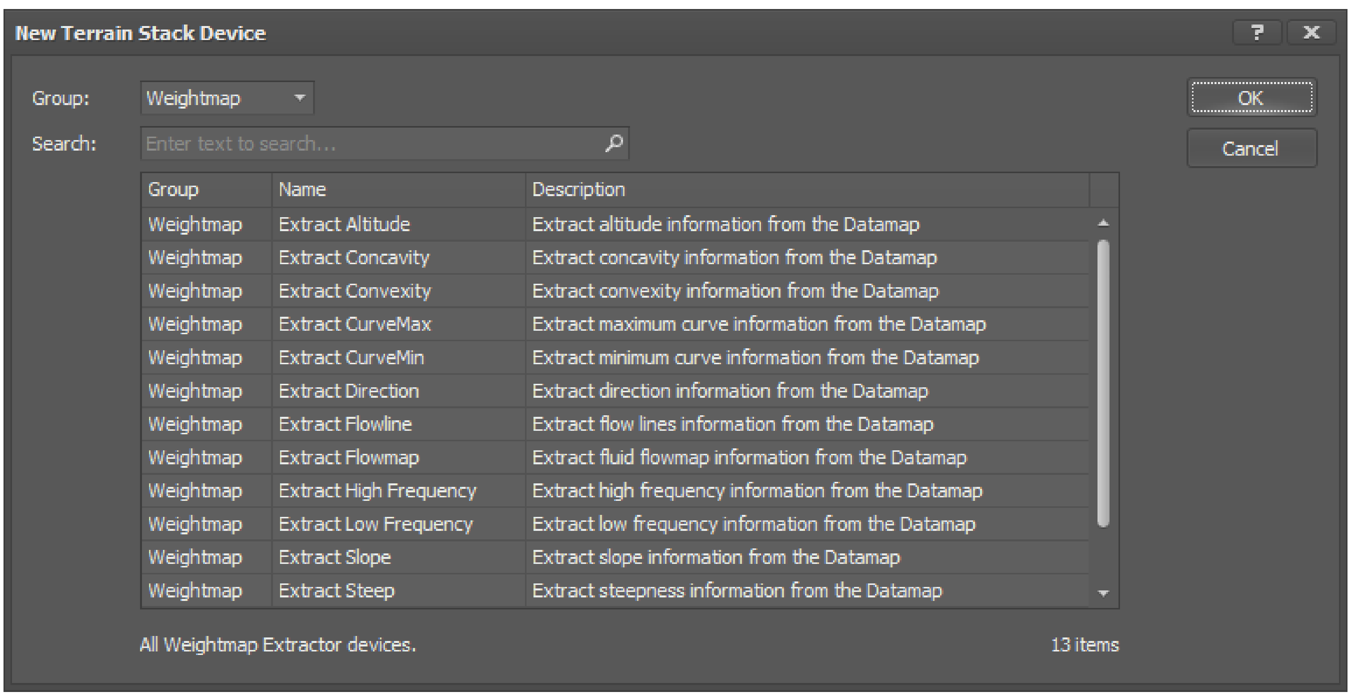
Notes

This device is multi-threaded.
This device requires zero additional datamap allocations.

Weightmap Menu: Devices

The Weightmap menu contains devices that extract weightmap masks from heightmaps.
The Weightmap devices are typically used for creating texture layer masks or splatmaps.





Weightmap Overview

The weightmap devices provide a variety of algorithms for extracting weightmap mask data from datamaps. The weightmap masks are typically used in video game engines for terrain layer systems and splatmaps and foliage mesh scattering.

Typical weightmap mask use for terrain textures or material shaders includes:
- Altitude, high: for mountain snow caps.
- Altitude, low: for oceans or lakes.
- Slope, flat: for grasslands, for grass mesh scattering.
- Slope, steep: for cliff faces.

Each weightmap dialog provides a centralized area for controlling all of the weightmap mask parameters. The dialog includes a large 2D preview window, a toolbar and information status bars, and multiple sliders and numeric controls to modify the weightmap properties.

Each weightmap type also includes parameters for smoothing the mask.
File parameters are available for immediate mode saving of the weightmap mask file to disk.
To save weightmaps on the terrain stack use the device item properties save feature.

Weightmap Common Properties

Smooth Group

Bypass   Bypass the smooth function.

Size: Specify the smooth kernel size. Larger values provide more smoothing strength.

Strength: Specify the smooth strength.

File output Group

Format: Choose the weightmap mask file output file format.
Grayscale 8-bit and 16-bit, and RGBA Grayscale 32-bit and 64-bit formats supported.

Alpha: Choose the output file Alpha management.
Default or no Alpha: the default for Grayscale and RGBA images.
Black to Alpha Transparent: copies the black colors to the alpha mask bitplane.
White to Alpha Transparent: copies the white colors to the alpha mask bitplane.

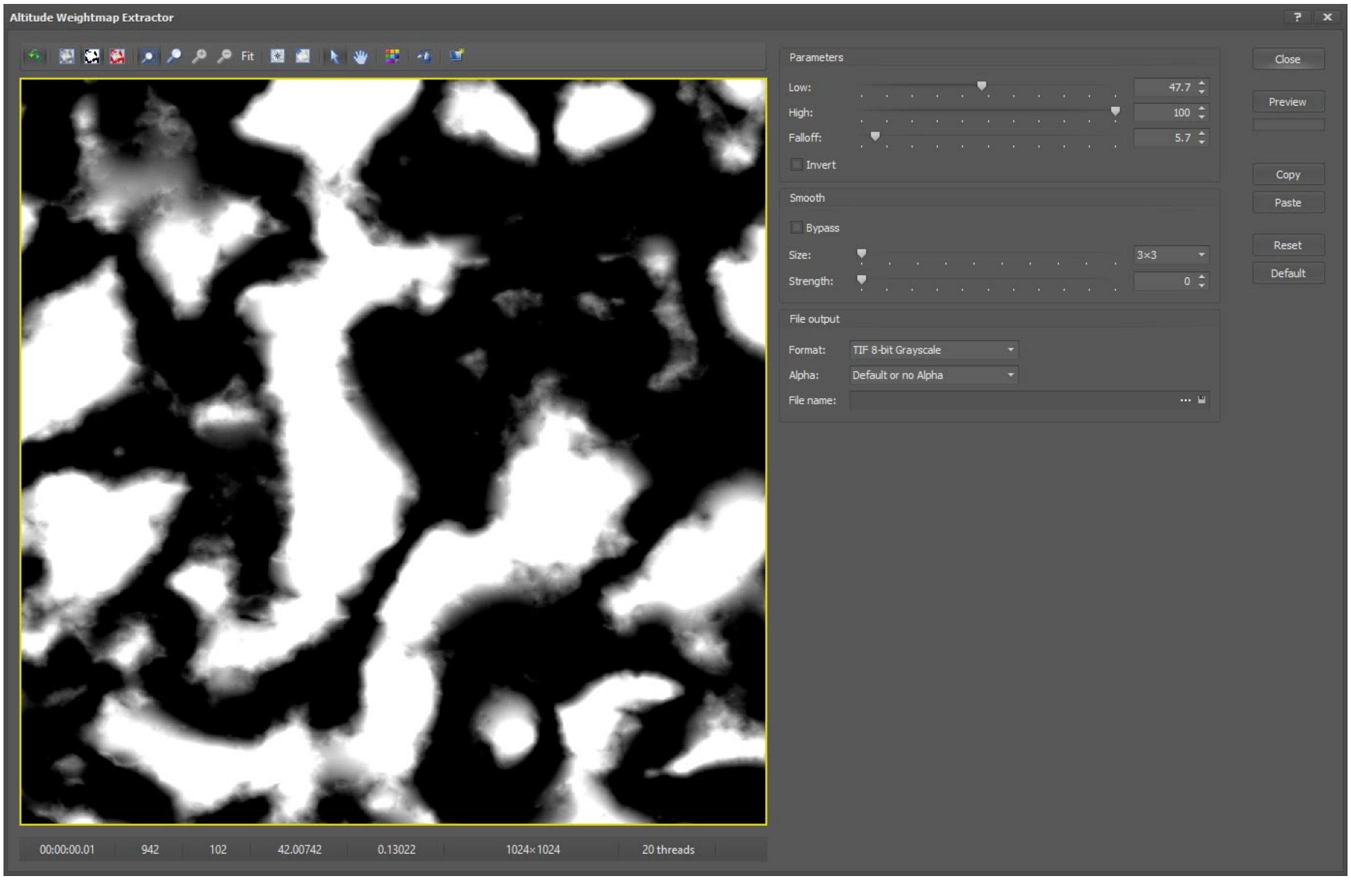
File name: Specify the weightmap mask file output name.

Browse: Browse for the output folder and file name.

Save: Save the weightmap mask file to disk.

Weightmap: Altitude

Extract mask information based on altitude.



Parameters Group

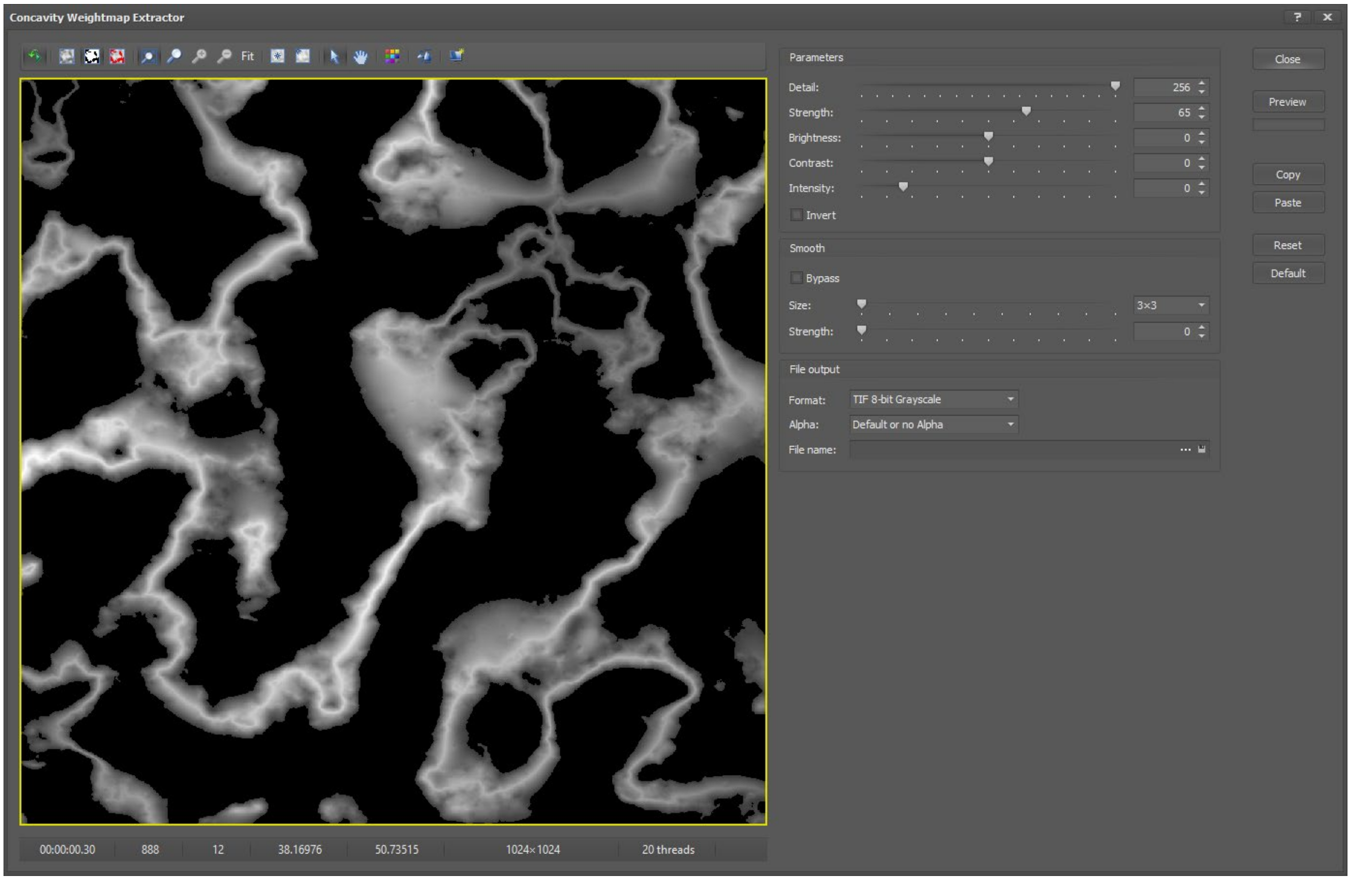
Low:	The low altitude value.
High:	The high altitude value.
Falloff:	The altitude falloff value.
Invert:	Invert the mask.

Notes

This device is multi-threaded.
This device requires 1 additional datamap memory allocation for the mask.

Weightmap: Concavity

Extract mask information based on concavity (depressions in the datamap).



Parameters Group

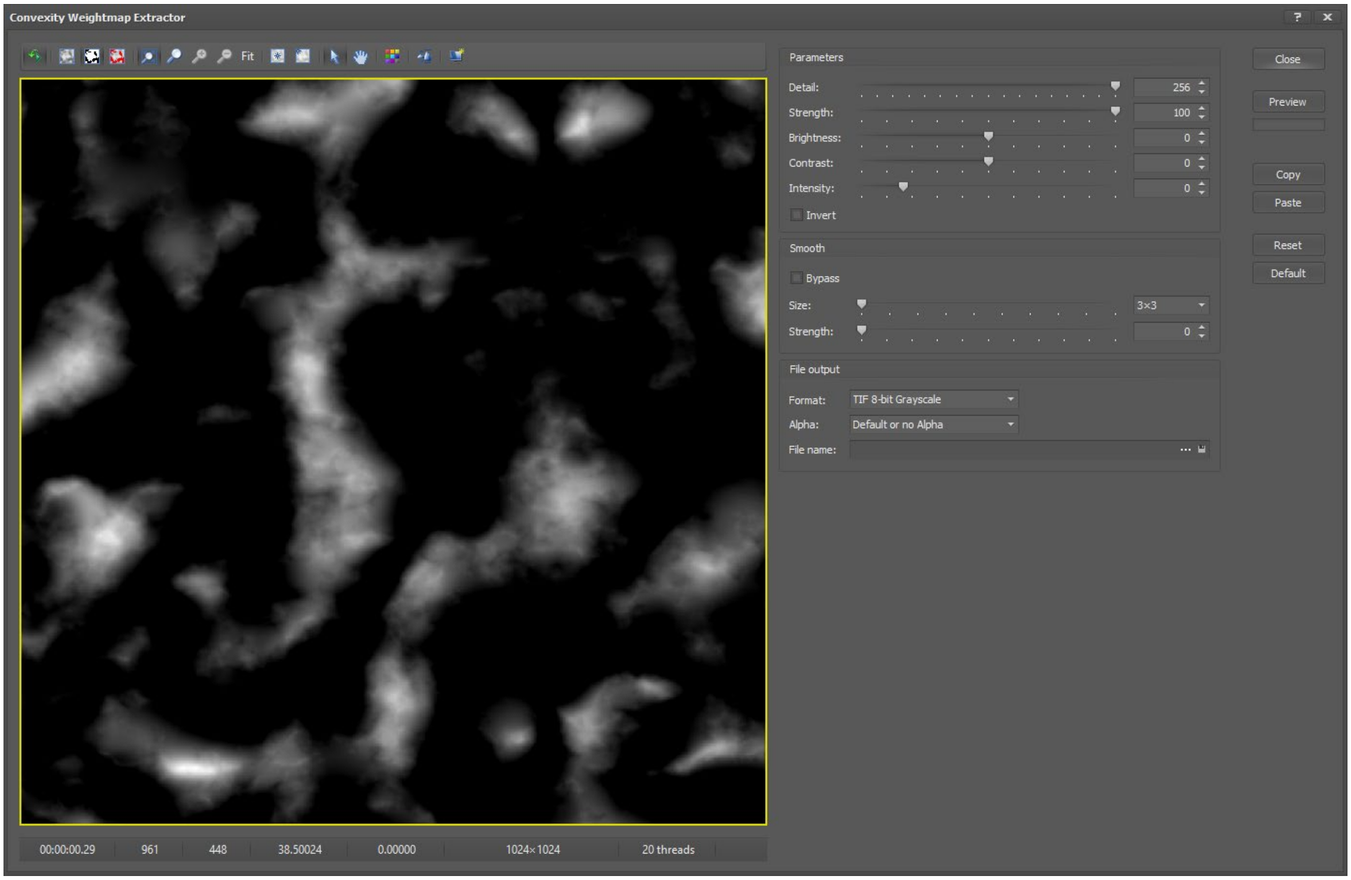
Detail:	The size of the concavity filter small to large.
Strength:	The strength of the filter.
Brightness:	Adjust the mask exposure brightness.
Contrast:	Adjust the mask exposure contrast.
Intensity:	Adjust the mask exposure intensity.
Invert:	Invert the mask.

Notes

This device is multi-threaded.
This device requires 1 additional datamap memory allocation for the mask.

Weightmap: Convexity

Extract mask information based on convexity (mounds in the datamap).



Parameters Group

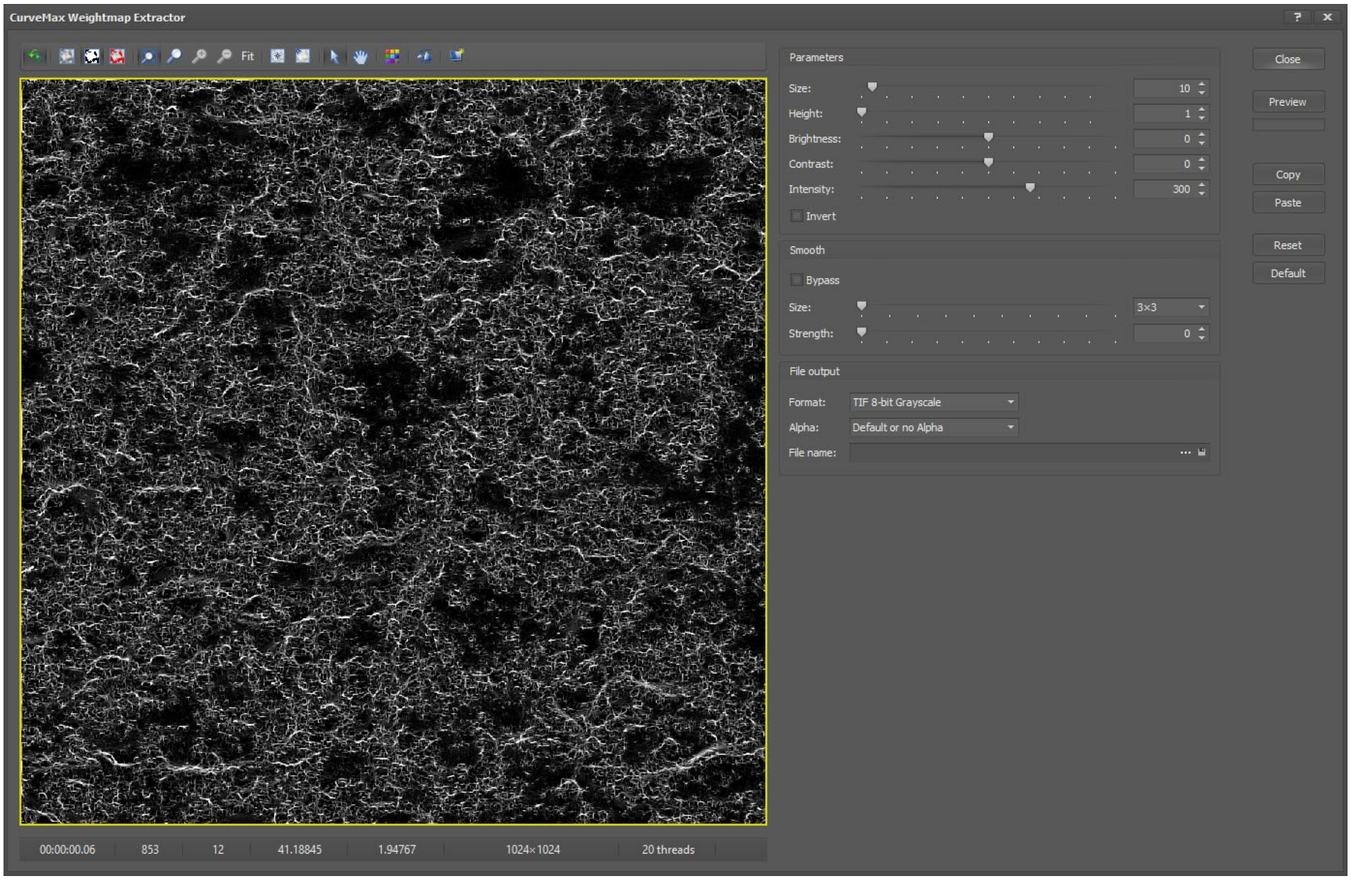
Detail:	The size of the concavity filter small to large.
Strength:	The strength of the filter.
Brightness:	Adjust the mask exposure brightness.
Contrast:	Adjust the mask exposure contrast.
Intensity:	Adjust the mask exposure intensity.
Invert:	Invert the mask.

Notes

This device is multi-threaded.
This device requires 1 additional datamap memory allocation for the mask.

Weightmap: Curve Max

Extract mask information based on the maximum curvature of the datamap.



Parameters Group

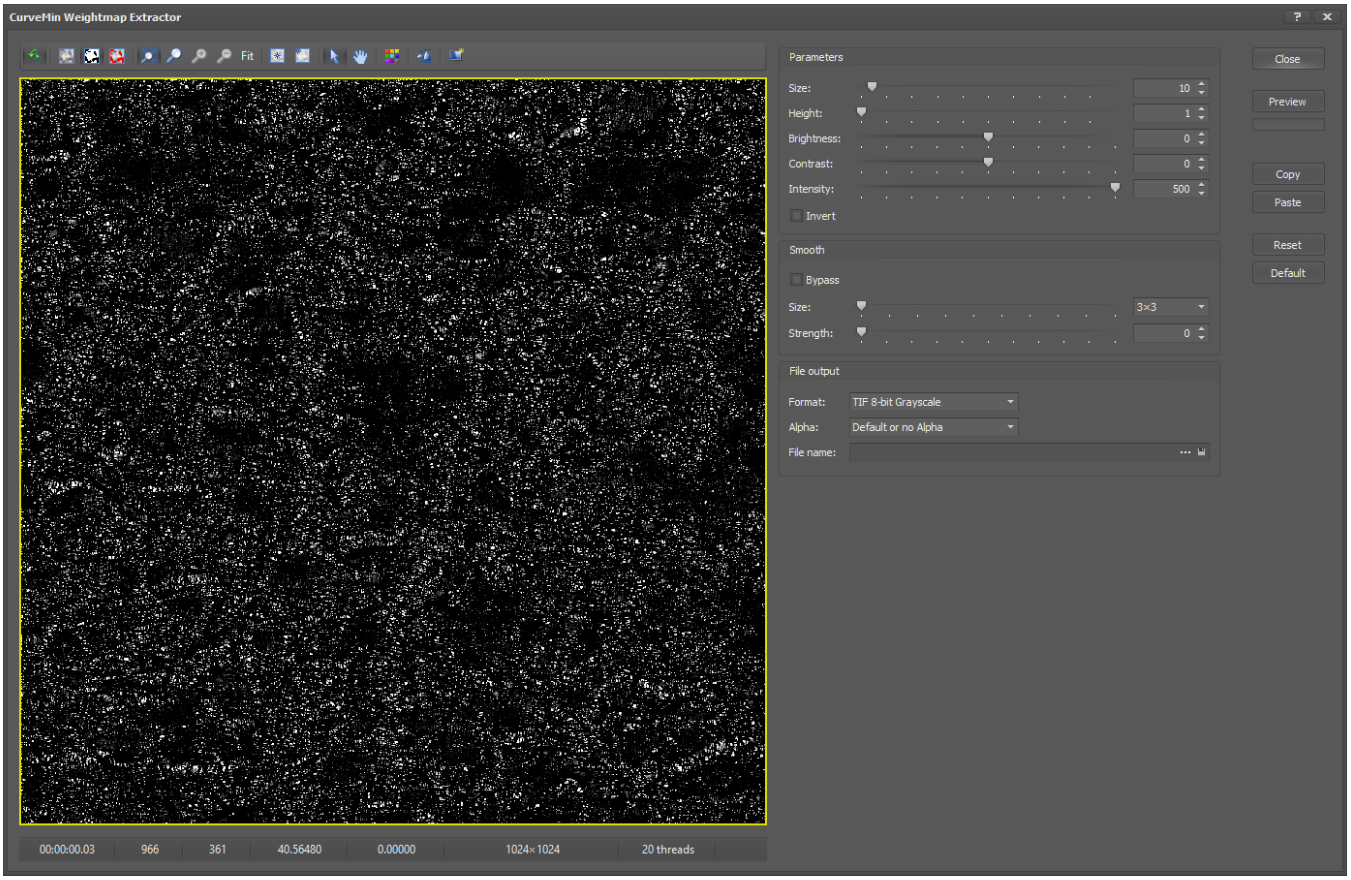
Size:	The size of the curve filter small to large.
Height:	The elevation height of the datamap, higher values filter out more detail.
Brightness:	Adjust the mask exposure brightness.
Contrast:	Adjust the mask exposure contrast.
Intensity:	Adjust the mask exposure intensity.
Invert:	Invert the mask.

Notes

This device is multi-threaded.
This device requires 1 additional datamap memory allocation for the mask.

Weightmap: Curve Min

Extract mask information based on the minimum curvature of the datamap.



Parameters Group

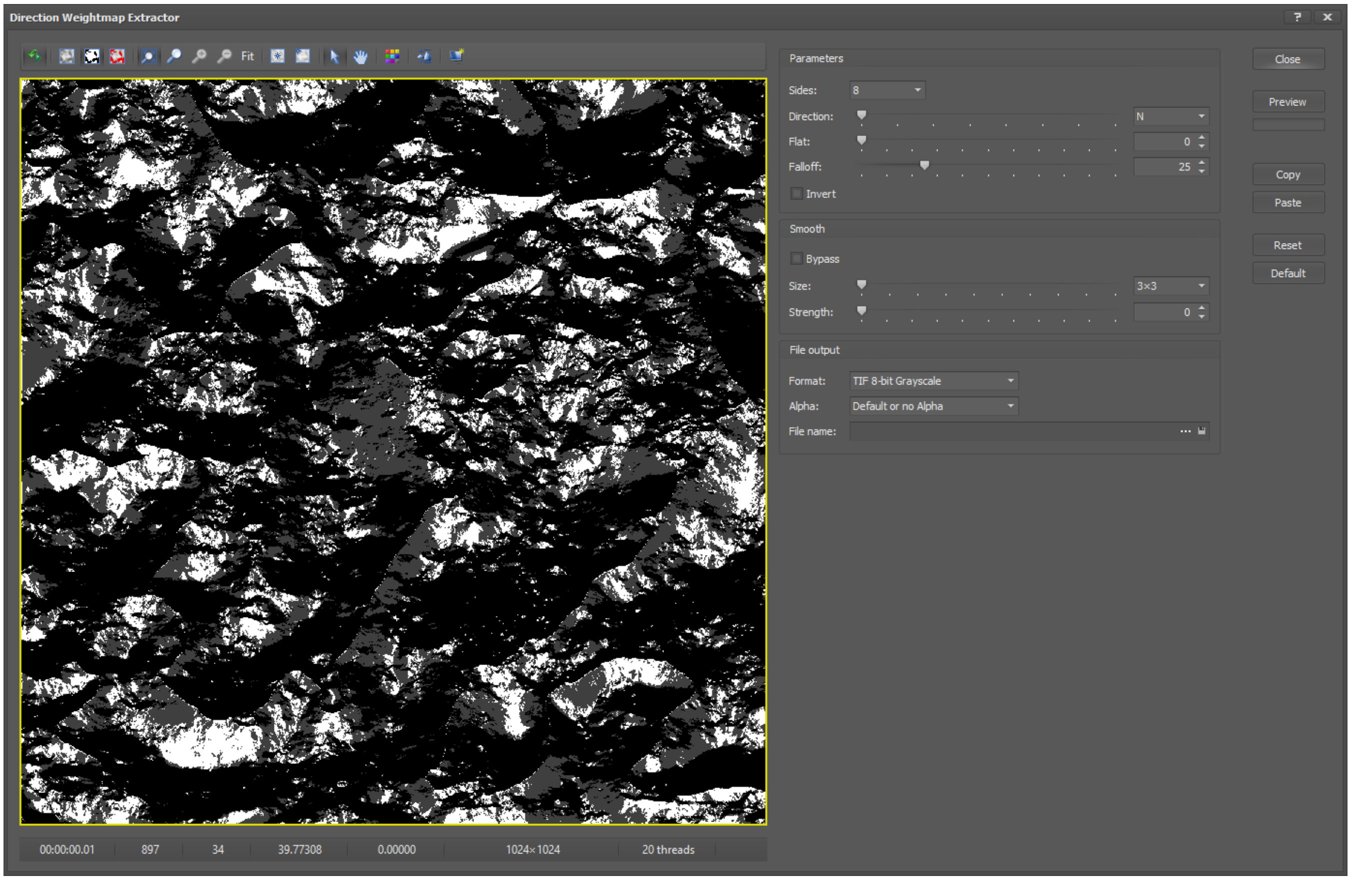
Size:	The size of the curve filter small to large.
Height:	The elevation height of the datamap, higher values filter out more detail.
Brightness:	Adjust the mask exposure brightness.
Contrast:	Adjust the mask exposure contrast.
Intensity:	Adjust the mask exposure intensity.
Invert:	Invert the mask.

Notes

This device is multi-threaded.
This device requires 1 additional datamap memory allocation for the mask.

Weightmap: Direction

Extract mask information based on the direction of the surface.



Parameters Group

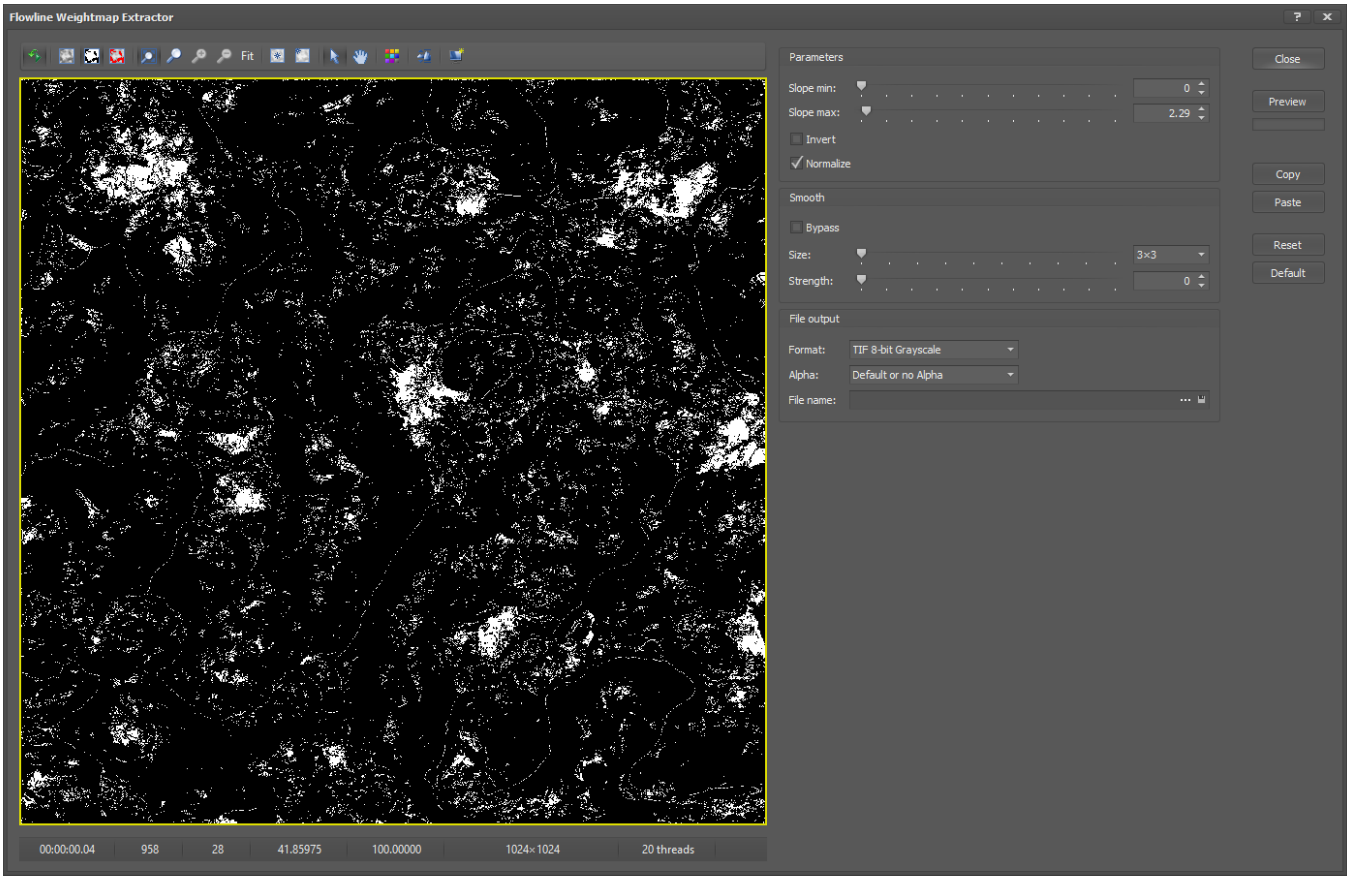
Sides:	The number of direction sides, 8 or 16.
Direction:	Mask the terrain sides that are facing the specified compass direction.
Flat:	Exclude the flatter regions.
Falloff:	The direction falloff value. Blend in the adjacent directions.
Invert	Invert the mask.

Notes

This device is multi-threaded.
This device requires 1 additional datamap memory allocation for the mask.

Weightmap: Flowline

Extract mask information based on the surface water flow slope angles.



Parameters Group

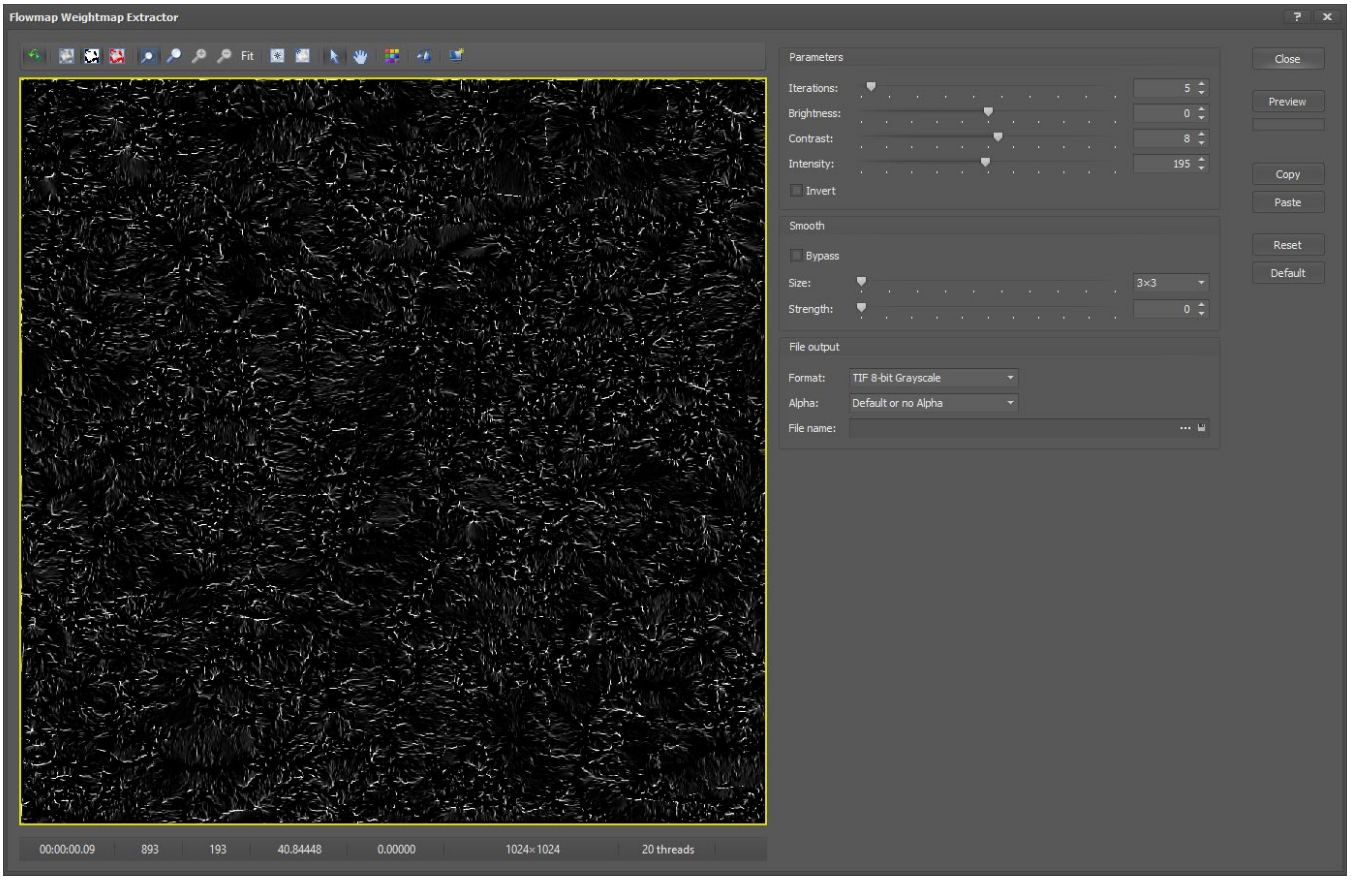
Slope min:	The slope minimum value.
Slope max:	The slope maximum value.
Invert	Invert the mask.
Normalize	Normalize the mask.

Notes

This device is multi-threaded.
This device requires 1 additional datamap memory allocation for the mask.

Weightmap: Flowmap

Extract mask information based on the water flow map.



Parameters Group

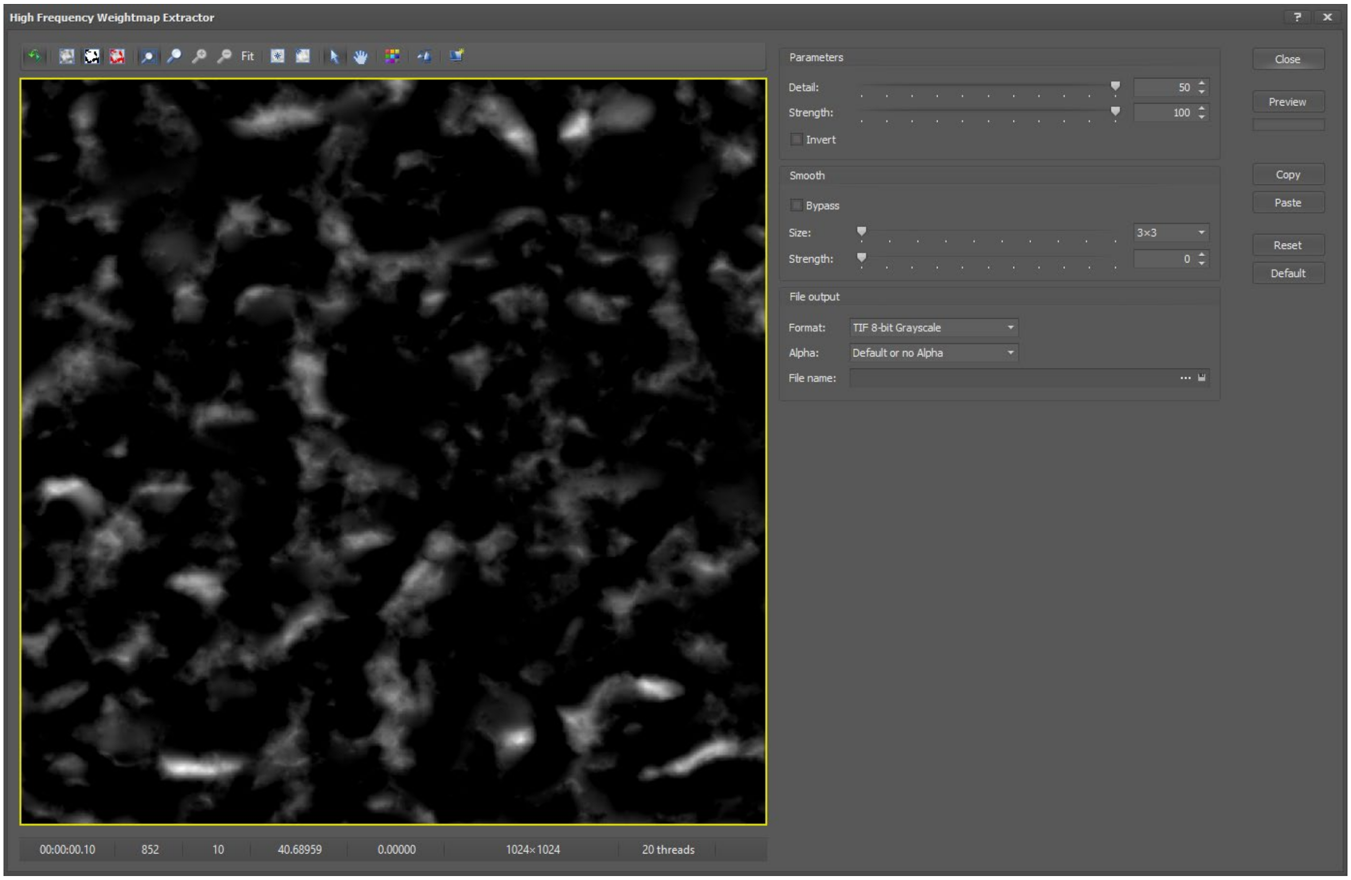
Iterations:	The number of water flow cycles to perform.
Brightness:	Adjust the mask exposure brightness.
Contrast:	Adjust the mask exposure contrast.
Intensity:	Adjust the mask exposure intensity.
Invert:	Invert the mask.

Notes

This device is multi-threaded.
This device requires 1 additional datamap memory allocation for the mask.

Weightmap: High Frequency

Extract mask information based on the high frequency data in the datamap.



Parameters Group

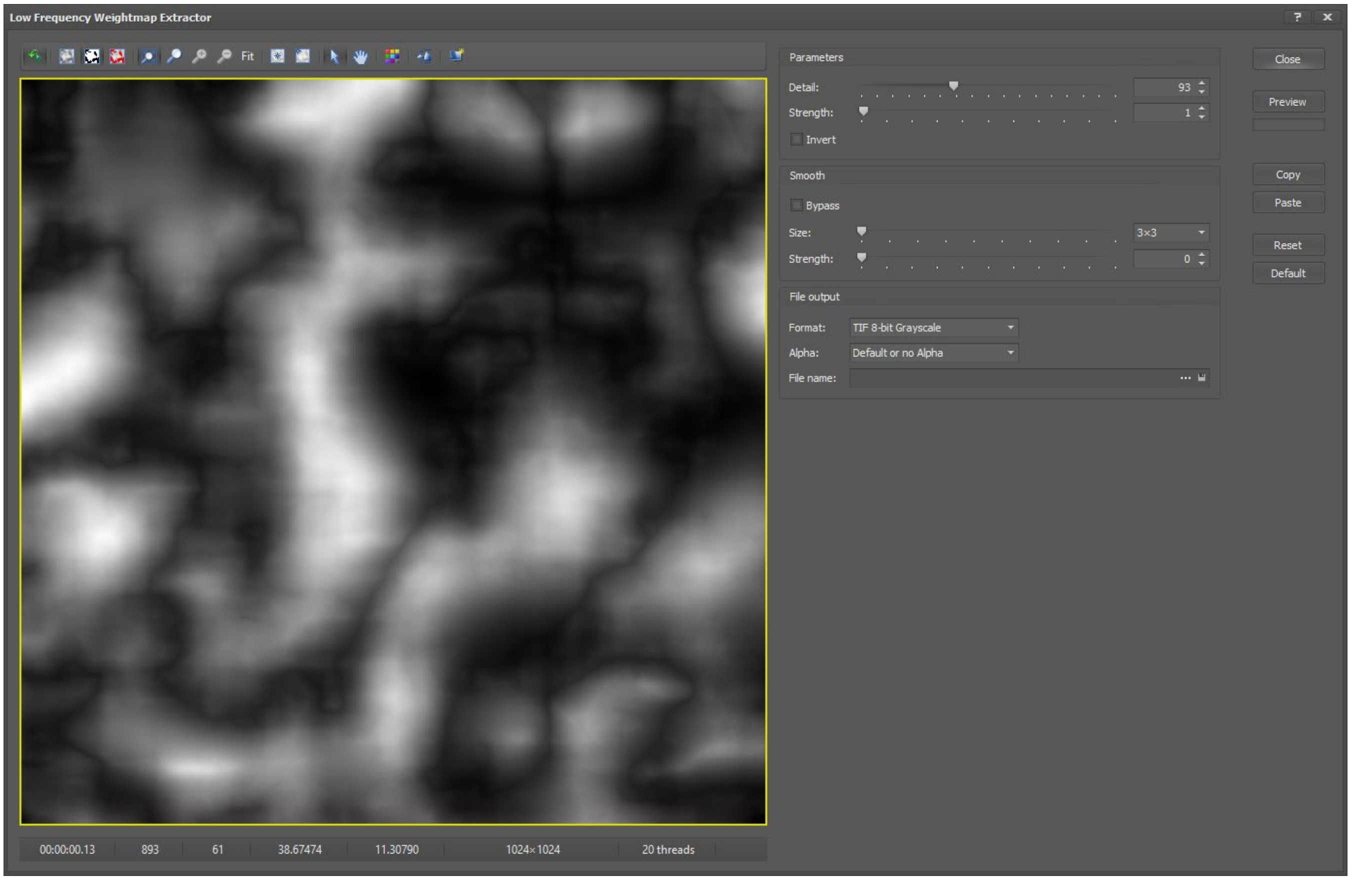
Detail: The resolution of the gaussian filter.
Strength: The strength of the gaussian filter.
Invert: Invert the mask.

Notes

This device is multi-threaded.
This device requires 1 additional datamap memory allocation for the mask.

Weightmap: Low Frequency

Extract mask information based on the low frequency data in the datamap.



Parameters Group

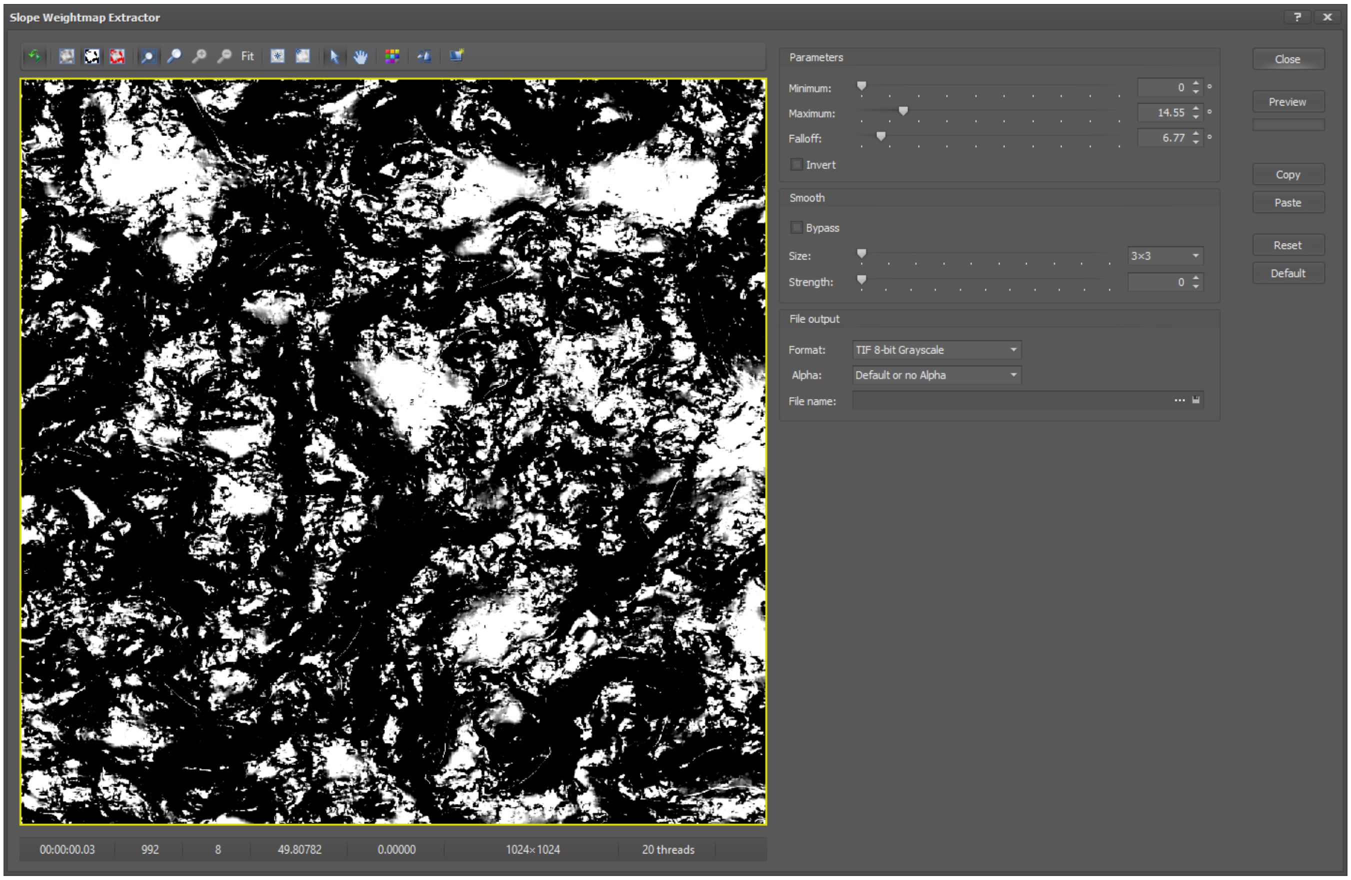
Detail:	The resolution of the gaussian filter.
Strength:	The strength of the gaussian filter.
Invert:	Invert the mask.

Notes

This device is multi-threaded.
This device requires 1 additional datamap memory allocation for the mask.

Weightmap: Slope

Extract mask information based on the slope data.



Parameters

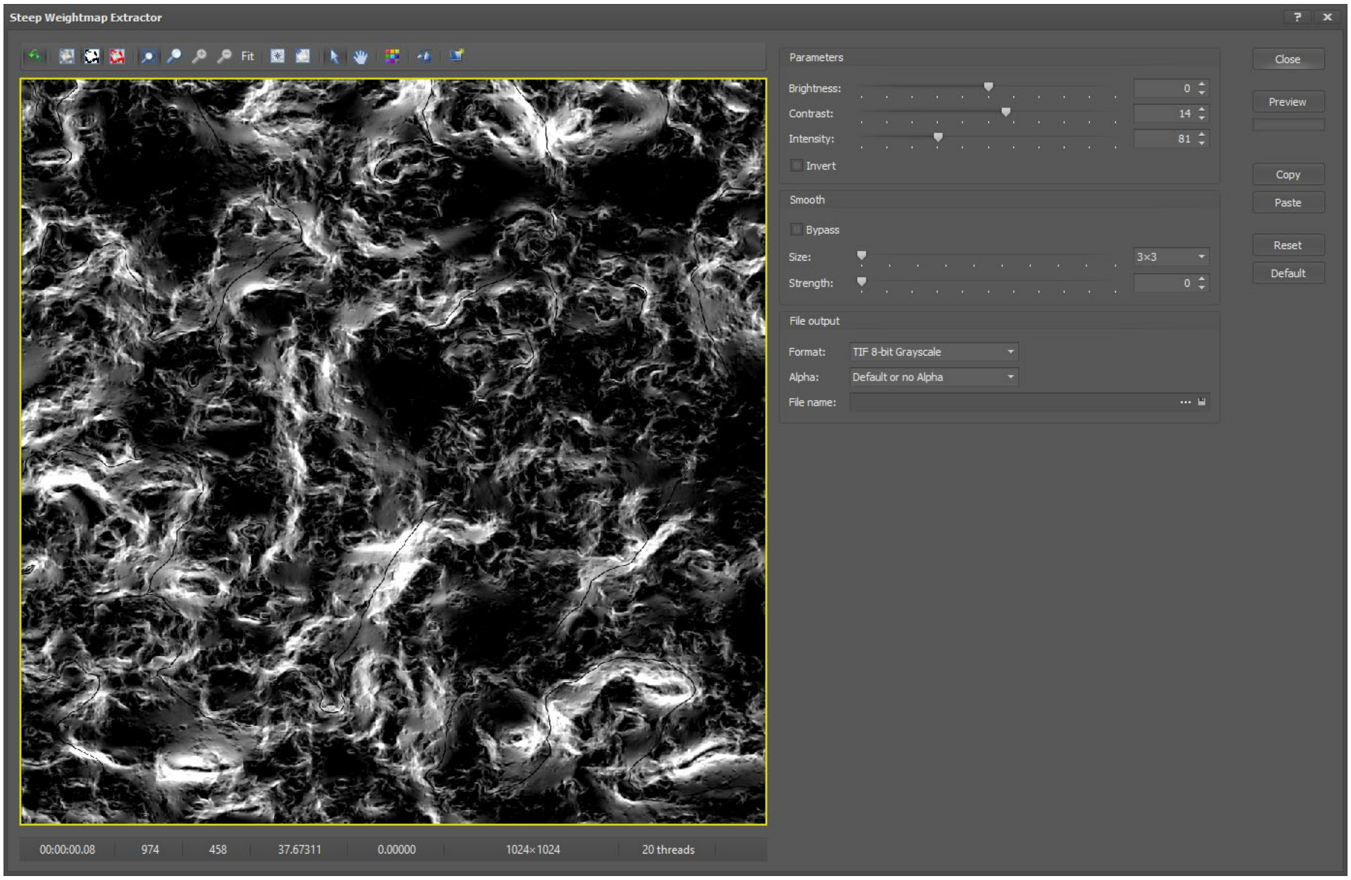
Minimum:	The minimum slope angle value in degrees.
Maximum:	The maximum slope angle value in degrees.
Falloff:	The slope angle falloff value in degrees.
Invert	Invert the mask.

Notes

This device is multi-threaded.
This device requires 1 additional datamap memory allocation for the mask.

Weightmap: Steep

Extract mask information based on the datamap cell steepness.



Parameters Group

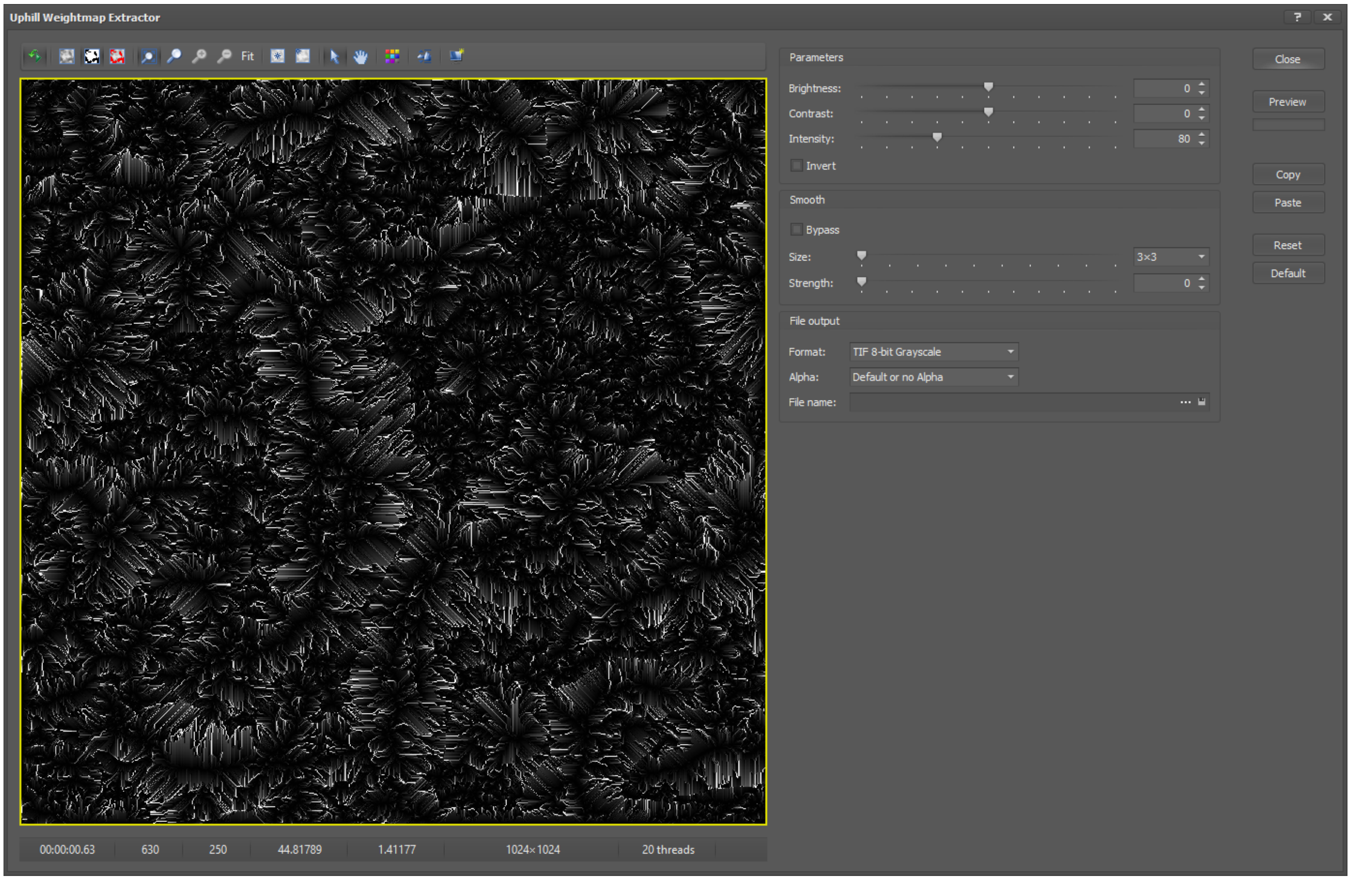
Brightness:	Adjust the mask exposure brightness.
Contrast:	Adjust the mask exposure contrast.
Intensity:	Adjust the mask exposure intensity.
Invert:	Invert the mask.

Notes

This device is multi-threaded.
This device requires 1 additional datamap memory allocation for the mask.

Weightmap: Uphill

Extract mask information based on the datamap cell uphill traversal.



Parameters Group

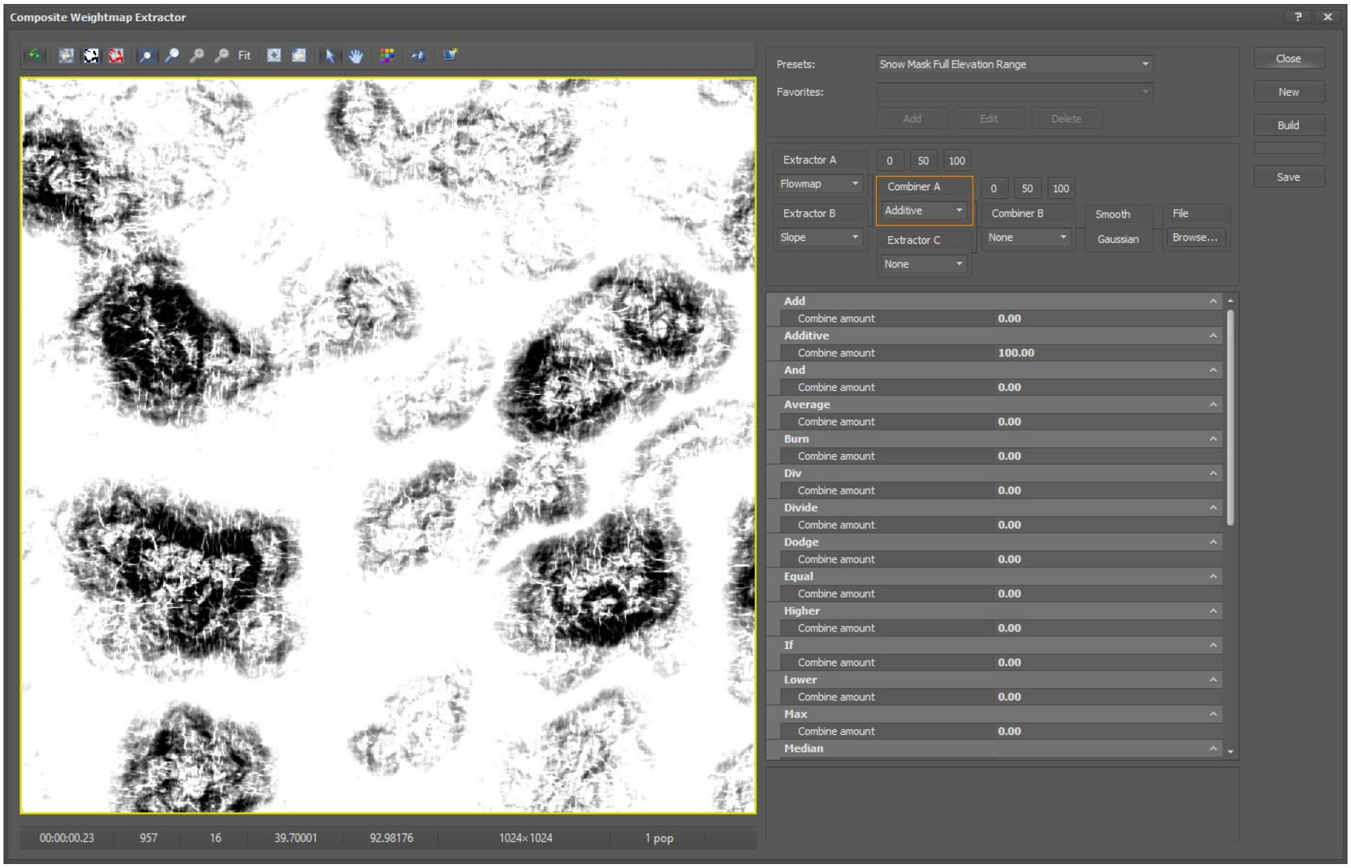
Brightness:	Adjust the mask exposure brightness.
Contrast:	Adjust the mask exposure contrast.
Intensity:	Adjust the mask exposure intensity.
Invert:	Invert the mask.

Notes

This device is partially multi-threaded.
This device requires 1 additional datamap memory allocation for the mask.

Weightmap: Composite

Extract mask information based on the combination of up to three weightmap extractors.



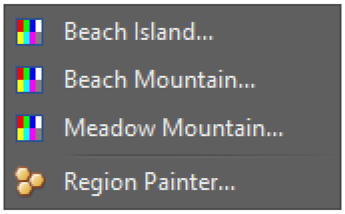
Presets:	Choose from various preset composite weightmap algorithms.
Extractor A:	Weightmap extractor A.
Extractor B:	Weightmap extractor B.
0/50/100:	Set the combiner output values.
Combiner A:	The algorithm used to combine extractor A and B.
Extractor C:	Weightmap extractor C.
0/50/100:	Set the combiner output values.
Combiner B:	The algorithm used to combine extractor A:B and C.
Smooth:	The mask smoothing.
File:	The file to save the weightmap as.
Grid:	Adjust the extractor and combiner properties.

Notes

This device is single-threaded with multi-threaded extractors.
This device requires 1 additional datamap memory allocation for each mask.

Biome Menu: Devices

The Biome menu contains devices that extract biome weightmaps and splatmaps.
And a Region Painter for creating multi-biome masks.



To use the Biome Devices, adjust the sliders and numeric controls to get the weightmaps adjusted as desired for the splatmap layout, click on the Build button to build all of the maps. You can also press the F5 key to Build.

Three Weightmap Blend Modes are available, Blend, Priority, and Solid.
Blend – default proportional blend, each weightmap is blended by percent so that all four weightmaps = 100%.
Priority – mask priority of R>G>B>A, the Red weightmap color is mixed first, then Green, then Blue, then Alpha.
Solid – highest value becomes solid, the highest RGB color becomes a solid color, this created a Colormap.

Two Splatmap Modes are available: RGBA and RGBAK.
RGBA – creates a 4-layer RGBA Splatmap.
RGBAK – creates a 5-layer RGBAK Splatmap.

Once you have the final weightmap and splatmap layout that you want, then type in a base filespec or use the "…" button to browse for a save file, then perform the Build again to build the maps and save them to disk. Be sure to include the file extension of png or tif so that the software knows which file format you wish to save to. The weightmap files can also be saved as 16-bit grayscale images by enabling the 16-bit checkbox.

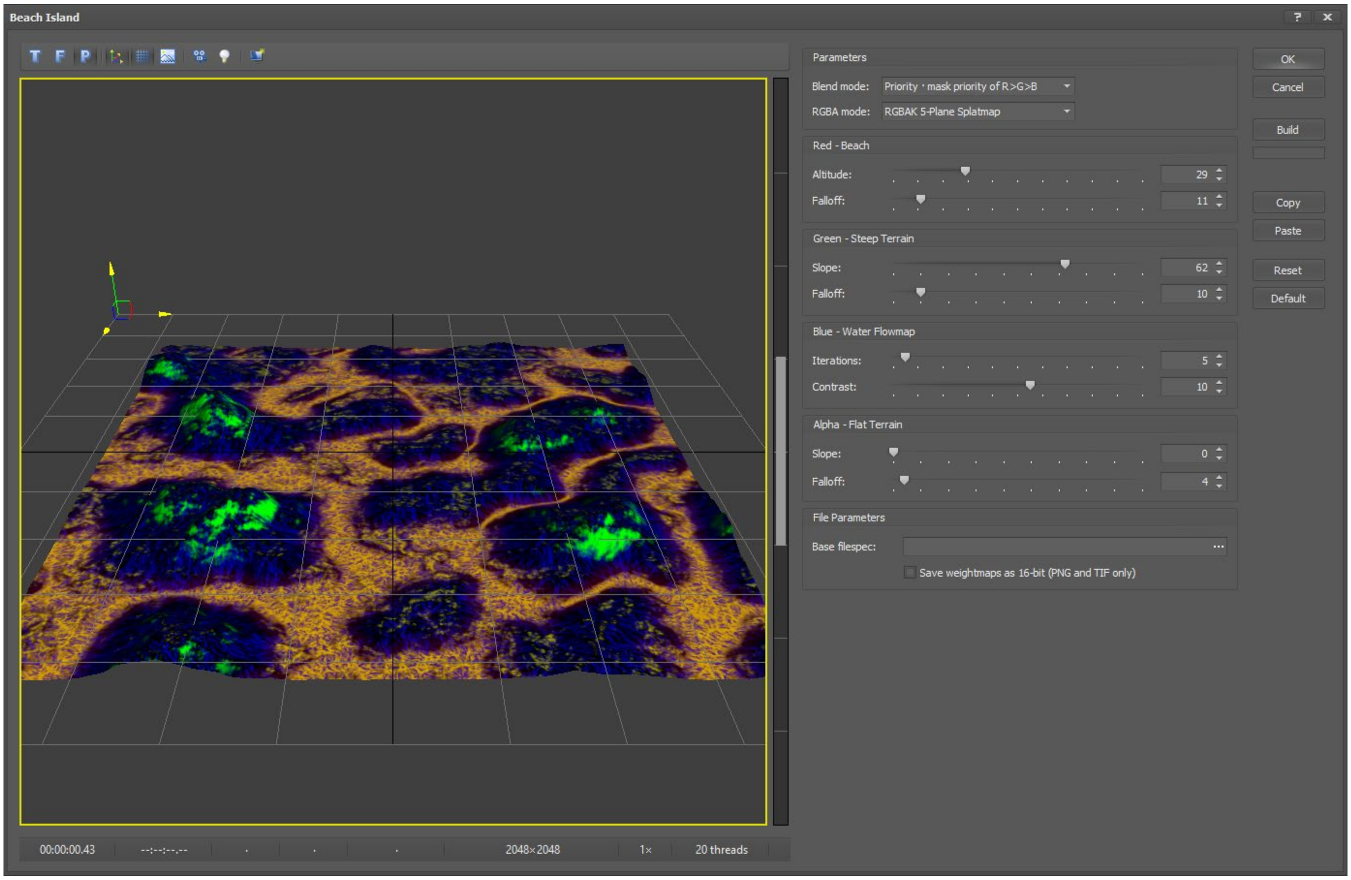
The filespec selected will be used as the base file name for the final map files.
For example, if you chose a filespec of "I:\MyBiome.png" then the map files will be:
I:\MyBiome_Flat.png, I:\MyBiome_Steep.png, I:\MyBiome_Flowmap.png, I:\MyBiome_High.png, I:\MyBiome_Splatmap.png, etc.

When you are finished creating your biome, click on the Cancel button to simply close the dialog, or click on the OK button to save the current slider values as persistent data for the current editor session.

The Region Painter is an RGBA region mask painter that allows for creating a hand-painted set of biome masks.

Biome: Beach Island

Extract a set of biome weightmaps and splatmap for Low altitude, Steep slope, Water flowmap, and Flat slope.



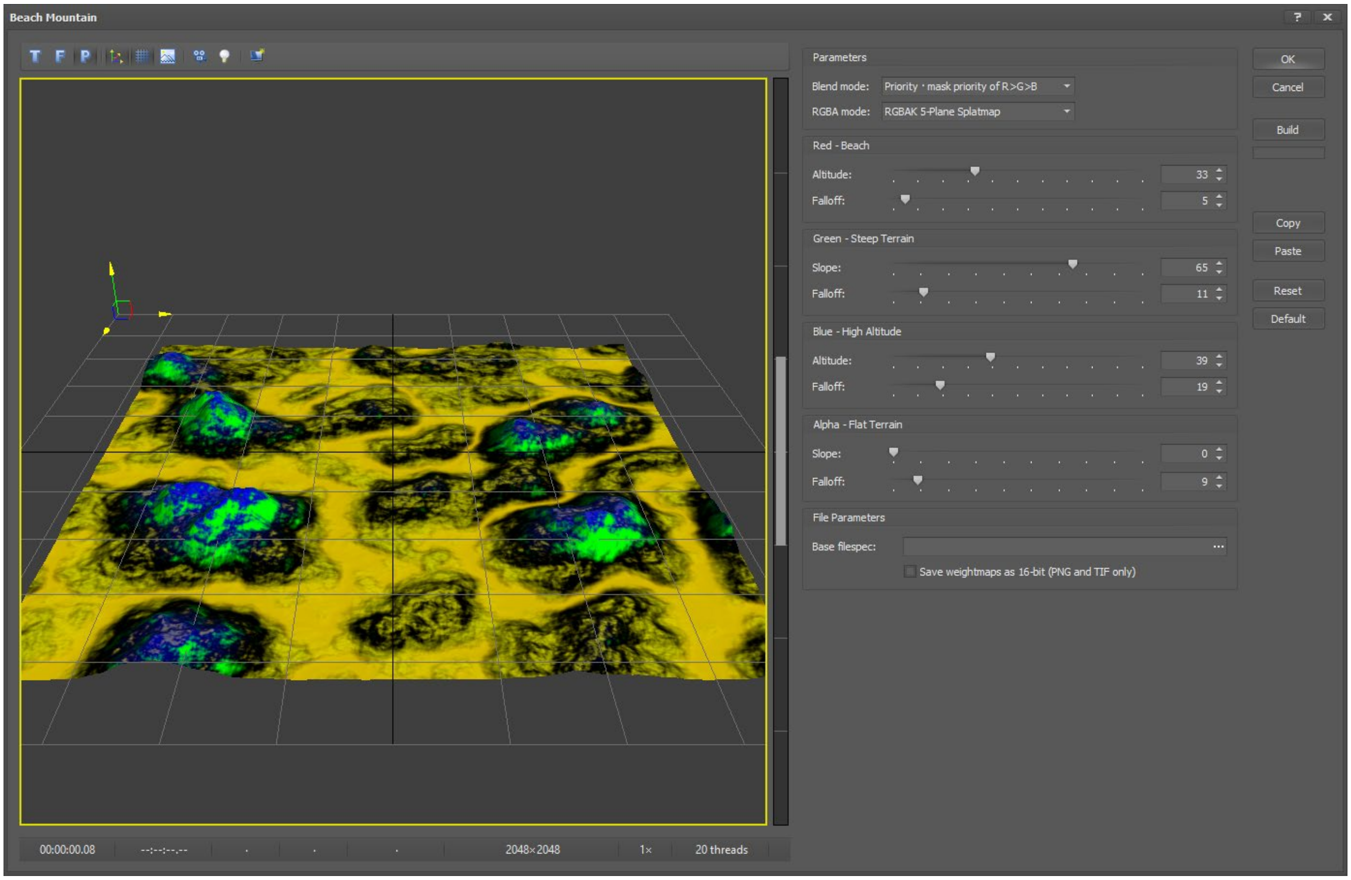
Blend mode	The method used to blend and normalize the weightmaps.
RGBA Mode	Choose between a 4-Layer RGBA Splatmap and 5-Layer RGBAK Splatmap.
Beach Altitude	The low altitude weightmap level.
Beach Falloff	The low altitude weightmap feathering.
Steep Slope	The steep slope weightmap angle.
Steep Falloff	The steep slope weightmap feathering.
Flowmap Iterations	The execution count of the water flowmap weightmap.
Flowmap Contrast	The image contrast of the water flowmap weightmap.
Flat Slope	The flat slope weightmap angle.
Flat Falloff	The flat slope weightmap feathering.
Base filespec	The base filespec name used to save the weightmaps and splatmap. The file names will be appended with _Beach, _Steep, _Flowmap, _Flat, _Splatmap. The base file specification should be in the format of C:\Temp\MyBiome.png or .tif.
Save 16-bit	Whether to save the weightmap files as 16-bit grayscale versus the default 8-bit format.

Notes

This device is multi-threaded.
This device requires 8 additional datamap memory allocations.

Biome: Beach Mountain

Extract a set of biome weightmaps and splatmap for Low altitude, Steep slope, High altitude, and Flat slope.



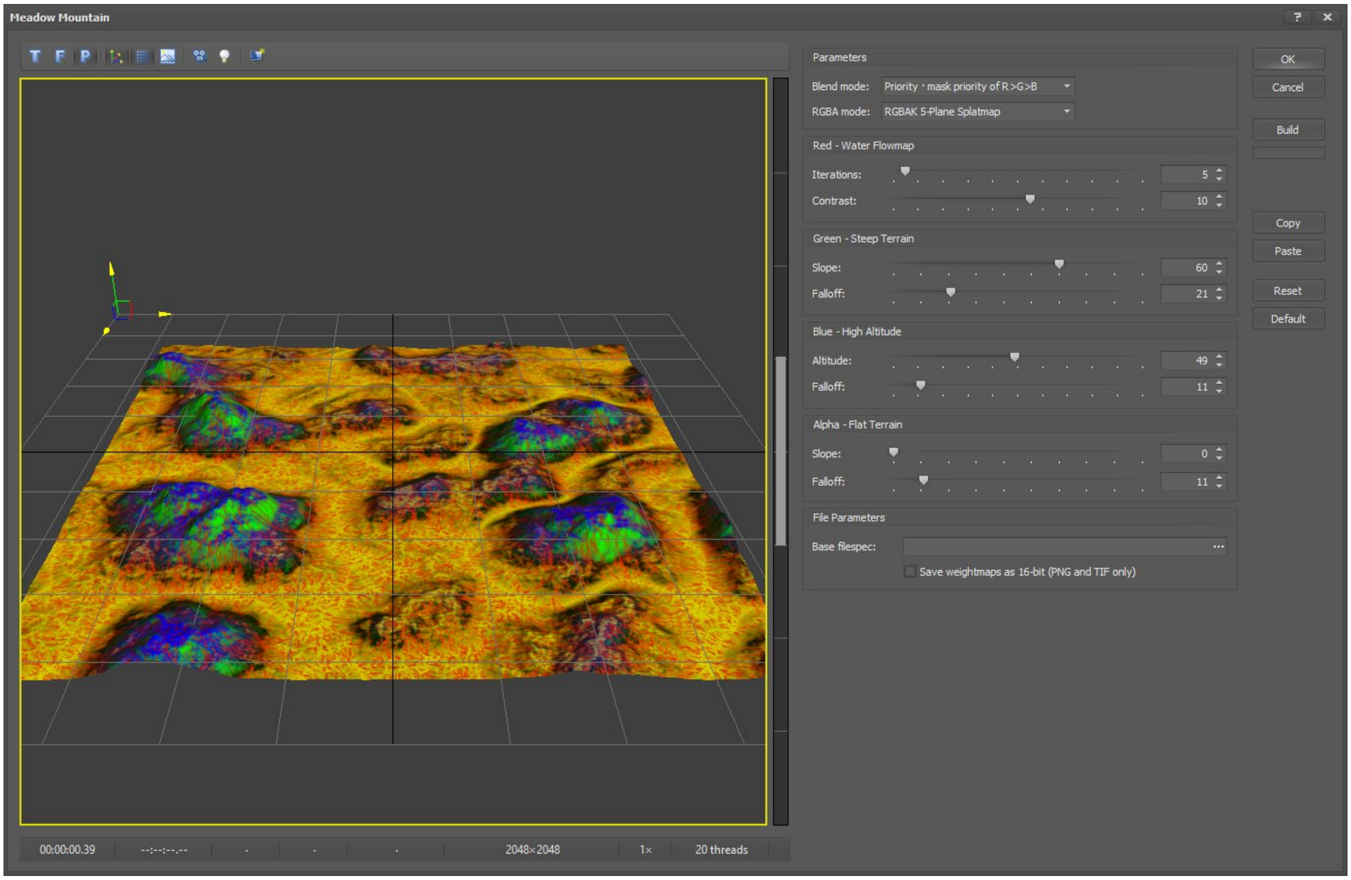
Blend mode	The method used to blend and normalize the weightmaps.
RGBA Mode	Choose between a 4-Layer RGBA Splatmap and 5-Layer RGBAK Splatmap.
Beach Altitude	The low altitude weightmap level.
Beach Falloff	The low altitude weightmap feathering.
Steep Slope	The steep slope weightmap angle.
Steep Falloff	The steep slope weightmap feathering.
High altitude	The high altitude weightmap level.
High Falloff	The high altitude weightmap feathering.
Flat Slope	The flat slope weightmap angle.
Flat Falloff	The flat slope weightmap feathering.
Base filespec	The base filespec name used to save the weightmaps and splatmap. The file names will be appended with _Beach, _Steep, _High, _Flat, _Splatmap. The base file specification should be in the format of C:\Temp\MyBiome.png or .tif.
Save 16-bit	Whether to save the weightmap files as 16-bit grayscale versus the default 8-bit format.

Notes

This device is multi-threaded.
This device requires 7 additional datamap memory allocations.

Biome: Meadow Mountain

Extract a set of biome weightmaps and splatmap for Water flowmap, Steep slope, High altitude, and Flat slope.



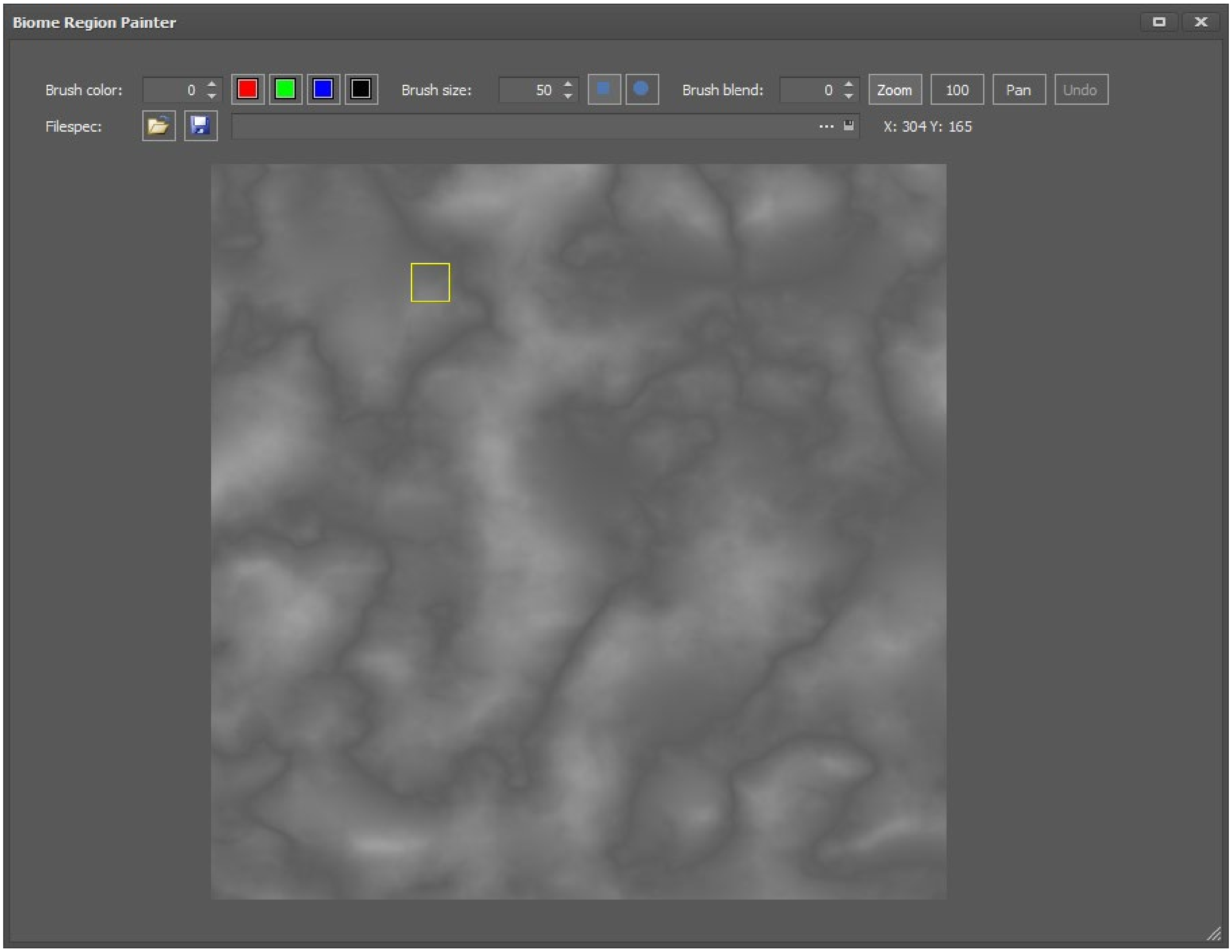
Blend mode	The method used to blend and normalize the weightmaps.
RGBA Mode	Choose between a 4-Layer RGBA Splatmap and 5-Layer RGBAK Splatmap.
Flowmap Iterations	The execution count of the water flowmap weightmap.
Flowmap Contrast	The image contrast of the water flowmap weightmap.
Steep Slope	The steep slope weightmap angle.
Steep Falloff	The steep slope weightmap feathering.
High altitude	The high altitude weightmap level.
High Falloff	The high altitude weightmap feathering.
Flat Slope	The flat slope weightmap angle.
Flat Falloff	The flat slope weightmap feathering.
Base filespec	The base filespec name used to save the weightmaps and splatmap. The file names will be appended with _Flowmap, _Steep, _High, _Flat, _Splatmap. The base file specification should be in the format of C:\Temp\MyBiome.png or .tif.
Save 16-bit	Whether to save the weightmap files as 16-bit grayscale versus the default 8-bit format.

Notes

This device is multi-threaded.
This device requires 8 additional datamap memory allocations.

Biome: Region Painter

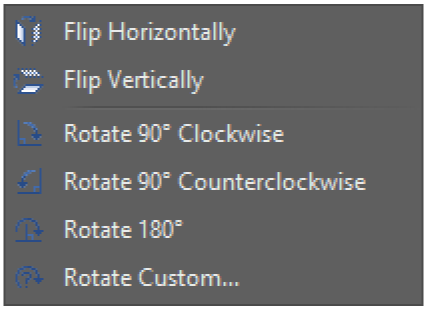
Hand-paint a set of RGBA biome region masks.

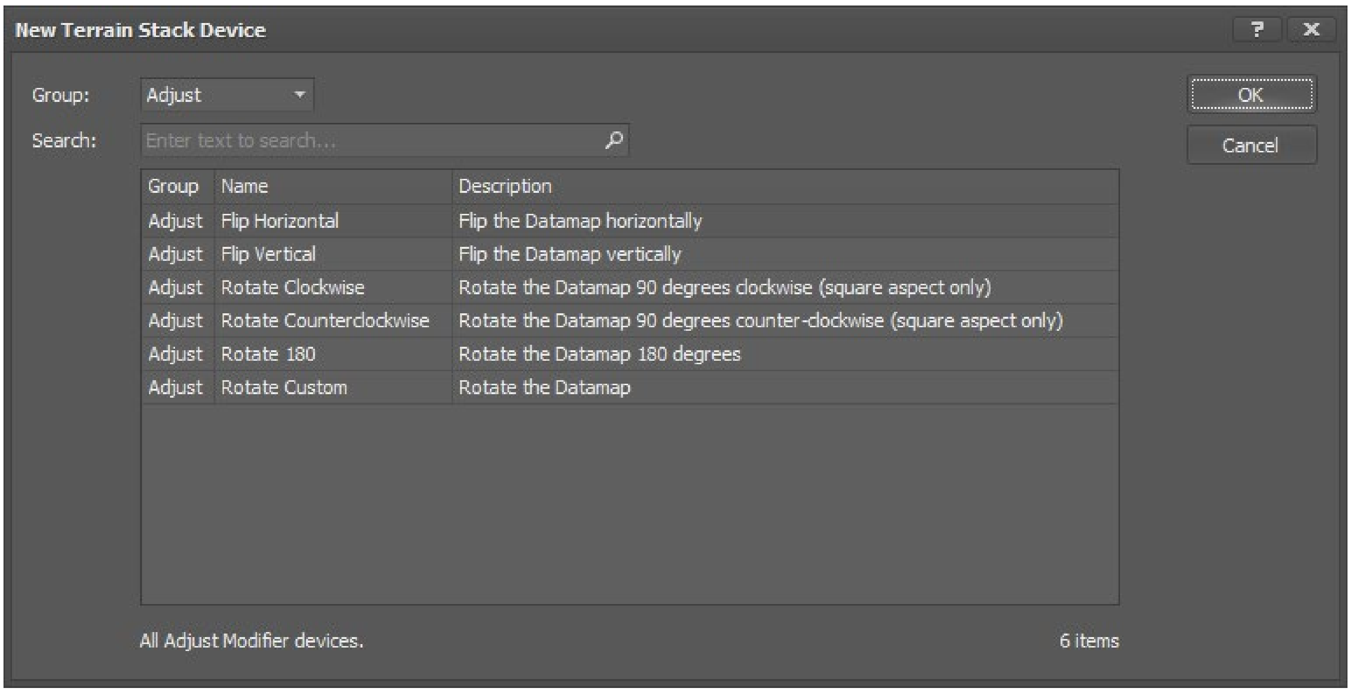


This tool is currently under development.

Adjust Menu: Devices

The Adjust menu contains devices that modify the heightmap or mask datamap.





Adjust: Flip Horizontally

Flips the datamap along the horizontal axis.
This function occurs immediately with no options or settings.

Notes

This device is multi-threaded.
This device requires 1 additional datamap memory allocation.

Adjust: Flip Vertically

Flips the datamap along the vertical axis.
This function occurs immediately with no options or settings.

Notes

This device is single-threaded.
This device requires 1 additional datamap memory allocation.

Adjust: Rotate 90° Clockwise

Rotates the datamap 90 degrees clockwise.
This function occurs immediately with no options or settings.

Notes

This device is single-threaded.
This device requires 1 additional datamap memory allocation.

Adjust: Rotate 90° Counterclockwise

Rotates the datamap 90 degrees counterclockwise.
This function occurs immediately with no options or settings.

Notes

This device is single-threaded.
This device requires 1 additional datamap memory allocation.

Adjust: Rotate 180°

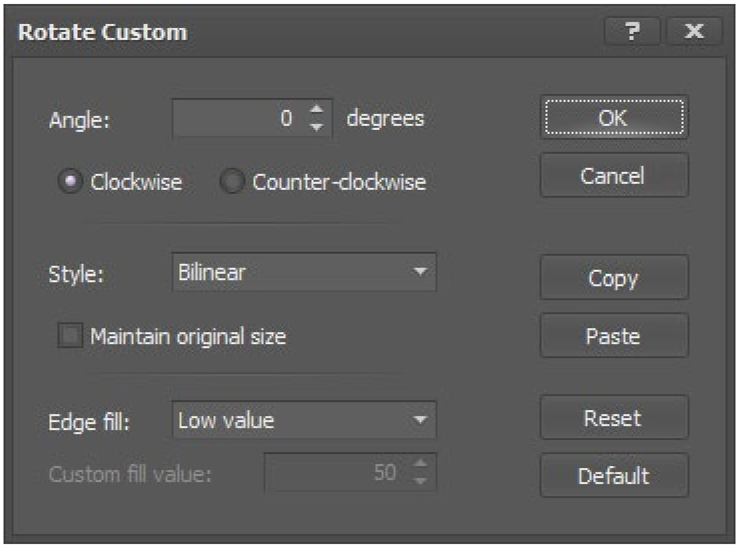
Rotates the datamap 180 degrees.
This function occurs immediately with no options or settings.

Notes

This device is single-threaded.
This device requires 1 additional datamap memory allocation.

Adjust: Rotate Custom

Rotates the datamap by a custom number of degrees, with additional options.
The rotation function features a high-precision accuracy rotation algorithm.



Angle:	Specify the rotation angle in degrees. The valid range is -360.00 to 360.00.
Clockwise:	The angle degrees are specified in the clockwise direction.
Counter-clockwise:	The angle degrees are specified in the counter-clockwise direction.
Style:	The rotation algorithm style. This affects the rotation quality. - Nearest Neighbor = fast nearest-neighbor. - Bilinear = high-quality bilinear.
Maintain original size:	Crop the rotated data to maintain the same dimensions as the original.
Edge fill:	The method used to fill the edges around the rotation. - Minimum = the heightmap minimum altitude. - Center = the heightmap center altitude. - Maximum = the heightmap maximum altitude. - Low value = the current heightmap low altitude. - Middle value = the current heightmap middle altitude. - High value = the current heightmap high altitude. - Custom = the altitude value specified in the Custom fill value control. - Duplicate = duplicate the value around the edge. - Fold = fold the heightmap tiled around the edge. - Mirror = mirror the heightmap tiled around the edge. - Wrap = wrap the heightmap tiled around the edge.
Custom fill value:	The custom edge fill altitude value to fill the edges around the rotated data.

Notes

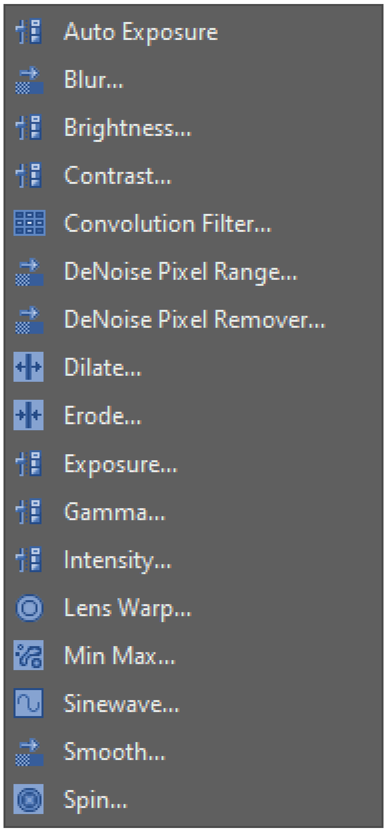
This device is single-threaded.
This device requires 1 additional datamap memory allocation.

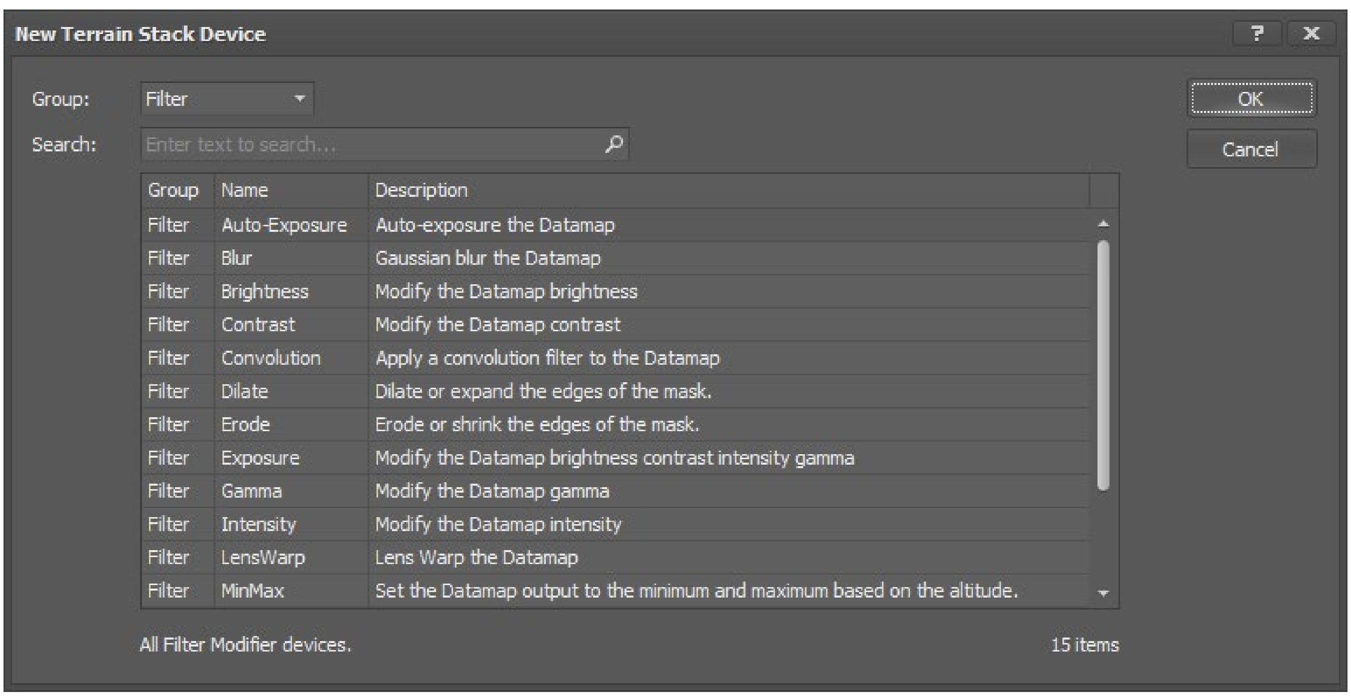
This device does not fully and precisely preserve the original altitude data in its entirety.

Rotation by 0 degrees and 360 degrees is no rotation, and simply returns with no change.
Rotation by 90, 180 and 270 degrees should be accomplished using the Rotate 90 and 180 functions instead.
The Rotate Custom dialog “short-circuits” the 90, 180, 270 operation and calls the appropriate rotation function.

Filter Menu: Devices

The Filter menu contains devices that modify the heightmap or mask datamap.





Filter: Auto Exposure

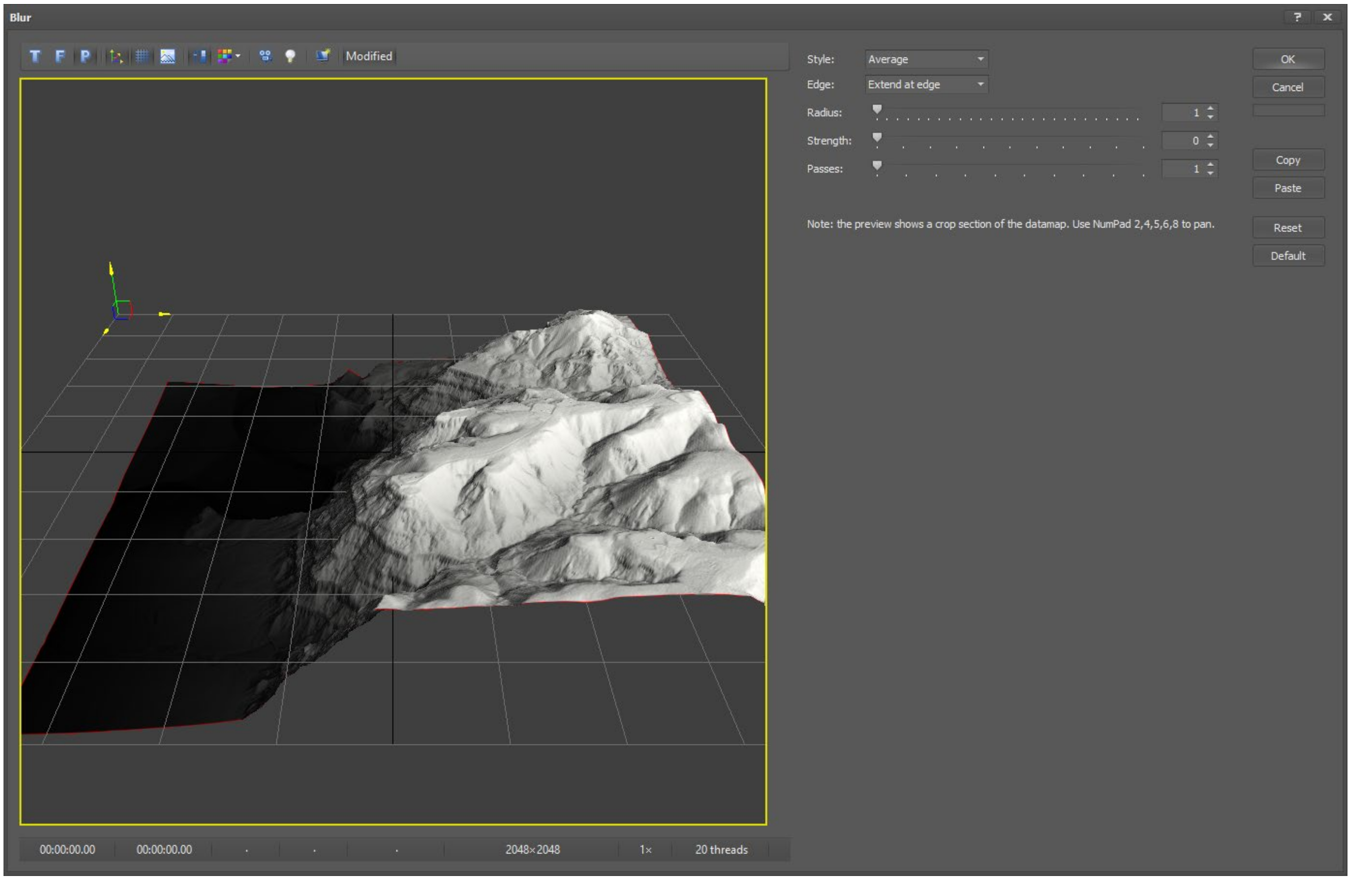
Normalizes the exposure gamma of the datamap.
This device occurs immediately with no options or settings.

Notes

This device is single-threaded.
This device requires 0 additional datamap memory allocations.
This device requires 262144 bytes (256kb) memory allocation.

Filter: Blur

Smooths the datamap using a gaussian blur kernel.



Style: The blur style.
- Average
- Gaussian
- Radial

Edge: The method for managing the gaussian kernel values along the datamap edges.
- Extend at edge
- Wrap at edge

Radius: The gaussian kernel radius in pixels.

Strength: The gaussian blur strength.

Passes: The number of times to execute the blur.

Notes

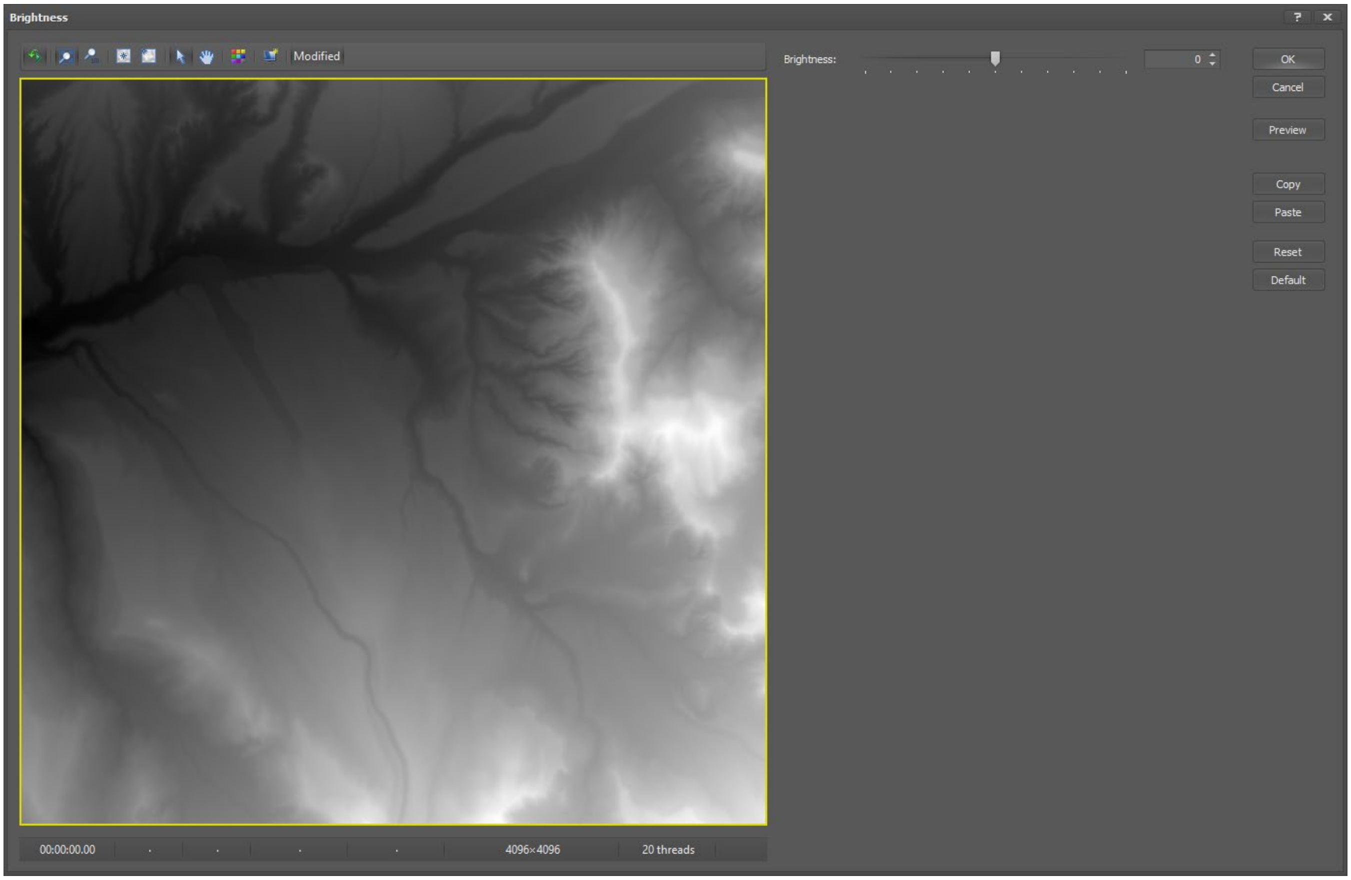
This device does not preserve the original altitude data.

This device is multi-threaded.
This device requires 1 additional datamap memory allocation.

The Blur Device uses a 2-Pass 1D Kernel, 1-Pass horizontal and 1-Pass vertical.
This is for maximum performance. There may be slight visual anomalies on perfectly clean geometry along edges that are perfectly horizontal or vertical. This is usually not noticeable on heightmaps.
For a 1-Pass 2D Kernel blur method use the Smooth Device.

Filter: Brightness

Adjusts the exposure brightness of the datamap.



Brightness: The brightness value.

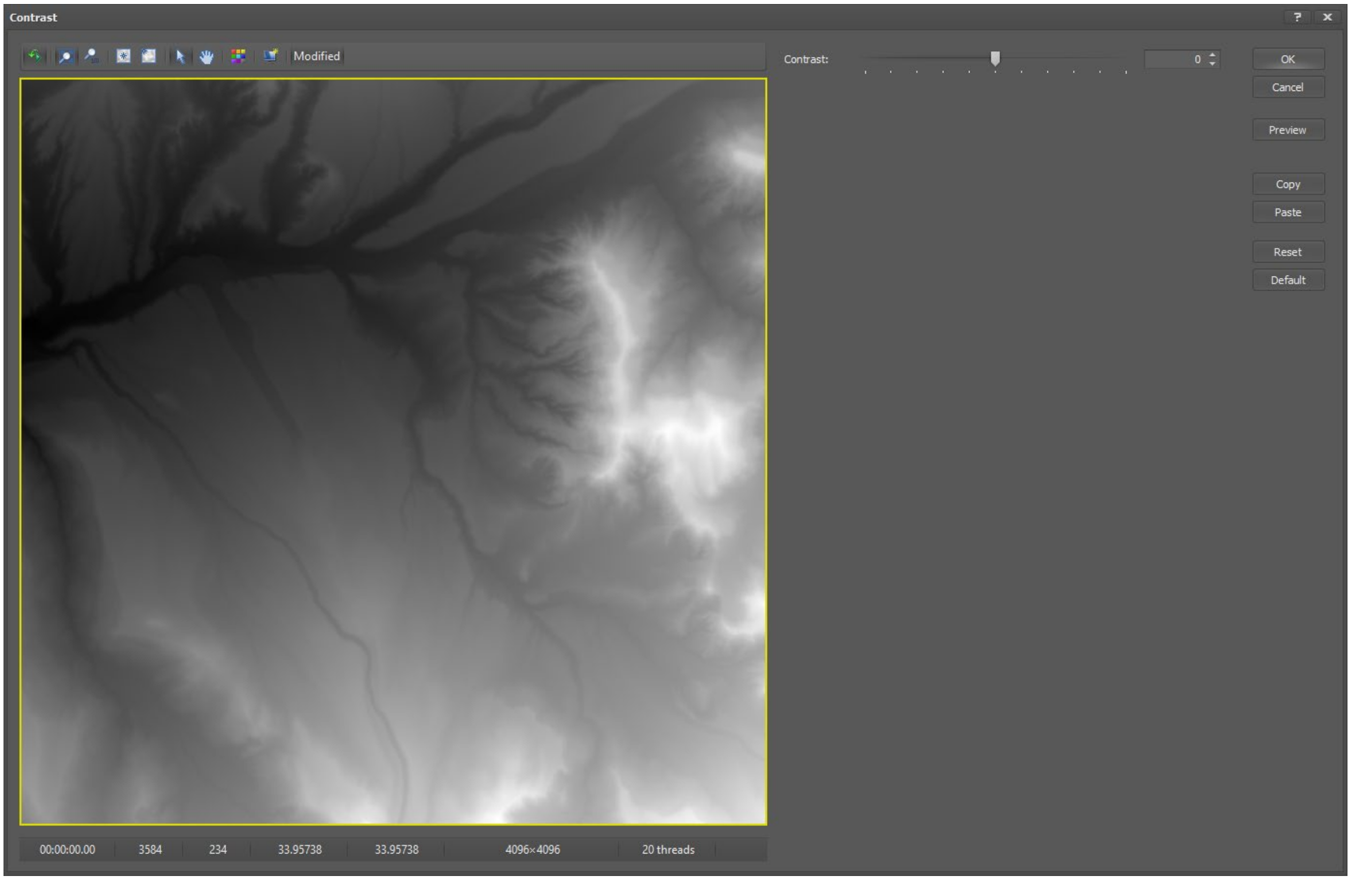
Notes

This device does not preserve the original altitude data.

This device is multi-threaded.
This device requires 0 additional datamap memory allocations.

Filter: Contrast

Adjusts the exposure contrast of the datamap.



Contrast: The contrast value.

Notes

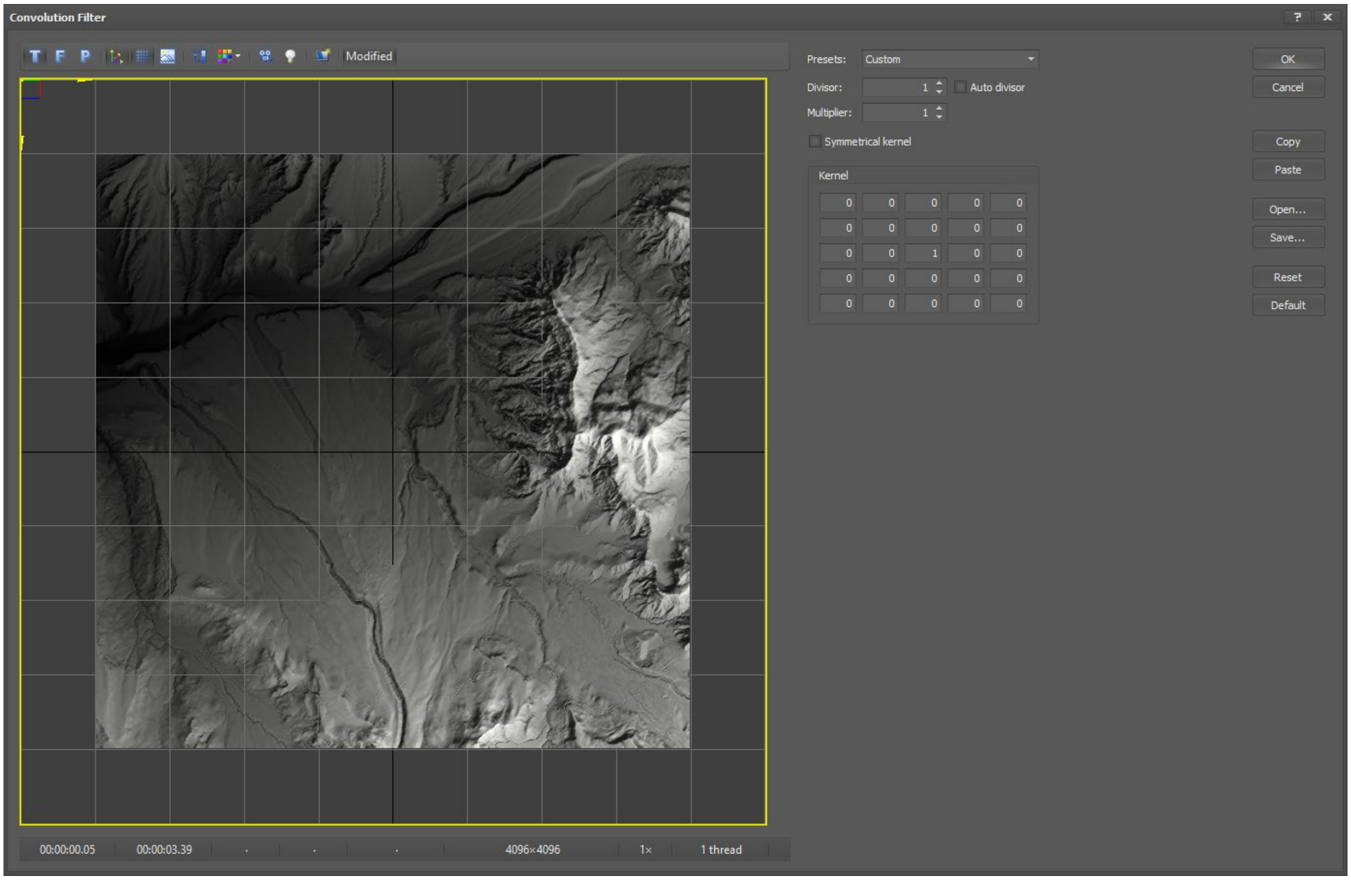
This device does not preserve the original altitude data.

This device is multi-threaded.
This device requires 0 additional datamap memory allocations.

Filter: Convolution

Performs a user-defined fixed-window convolution filter algorithm over the datamap data.

Convolution filters can provide a wide variety of adjustments to datamap data including smoothing, sharpening, edge enhancing, smear offsetting, 3D embossing, jittering, and a wide variety of other data modifications.



Presets:	Filter using these common preset settings.
Divisor:	Specify the kernel divisor, which is typically the sum of all of the Kernel values.
Auto divisor:	Automatically calculate the proper divisor based on the Kernel values.
Multiplier:	A multiplier applied to the Kernel as an offset, either darkening or brightening the result.
Symmetrical:	The Kernel value entries are set to the same value symmetrically around the center pixel.
Kernel boxes	The weight multiplier for the center and outlying pixels.

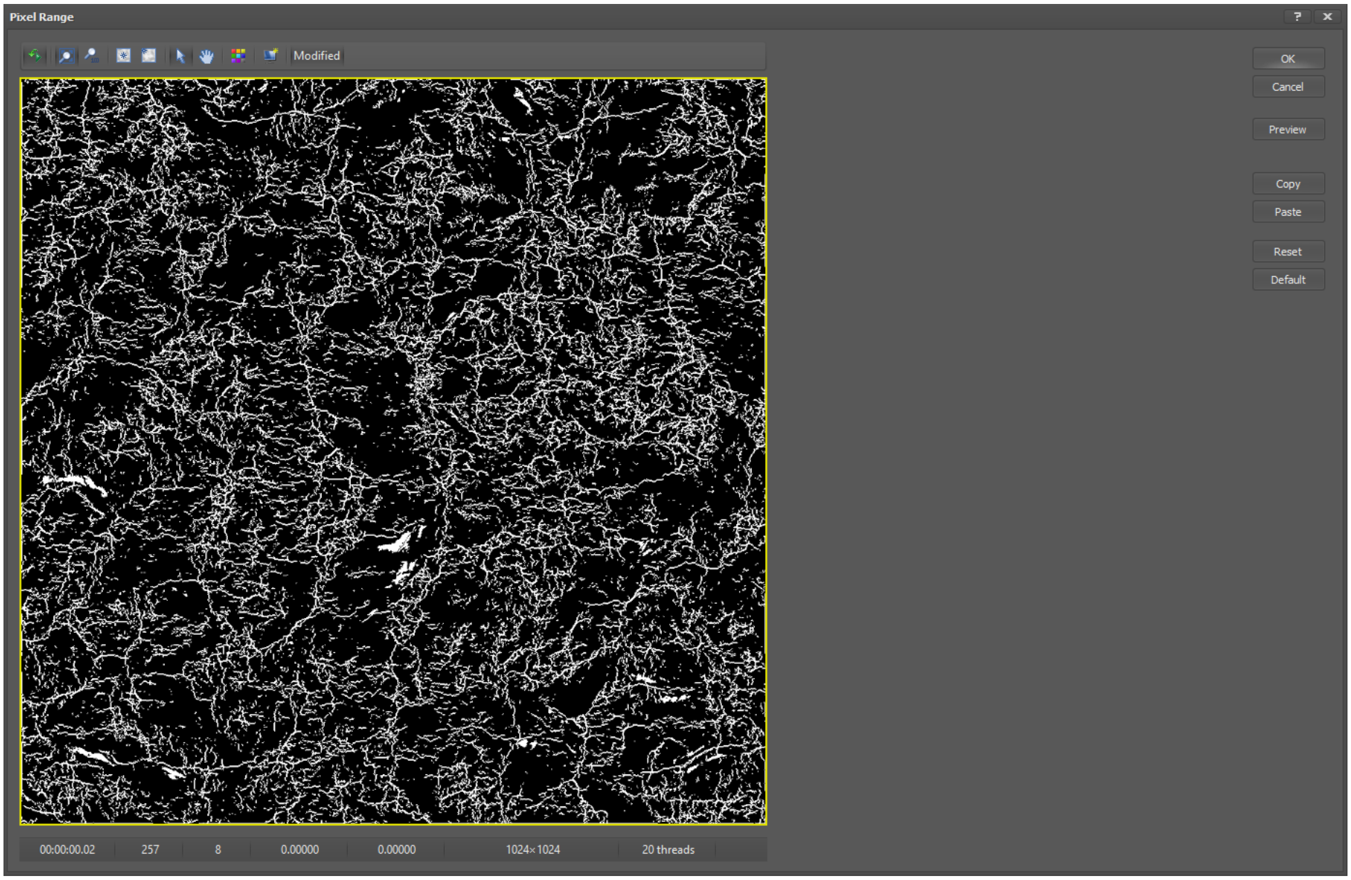
Notes

This device does not preserve the original altitude data.

This device is single-threaded.
This device requires 1 additional datamap memory allocation.

Filter: DeNoise Pixel Range

Remove salt and pepper noise in weightmaps and masks.
Click on the Preview button to preview the device.



This device has no settings or options.

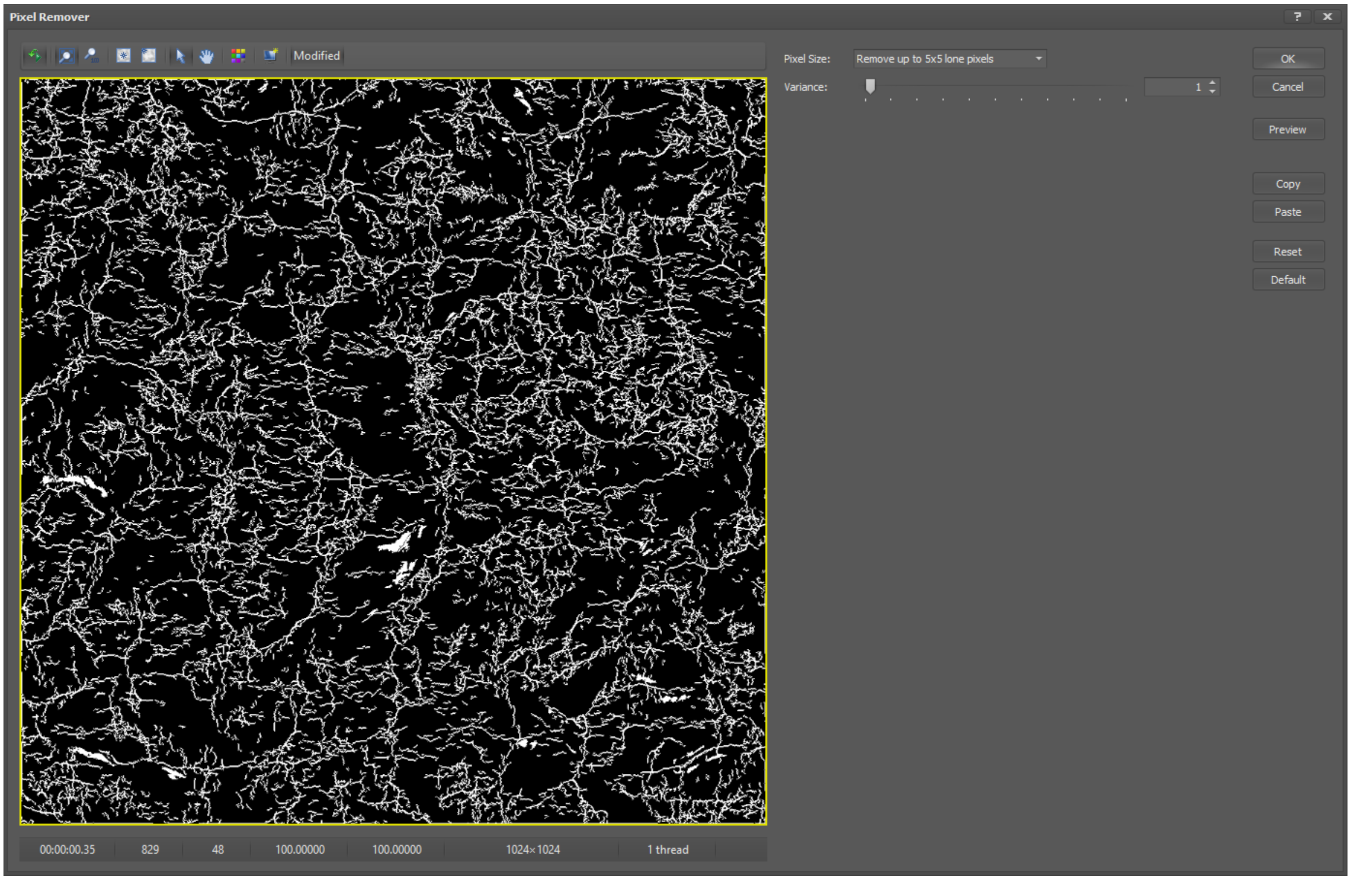
Notes

This device does not preserve the original altitude data.

This device is multi-threaded.
This device requires 0 additional datamap memory allocations.

Filter: DeNoise Pixel Remover

Remove islands of isolated pixels in weightmaps and masks.
Click on the Preview button to preview the device.



Pixel size	Choose to remove islands of 1 pixel, up to 3 pixels, or up to 5 pixels.
Variance:	Specify how much variance there is in the pixel island.

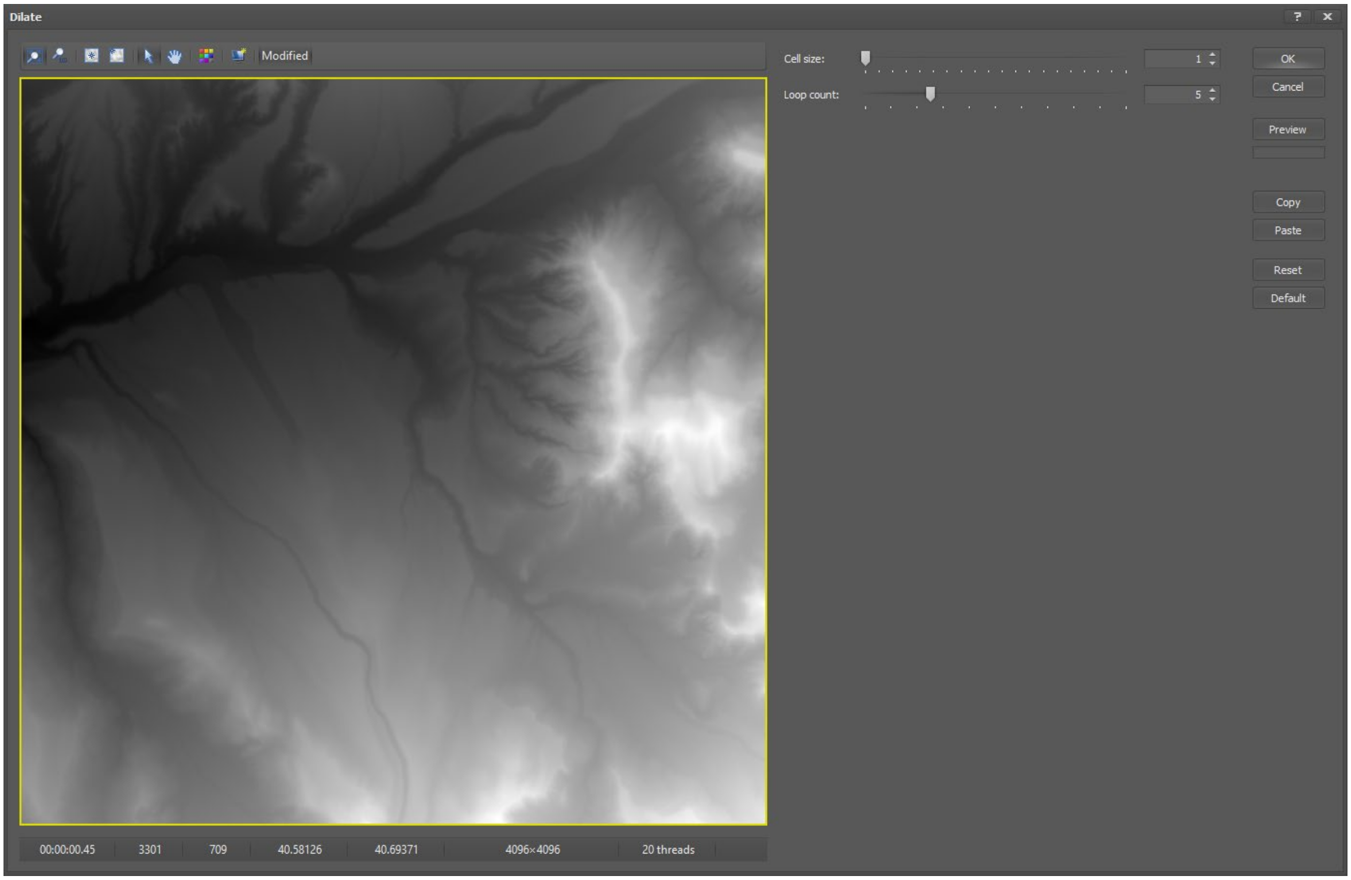
Notes

This device does not preserve the original altitude data.

This device is single-threaded.
This device requires 0 additional datamap memory allocations.

Filter: Dilate

Expand the border edges of the mask.
Click on the Preview button to preview the device.



Cell size: The size of the filter cell, larger cells dilate more.

Loop count: The number of times to execute the filter.

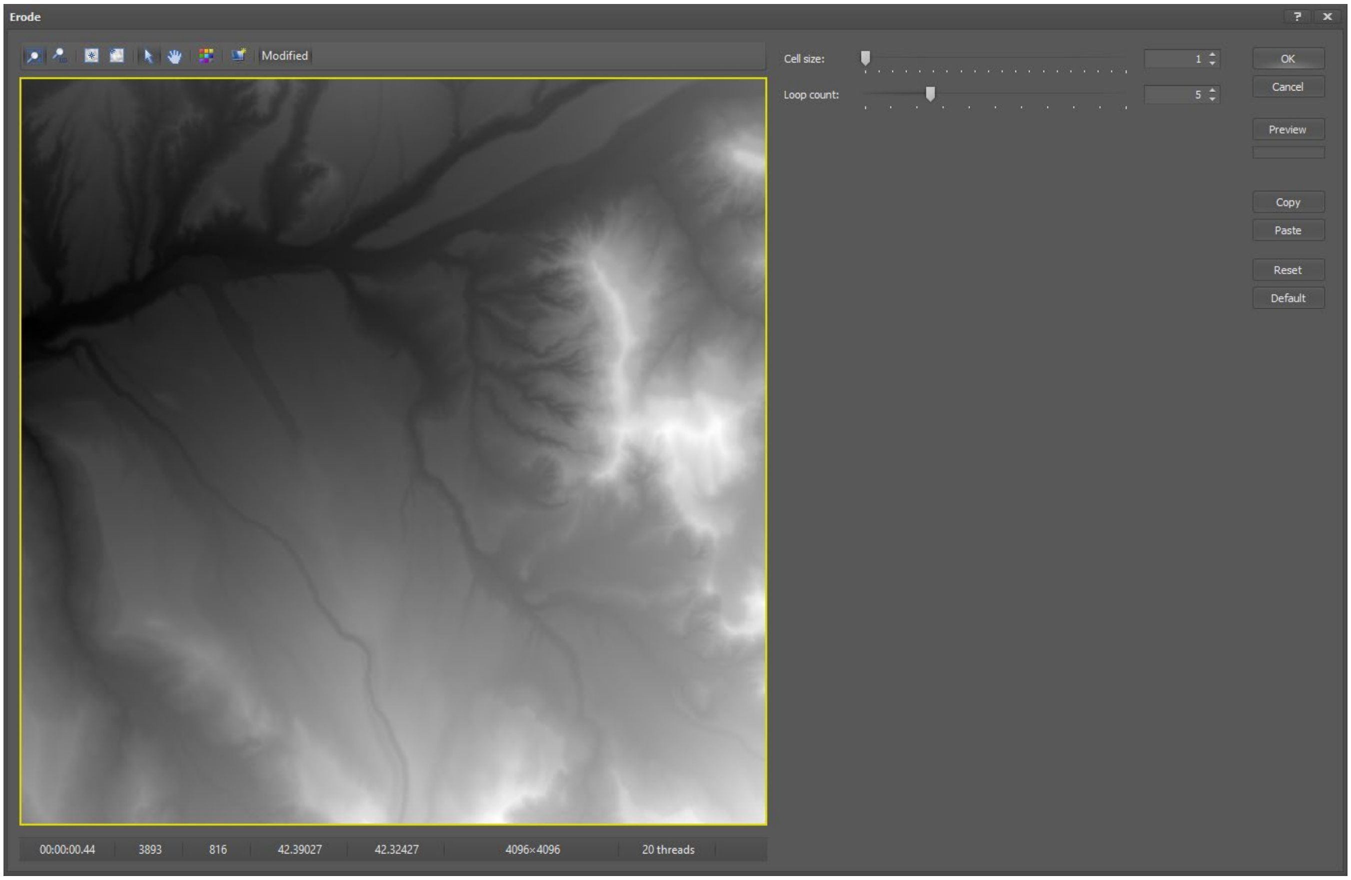
Notes

This device does not preserve the original altitude data.

This device is multi-threaded.
This device requires 1 additional datamap memory allocations.

Filter: Erode

Shrink the border edges of the mask.
Click on the Preview button to preview the device.



Cell size:	The size of the filter cell, larger cells erode more.
Loop count:	The number of times to execute the filter.

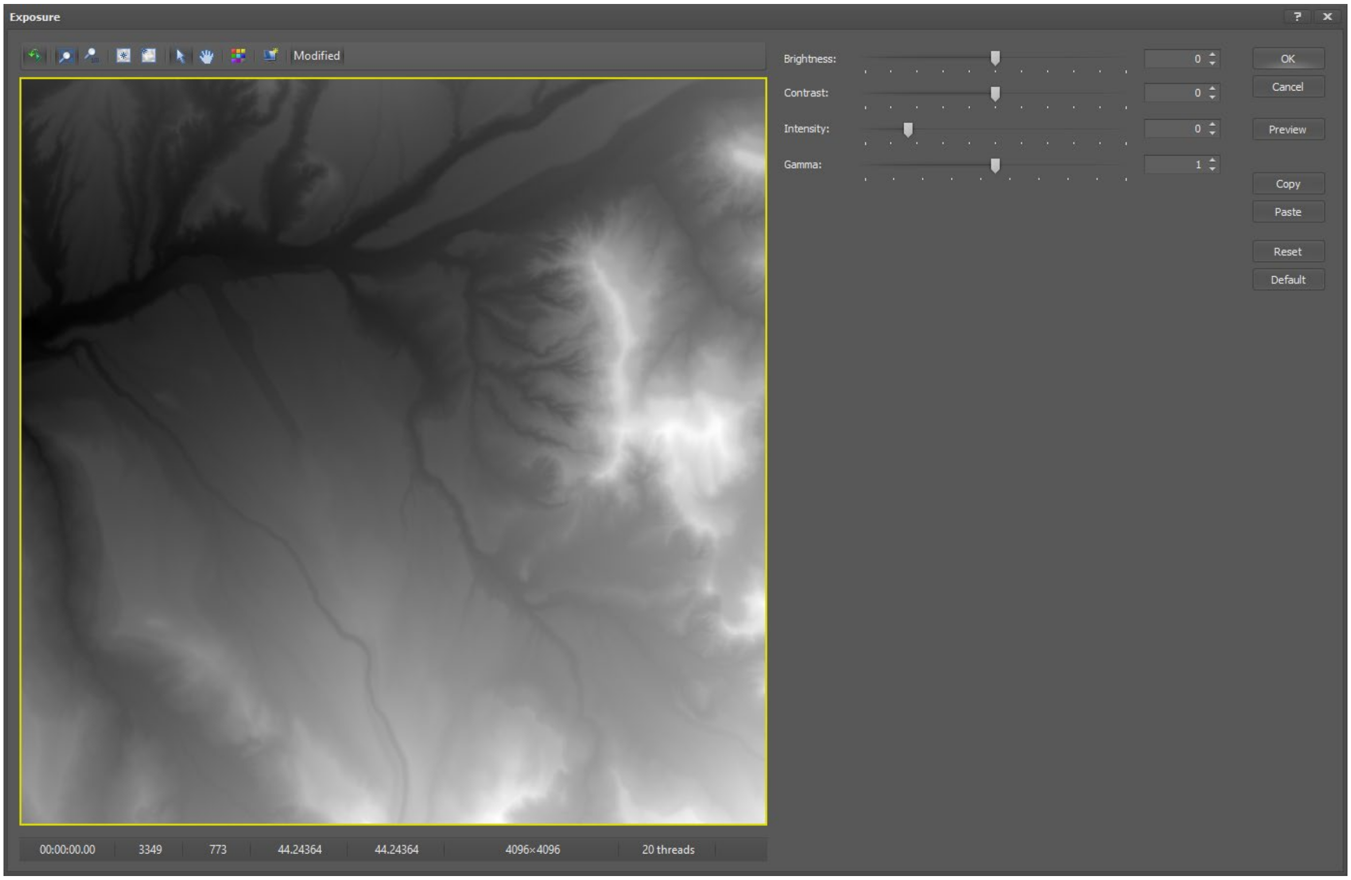
Notes

This device does not preserve the original altitude data.

This device is multi-threaded.
This device requires 1 additional datamap memory allocations.

Filter: Exposure

Changes the Brightness, Contrast, Intensity and Gamma of a datamap.
Click on the Preview button to preview the device.



Brightness:	Adjust the image brightness.	0 is no change.	The range is -100 to +100.
Contrast:	Adjust the image contrast.	0 is no change.	The range is -100 to +100.
Intensity:	Adjust the image intensity.	0 is no change.	The range is -100 to +100.
Gamma:	Adjust the image gamma.	1.00 is no change.	The range is 0.1 to 10.0.

Notes

This device does not preserve the original altitude data.

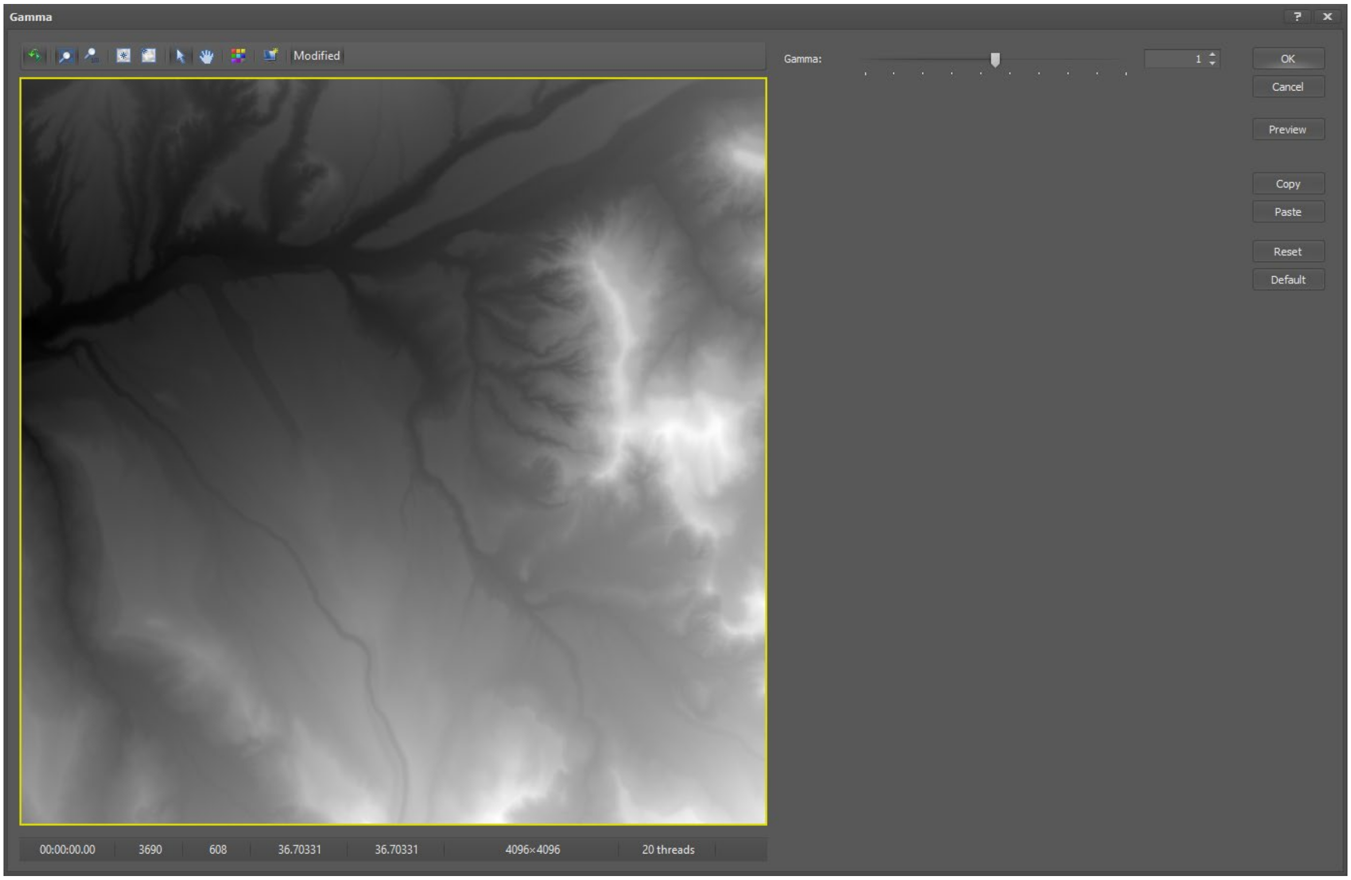
Exposure adjustments are normally used on masks or weightmaps.

Intensity is a curve-weighted brightness that typically complements the Contrast adjustment.

This device is multi-threaded.
The Gamma function requires 400kb additional memory allocation.

Filter: Gamma

Adjust the exposure gamma of the datamap.
Click on the Preview button to preview the device.



Gamma: The gamma value.

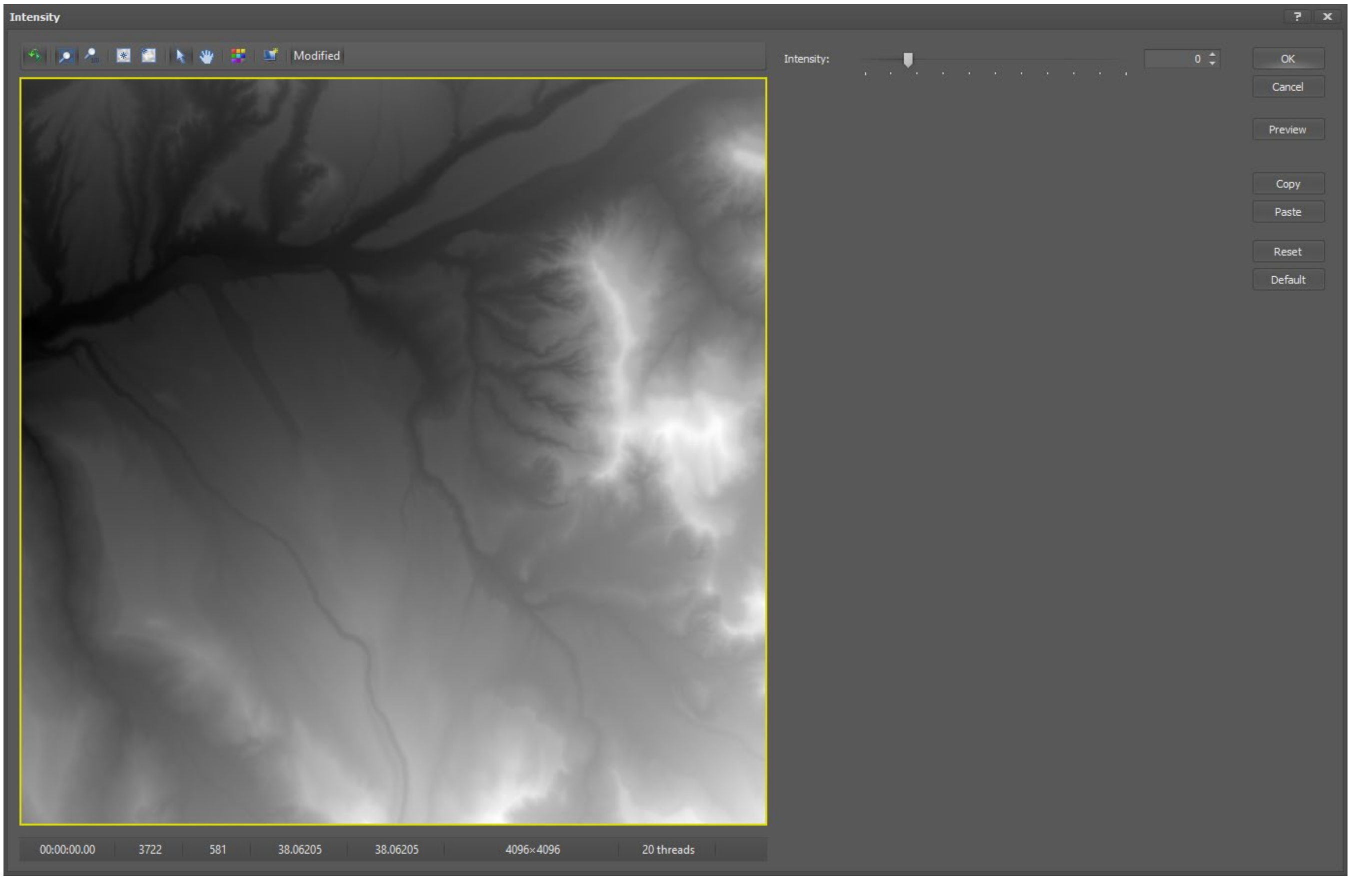
Notes

This device does not preserve the original altitude data.

This device is multi-threaded.
This device requires 400kb additional memory allocation.

Filter: Intensity

Adjust the exposure intensity of the datamap.
Click on the Preview button to preview the device.



Intensity: The intensity value.

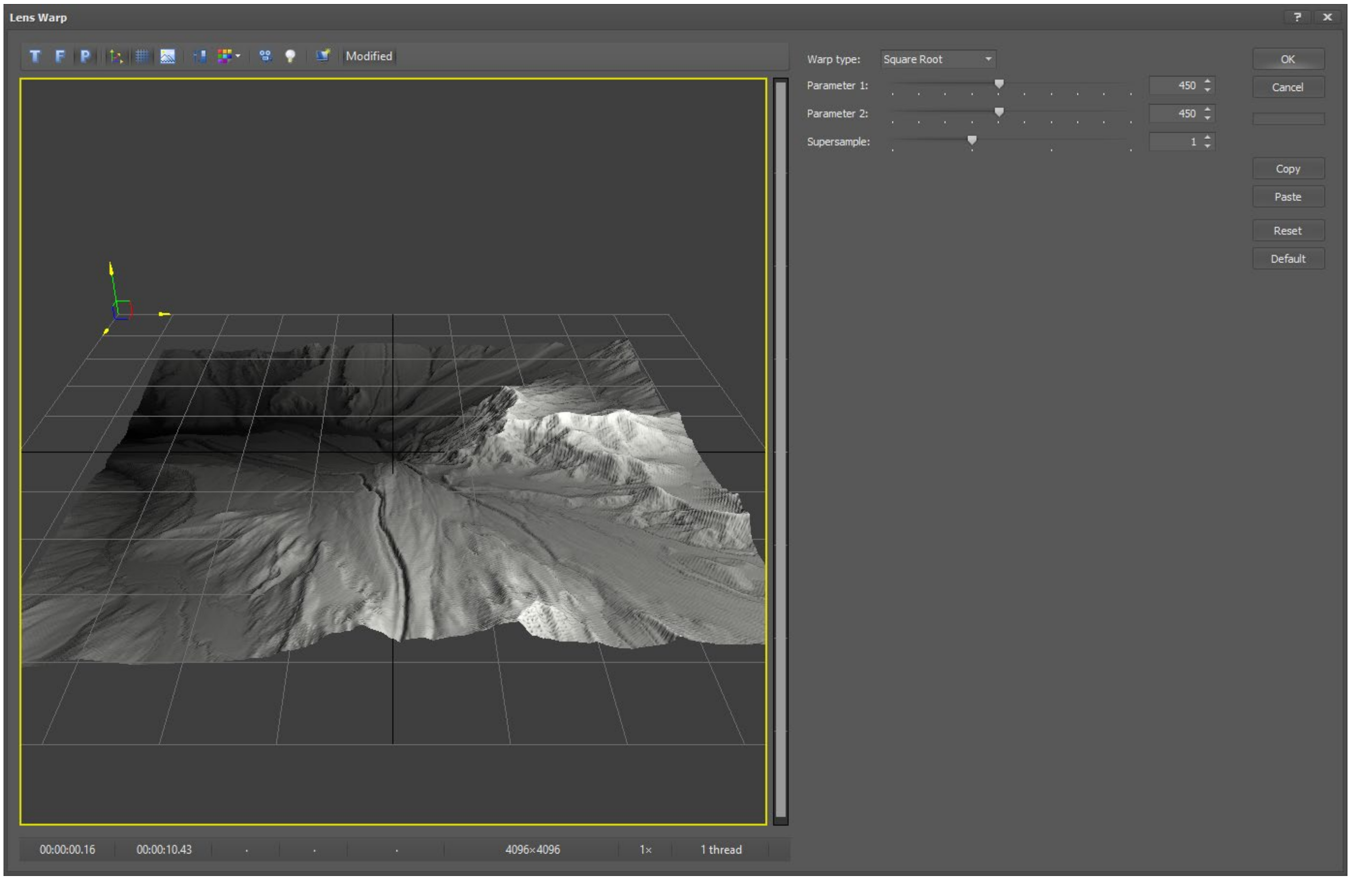
Notes

This device does not preserve the original altitude data.

This device is multi-threaded.
This device requires 0 additional datamap memory allocations.

Filter: Lens Warp

Warp the datamap using pinch and punch displacement.



Warp style:	The warp style. - Square Root - Sine Cartesian - Square Cartesian - Cartesian - Logarithmic
Parameter 1:	Warp parameter 1.
Parameter 2:	Warp parameter 2.
Super Sample:	Bilinear smoothing amount.

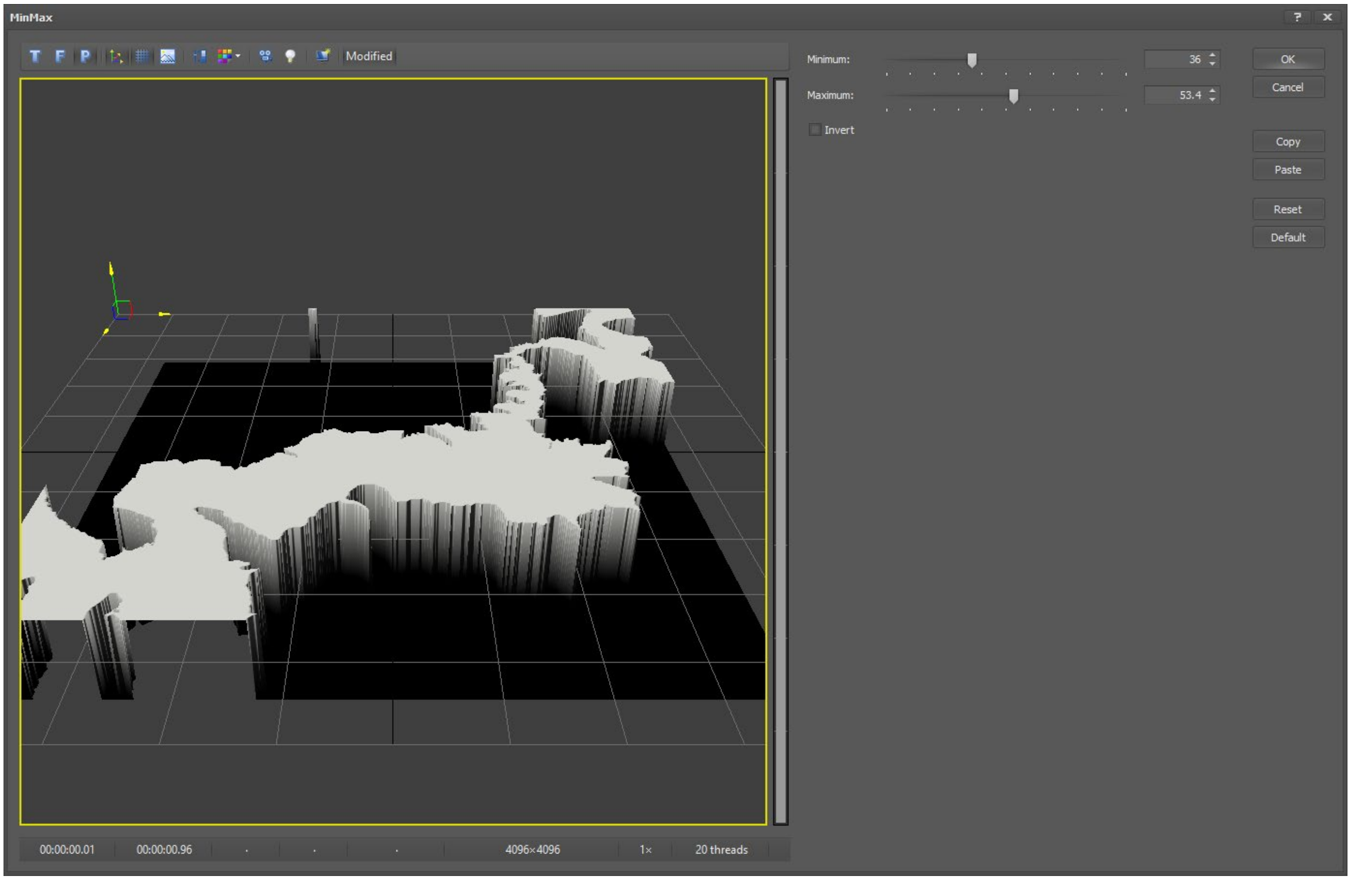
Notes

This device does not preserve the original altitude data.

This device is single-threaded.
This device requires 1 additional datamap memory allocation.

Filter: Min Max

Adjusts the datamap elevations within the minimum and maximum values to full scale.



Minimum: Specify the minimum value that is converted to full scale.
Maximum: Specify the maximum value that is converted to full scale.
Invert: Invert the result.

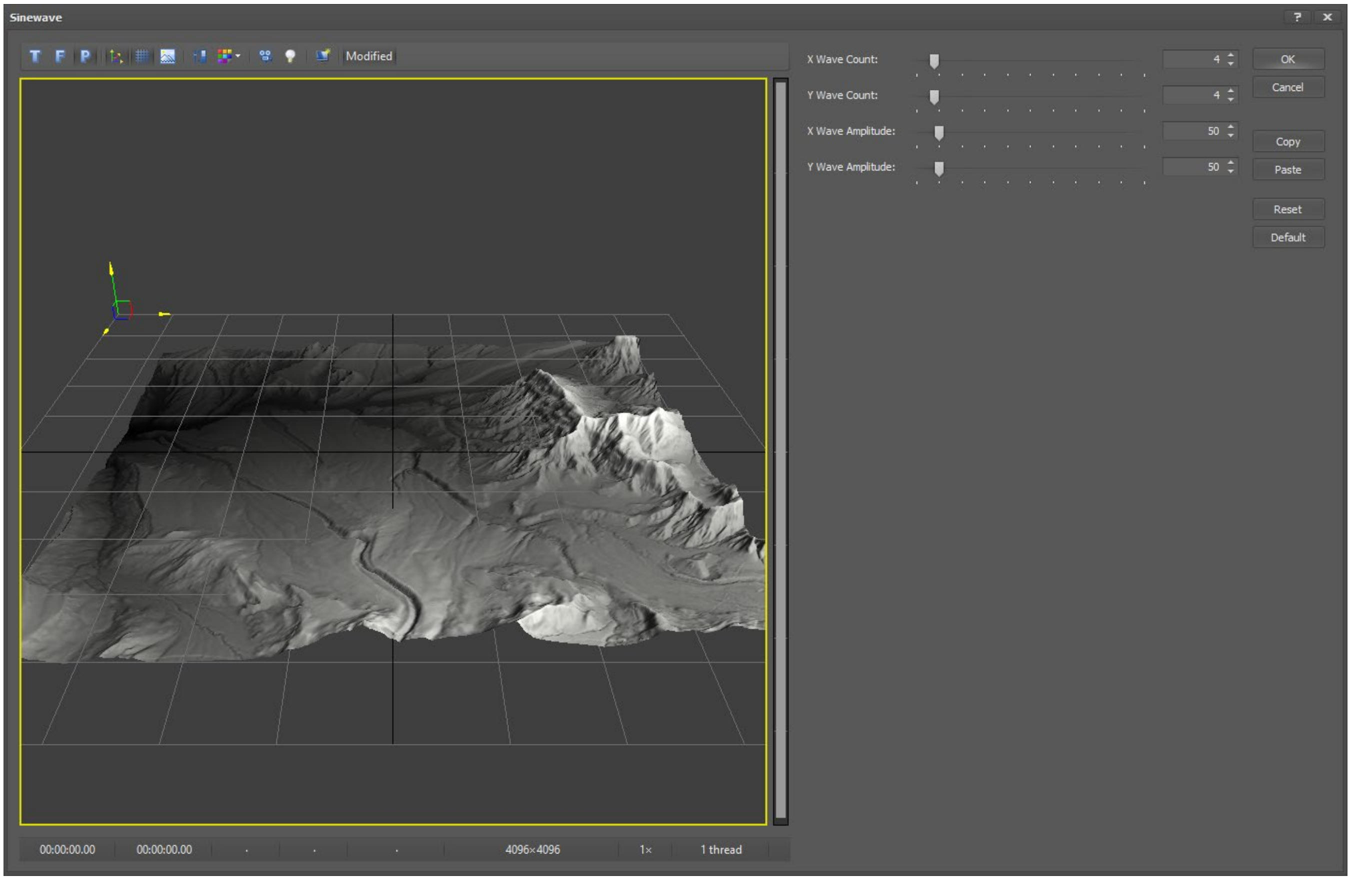
Notes

This device does not preserve the original altitude data.

This device is multi-threaded.
This device requires 0 additional datamap memory allocations.

Filter: Sinewave

Warp the datamap with horizontal and vertical sinewaves.



X wave count:	The number of sinewaves in the X direction (horizontal).
Y wave count:	The number of sinewaves in the Y direction (vertical).
X wave amplitude:	The strength of the X sinewave distortion.
Y wave amplitude:	The strength of the Y sinewave distortion.

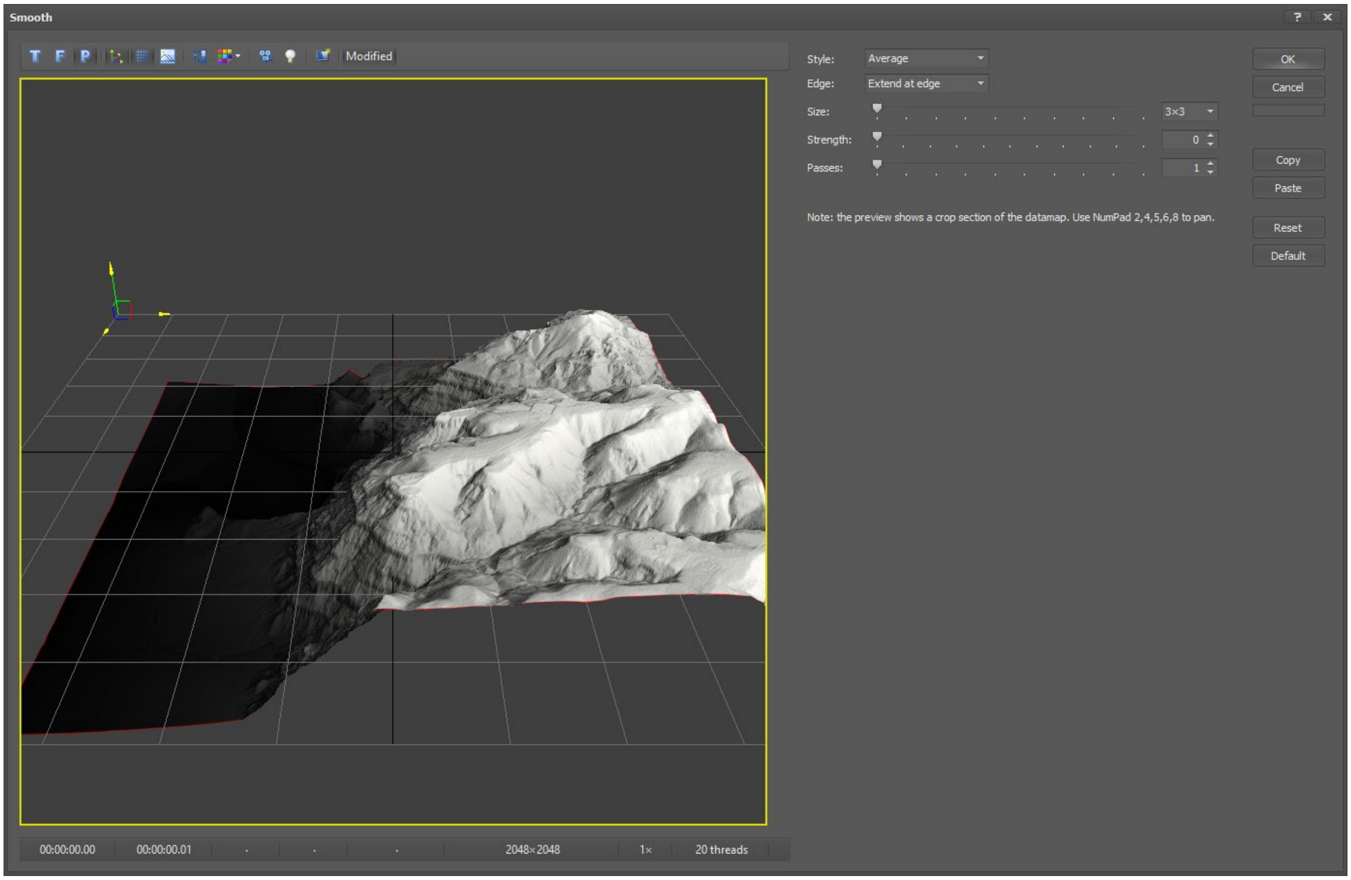
Notes

This device does not preserve the original altitude data.

This device is single-threaded.
This device requires 1 additional datamap memory allocation.

Filter: Smooth

Smoothens the surface of the datamap by adjusting the altitudes to remove steeper inclines and angles.



Style:	The smooth style algorithm.	
	- Average:	Performs a variable-window averaging.
	- Conservative:	Performs a variable-window conservative smooth.
	- Gaussian:	Performs a variable-window gaussian weighted smooth.
	- Median:	Performs a variable-window median value smooth.
	- Middle:	Performs a variable-window middle value smooth.
	- Radial:	Performs a variable-window radial smooth.
Size:	The size of the smoothing window.	
Strength:	The applied smoothing strength.	
Passes:	The number of smoothing passes.	

Notes

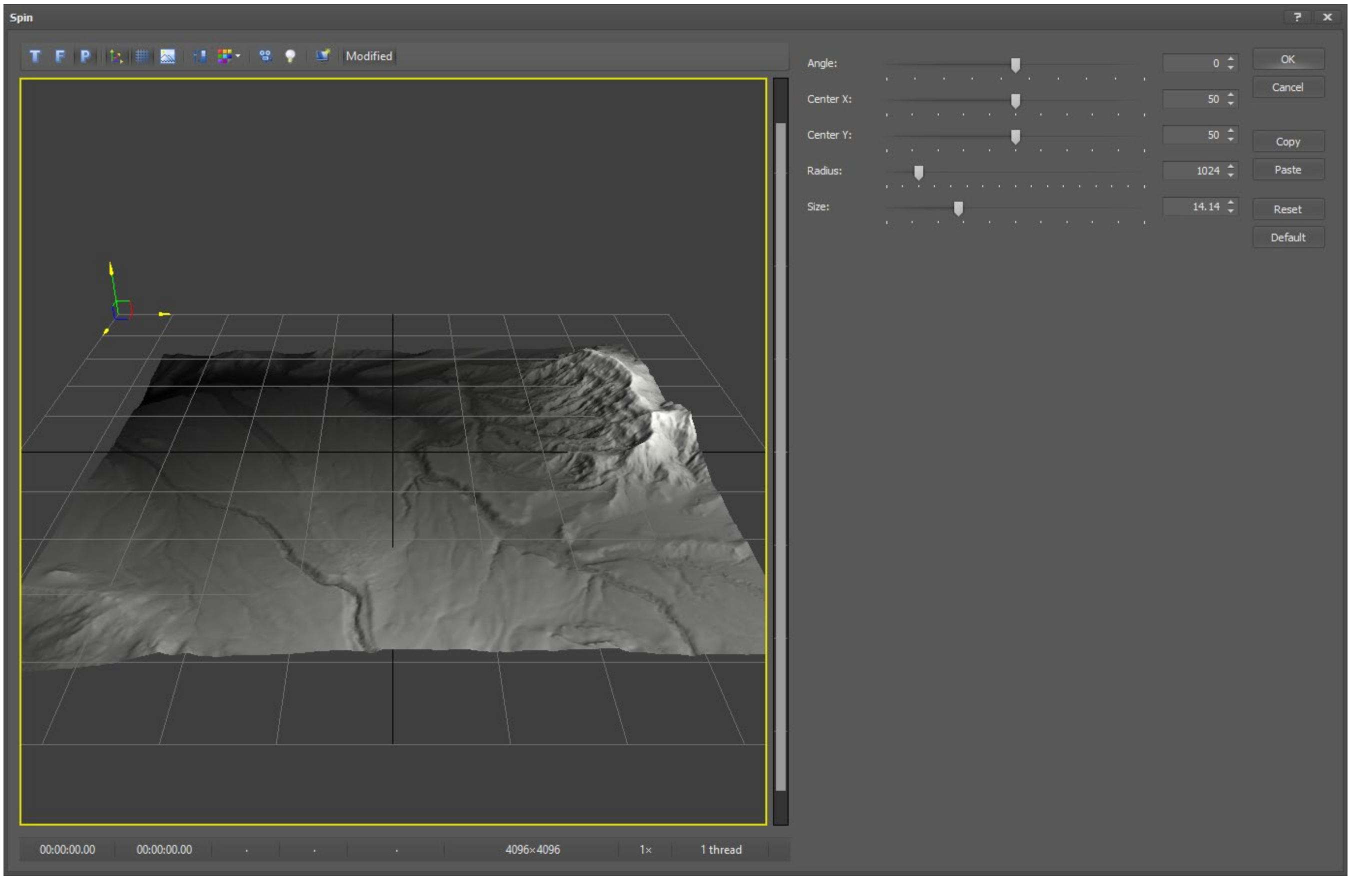
This device does not preserve the original altitude data.

This device is multi-threaded.
This device requires 1 additional datamap memory allocation.

The Smooth Device is using a 1-Pass 2D Kernel full-radius window algorithm for higher quality. This provides a more accurate and pleasing smooth but at a cost of more time. Also see the Filter Blur device for a faster 2-Pass 1D Kernel blur algorithm.

Filter: Spin

Warp the datamap with an angular spin.



Angle:	The angle of spin rotation.
Center X:	The center X coordinate of the spin.
Center Y:	The center Y coordinate of the spin
Radius:	The radius of the spin.
Size:	The size of the spin.

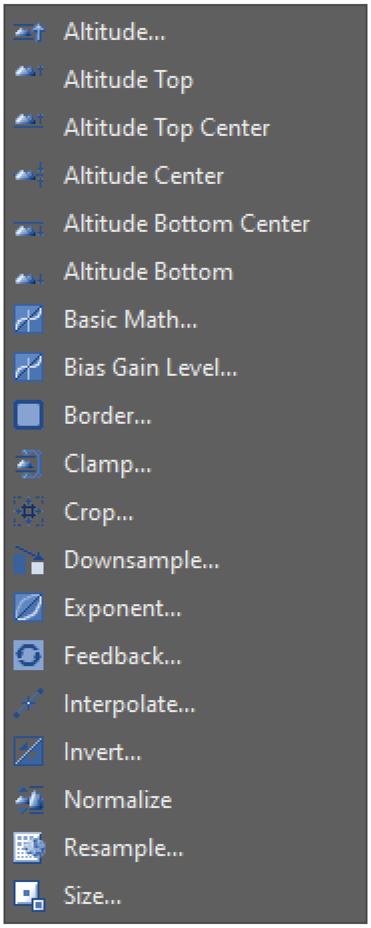
Notes

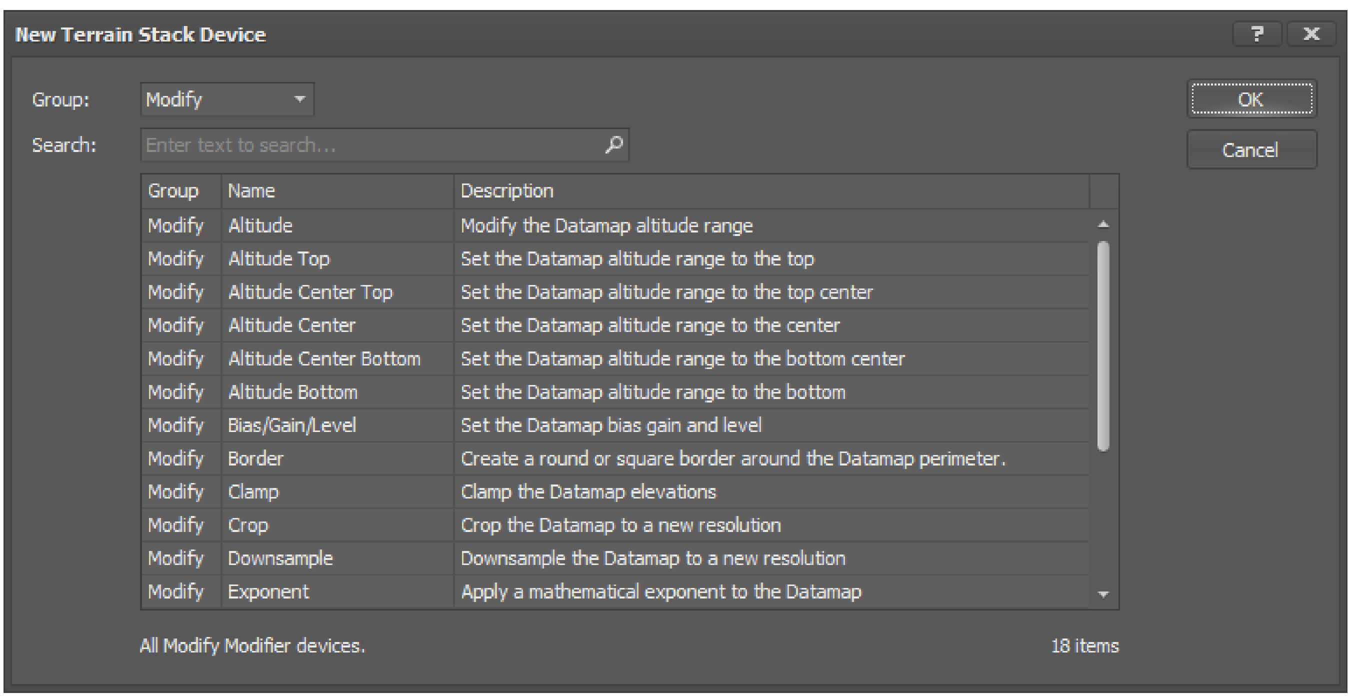
This device does not preserve the original altitude data.

This device is single-threaded.
This device requires 1 additional datamap memory allocation.

Modify Menu: Devices

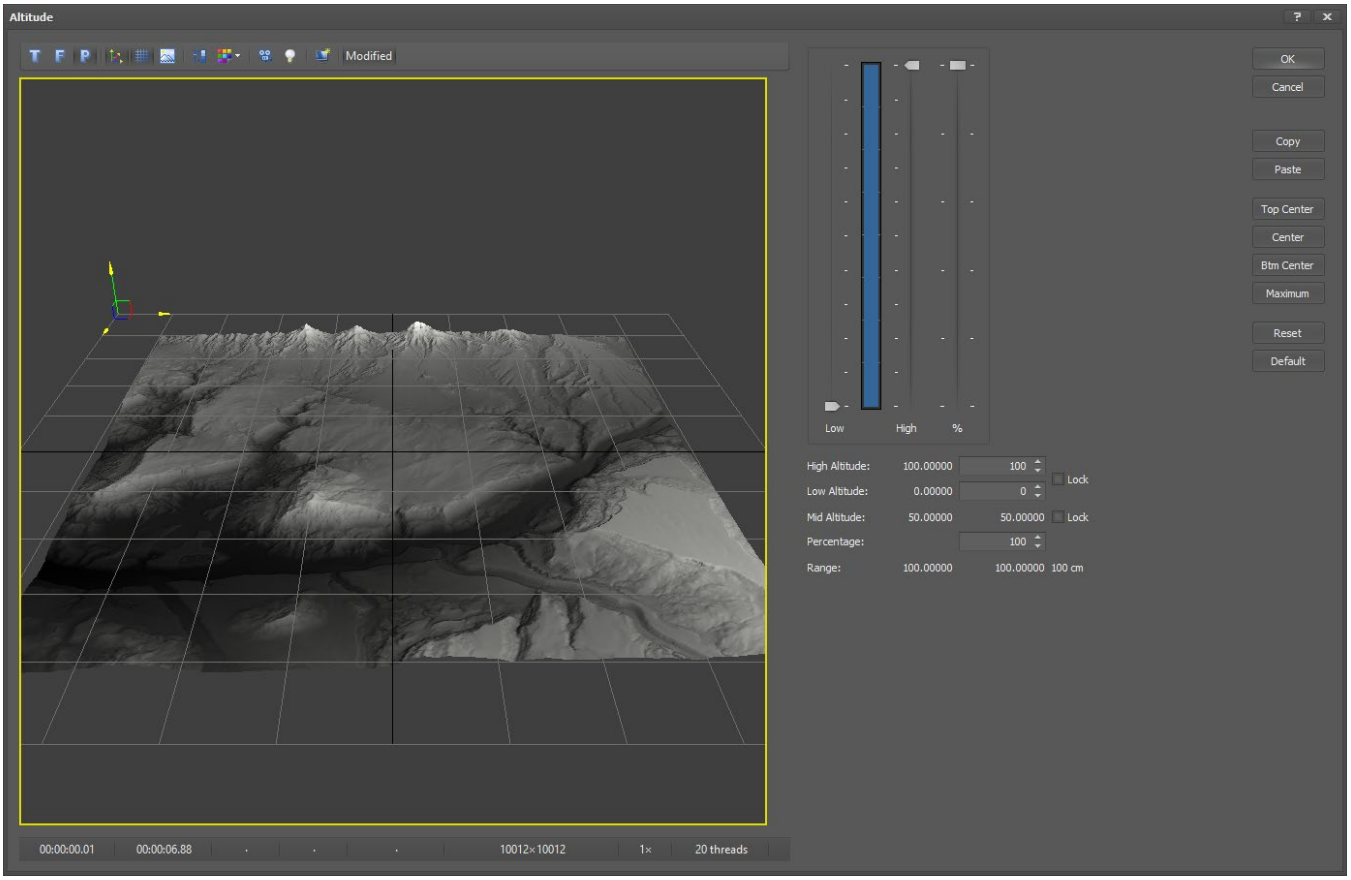
The Modify menu contains devices that modify the heightmap or mask datamap.





Modify: Altitude

Allows for fine adjustments to the datamap range and altitude.



High Altitude: Specify the high altitude value. High must be greater than Mid.
Low Altitude: Specify the low altitude value. Low must be less than Mid.
Mid Altitude : Specify the mid altitude value.
Percentage: Specify the altitude range as a percentage of the original.
Range: Displays the original and current altitude range and the range in real world units.

High/Low Lock: Select this to lock the high and low value range difference.
Mid Lock: Select this to lock the mid value, changes to high or low values are mirrored.

Low slider Changes the low altitude value.
Altitude bar graph Displays the original altitude range in gray and the current altitude range in blue.
High slider Changes the high altitude value.
% percent slider Changes the altitude range as a percentage of the original range.

Top Center Move the entire heightmap to the top-center position.
Center Move the entire heightmap to the center mid value of 50.0.
Btm Center Move the entire heightmap to the bottom-center position.
Maximum Change the heightmap range to the maximum range of low 0.0 through high 100.0.

Notes

Changes to the altitude range does not preserve the original altitude data.
An altitude range move causes no loss in data resolution.
An altitude compression may cause a lossy change in data resolution.

This device is multi-threaded.
This device requires 0 additional datamap memory allocations.

Modify: Altitude Top

Moves the datamap data to the top of its altitude range.

This device occurs immediately with no options or settings.

Notes

Changes to the altitude range does not preserve the original altitude data.
An altitude range move causes no loss in data resolution.
An altitude compression may cause a lossy change in data resolution.

This device is multi-threaded.
This function requires 0 additional datamap memory allocations.

Modify: Altitude Top-Center

Moves the datamap data to the top-center of its altitude range.

This device occurs immediately with no options or settings.

Notes

Changes to the altitude range does not preserve the original altitude data.
An altitude range move causes no loss in data resolution.
An altitude compression may cause a lossy change in data resolution.

This device is multi-threaded.
This function requires 0 additional datamap memory allocations.

Modify: Altitude Center

Moves the ddatamap data to the center of its altitude range.

This device occurs immediately with no options or settings.

Notes

Changes to the altitude range does not preserve the original altitude data.
An altitude range move causes no loss in data resolution.
An altitude compression may cause a lossy change in data resolution.

This device is multi-threaded.
This device requires 0 additional datamap memory allocations.

Modify: Altitude Bottom-Center

Moves the datamap data to the bottom center of its altitude range.

This device occurs immediately with no options or settings.

Notes

Changes to the altitude range does not preserve the original altitude data.
An altitude range move causes no loss in data resolution.
An altitude compression may cause a lossy change in data resolution.

This device is multi-threaded.
This device requires 0 additional datamap memory allocations.

Modify: Altitude Bottom

Moves the datamap data to the bottom of its altitude range.

This device occurs immediately with no options or settings.

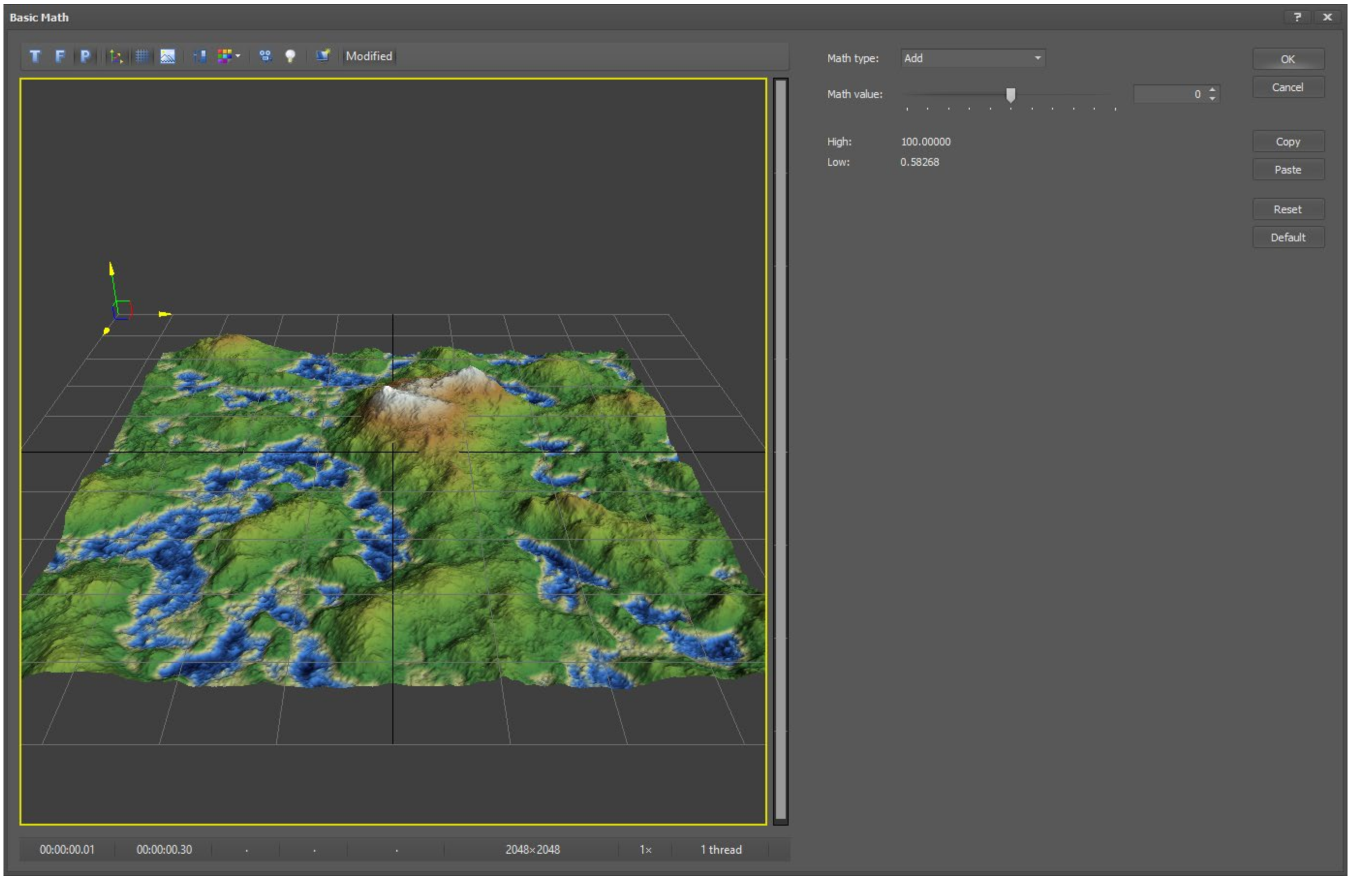
Notes

Changes to the altitude range does not preserve the original altitude data.
An altitude range move causes no loss in data resolution.
An altitude compression may cause a lossy change in data resolution.

This device is multi-threaded.
This device requires 0 additional datamap memory allocations.

Modify: Basic Math

Modifies the datamap data by adding, subtracting, multiplying or dividing a specified constant value.



Math type	Choose from Add, Subtract, Multiply, or Divide.
Math value	The constant value that is added, subtracted, multiplied, or divided.

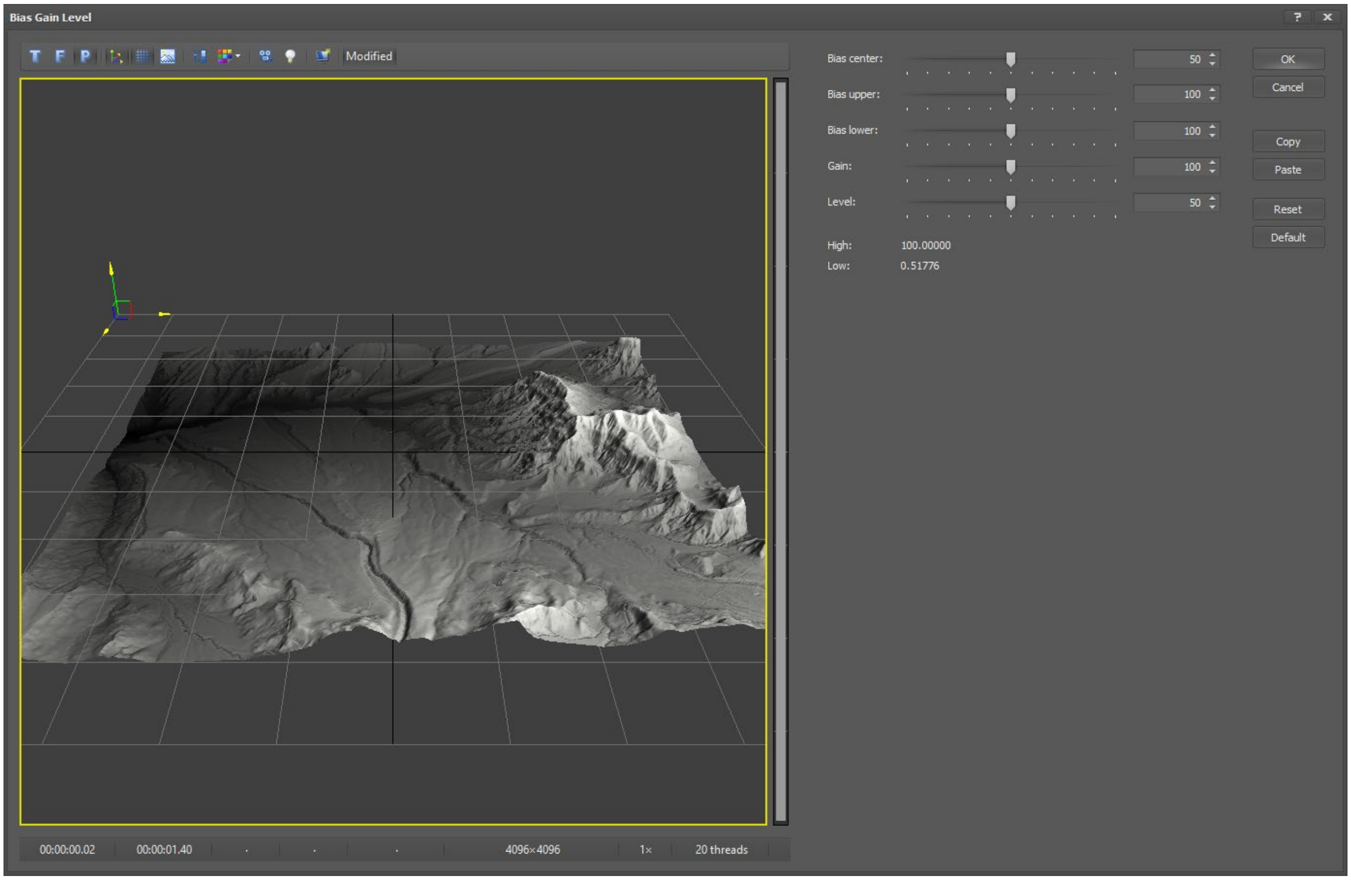
Notes

This device can be used to quickly perform such operations as changing the datamap data values to be 50% the range, or 200% the range, or to subtract 50% to lower the datamap elevation range, etc.

This device is multi-threaded.
This device requires 0 additional datamap memory allocations.

Modify: Bias Gain Level

Modifies the datamap data along a bias curve, and gain and level values.



Bias center:	Specify the center altitude value that the bias curve will modify around.
Bias upper:	Specify the bias multiplier to the altitude values higher than Bias center. This can be used to effectively increase mountain height for example.
Bias lower:	Specify the bias multiplier to the altitude values lower than Bias center. This can be used to effectively increase ocean depth for example.
Gain:	Specify the altitude range gain as a percentage of the original.
Level:	Specify the center altitude level.

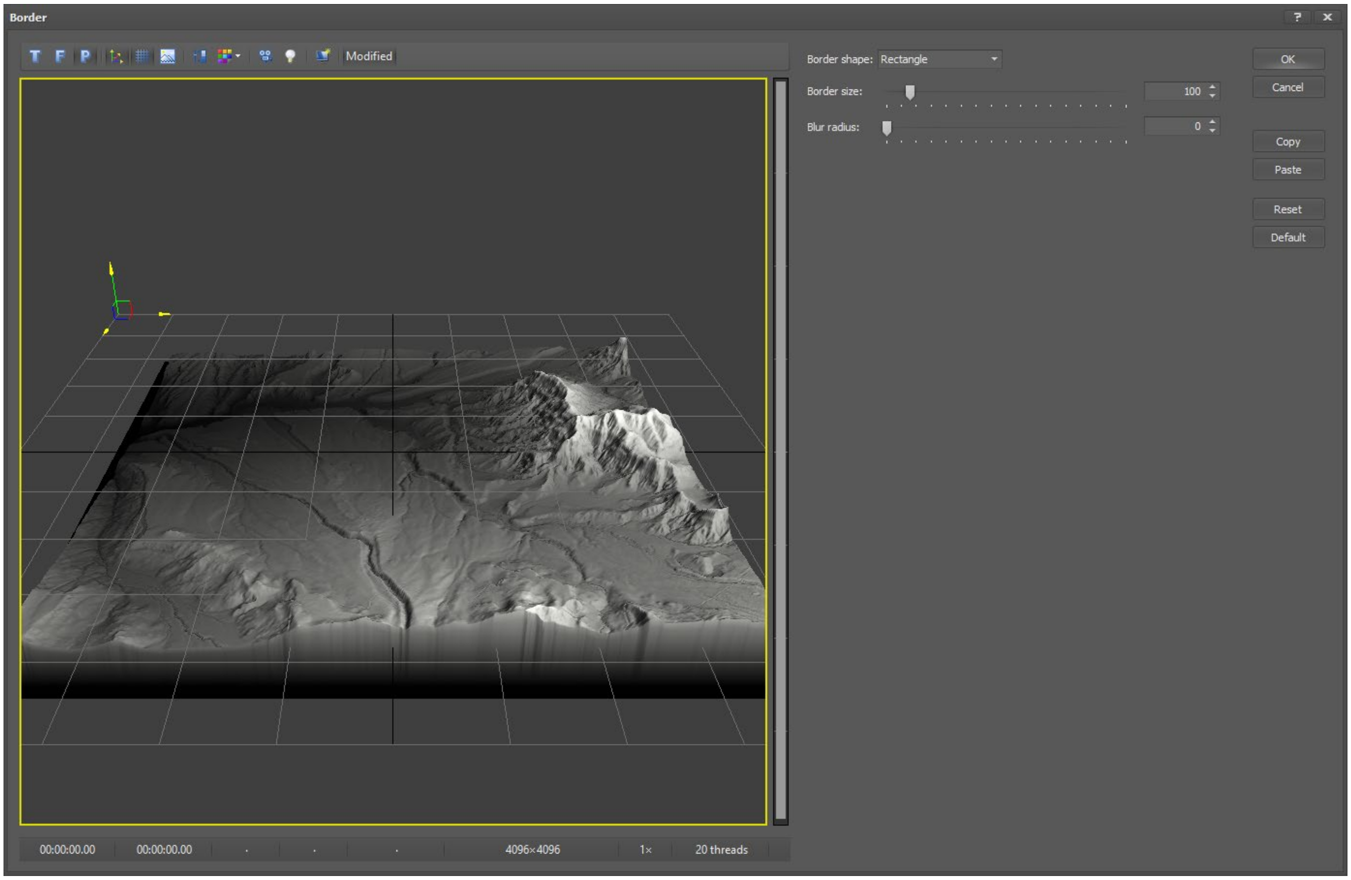
Notes

Changes to the altitude range does not preserve the original altitude data.
An altitude compression may cause a lossy change in data resolution.

This device is multi-threaded.
This device requires 0 additional datamap memory allocations.

Modify: Border

Creates a circular or rectangular border around the datamap.



Border size:	The size of the border in pixels.
Blur radius	The amount to blur the edges of the datamap.

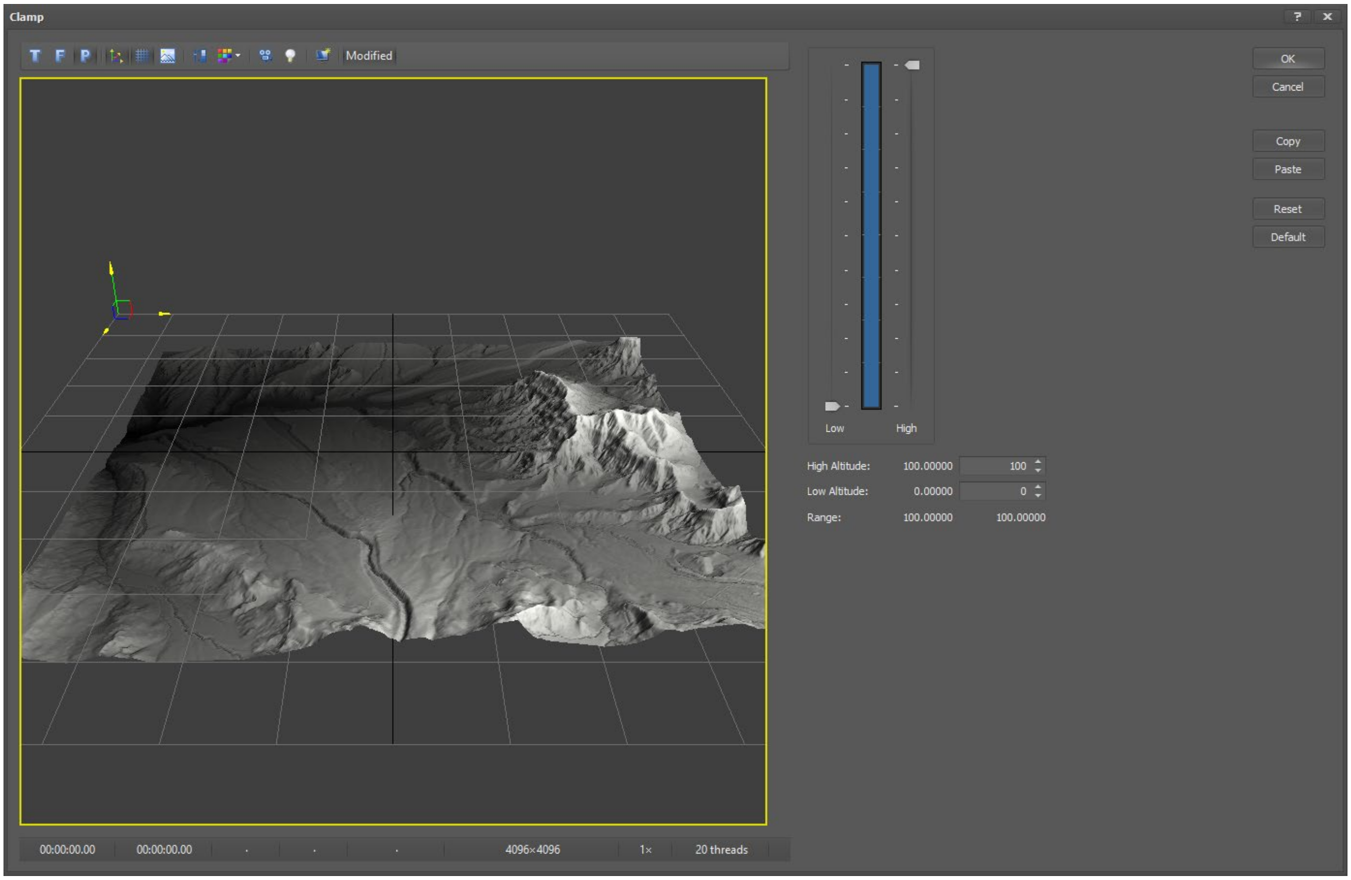
Notes

This device does not preserve the original altitude data.

This device is multi-threaded.
This device requires 1 additional datamap memory allocation.

Modify: Clamp

Clamps the datamap altitude range within the specified high and low values.
The datamap data is hard-clipped at the clamp values.



Low slider	Changes the low altitude clamp value.
Altitude bar graph	Displays the original altitude range in gray and the clamp range in blue.
High slider	Changes the high altitude clamp value.
High Altitude:	Specify the high altitude clamp value. High must be greater than Low.
Low Altitude:	Specify the low altitude clamp value. Low must be less than High.
Range:	Displays the original and current altitude range.

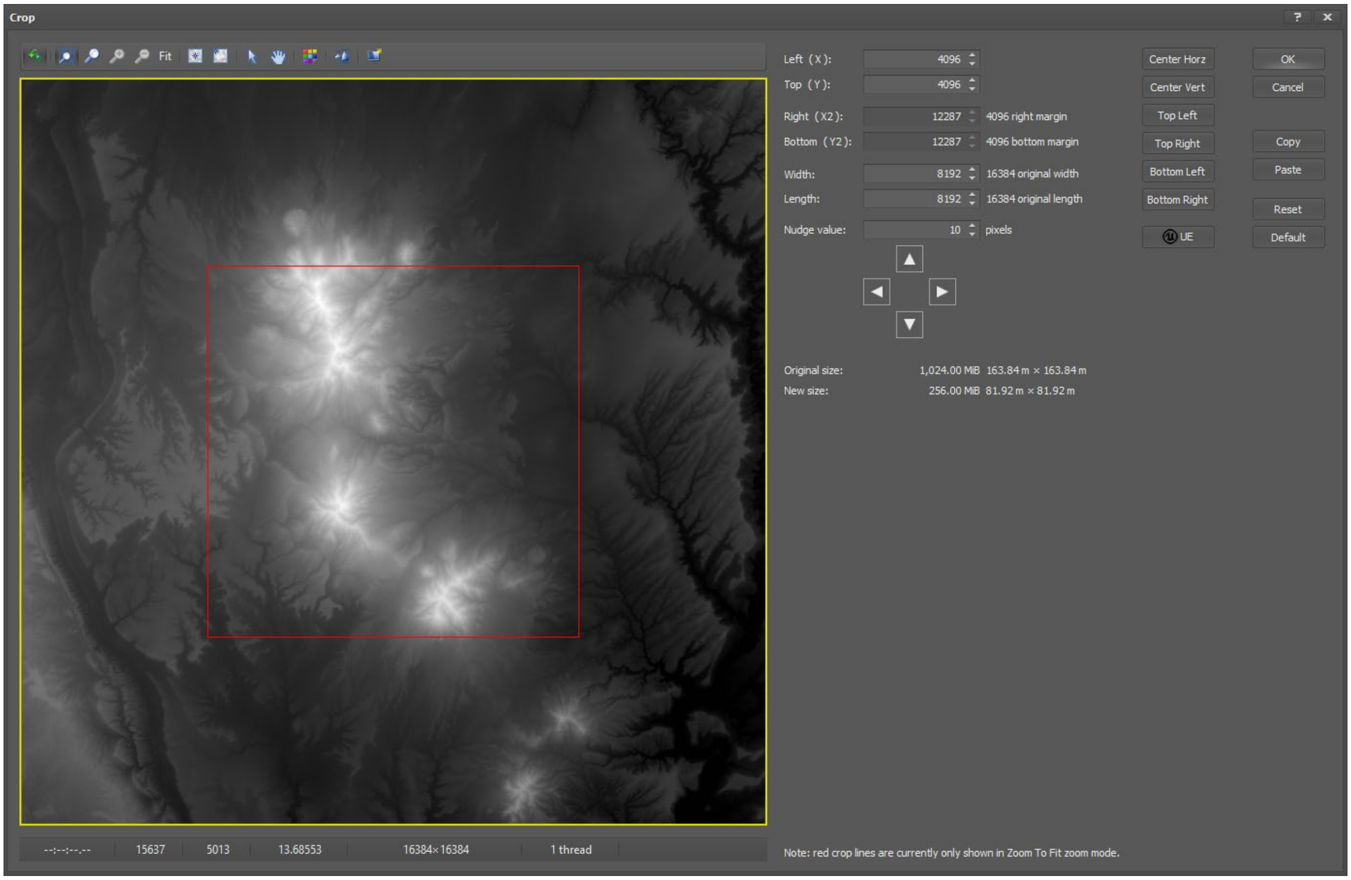
Notes

This device does not preserve the original altitude data.

This device is multi-threaded.
This device requires 0 additional heightmap memory allocations.

Modify: Crop

Crop the edges of the datamap to cut out a specific smaller area.



Left (X):	The left coordinate of the crop region.
Top (Y):	The top coordinate of the crop region.
Right (X2):	The right coordinate of the crop region. This value is read only and cannot be changed.
Bottom (Y2):	The bottom coordinate of the crop region. This value is read only and cannot be changed.
Width:	The width of the crop region.
Length:	The length of the crop region.
Nudge value:	The number of pixels to nudge the crop selection rectangle.
Nudge up:	Nudge the crop rectangle up. Can also use shortcut key Ctrl+UpArrow.
Nudge right:	Nudge the crop rectangle right. Can also use shortcut key Ctrl+RightArrow.
Nudge left:	Nudge the crop rectangle left. Can also use shortcut key Ctrl+LeftArrow.
Nudge down:	Nudge the crop rectangle down. Can also use shortcut key Ctrl+DownArrow.
Center Horz:	Center the crop area horizontally.
Center Vert:	Center the crop area vertically.
Top Left:	Move the crop area to the top left.
Top Right:	Move the crop area to the top right.
Bottom Left:	Move the crop area to the bottom left.
Bottom Right:	Move the crop area to the bottom right.
UE	This dialog includes the UE button if the Settings Dimensions includes Unreal Engine.

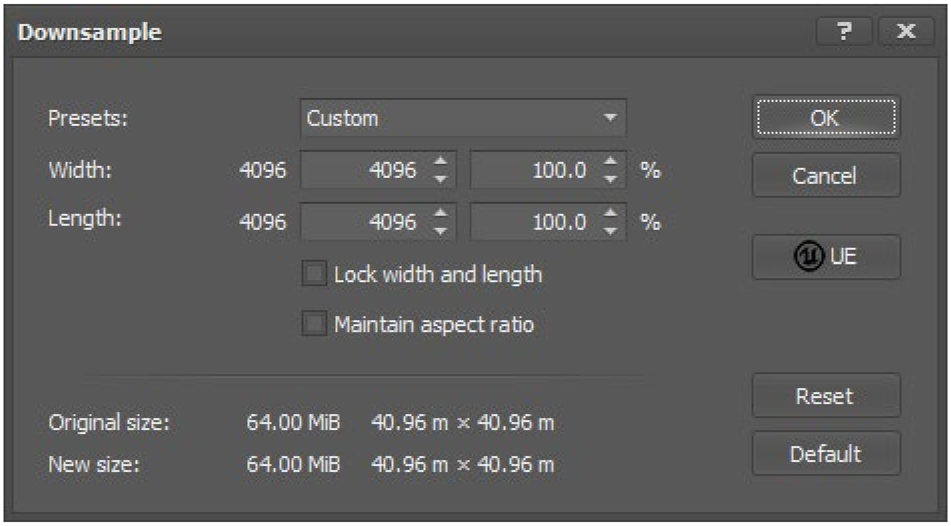
Notes

This device is single-threaded.
This device requires 1 additional datamap memory allocation.

The Nudge system allows for moving the current crop rectangle by small pixel increments, to help in exactly selecting the desired terrain region.
The workflow for selection typically involves setting the Width and Length values to the desired size, then centering the selection rectangle on the terrain features desired. The nudge can be used to move the selection by small increments, while maintaining the Width and Length region size.

Modify: Downsample

Size the datamap smaller using a variable size window algorithm.



Presets:	Choose from preset smaller sizes.
Width:	The new datamap width.
Length:	The new datamap length.
Lock width and length:	Lock the width and length to the same value.
Maintain aspect ratio	Maintain the rectangular aspect ratio of the source datamap.

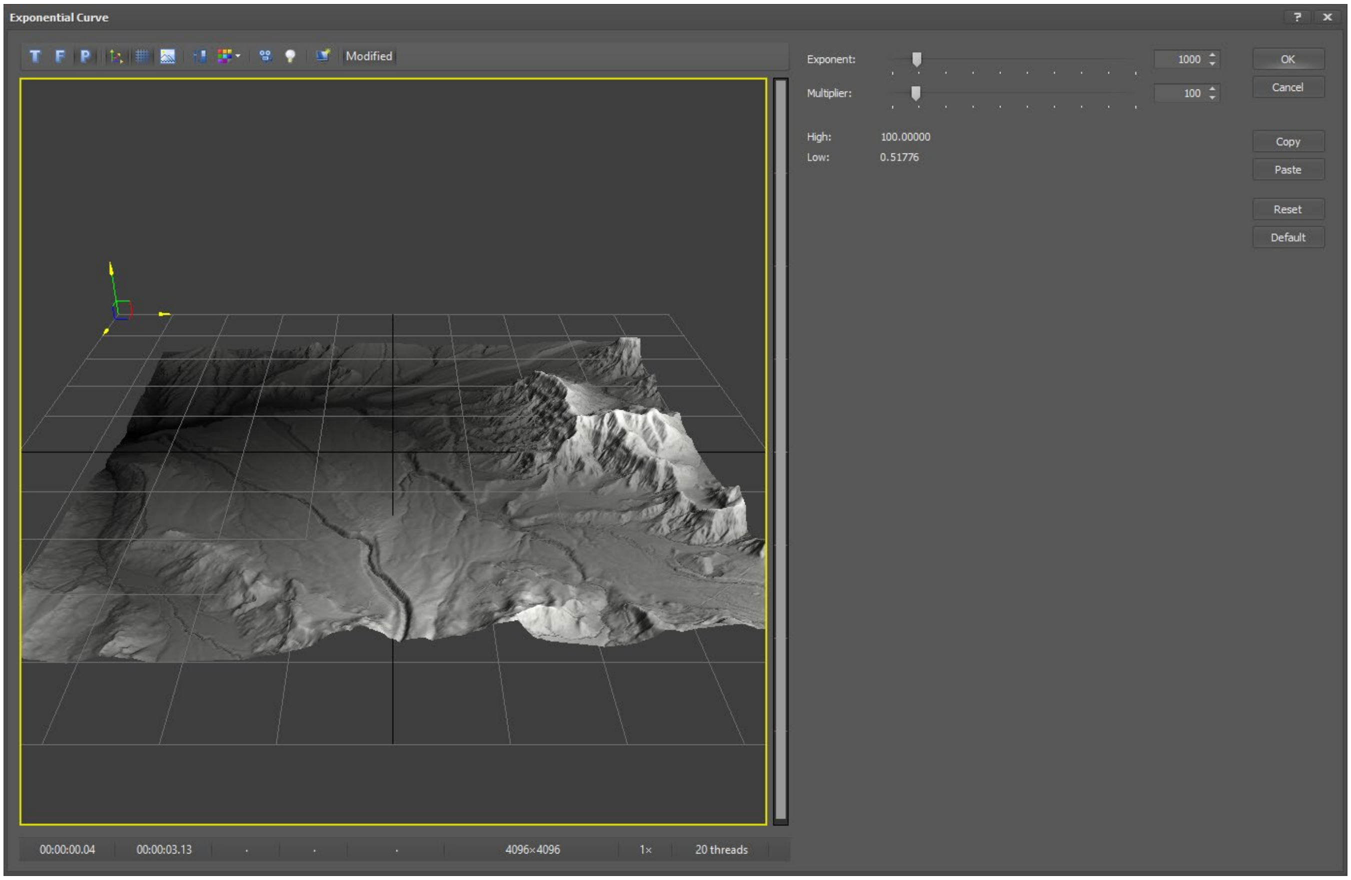
This dialog includes the Unreal Engine button if the Settings Dimensions set includes Unreal Engine.

Notes

This device is single-threaded.
This device requires 1 additional datamap memory allocation.

Modify: Exponent

Multiplies the datamap altitude data by the exponent value.



Exponent:	The exponent value.
Multiplier:	The multiplier value.
High:	The altitude high value.
Low:	The altitude low value.

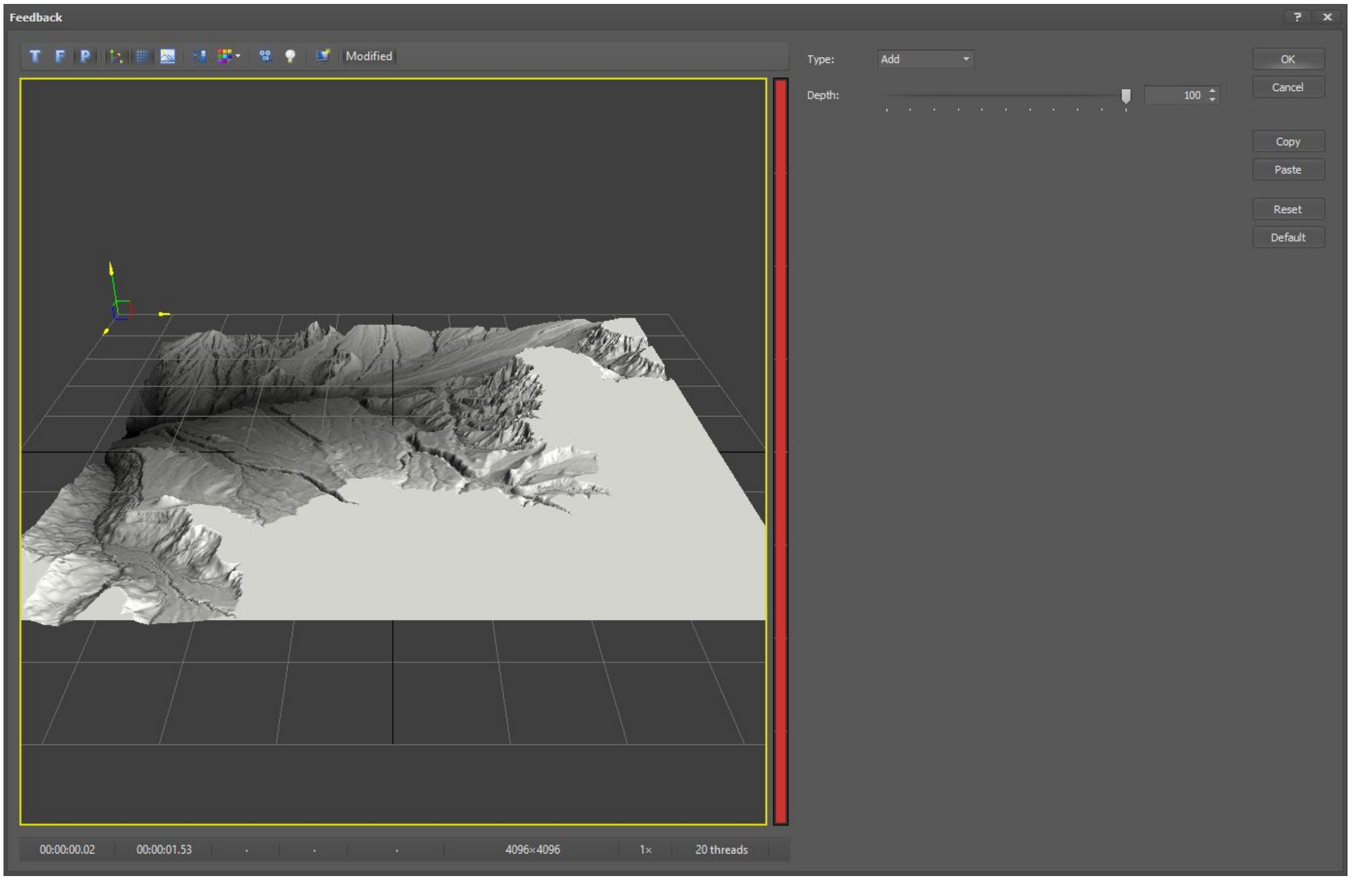
Notes

This device does not preserve the original altitude data.

This device is multi-threaded.
This device requires 0 additional datamap memory allocation.

Modify: Feedback

Adds or multiplies the datamap values back on themselves.



Type: The feedback type:
- Add
- Add Invert
- Divide
- Multiply

Depth: The amount of feedback.

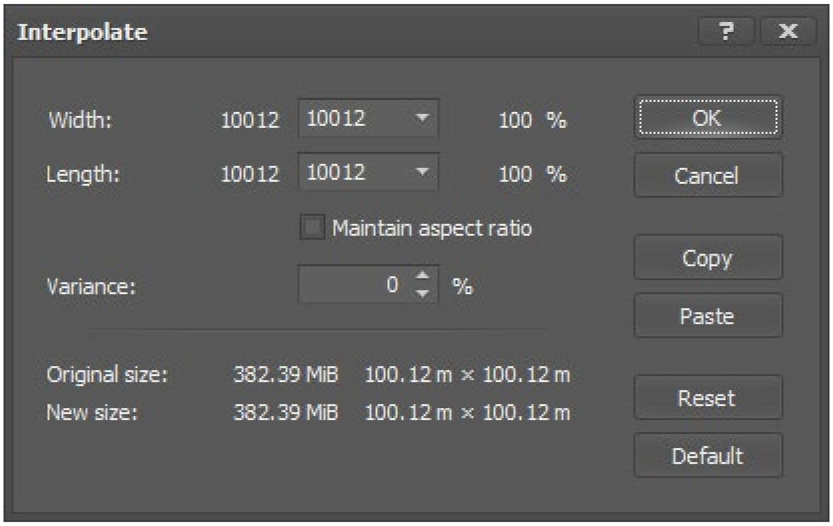
Notes

This device does not preserve the original altitude data.

This device is multi-threaded.
This device requires 0 additional datamap memory allocation.

Modify: Interpolate

Increase the dimensions of the datamap using a linear interpolation algorithm.
Interpolation is different from Resample in that it only supports enlargement multiples such as 200%, 300%, 400%, 500%, etc. Interpolation retains all of the original altitude sample values and inserts "interpolated" altitude values to provide an increase in dimensions resolution while maintaining the exact original data.



Width:	The desired new width dimension. This can only be an integer multiple of the original.
Length:	The desired new length dimension. This can only be an integer multiple of the original.
Maintain aspect ratio:	Locks the width and length controls to maintain the same aspect ratio as the original.
Variance:	Applies a random variance to the interpolated altitude values placed between the original.
Original size:	Displays the original size information.
New size:	Displays the new size information.

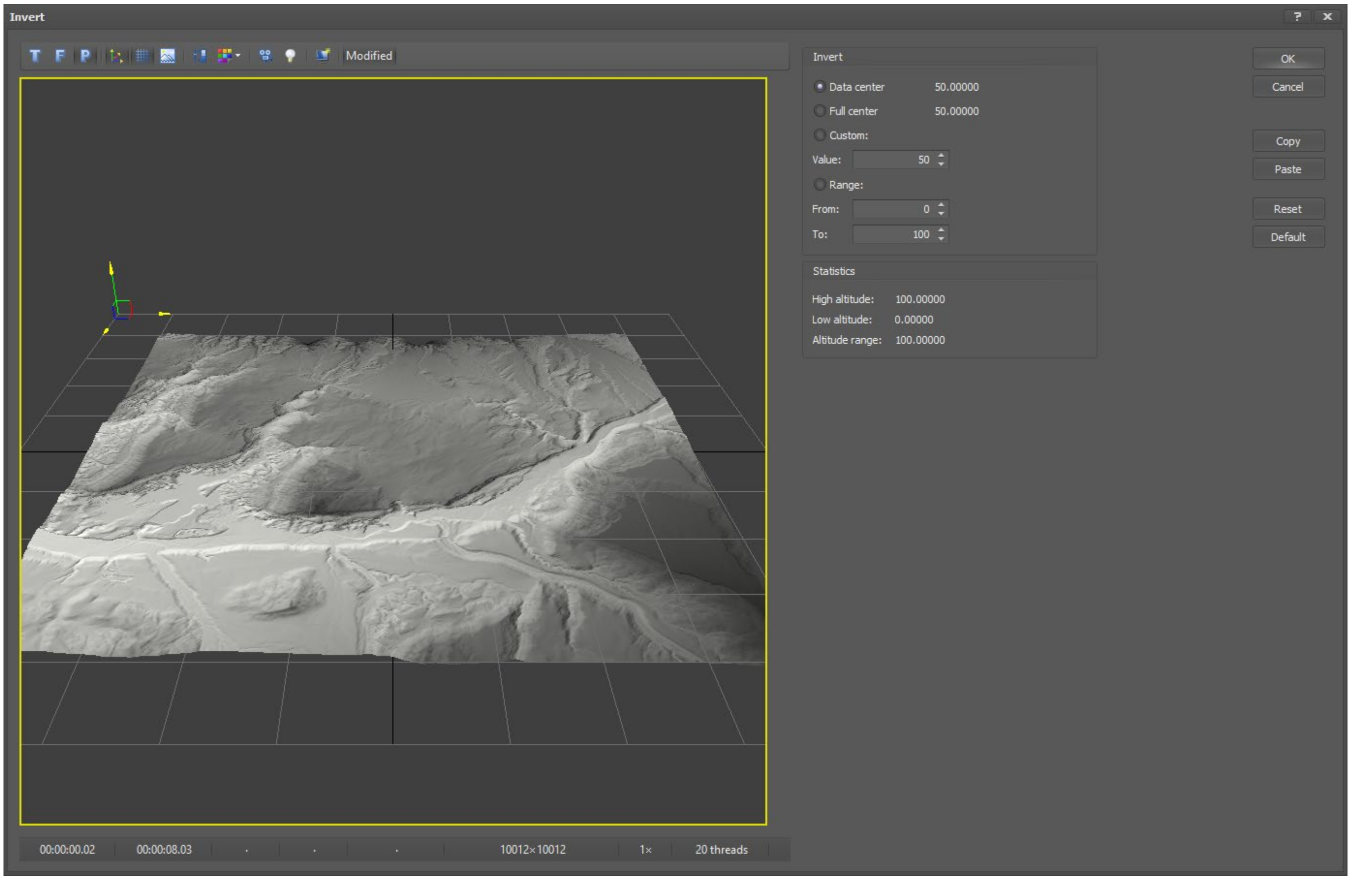
Notes

To perform a "cut" on the heightmap to a smaller dimension while retaining the exact sample point altitudes for those points that are not removed, use the Resample function with the Fast Quality to an equal smaller divisor dimension such as 50%, 25%, etc.

This device is single-threaded.
This device requires 1 additional datamap memory allocation.

Modify: Invert

Inverts the datamap data around the specified center point.
This effectively flips the datamap data, turning hills into valleys, and valleys into hills.



Data center:	Invert at the datamap's data center median altitude.
Full center:	Invert at the full range center altitude of 50.0.
Custom:	Invert at the custom altitude. This inverts and moves the datamap up or down.
Value	The custom altitude value.
Range:	Invert only the specified range of altitudes.
From:	The invert range from altitude.
To:	The invert range to altitude.
High altitude:	The datamap high altitude.
Low altitude:	The datamap low altitude.
Altitude range:	The datamap altitude range.

Notes

This device is multi-threaded.
This device requires 0 additional datamap memory allocations.

Modify: Normalize

Changes the altitude of the datamap to the maximum range of 0.0 to 100.0.

This device executes immediately with no options or settings.

Notes

A normalize is typically executed on the datamap prior to exporting to a file format that reduces the data type resolution from the source floating-point data type, such as exporting to PNG 16-bit Grayscale. This is to reduce the destination format bit loss.

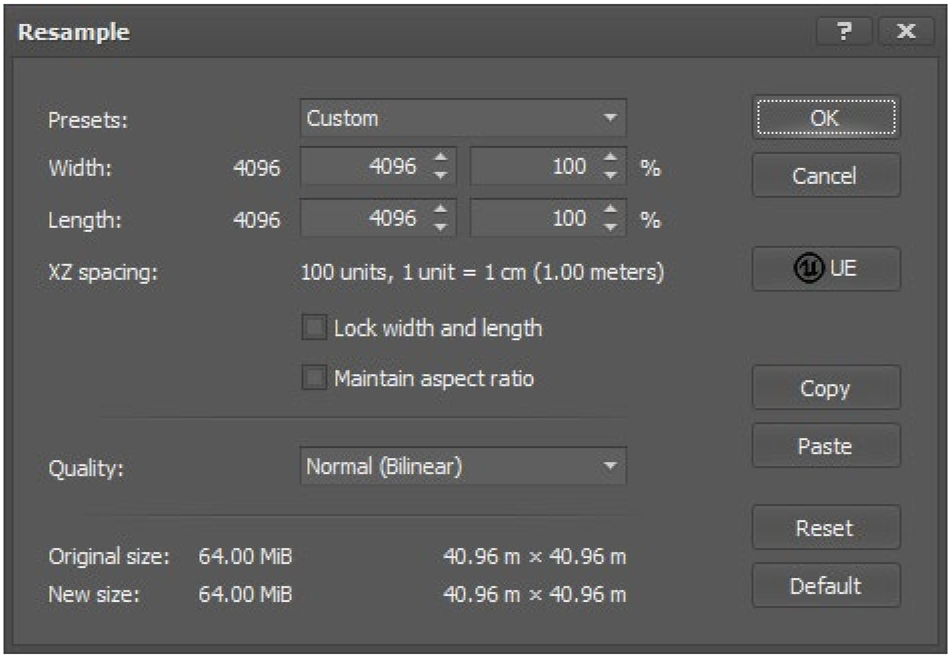
This device does not preserve the original altitude data.

This device is multi-threaded.
This device requires 0 additional datamap memory allocations.

Modify: Resample

Allows increasing or decreasing the width and length dimensions of the datamap.
The new dimensions can be any valid values in the range of 2x2 up to the largest supported size.
The datamap data may be filtered to provide a more accurate and smoother resampling depending on the Quality value chosen.

Note that resampling does not fully preserve the original altitude data in its entirety, but provides the closest matching altitudes for the given downsampling or upsampling dimensions ratio. To accurately preserve the original heightmap data when upsampling by dimension multiples, use the Downsample or Interpolate functions.



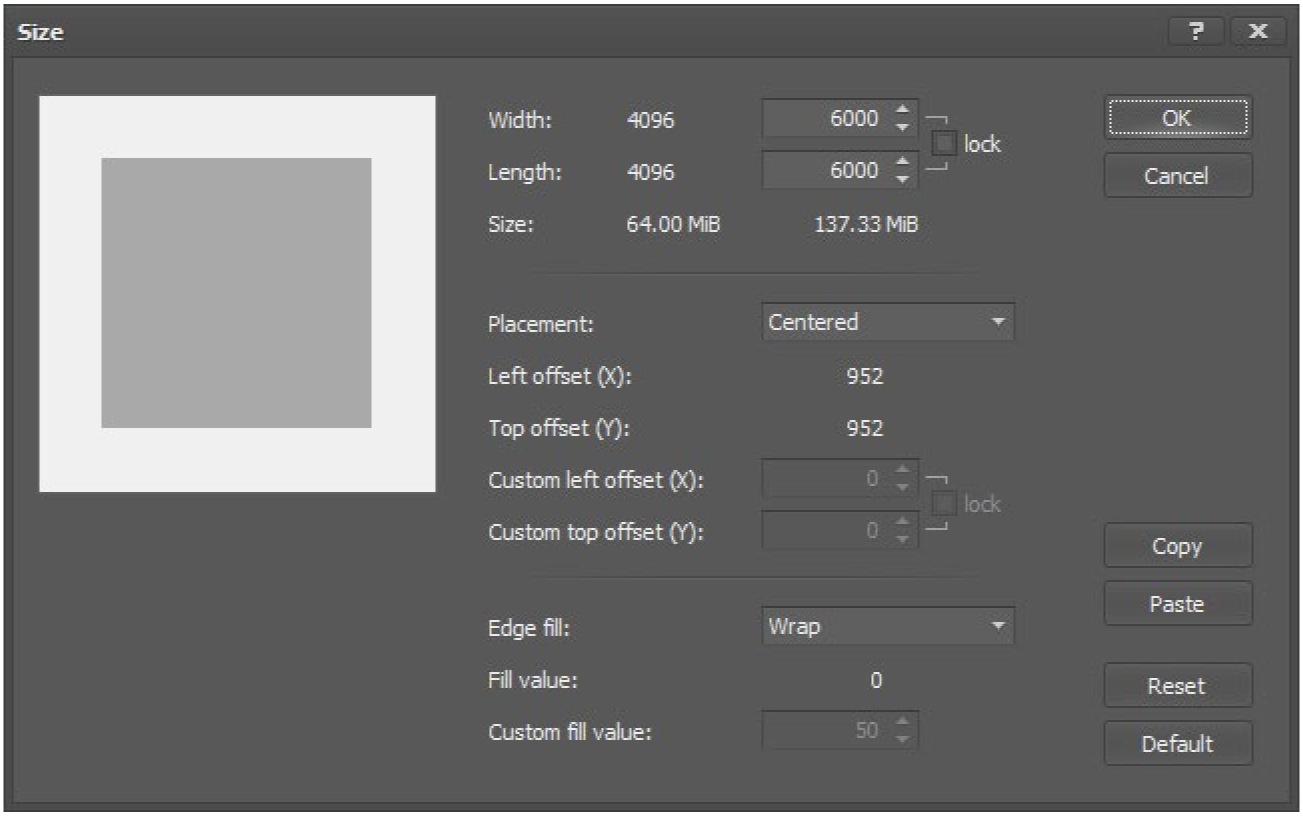
Presets:	Resample using these common preset settings. Downsample to smaller common power-of-two sizes or percentages. Upsample to larger common power-of-two sizes or percentages.
Width: Length:	The new custom width. The new custom length.
XZ Spacing:	The current engine XZ spacing units.
Lock width and length: Maintain aspect ratio:	Locks the width and length controls to maintain the same values. Locks the width and length controls to maintain the same aspect ratio as the original.
Quality:	Specifies the resampling quality, or the overall accuracy of the resampling algorithm. Fast: very accurate nearest-neighbor. Normal: bilinear filter. High: large window bicubic convolution filter. Best: large window lanczos filter.
Original size: New size:	Displays the original memory size and unit scale dimensions. Displays the new memory size and unit scale dimensions.
UE button	Choosing this button will display the Unreal Engine Landscape Sizes dialog. This button will be available only when Unreal Engine is enabled in the Settings.

Notes

This device is single-threaded except Fast Nearest Neighbor which is multi-threaded.
This device requires 1 additional datamap memory allocation.

Modify: Size

Change the size dimensions of the datamap.
For larger sizes on either dimension, the new area is filled with the specified Edge fill style.
For smaller sizes on either dimension, the original datamap is cropped.



Width:	The new Width value.
Length:	The new Length value.
Lock:	Lock the new Width and Length values.
Size:	Displays the original and new datamap sizes
Placement:	Specify the location of the original datamap data within the new size dimensions. - Locations: Specify the location of the original datamap data using these preset locations. - Custom: Specify the original datamap data location using the Left and Top offsets.
Left offset:	The offset from the left that the original datamap data is located in the new size.
Top offset:	The offset from the top that the original datamap data is located in the new size.
Custom Left offset:	The custom offset from the left that the original datamap data is located in the new size.
Custom Top offset:	The custom offset from the top that the original datamap data is located in the new size.
Lock:	Lock the Custom Left offset and Custom Top offset values.
Edge fill:	The style of edge fill if the new size is larger. - Minimum = the datamap minimum altitude. - Center = the datamap center altitude. - Maximum = the datamap maximum altitude. - Low value = the current datamap low altitude. - Middle value = the current datamap middle altitude. - High value = the current datamap high altitude. - Custom = the altitude value specified as the Custom fill value. - Duplicate = duplicate the value around the edge. - Fold = fold the datamap tiled around the edge. - Mirror = mirror the datamap tiled around the edge. - Wrap = wrap the datamap tiled around the edge.

Fill value:	The fill value.
Custom fill value:	The custom fill value.

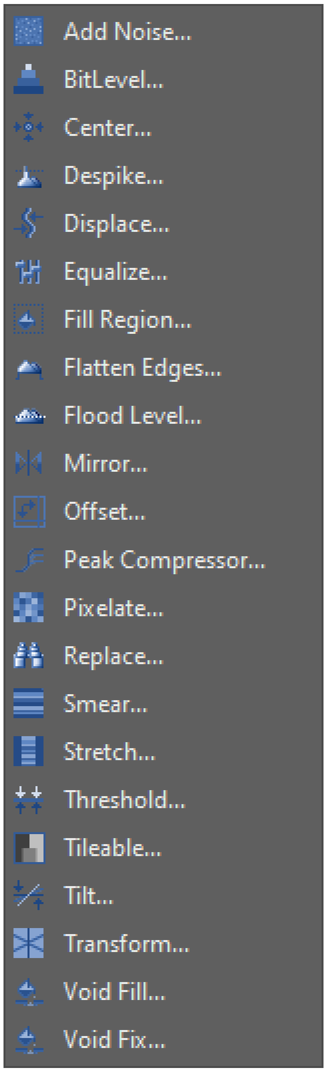
Notes

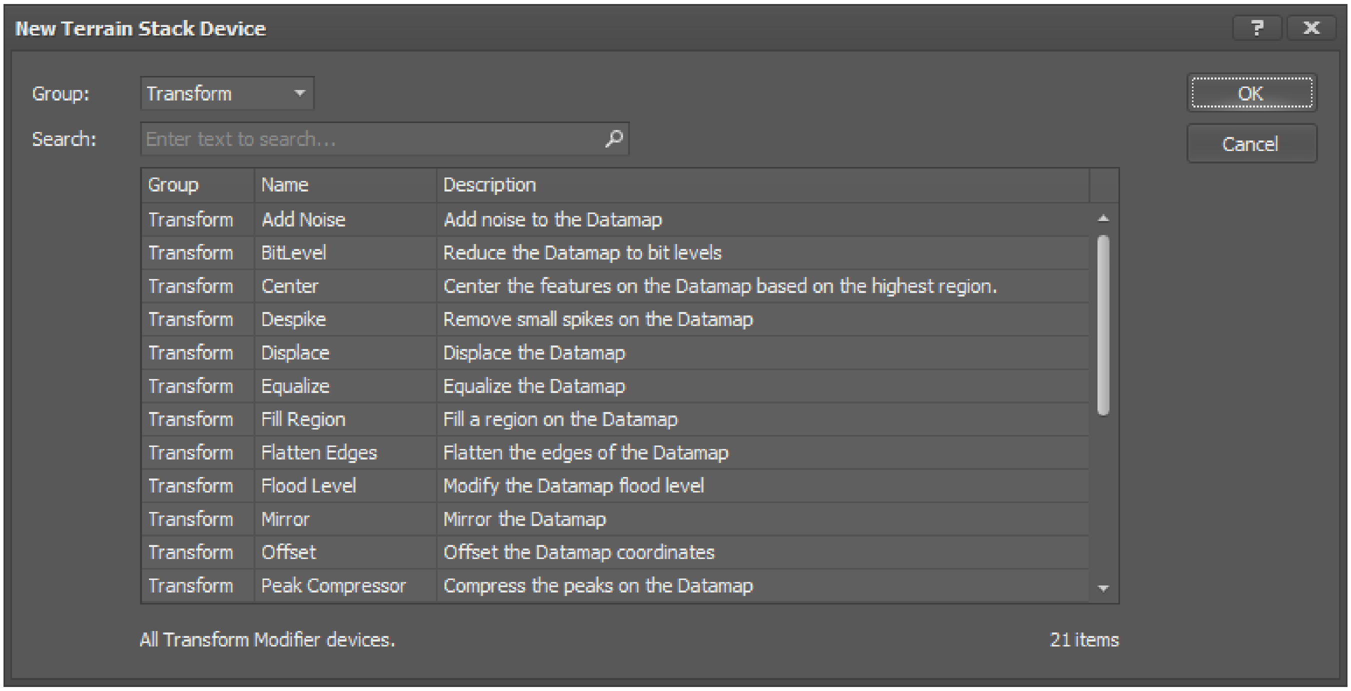
The Left and Top offset values in conjunction with the Edge fill style of Mirror allows the datamap to be offset in any direction by the specified number of pixels.

This device is single-threaded.
This device requires 1 additional datamap memory allocation.

Transform Menu: Devices

The Transform menu contains devices that modify the heightmap or mask datamap.
Transform type devices typically modify the datamap data to a greater extent than modify type devices.




New Terrain Stack Device
Group:
Transform
Search:
Enter text to search...
OK
Cancel
Group
Name
Description
Transform
Add Noise
Add noise to the Datamap
Transform
BitLevel
Reduce the Datamap to bit levels
Transform
Center
Center the features on the Datamap based on the highest region.
Transform
Despike
Remove small spikes on the Datamap
Transform
Displace
Displace the Datamap
Transform
Equalize
Equalize the Datamap
Transform
Fill Region
Fill a region on the Datamap
Transform
Flatten Edges
Flatten the edges of the Datamap
Transform
Flood Level
Modify the Datamap flood level
Transform
Mirror
Mirror the Datamap
Transform
Offset
Offset the Datamap coordinates
Transform
Peak Compressor
Compress the peaks on the Datamap
All Transform Modifier devices.
21 items

Transform: Add Noise

Add random noise at intervals on the datamap.

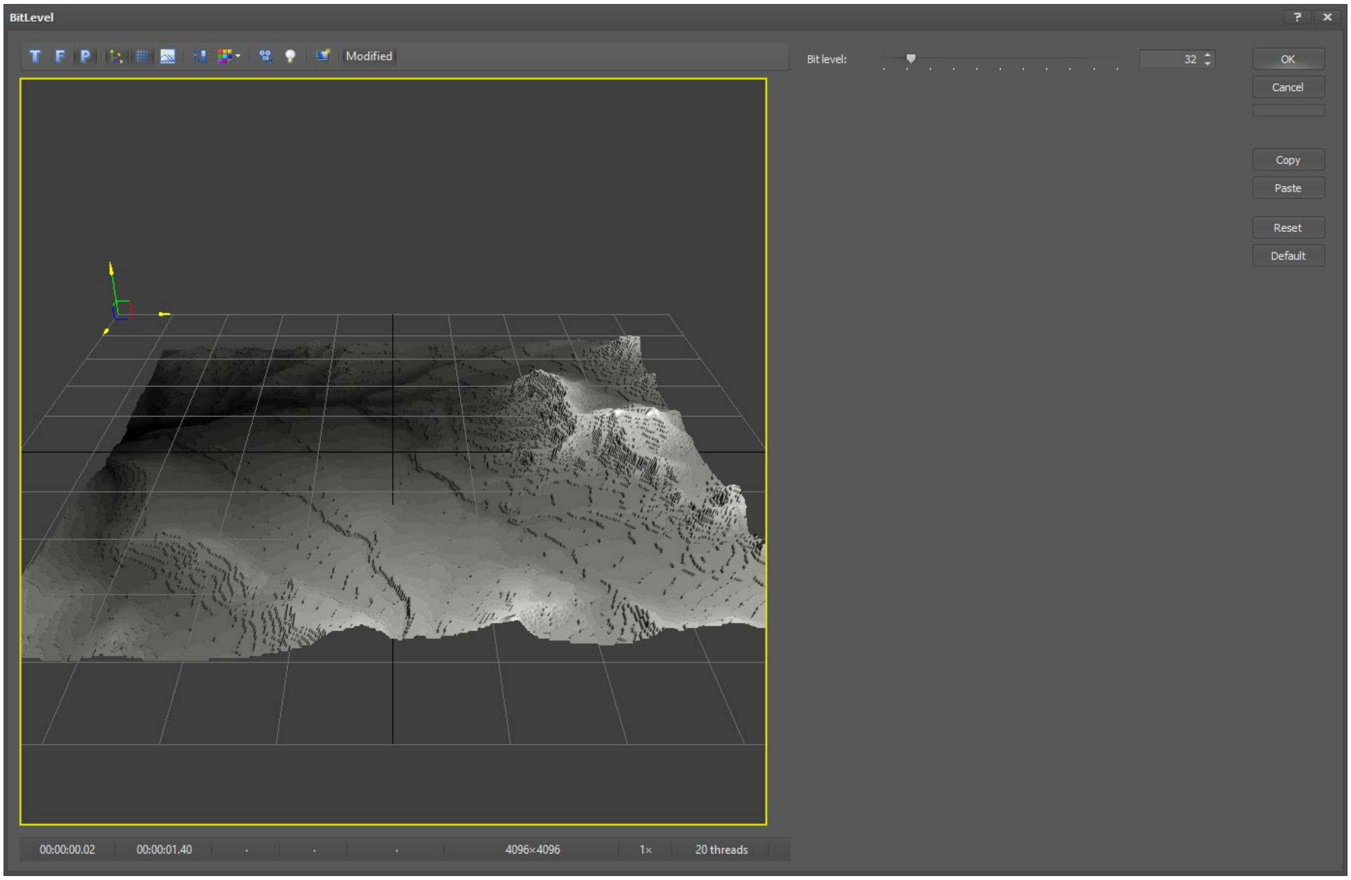
Size:	The spacing between random noise elements.
Strength:	The altitude strength of the random noise.

Notes

This device is single-threaded.
This device requires 0 additional datamap memory allocations.

Transform: Bit Level

Reduce the datamap to the number of bit levels.



Bit level The number of bit levels of altitude resolution, 2 to 256.

Notes

This device does not preserve the original altitude data.

This device is multi-threaded.
This device requires 1024 bytes additional memory allocation.

Transform: Center

Center the datamap data.

This device occurs immediately with no options or settings.

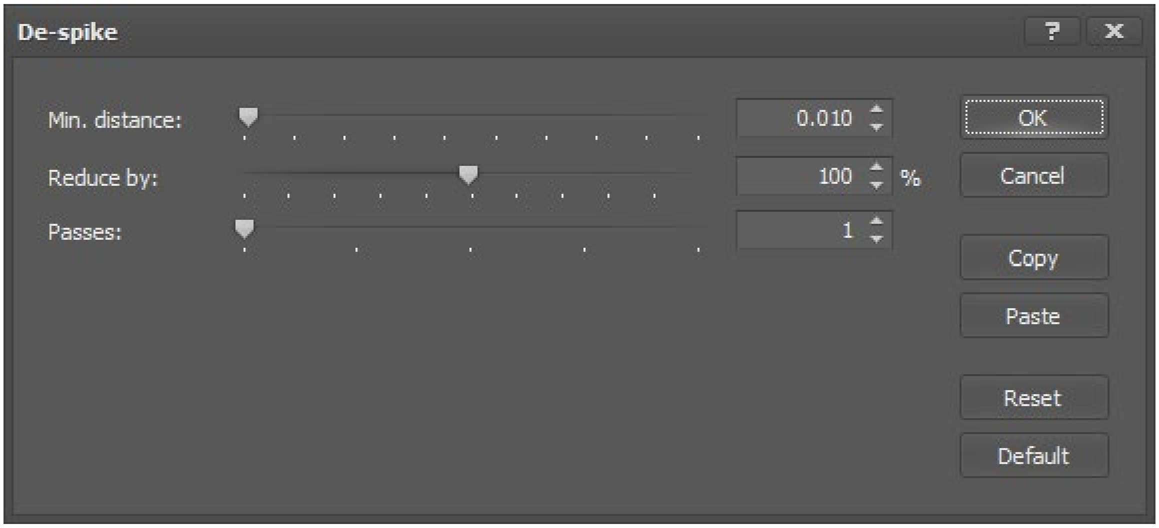
Notes

The algorithm used scans the datamap for the highest pixel, then scans in a diagonal x pattern to determine the bounds of the highest region, and centers on that. So it is possible that a datamap with more than one high region may be centered only on the first region found.

This device is single-threaded.
This function requires 0 additional datamap memory allocations.

Transform: De-spike

Reduce or remove single-sample spikes in the datamap.
This is normally used to reduce single sample spikes in datamaps created with the Ridged Noise generator, or to despike Digital Elevation Model files that contain a large number of trees.



Min. distance:	The minimum distance in altitude difference before a sample is classified as a spike.
Reduce by:	The percentage of the distance difference to reduce the spike by.
Passes:	The number of de-spiking passes.

Notes

This device does not preserve the original altitude data.

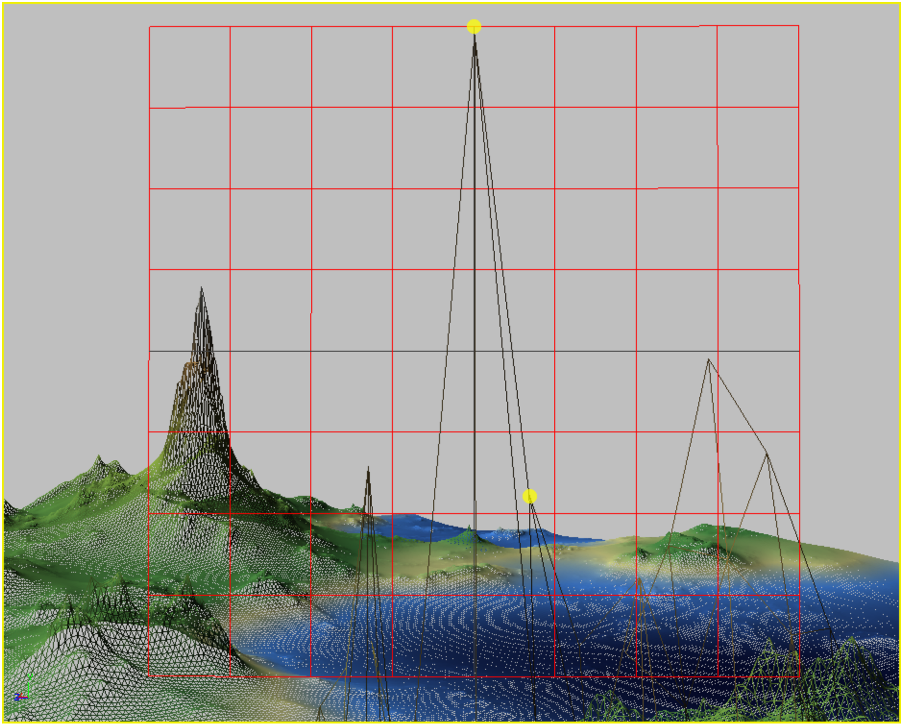
This device is single-threaded.
This device requires 0 additional datamap memory allocations.

The Minimum distance value is the altitude distance difference between a datamap sample point and all of the sample points that surround it, ie. its neighbors. If a sample point is 20 units above all of its surrounding neighbor samples, it is classified as a spike with a Minimum distance of 20. Setting Minimum distance to 20 will catch all spike samples that are 20 or more units higher than all of their surrounding neighbors.
The Minimum distance value is not in world units but is in datamap altitude values. To convert from the datamap altitude values to the current 3D Editor vertex-based world units, divide the datamap altitude by Units Y Scale, and multiply it by the current Units Y Spacing.

The number of de-spiking passes is only relevant if the Reduce by percentage is less than or greater than 100%. For example, if the datamap contains a number of spikes that are comprised of two side-by-side samples at varying heights, and the Reduce by value is set at 150%, the first pass will move the taller of the two samples down by 150%, making it shorter than the other sample; the second pass will then move the other taller sample down by 150%.

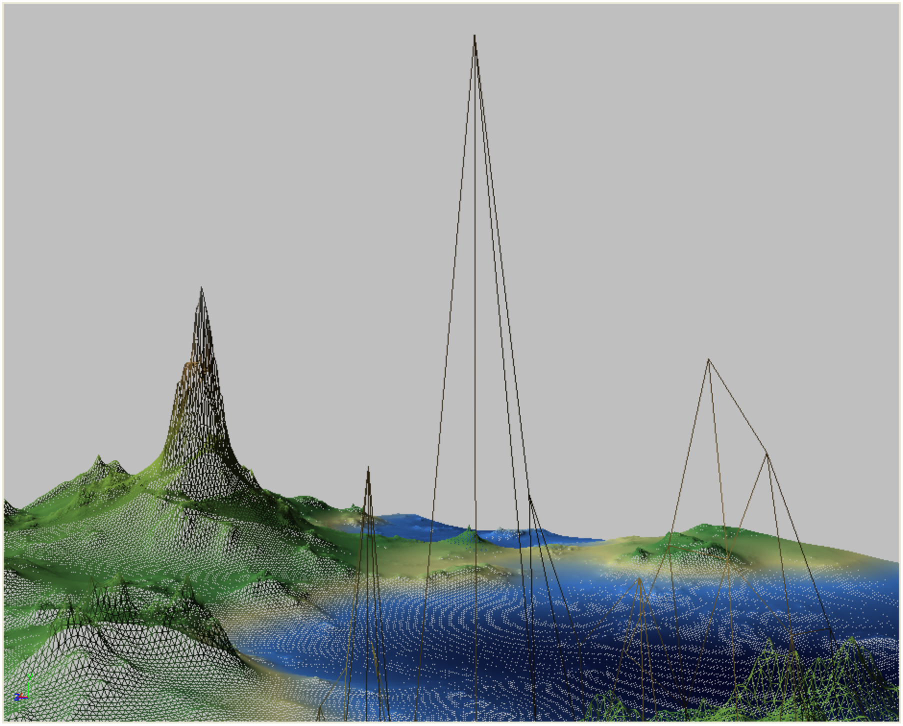
A typical De-spiking routine to reduce many spikes may be a sequence of:
- 50 Min. distance, 150% Reduce by, 1 Pass
- 10 Min. distance, 100% Reduce by, 1 Pass
- 1 Min. distance, 100% Reduce by, 1 Pass

Additional smoothing of spiked areas can be accomplished by using a steep-Slope Mask with the Smooth function in the Terrain Stack.

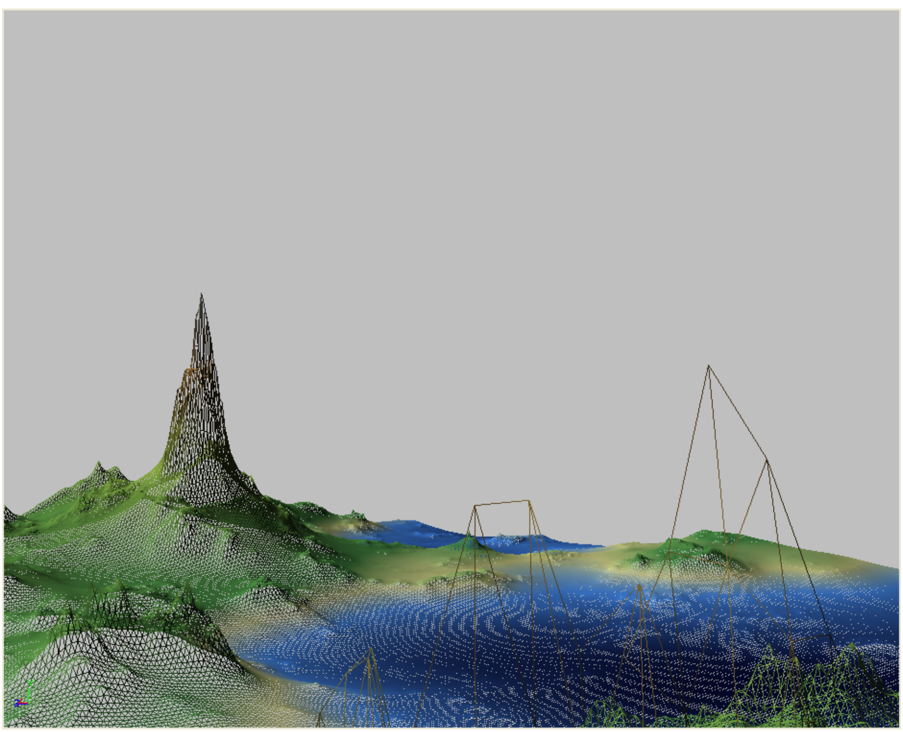


In this example, a 256 spacing user grid (in red) has been positioned at a spike in the terrain. The two yellow dots show the top-most spike vertex and the closest neighboring vertex below the spike. With a Units Y Spacing of 256, the altitude distance difference between these two datamap samples is almost 6 grid cells which is approximately 6.0 in heightmap altitude.

A De-spike *Minimum distance* value of 5.0 will easily remove this spike.
A *Reduce by* value of 100% will lower the top spike vertex down to the next closest neighbor vertex's altitude.



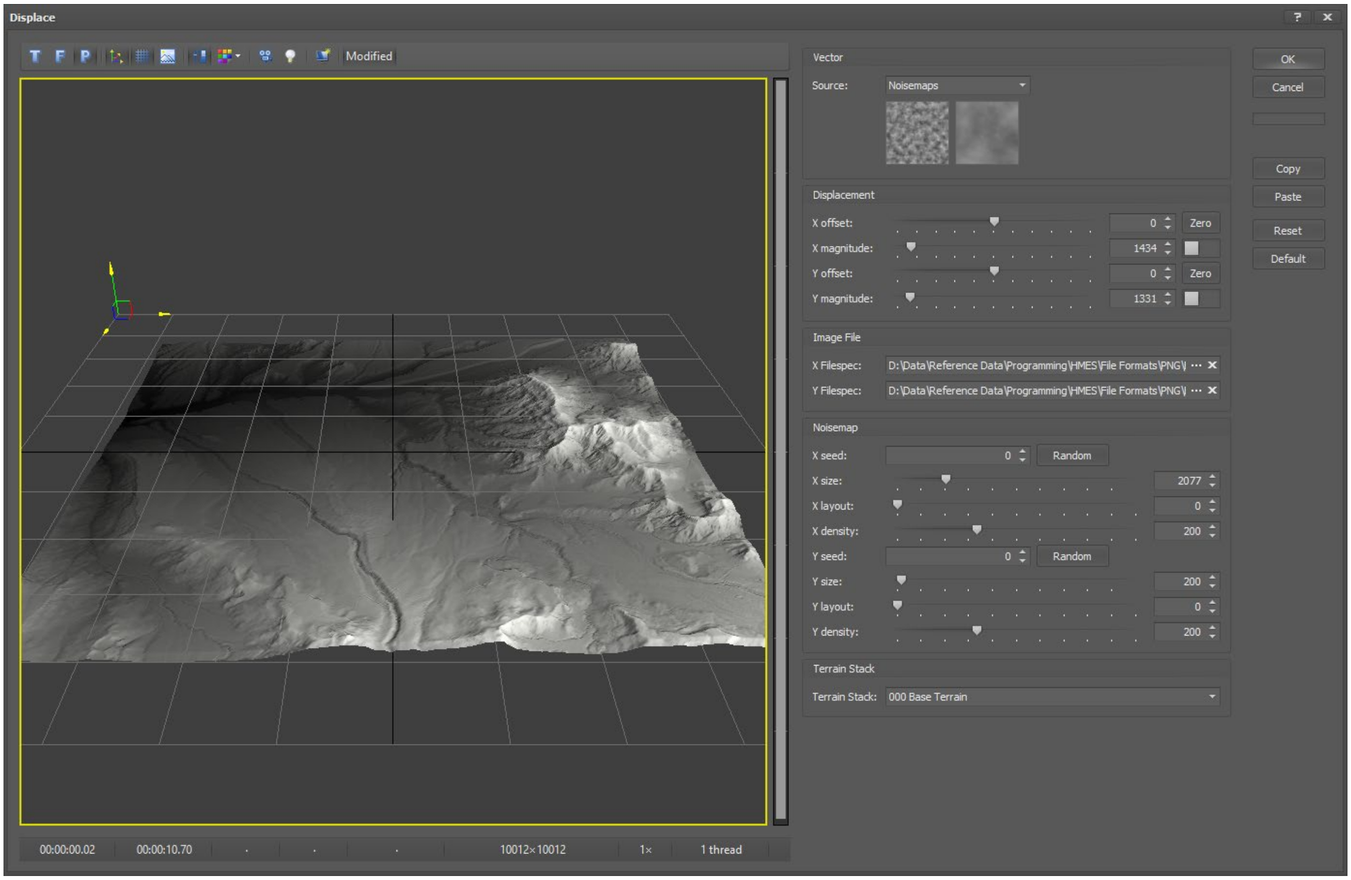
Before De-spiking.



After De-spiking.

Transform: Displace

Displace or warp the datamap data using a number of algorithms.



Vector

Source: The displacement vector source:
- Feedback
- External Files
- Noisemaps
- Terrain Stack

Thumbnails Display thumbnails of the vector sources.

Displacement

X offset: The X axis vector offset.
Zero: Zero the X offset.
X magnitude: The X axis vector magnitude (amplitude level).
Flip direction: Flip the X axis vector direction.

Y offset: The Y axis vector offset.
Zero: Zero the Y offset.
Y magnitude: The Y axis vector magnitude (amplitude level).
Flip direction: Flip the Y axis vector direction.

Image File

X Filespec: The external image file specification used for the displace X vector source.
Y Filespec: The external image file specification used for the displace Y vector source.

Noisemap

X seed:	The noisemap X axis random seed.
Random:	Generate a new random seed.
X size:	The noisemap X axis size.
X layout:	The noisemap X axis layout.
X density:	The noisemap X axis density.
Y seed:	The noisemap Y axis random seed.
Random:	Generate a new random seed.
Y size:	The noisemap Y axis size.
Y layout:	The noisemap Y axis layout.
Y density:	The noisemap Y axis density.

Terrain Stack

Terrain Stack: The item index on the Terrain Stack used for the displace vector source.

Notes

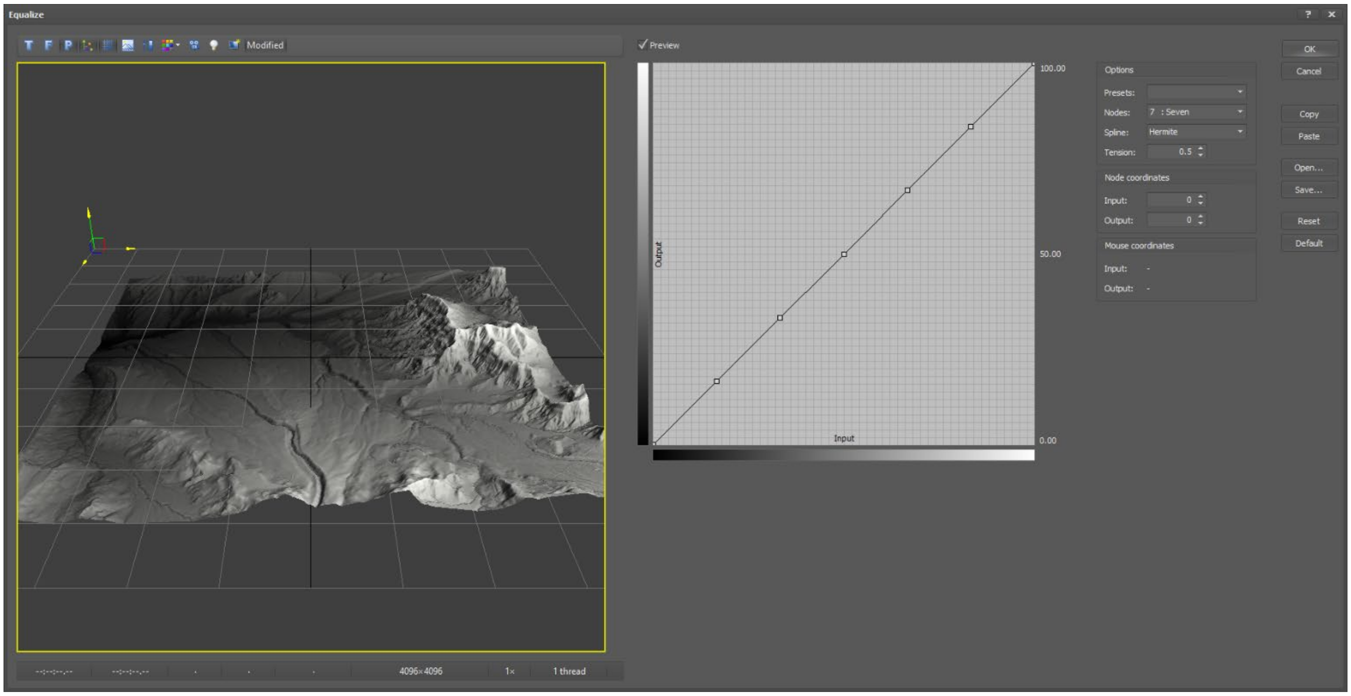
When using the X Filespec and Y Filespec displacement vector source type, both X and Y external files must contain images, even if the same image is loaded into both slots.

This device does not preserve the original altitude data.

This device is single-threaded.
This device requires 3 additional datamap memory allocations.

Transform: Equalize

Modifies the datamap data based on the spline equalization graph.



Preview:	Toggle the 3D Preview window visibility.
Equalize graph	Provides a visual editor for the graph spline control points.
Presets:	A set of common preset equalize graphs.
Nodes:	The number of spline nodes: 4, 5, 7, 9, 11.
Spline:	Chooses from a set of specific spline interpolation algorithm types. - Cubic - Catmull-Rom - Hermite
Tension:	Sets the spline tension around the control point.
Node Input: Node Output:	The currently selected spline control point node input value. The currently selected spline control point node output value.
Mouse Input: Mouse Output:	The current mouse coordinates along the input scale. The current mouse coordinates along the output scale.

Notes

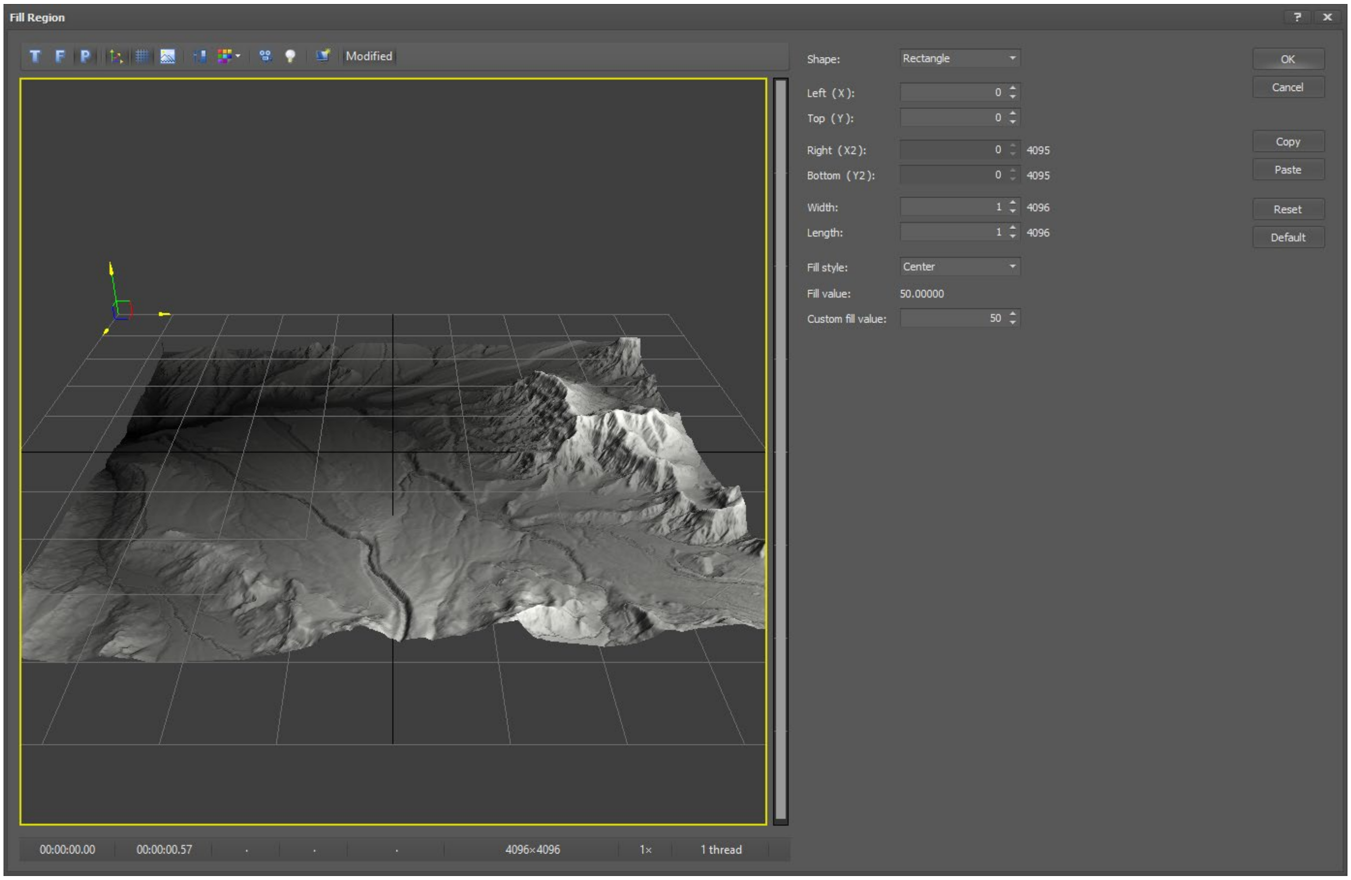
This device does not preserve the original altitude data.

This device is single-threaded.
This device requires 0 additional datamap memory allocations.

The available spline types vary in their accuracy and smoothness, with Cubic as low quality, Catmull-Rom as medium quality, and Hermite as high quality.

Transform: Fill Region

Fill the selected region with the specified altitude value.



Shape:	The fill region shape.
Left (X):	The fill region left coordinate.
Top (Y):	The fill region top coordinate.
Right (X2):	The fill region right coordinate.
Bottom (Y2):	The fill region bottom coordinate.
Width:	The fill region width.
Length:	The fill region length.
Fill style:	The fill style: - Minimum = the heightmap minimum altitude. - Center = the heightmap center altitude. - Maximum = the heightmap maximum altitude. - Low value = the current heightmap low altitude. - Middle value = the current heightmap middle altitude. - High value = the current heightmap high altitude. - Custom = the altitude value specified in the Custom fill value control.
Fill value:	The fill value.
Custom fill value:	The custom fill value.

Notes

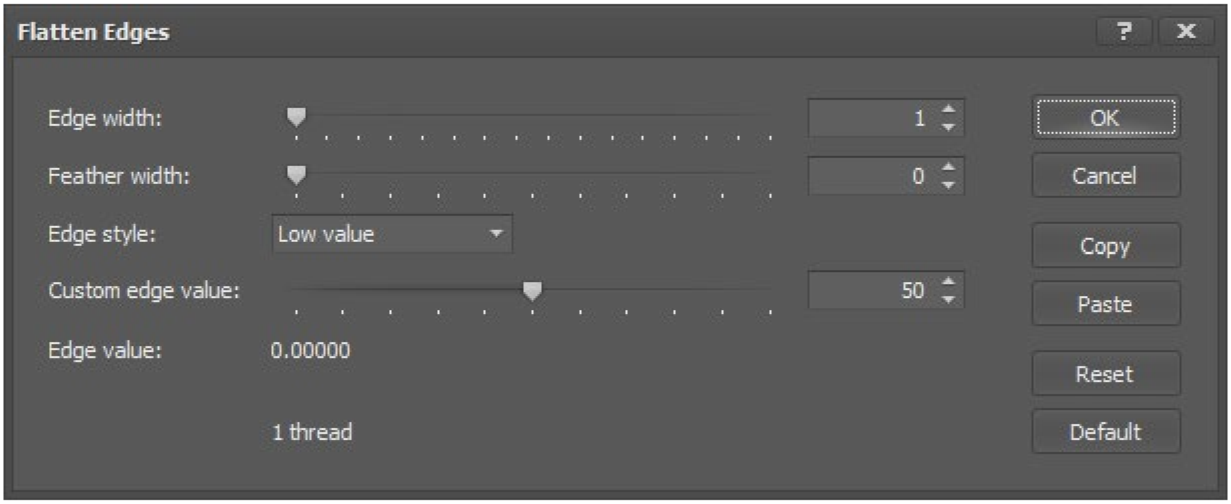
This device is typically used for creating flat regions on the datamap for bases.

This device does not preserve the original altitude data within the fill region.

This device is single-threaded.
This device requires 0 additional datamap memory allocations.

Transform: Flatten Edges

Changes the outer edges of the datamap to the specified fixed altitude value.



Edge width: The number of samples (pixels or vertices) around the edges to flatten to the edge altitude.

Feather width: The number of pixels to smooth the edge.

Edge style: The edge flatten altitude style presets:
- Minimum = the heightmap minimum altitude.
- Center = the heightmap center altitude.
- Maximum = the heightmap maximum altitude.
- Low value = the current heightmap low altitude.
- Middle value = the current heightmap middle altitude.
- High value = the current heightmap high altitude.
- Custom = the altitude value specified in the Custom fill value control.

Custom edge value: The custom edge altitude value to flatten the edges to.

Edge value: The edge value.

Notes

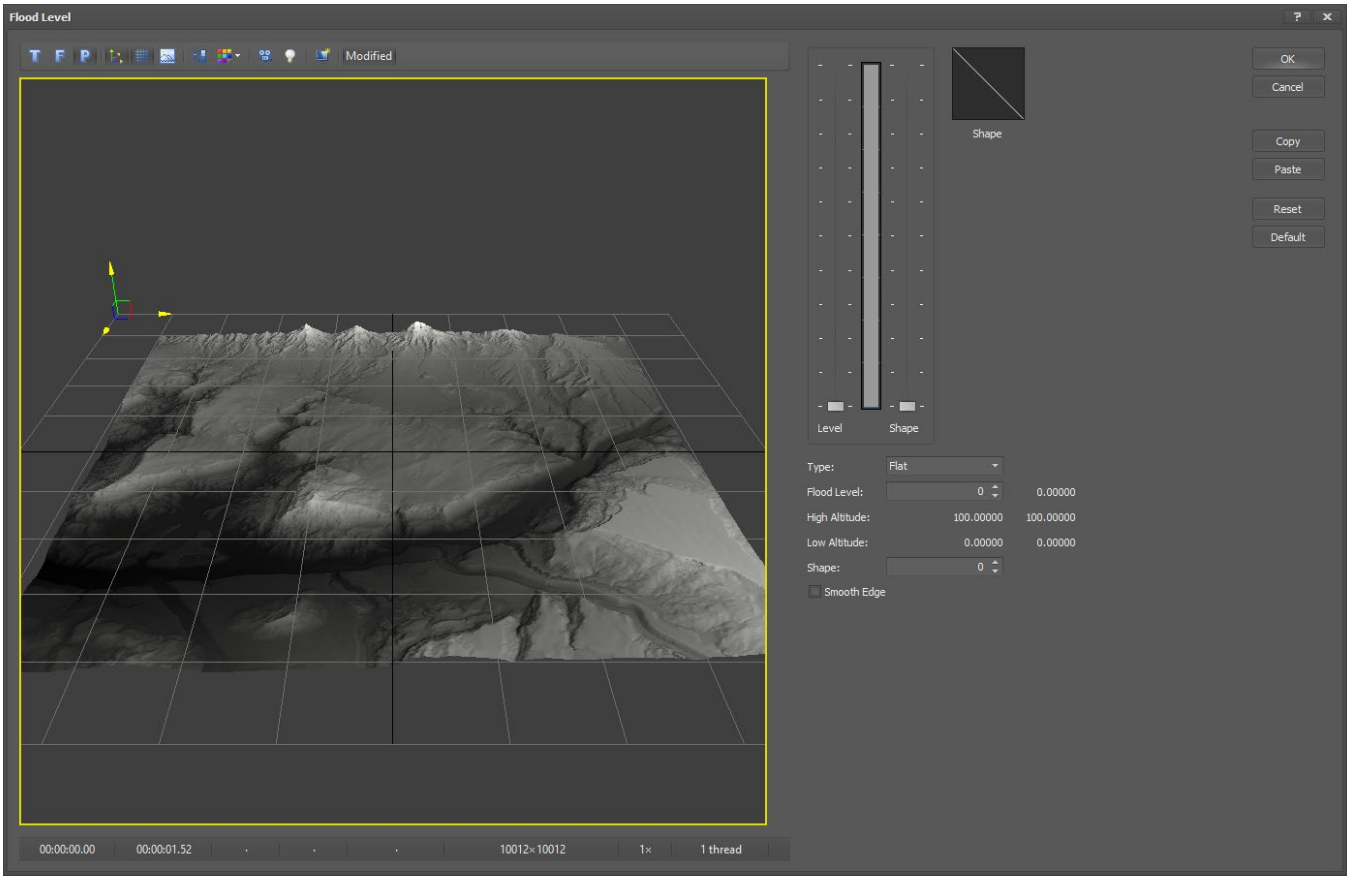
If the source datamap is larger than the terrain rendering LOD, then the front and right edge may not visually look like it is flattened to the specified altitude. This is due to the resampling function that occurs to the datamap data before it is converted to the viewport rendering mesh.
In other words, if the single pixel edge of an 8000x8000 pixel datamap is flattened it won't be visible on the viewport terrain mesh.

This device does not preserve the original altitude data around the datamap edges.

This device is single-threaded.
This device requires 0 additional datamap memory allocations.

Transform: Flood Level

Simulates flooding the datamap with water.



Type:	The flood level shape type. - Flat: the flood level is clipped flat at the level altitude. - Curved: the flood level is angled at the level altitude by the shape percent.
Flood Level:	The positive offset altitude where the flood level starts.
High altitude:	The terrain high altitude.
Low altitude:	The terrain low altitude.
Shape:	The percent that the altitudes below Level are flooded. Curved Type only.
Smooth Edge:	Applies smoothing around the flood level edge. Flat or Curve 100 only.

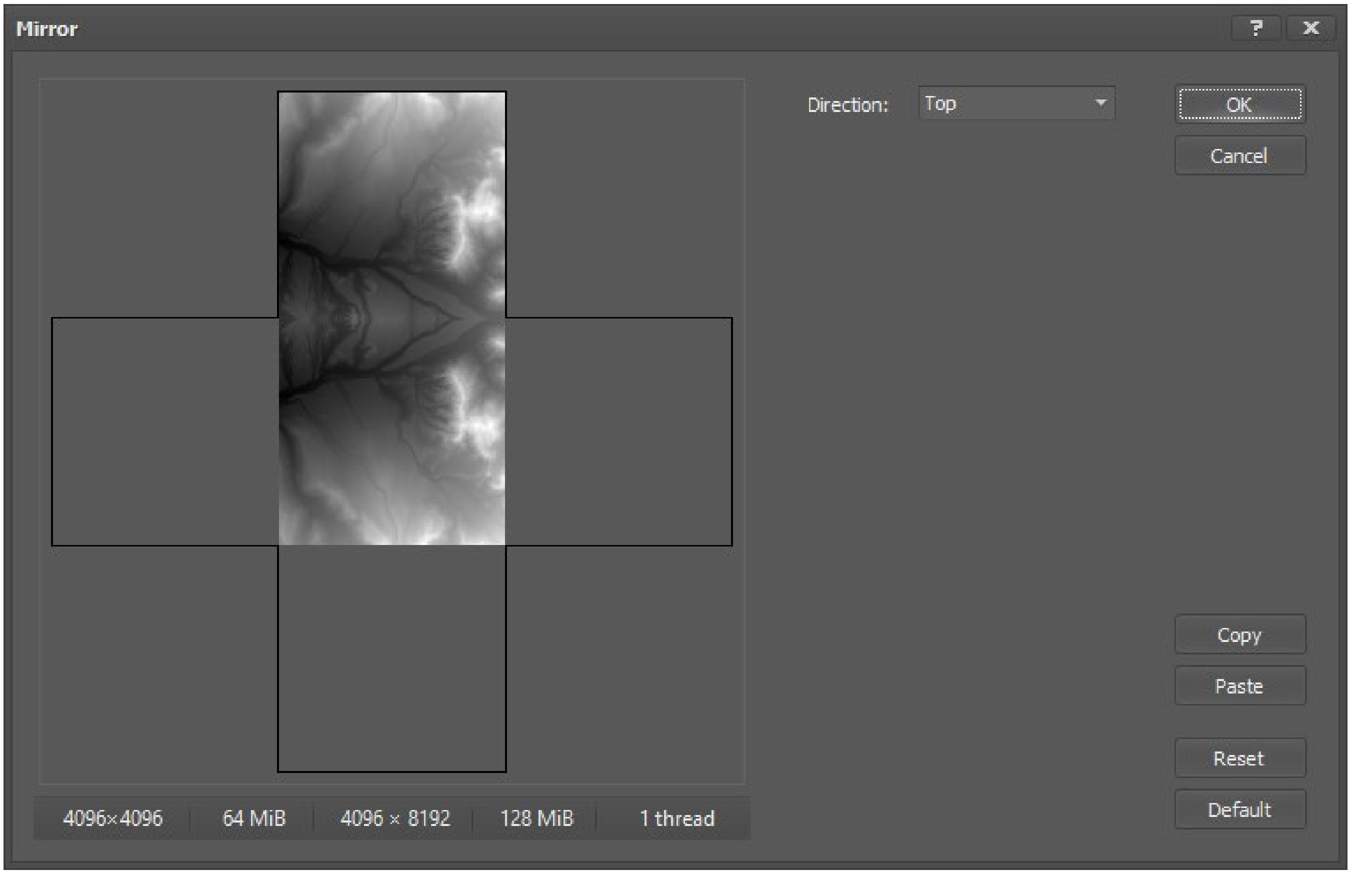
Notes

This device does not preserve the original altitude data.

This device is single-threaded.
This device requires 1 additional datamap memory allocation if Smooth Edge is enabled.

Transform: Mirror

Mirrors the datamap on one of its four sides, typically for symmetrical map designs.



Direction: Specifies the heightmap side to mirror to.

Notes

The real-time preview display can also be used to select the desired mirror direction using the mouse. Hover the mouse over any mirror side to choose that direction, then click to accept the choice.

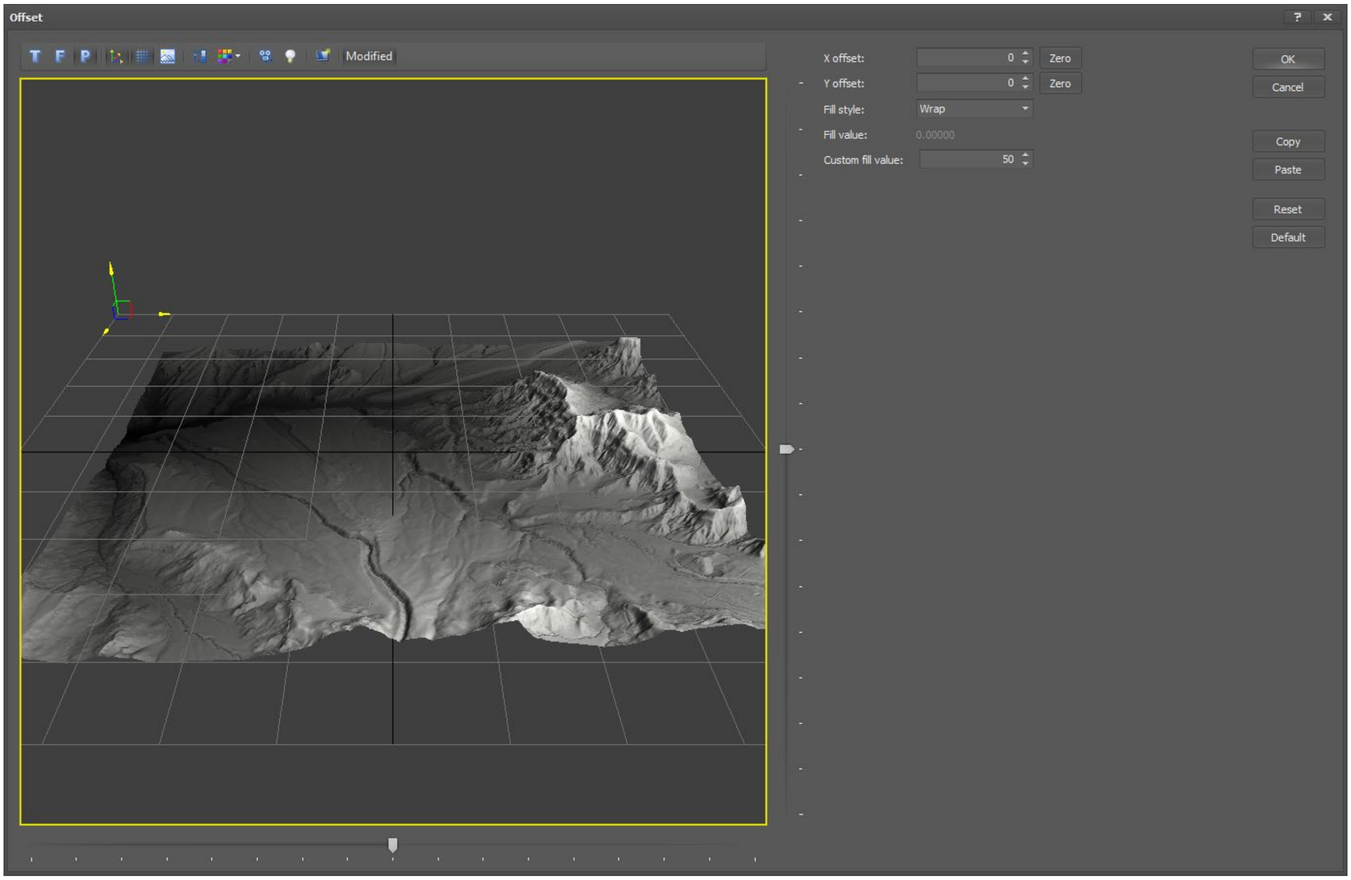
The real-time preview display does not show an aspect-correct thumbnail version of the source heightmap. This is by design so that heightmaps with very tall or very wide aspect ratios can still be previewed more easily.

This device is typically used to create symmetrical heightmaps for specific FPS game types such as Capture-The-Flag. The terrain for one team side can be created and mirrored to provide proper symmetry for the second team.

This device is single-threaded.
This device requires 1 additional datamap memory allocation.

Transform: Offset

Offsets the datamap by the specified number of pixels.



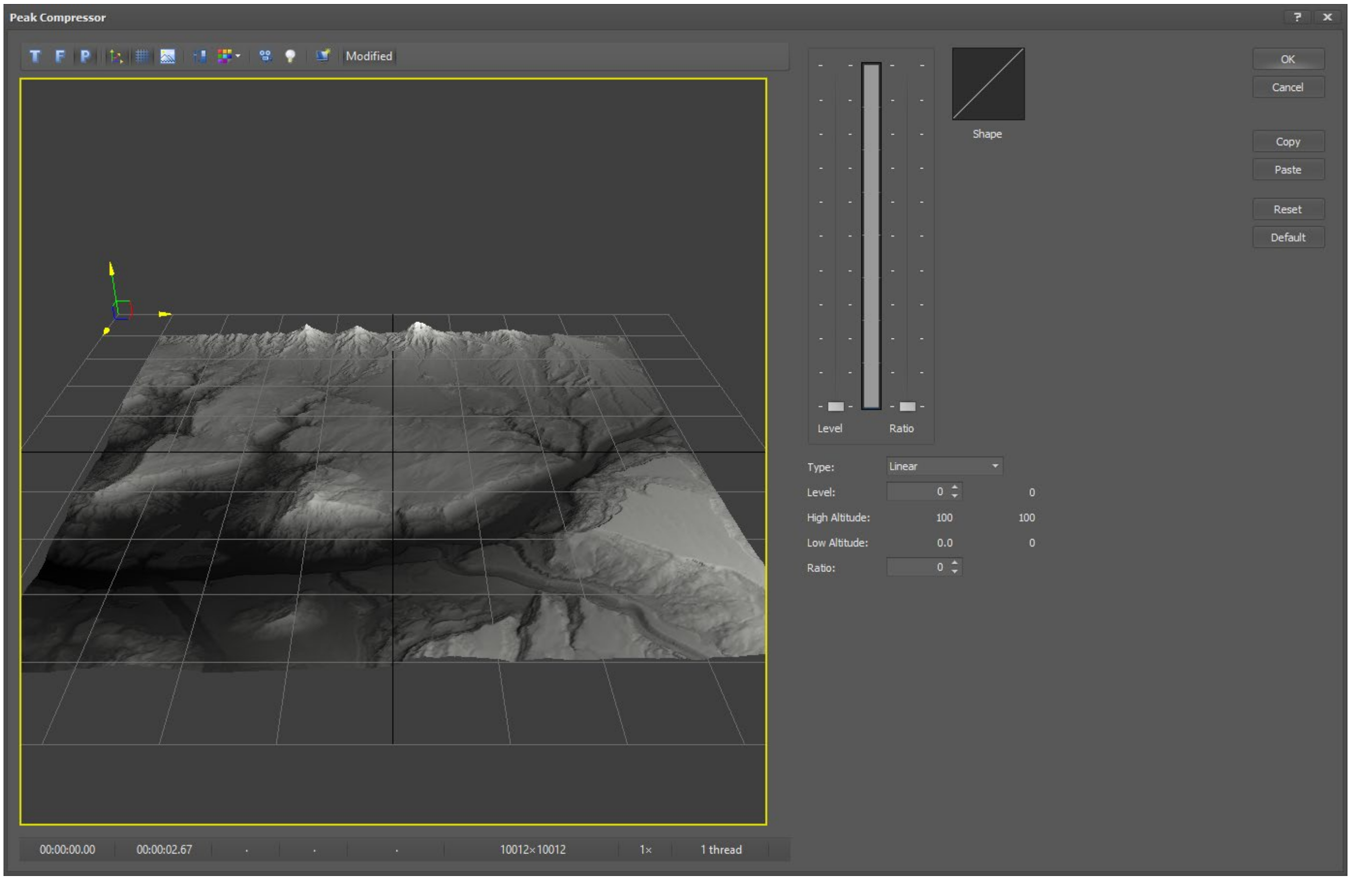
X offset:	The number of samples to offset on the datamap X direction.
Y offset:	The number of samples to offset on the datamap Y direction.
Fill style:	The fill style: - Minimum = the datamap minimum altitude. - Center = the datamap center altitude. - Maximum = the datamap maximum altitude. - Low value = the current datamap low altitude. - Middle value = the current datamap middle altitude. - High value = the current datamap high altitude. - Custom = the altitude value specified as the Custom fill value. - Duplicate = duplicate the value around the edge. - Fold = fold the datamap tiled around the edge. - Mirror = mirror the datamap tiled around the edge. - Wrap = wrap the datamap tiled around the edge.
Fill value:	The fill value.
Custom fill value:	The custom fill value.

Notes

This device is single-threaded.
This device requires 1 additional datamap memory allocation.

Transform: Peak Compressor

Applies compression to the upper peak altitudes of the datamap.



Type:	The peak compressor type. - Linear: the compression is linear across the level altitude and the crossover point. - Curve 1: a C curve, the compression is curved across the altitude range. - Curve 2: an S curve, the compression is curved across the altitude range.
Level:	The positive offset altitude where the compression starts.
High Altitude:	The datamap high altitude value.
Low Altitude:	The datamap low altitude value.
Ratio:	The compression ratio percent. 0 = none, 100 = full.

Notes

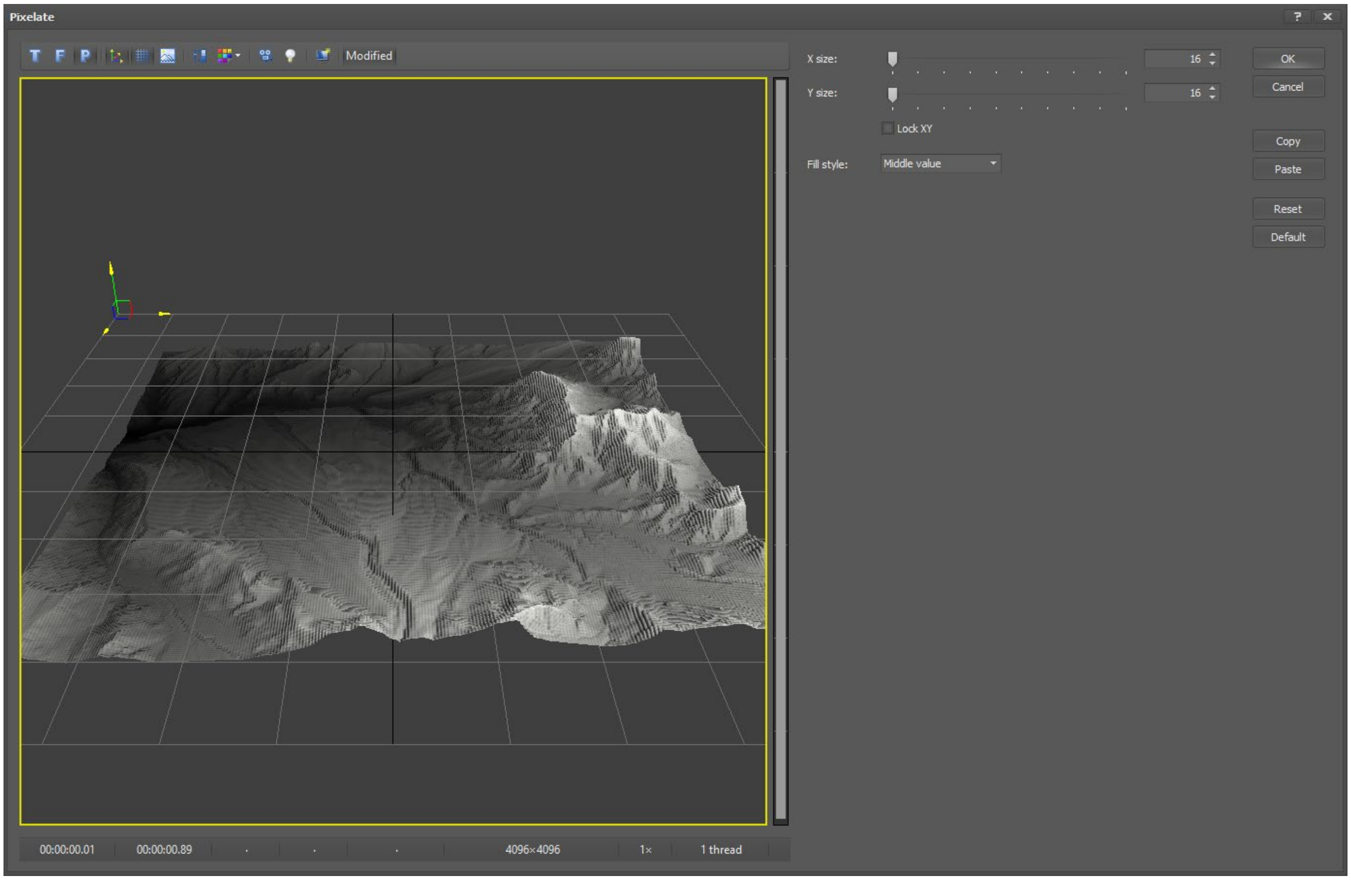
The curved compression shapes vary non-linearly across their range.

This device does not preserve the original altitude data.

This device is single-threaded.
This device requires 0 additional datamap memory allocations.

Transform: Pixelate

Applies an XY axis pixelation resolution reduction to the datamap.
The result of this transform function is more for effect or to create Minecraft like block terrain.



X size:	The datamap X axis block size in pixels.
Y size:	The datamap Y axis block size in pixels.
Lock XY:	Lock the Y value to the X value.
Fill style:	The block region fill style: - Low value = the low altitude from the pixels in the block. - Middle value = the middle altitude from the pixels in the block. - High value = the high altitude from the pixels in the block.

Notes

This device does not preserve the original altitude data.

This device is single-threaded.
This device requires 0 additional datamap memory allocations.

Transform: Replace

Replace the specified altitude value in the datamap with a new value.

Find: The datamap altitude value to find.

Variance: The amount of variance on the value to find, for example 50 +/- 10.

Replace: The altitude value to replace the Find value with.

Notes

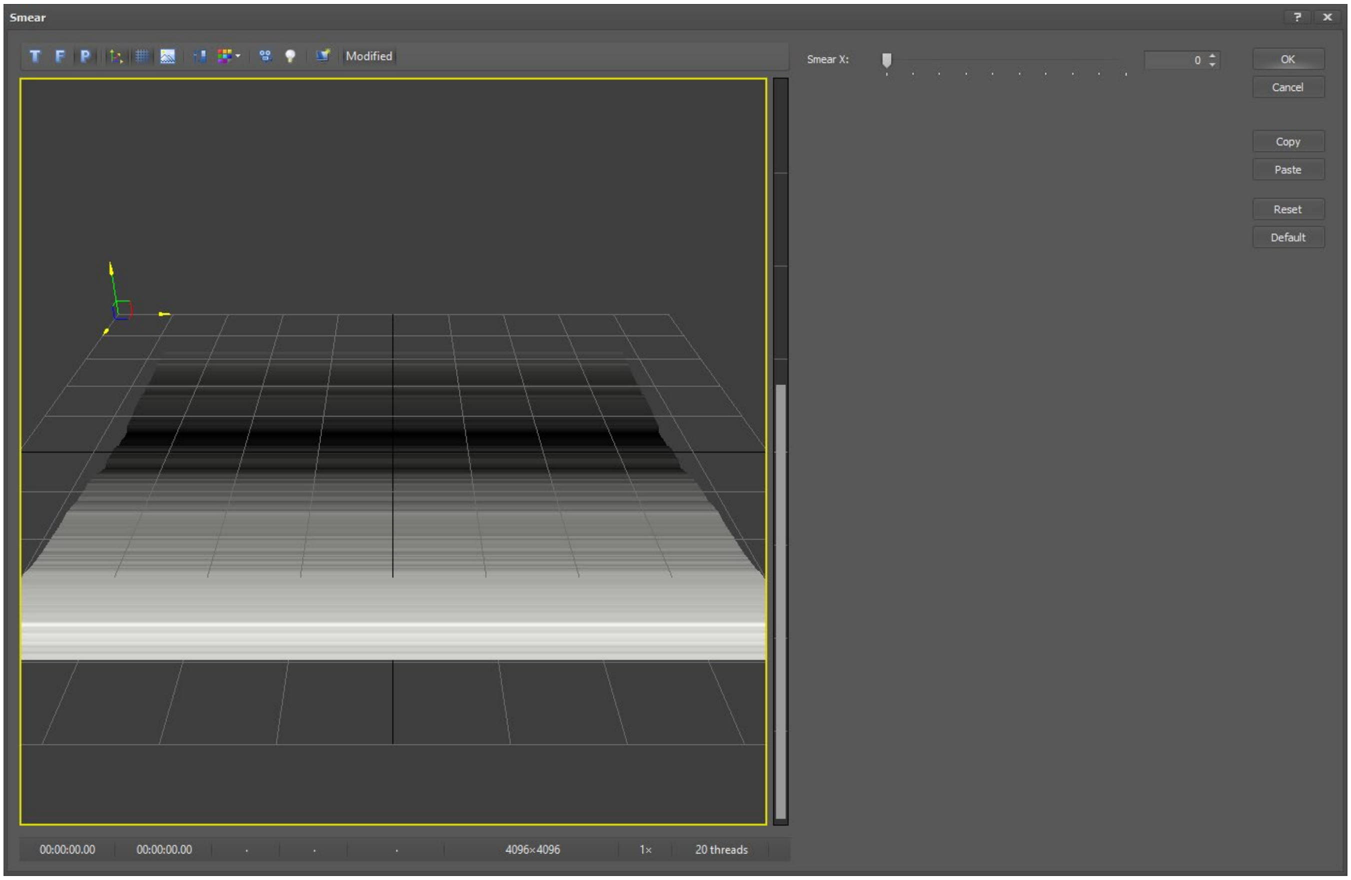
This device can also be used to remove Void regions from a Digital Elevation Model datamap.

This device does not preserve the original altitude data.

This device is single-threaded.
This device requires 0 additional datamap memory allocations.

Transform: Smear

Smear the datamap pixels horizontally.



Smear X: The datamap X coordinate to smear across the entire width.

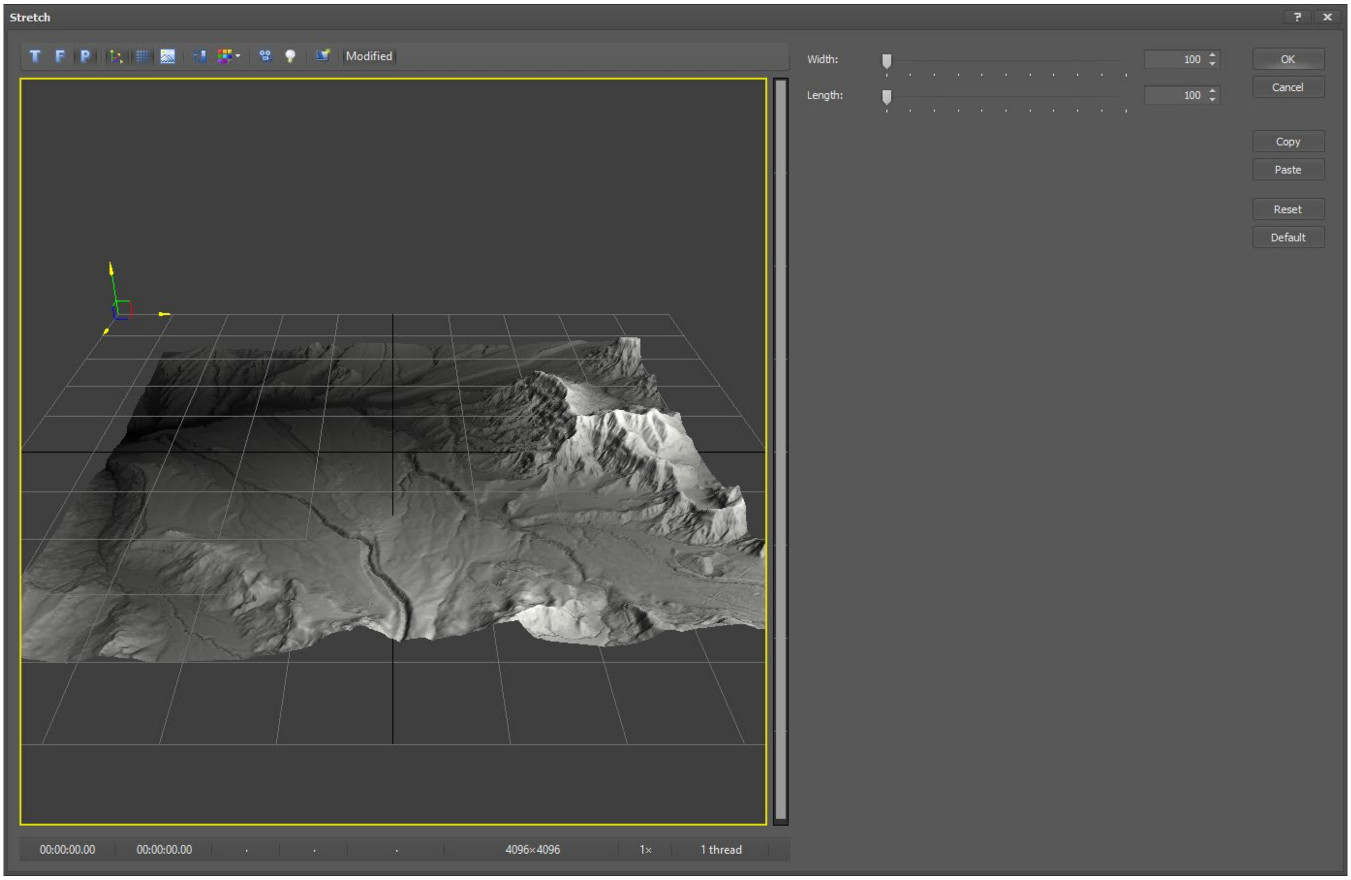
Notes

This device does not preserve the original altitude data.

This device is multi-threaded.
This device requires 0 additional datamap memory allocations.

Transform: Stretch

Stretch the datamap on the X and Y axes.



Width: The amount to stretch the X axis, 100% to 500%.
Length: The amount to stretch the Y axis, 100% to 500%.

Notes

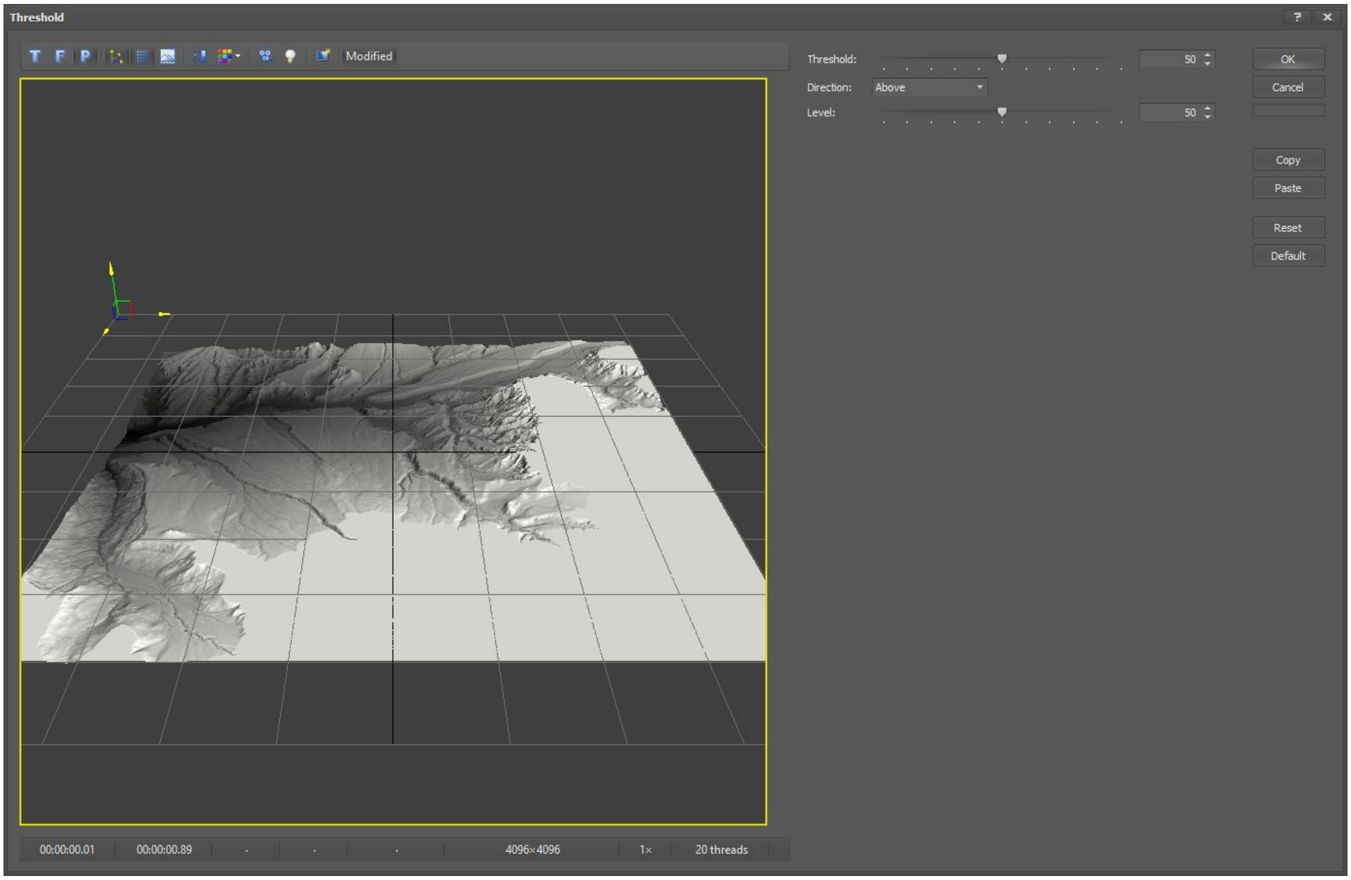
A similar effect with a wider range of stretching can be achieved by using the Resample device.

This device does not preserve the original altitude data.

This device is single-threaded.
This device requires 0 additional datamap memory allocations.

Transform: Threshold

Adjust the altitude levels up or down above or below the specified threshold altitude.



Threshold: The threshold altitude where everything specified by Direction is set to Level.

Direction: The direction that the Level property affects.
- Above: every altitude above Threshold is set to Level.
- Below: every altitude below Threshold is set to Level.

Level: The new altitude level.

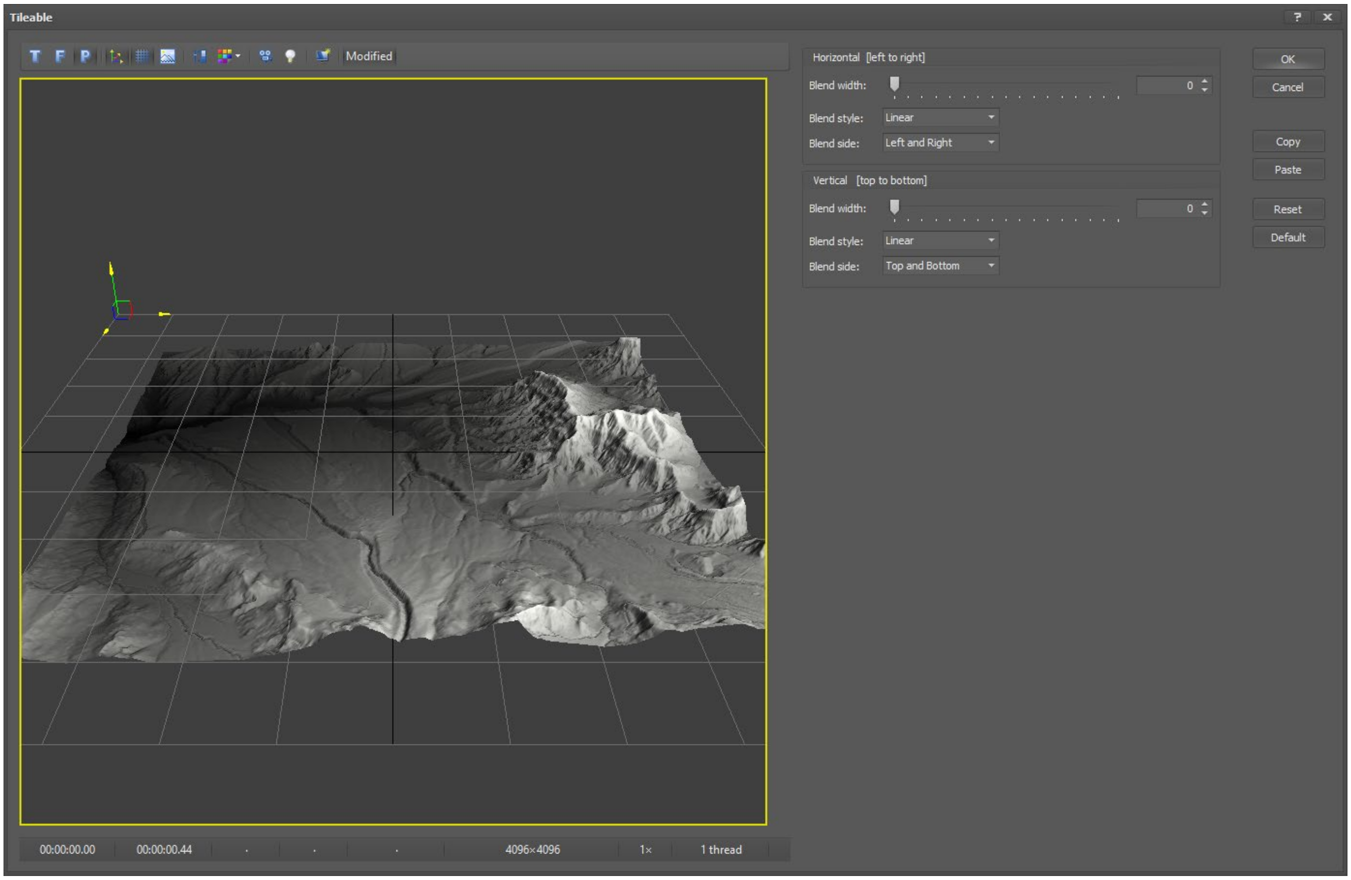
Notes

This device does not preserve the original altitude data.

This device is multi-threaded.
This device requires 0 additional datamap memory allocations.

Transform: Tileable

Modify the edges of a datamap so that it becomes tileable.



Blend width: The number of pixels to use along the Horizontal/Vertical axis for blending the edges.

Blend style: The blend style:
- Linear = a linear ramp blend.
- Curved = a curved ramp blend.

Blend side: Whether to blend the left, right, top, or bottom sides.

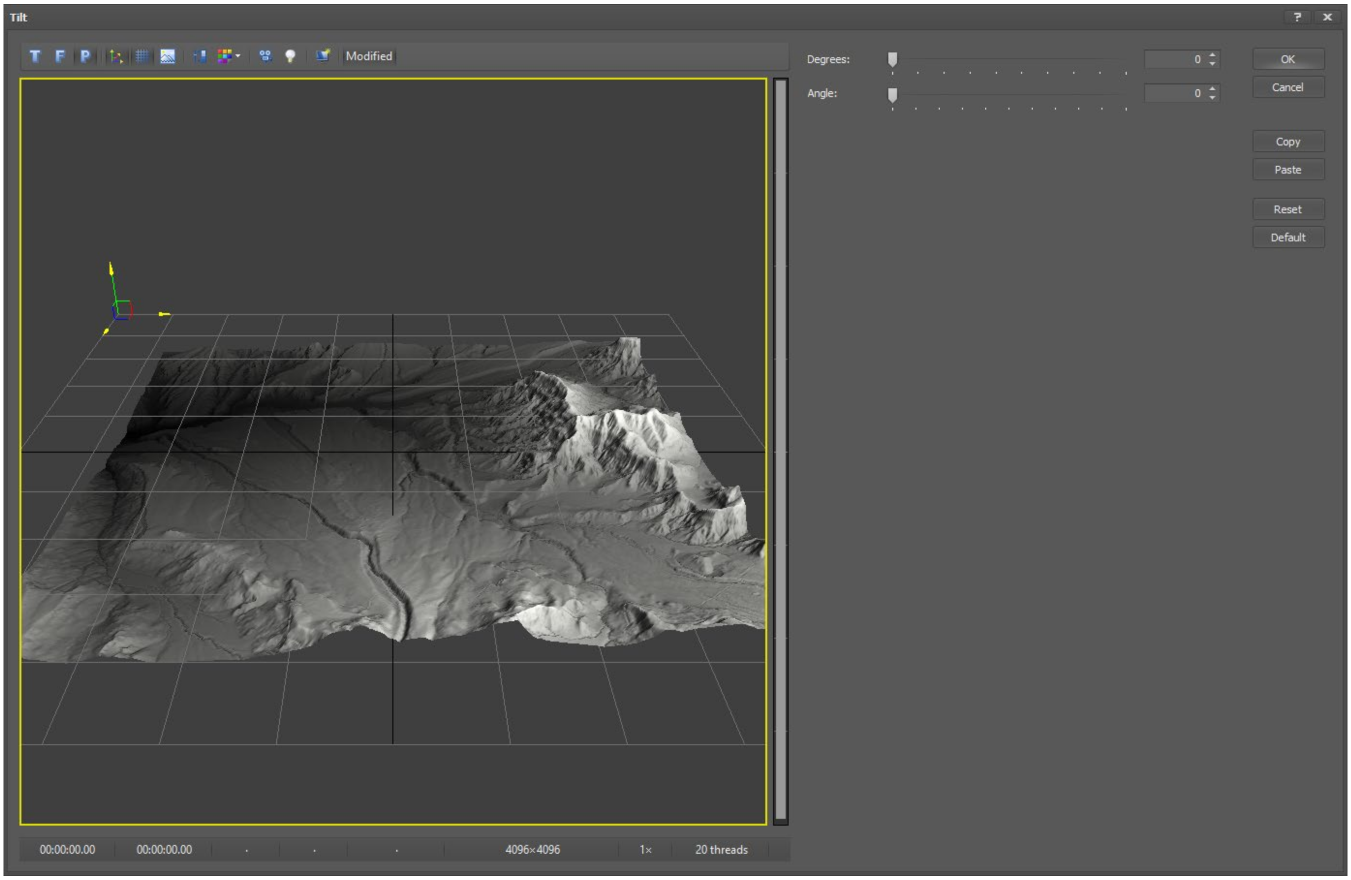
Notes

This device does not preserve the original altitude data.

This device is single-threaded.
This device requires 1 additional datamap memory allocation.

Transform: Tilt

Tilt the datamap at an angle on the specified rotation degrees.



Degrees: The tilt degrees, 0 to 360.

Angle: The tilt angle.

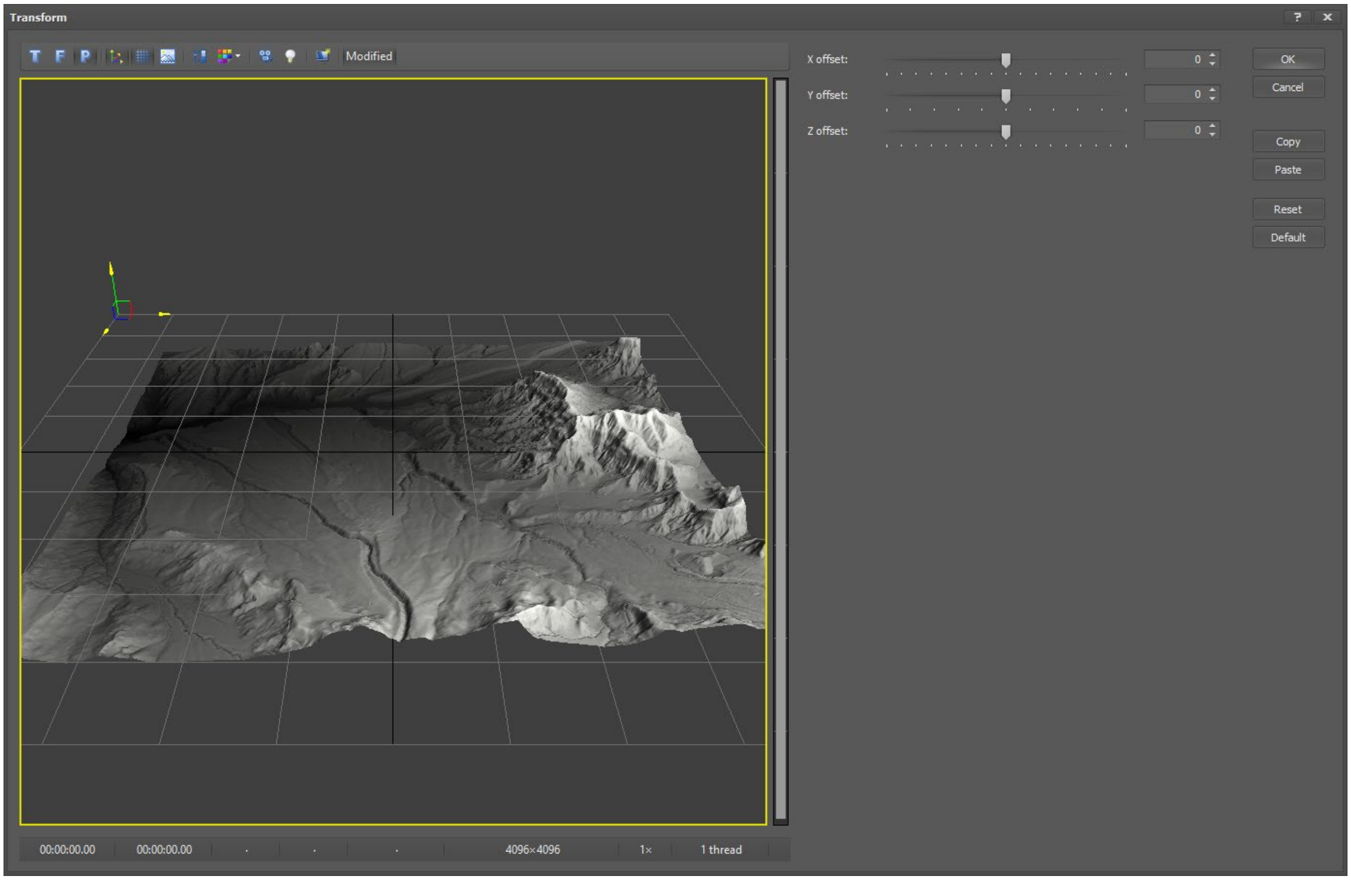
Notes

This device does not preserve the original altitude data.

This device is multi-threaded.
This device requires 1 additional datamap memory allocation.

Transform: Transform

Transform (move) the datamap on the X, Y, and Z axes.



X offset:	The amount to offset on the X axis.
Y offset:	The amount to offset on the Y axis.
Z offset:	The amount to offset on the Z axis.

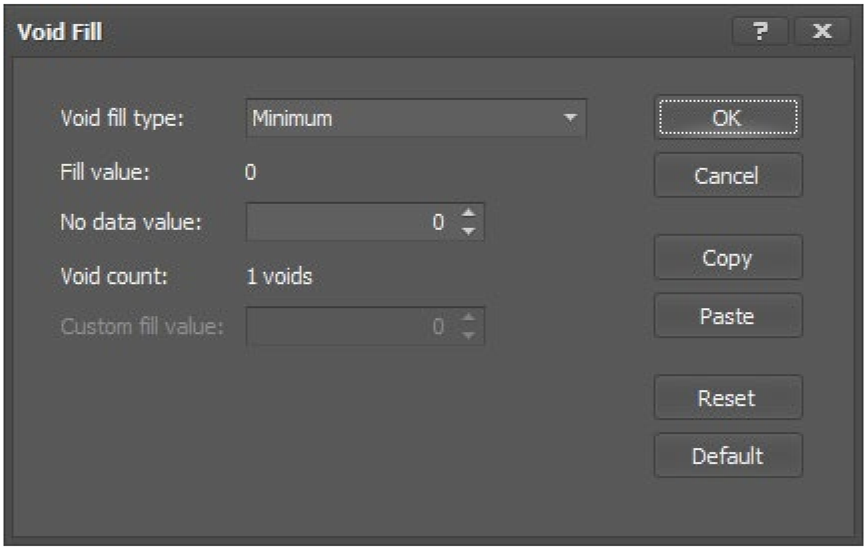
Notes

This device does not preserve the original altitude data.

This device is single-threaded.
This device requires 1 additional datamap memory allocation.

Transform: Void Fill

Fill Digital Elevation Model voids in the datamap.



Void fill type:	The void fill type. - Minimum: fill voids with the value 0.0. - Center: fill voids with the value 50.0. - Maximum: fill voids with the value 100.0. - Low value: fill voids with the low value of the heightmap. - Middle value: fill voids with the middle value of the heightmap. - High value: fill voids with the high value of the heightmap. - Blend Edge: fill voids with a smoothening blur. - Fill Holes: fill voids using a multi-directional hole fill, this typically has the best results. - Linear Interpolation 1 Horizontal: fill voids using horizontal line interpolation. - Linear Interpolation 2 Horizontal and Vertical: fill voids using line interpolation. - Linear Interp Smooth: fill voids using a smoothed line interpolation. - Proxy Heightmap: fill voids from a lower resolution proxy heightmap of the same region. - Custom: fill voids with the custom specified value.
Fill value:	The void fill value for single value fill types.
No data value:	The void or no-data value to fill.
Void count:	The number of voids found in the datamap.
Custom fill value:	The custom void fill value.

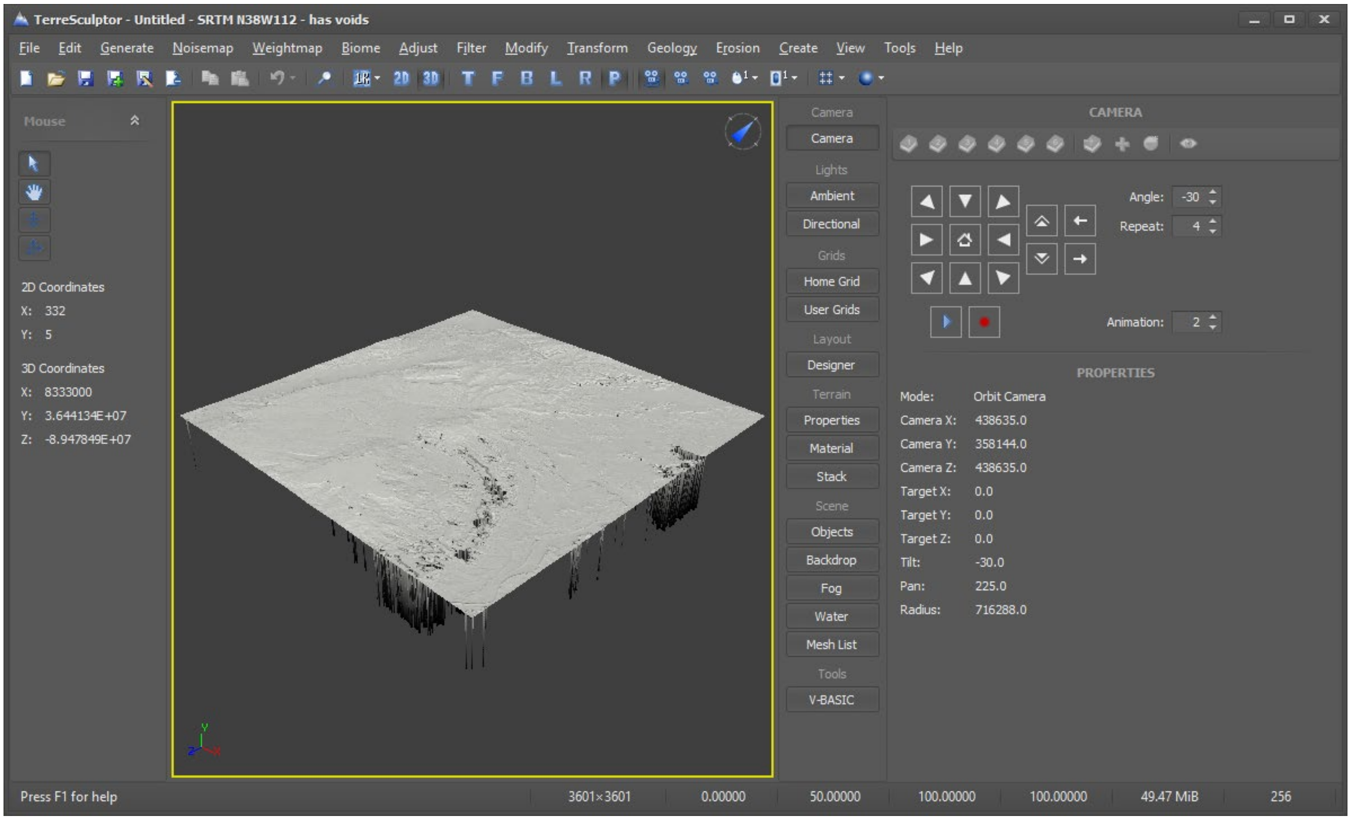
Notes

This device does not preserve the original altitude data.

This device is single-threaded.
This device requires 1 additional datamap memory allocation for some of the void fill algorithms.

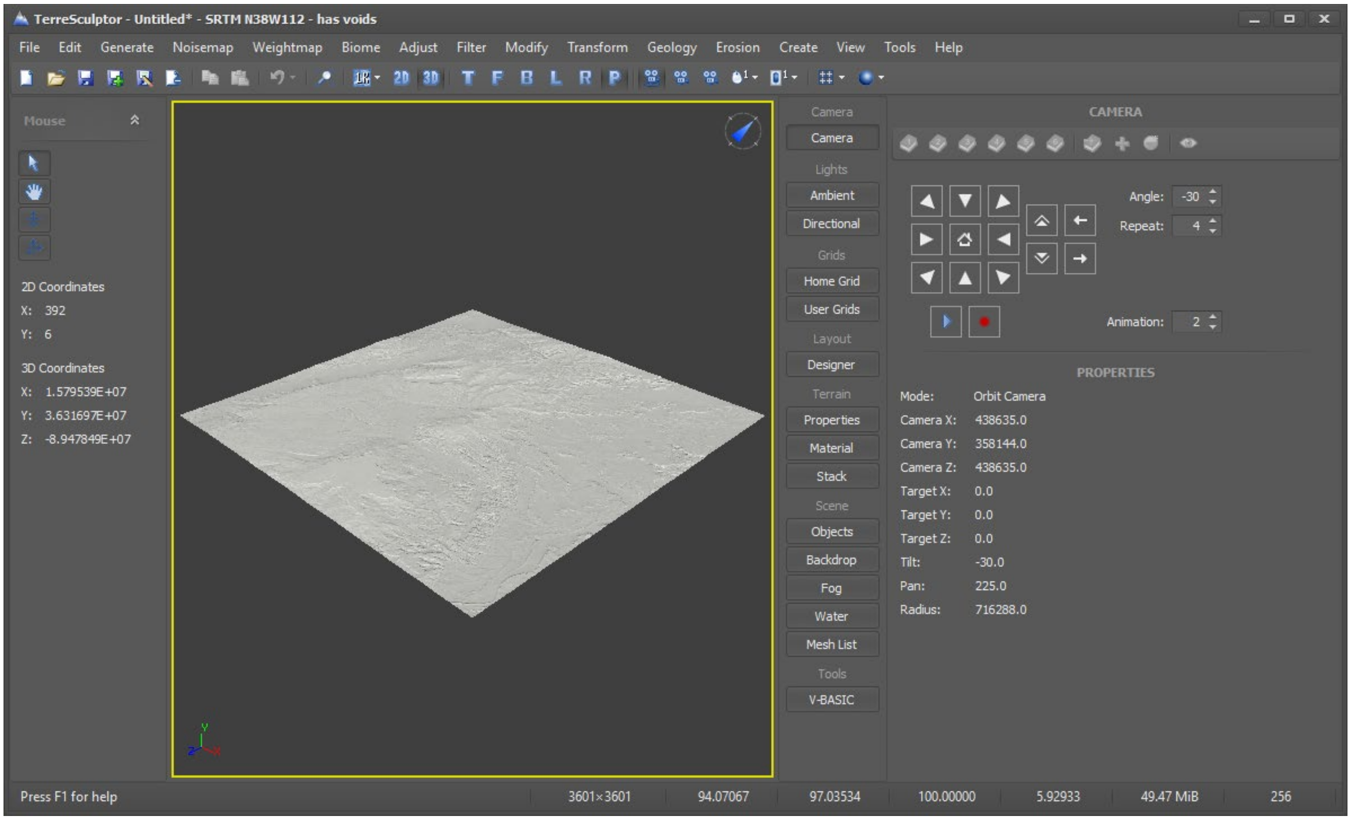
Example Void Filled Heightmap

This example real-world digital elevation model has a large number of small void holes in it where the elevation data was not collected. These voids can be filled using TerreSculptor's Void Fill features, either during Import or using the Void Fill Device on the Transform menu. The voids typically appear as tiny spikes shooting down below the terrain, and the terrain region is very flat due to the voids.

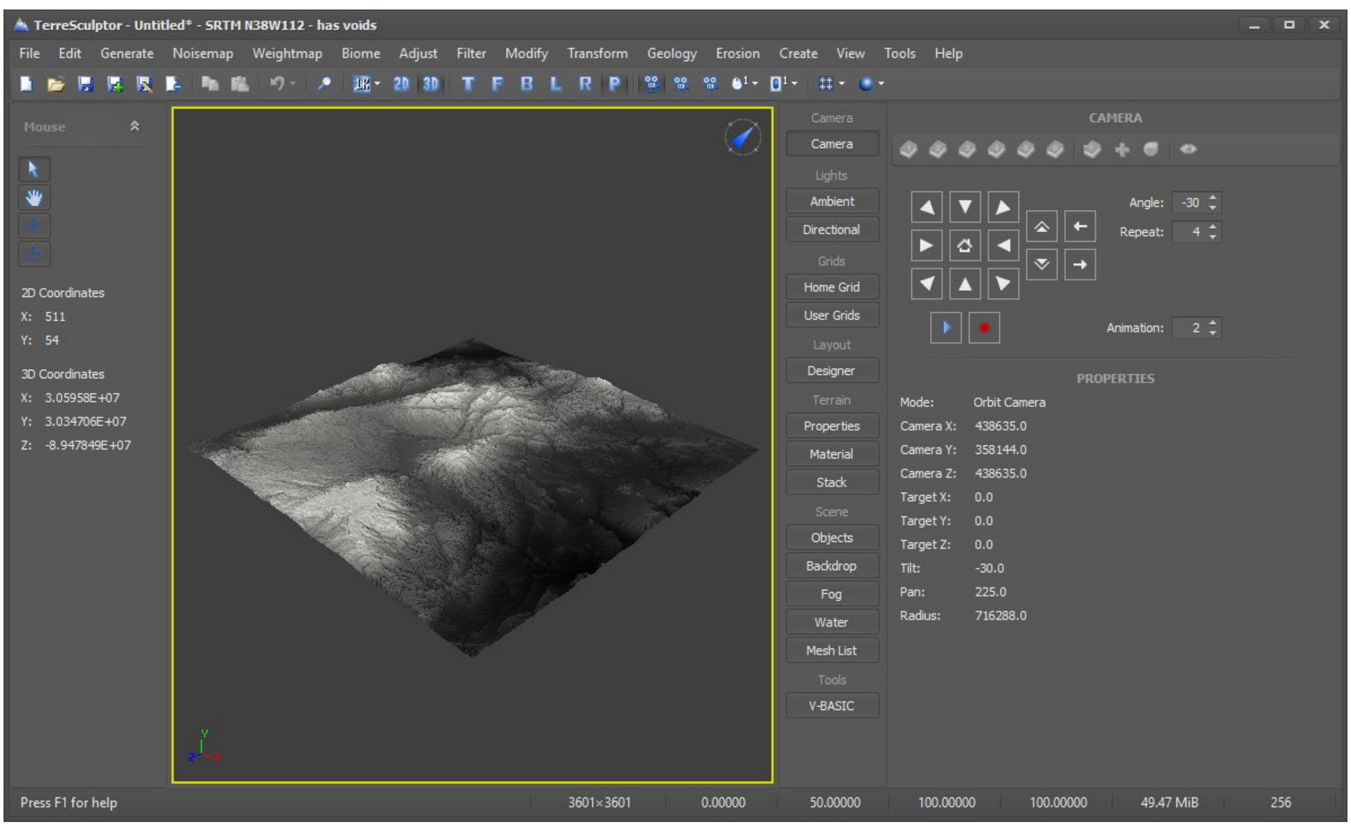


Using a Void Fill algorithm such as Fill Holes would be the best on this example, but other algorithms such as Linear Interpolation 2 H+V will also work.

The heightmap after performing a Fill Holes void fill.
The downward spikes are no longer present.

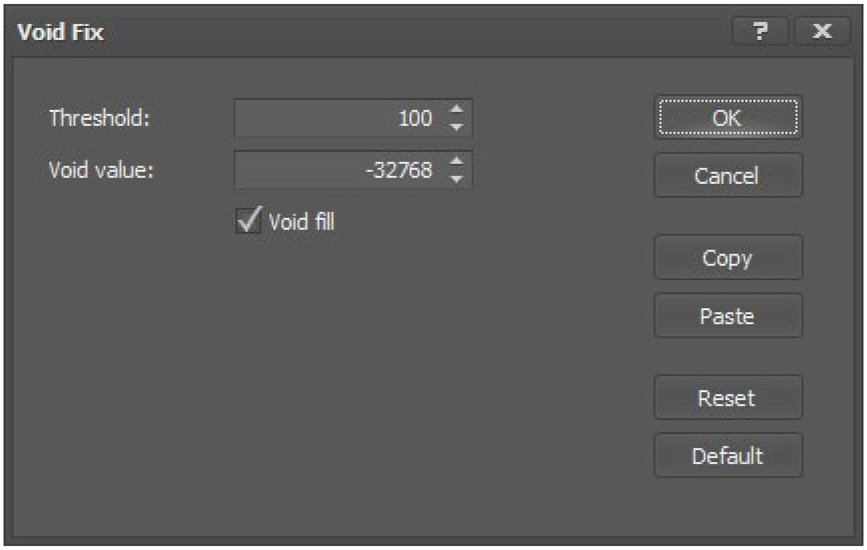


The heightmap can then be Normalized to recover the original elevation range.



Transform: Void Fix

Fix the Digital Elevation Model voids in the datamap.
This device fixes voids from the Mapper DEM Explorer, where the voids are all uneven random-ish values.
This device works by changing all void values within the threshold to the void value and then performs a void fill.



Threshold:	The void value threshold, for example 25 would be Void value +/- 25.0.
Void value:	The void value in the datamap. This will typically be between 0.0 and 100.0.
Void fill:	Perform a default Fill Holes Void Fill after the Void Fix.

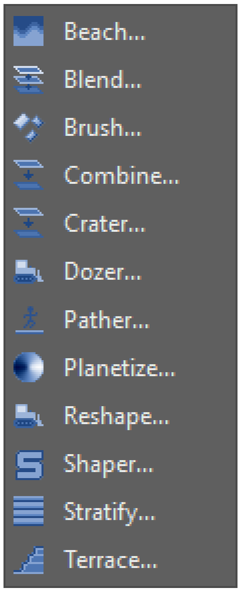
Notes

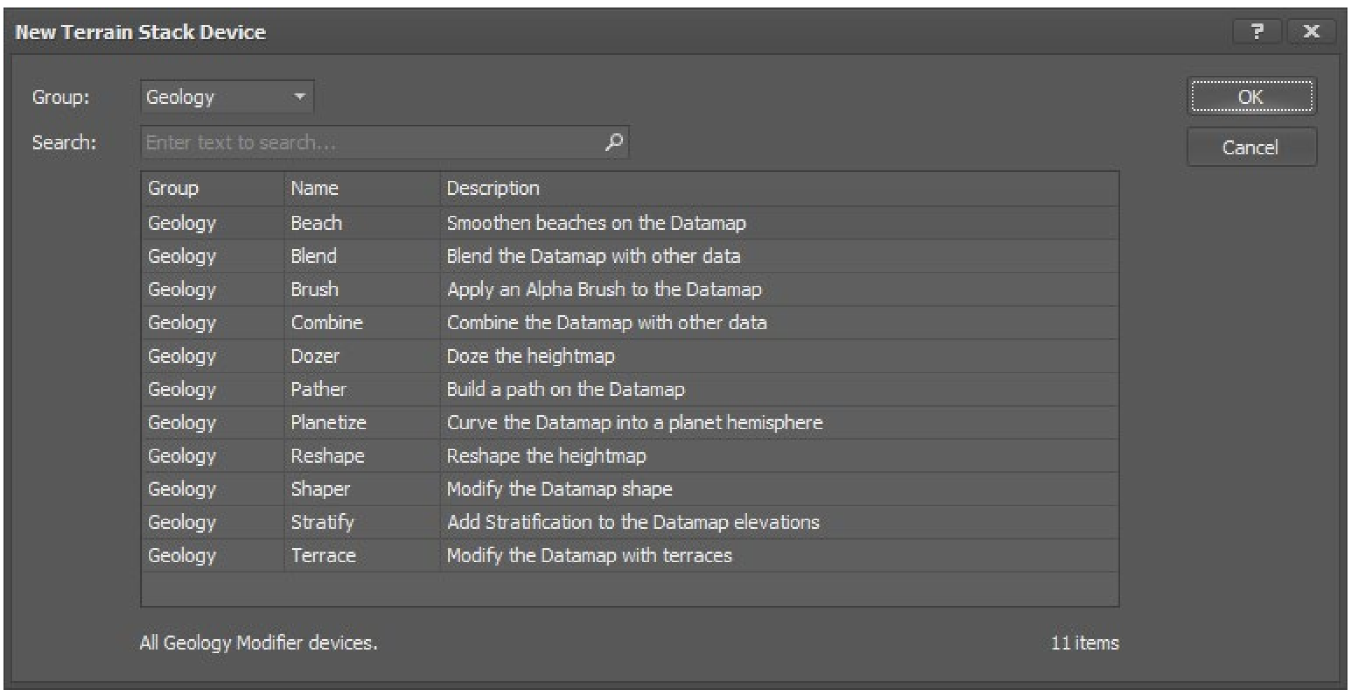
This device does not preserve the original altitude data.

This device is single-threaded.
This device requires 1 additional datamap memory allocation for some of the void fill algorithms.

Geology Menu: Devices

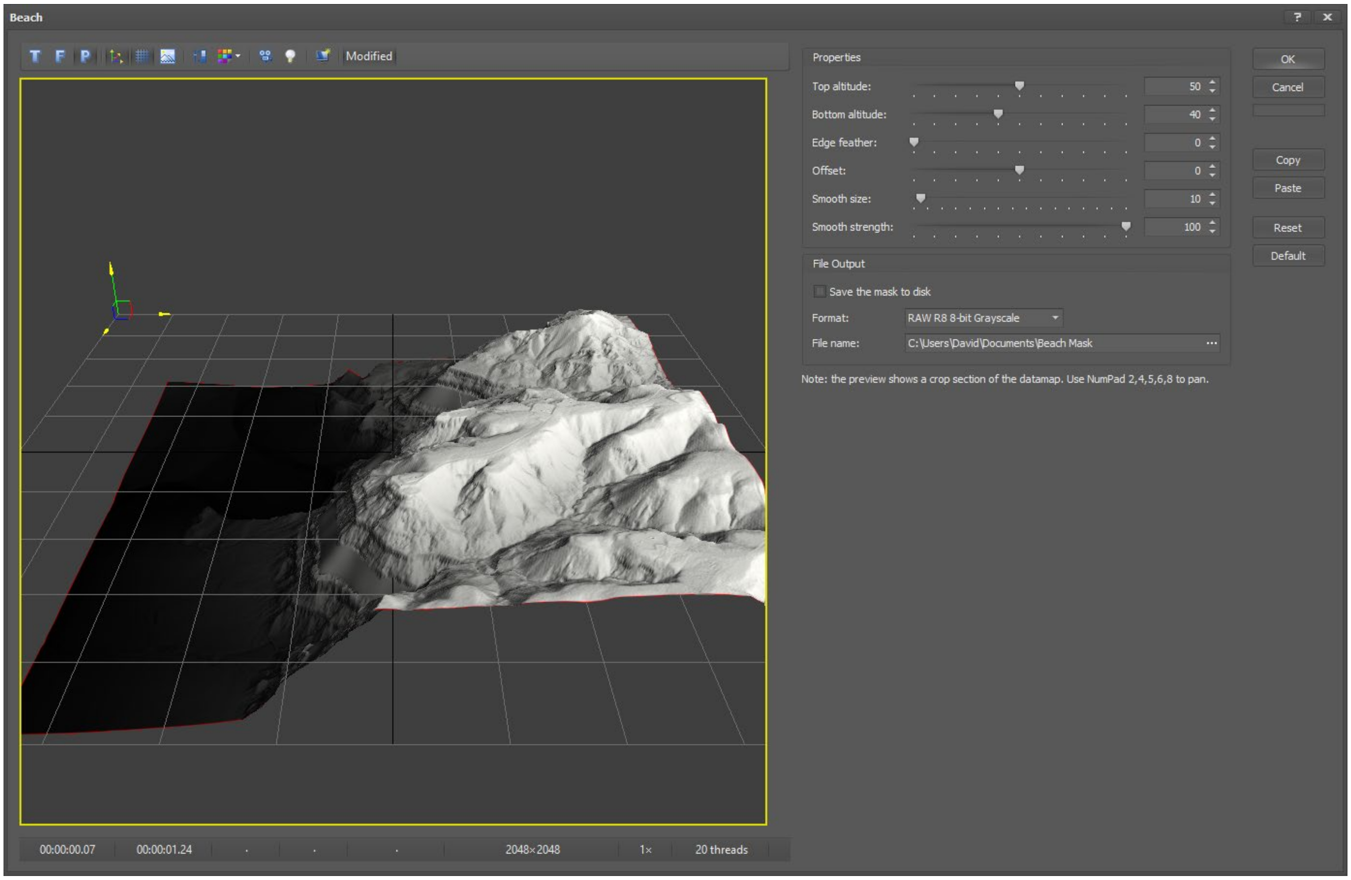
The Geology menu contains devices that modify the heightmap or mask datamap.





Geology: Beach

Smoothen the datamap along the beach elevation range.



Properties

Top altitude: The top altitude of the beach region.
Bottom altitude: The bottom altitude of the beach region.

Edge feather: The amount to feather the beach smoothing along the region edges.

Offset: The amount to vertically offset the beach region.

Smooth size: The beach region smooth size.
Smooth strength: The beach region smooth strength.

File Output

Optionally save the beach mask to a file.

Notes

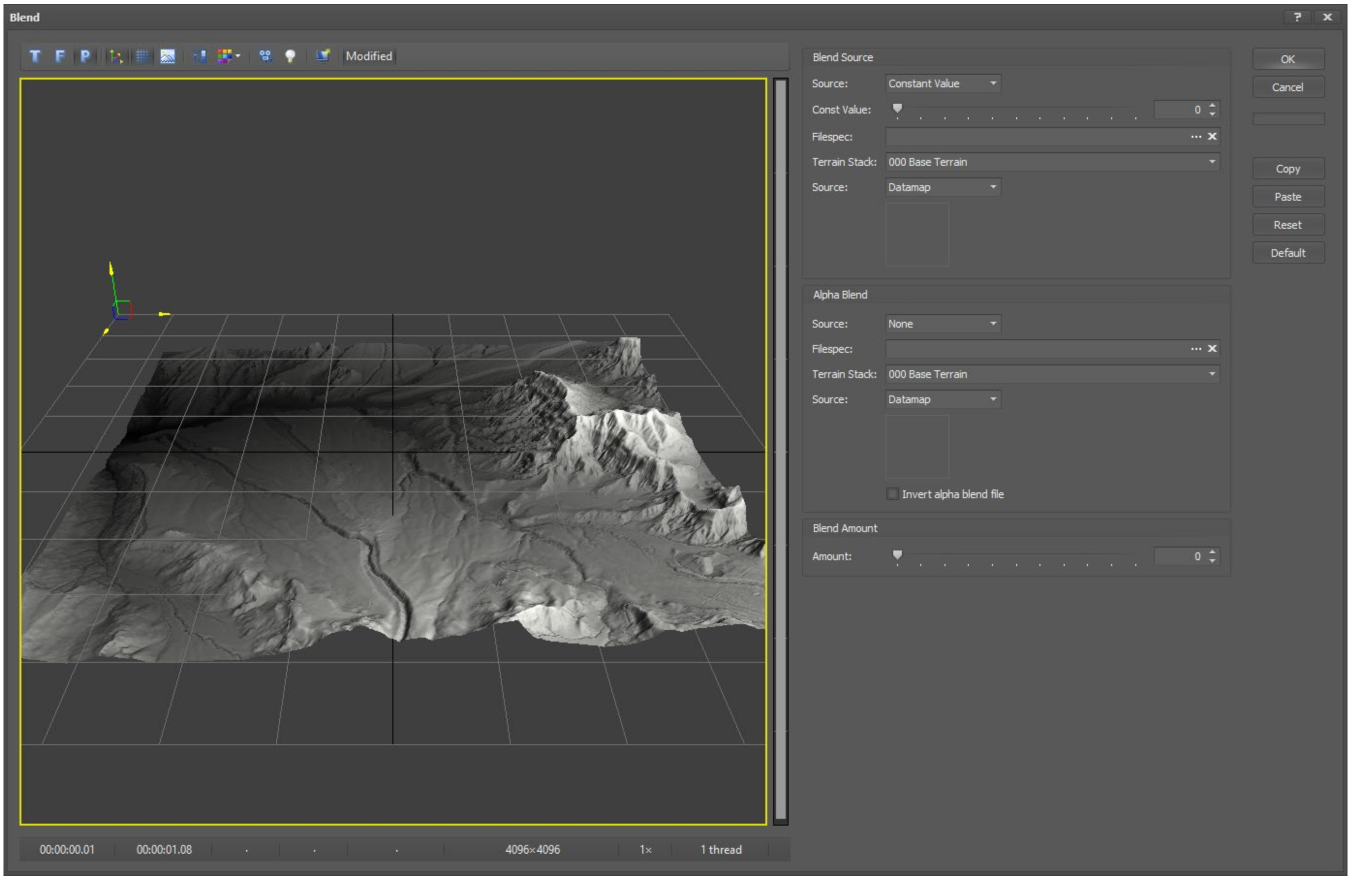
The beach mask can also be accessed on the Terrain Stack.

This device does not preserve the original altitude data.

This device is multi-threaded.
This device requires 2 additional datamap memory allocations.

Geology: Blend

Blend a datamap with a constant value, an external file, or a Terrain Stack item.



Blend Source

Source:	The blend source. - Constant Value: Blend with the specified Constant Value. - External File: Blend with the specified Filespec. - Terrain Stack: Blend with the specified Terrain Stack item datamap.
Const Value:	Blend with the specified constant value. This typically flattens the datamap.
Filespec:	Blend with the specified external file specification.
Terrain Stack:	Blend with the specified Terrain Stack item datamap.
Source:	The Terrain Stack source: Datamap, Mask, ResultMaskA, ResultMaskB.

Alpha Blend

Source:	Blend using an alpha mask so that only a portion of the source files are affected. - External File: Alpha blend with the specified Filespec. - Terrain Stack: Alpha blend with the specified Terrain Stack item datamap.
Filespec:	Alpha blend with the specified external file specification.
Terrain Stack:	Alpha blend with the specified Terrain Stack item datamap.
Source:	The Terrain Stack source: Datamap, Mask, ResultMaskA, ResultMaskB.
Invert alpha blend file:	Invert the alpha blend mask.

Blend Amount

Amount: The amount to blend, this is a percentage of the source datamap and the blend datamap.

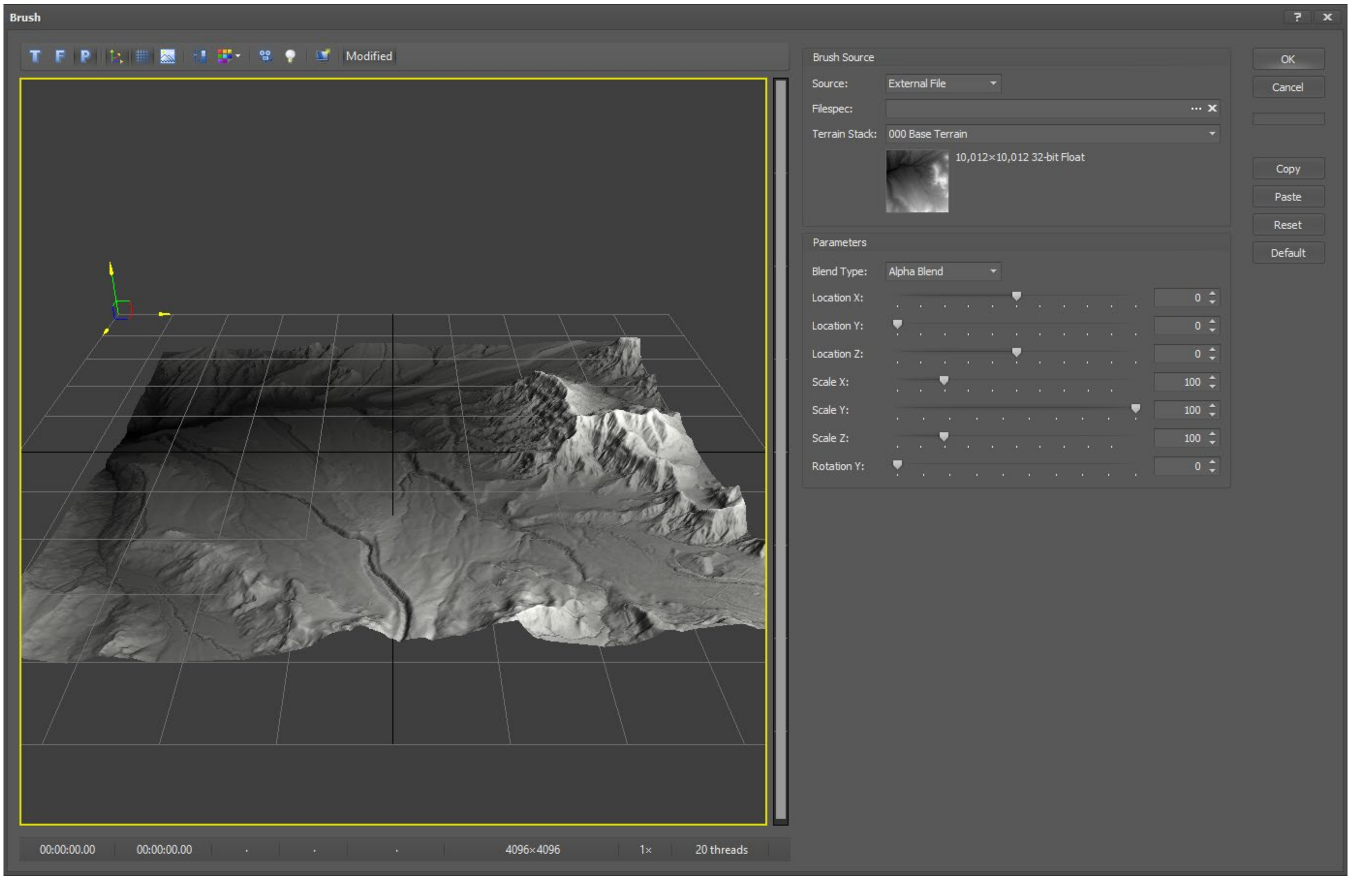
Notes

This device does not preserve the original altitude data.

This device is single-threaded.
This device requires 0 additional datamap memory allocations.

Geology: Brush

“Stamp” an Alpha Brush shape onto the current datamap.



Brush Source

Source:	The brush datamap source. - External File: load an external file from disk. - Terrain Stack: reference a datamap on the terrain stack.
Filespec:	The brush filespec to load.
Terrain Stack:	The terrain stack item index reference.

Parameters

Blend Type:	The brush blend type. - Alpha Blend: use the brush color as a alpha value. - IfHigher Blend: blend based on which pixel is higher.
Location X:	The brush location on the X axis.
Location Y:	The brush location on the Y axis.
Location Z:	The brush location on the Z axis.
Scale X:	The brush scale on the X axis.
Scale Y:	The brush scale on the Y axis.
Scale Z:	The brush scale on the Z axis.
Rotation Y:	The brush rotation on the Y axis.

Note that a fast rotation algorithm is used during preview which is a lower visual resolution.

Notes

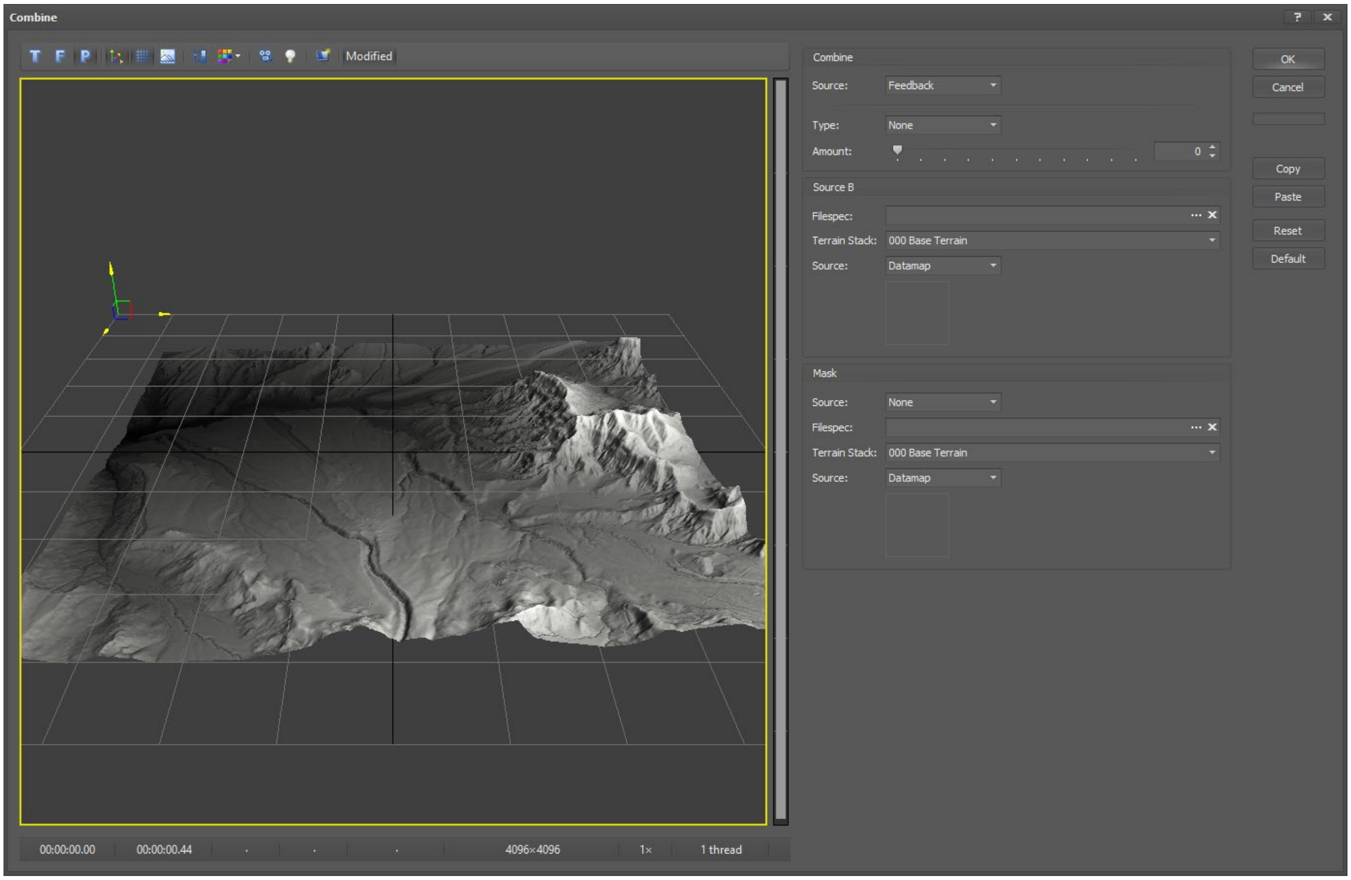
See the Google Asset Drive folder for a text file with links to hundreds of free alpha brushes of mountains and other geological features.

This device does not preserve the original altitude data.

This device is multi-threaded.
This device requires 1 additional datamap memory allocation.

Geology: Combine

Combine the datamap using a large number of blending algorithms.



Combine

Source: The combine source.
- Feedback: feed the datamap file back onto itself.
- External File: combine with the specified external file.
- Terrain Stack: combine with the terrain stack item datamap.

Type: The combine type. This drop-down contains a large number of mathematical combinations.

Amount: The combine amount

Source B

Filespec: Combine the current datamap with the file specification.

Terrain Stack: Combine the current datamap with the terrain stack item datamap.

Source: The terrain stack source datamap.

Mask

Source: The mask combine type source.

Filespec: The mask file specification.

Terrain Stack: The mask terrain stack item datamap.

Source: The terrain stack source datamap.

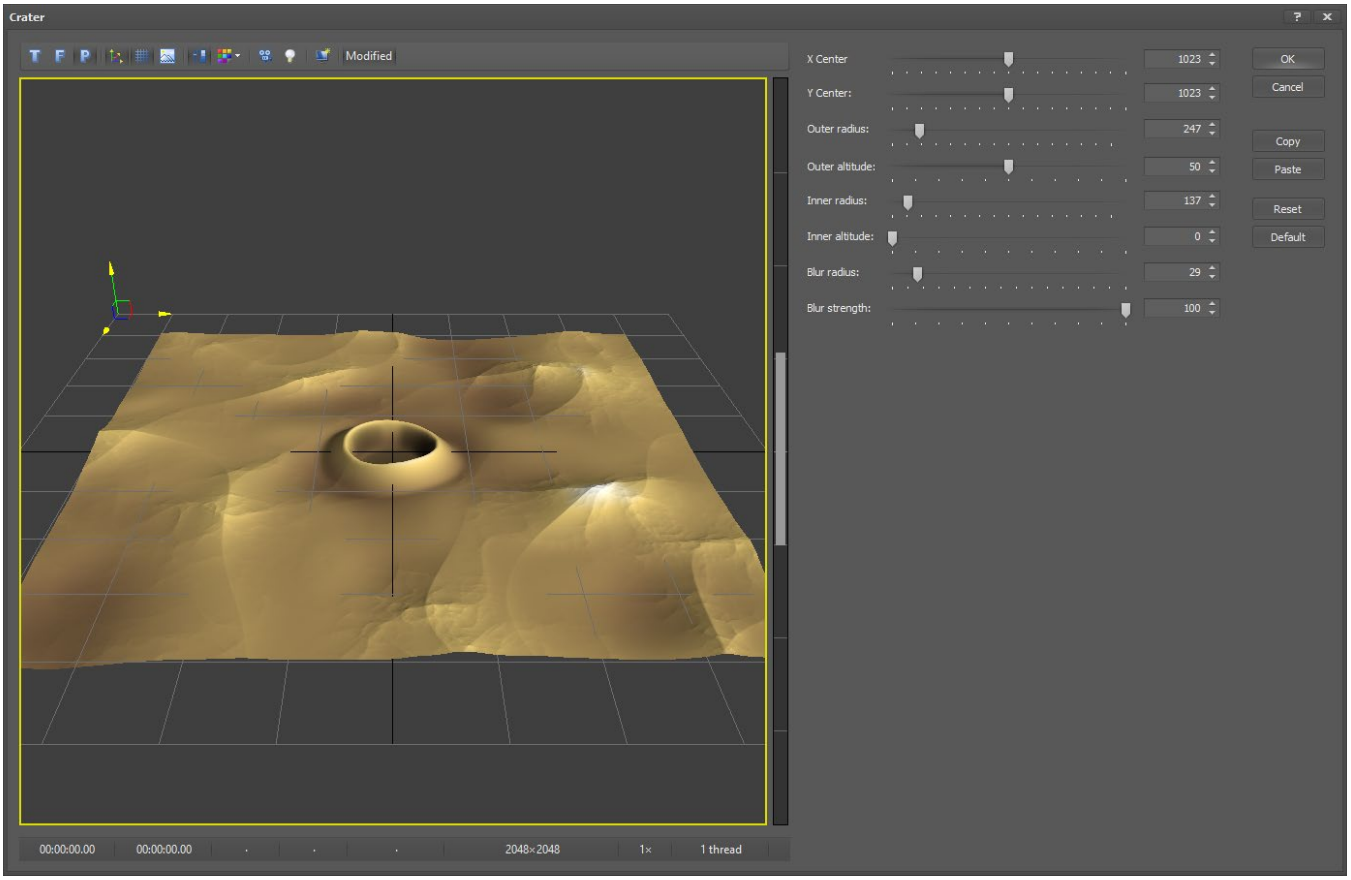
Notes

This device does not preserve the original altitude data.

This device is single-threaded.
This device requires 0 additional datamap memory allocations.

Geology: Crater

Add a crater to the datamap heightmap.



X Center:	The crater X axis center.
Y Center:	The crater Y axis center.
Outer Radius:	The crater outer ring radius.
Outer Altitude:	The crater outer ring altitude.
Inner Radius:	The crater inner hole radius.
Inner Altitude:	The crater inner hole altitude.
Blur Radius:	The crater smoothening blur radius.
Blur Strength:	The crater smoothening blur strength.

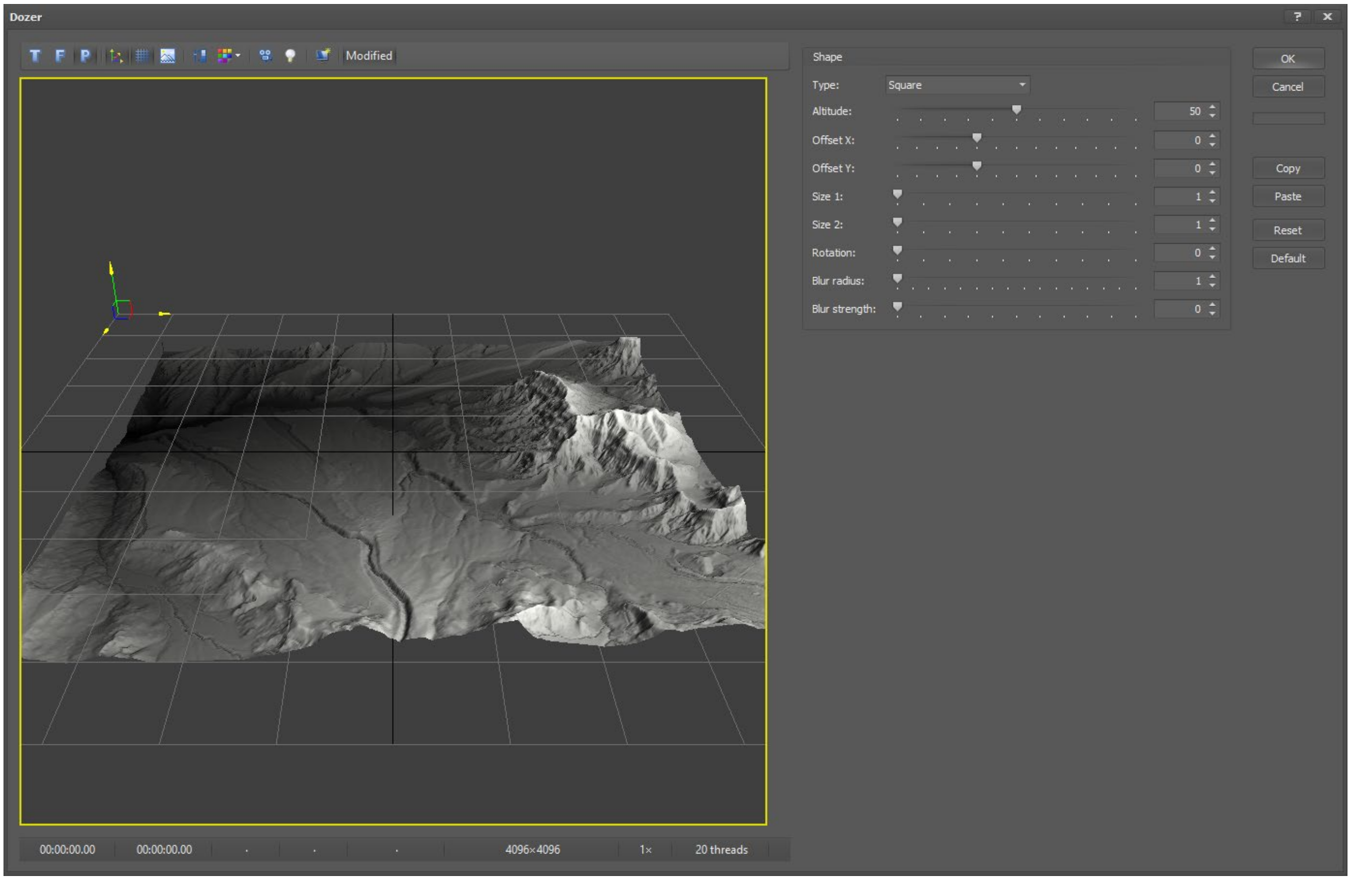
Notes

This device does not preserve the original altitude data.

This device is single-threaded.
This device requires 1 additional datamap memory allocations.

Geology: Dozer

Create a bulldozer flattened shape on a datamap for a platform or base or road etc.
Dozer is similar to Reshape but uses a slightly different algorithm.



Type:	The dozer shape type: Circle Diamond Square Rectangle Triangle
Altitude:	The elevation altitude of the bulldozed region.
Offset X:	The dozer region X coordinate.
Offset Y:	The dozer region Y coordinate.
Size 1:	The region size 1.
Size 2:	The region size 2.
Rotation:	The region rotation in degrees.
Blur radius:	Blur the edge of the region.
Blur strength:	Blur strength.

Notes

This device does not preserve the original altitude data.

This device is multi-threaded.
This device requires 1 additional datamap memory allocations.

Geology: Pather

Create a flattened path along the edge of a datamap for the use as a side-scroller terrain.

Top offset: The flattened path top coordinate.

Left offset: The flattened path left coordinate.

Width: The flattened path width.

Length: The flattened path length.

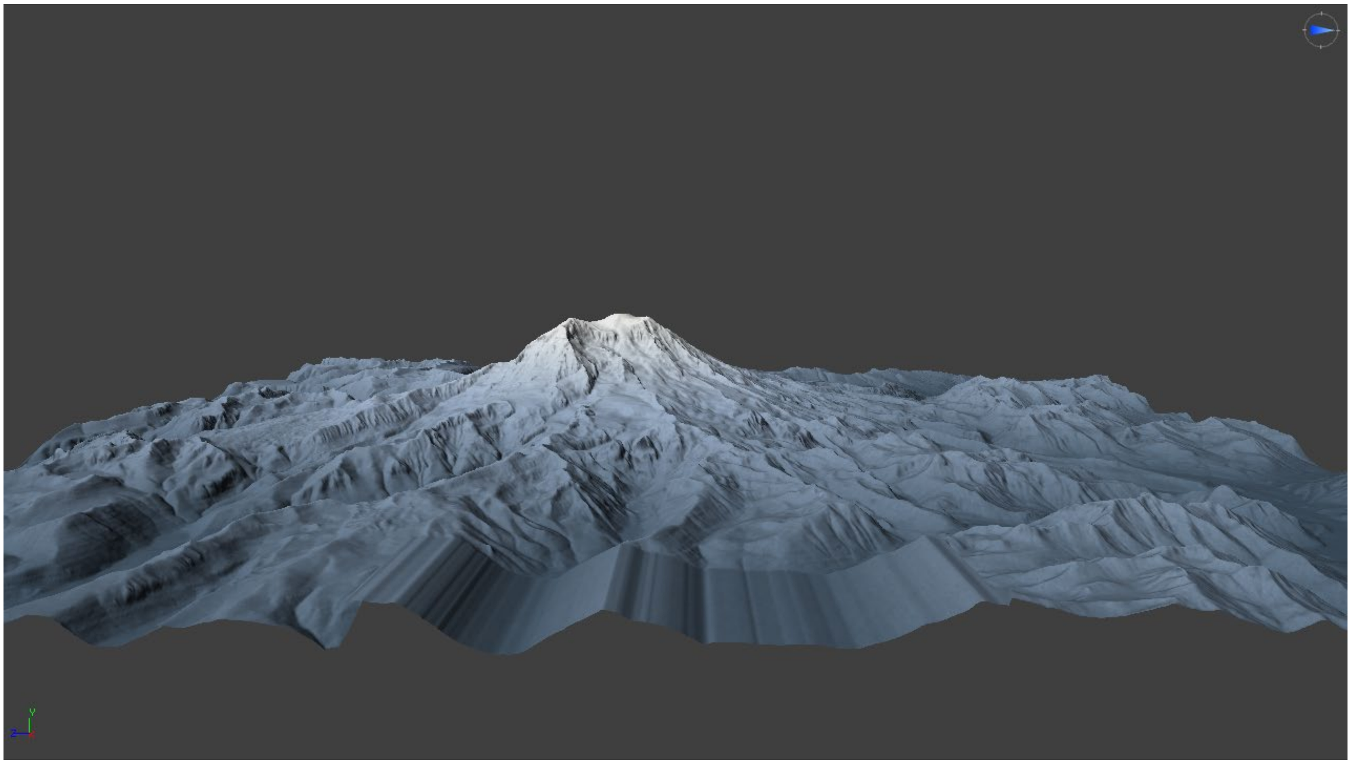
Type: The path flattening type.
- Average: use the average of the left and right pixel altitude.
- Left: flatten flatten the path using the left pixel altitude.
- Right: flatten the path using the right pixel altitude.

Notes

This device does not preserve the original altitude data.

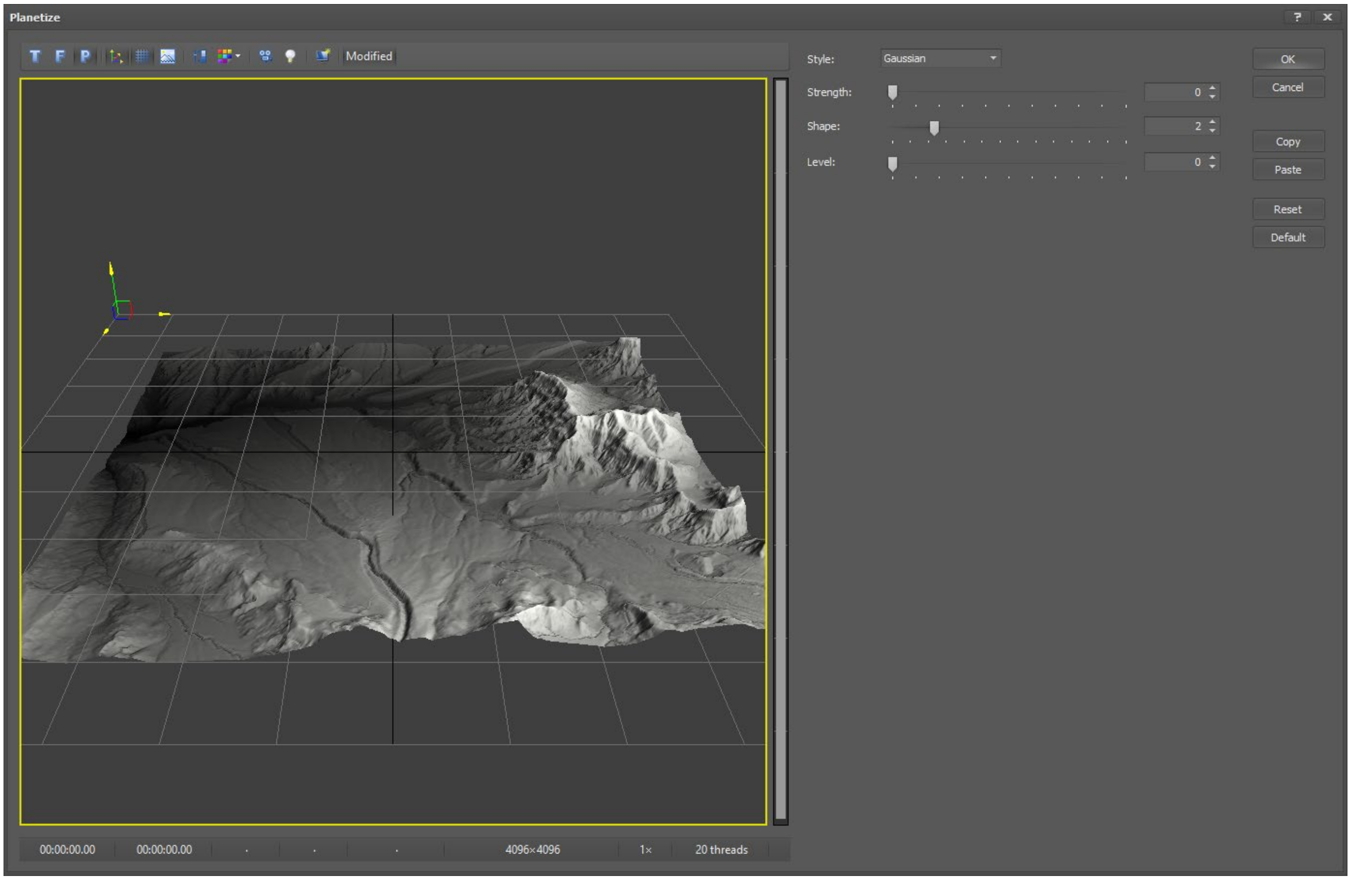
This device is single-threaded.
This device requires 0 additional datamap memory allocations.

An example of the pather creating a flattened wide path along the edge of a heightmap for use in a side-scroller video game.



Geology: Planetize

Applies a curve to the datamap surface to round it like a section from a planet or inverted like a crater or bowl.



Style:	The curve style: - Gaussian = a gaussian curve. - Radial = a radial curve. - Gaussian inverted = an inverted gaussian curve. - Radial inverted = an inverted radial curve.
Strength:	The curve strength.
Shape:	The curve shape.
Level:	The base terrain altitude level.

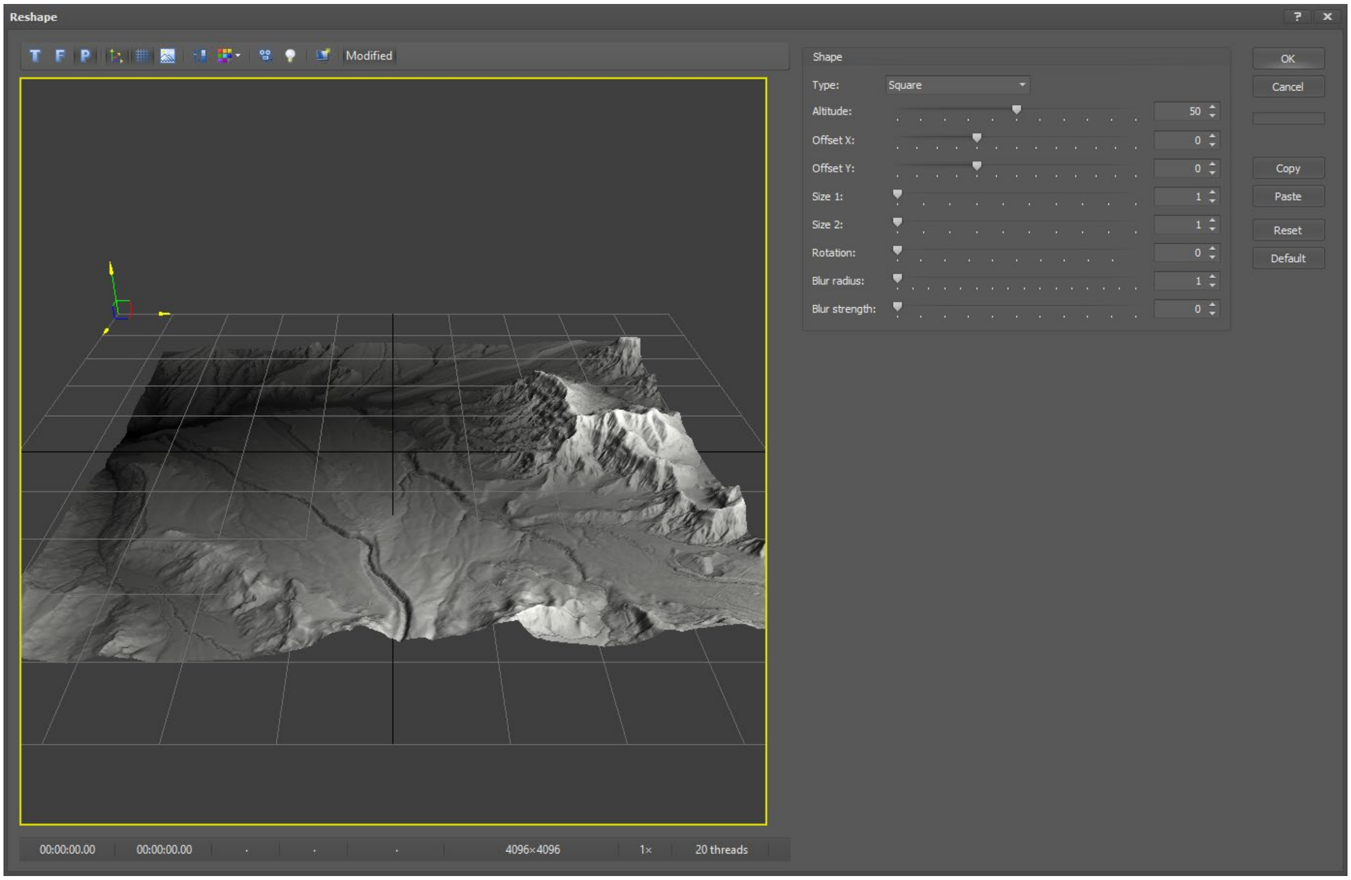
Notes

This device does not preserve the original altitude data.

This device is multi-threaded.
This device requires 1 additional datamap memory allocation.

Geology: Reshape

Create a bulldozer flattened shape on a datamap for a platform or base or road etc.
Reshape is similar to Dozer but uses a slightly different algorithm.



Type:	The reshape type: Circle Diamond Square Rectangle Triangle
Altitude:	The elevation altitude of the bulldozed region.
Offset X: Offset Y:	The dozer region X coordinate. The dozer region Y coordinate.
Size 1: Size 2:	The region size 1. The region size 2.
Rotation:	The region rotation in degrees.
Blur radius: Blur strength:	Blur the edge of the region. Blur strength.

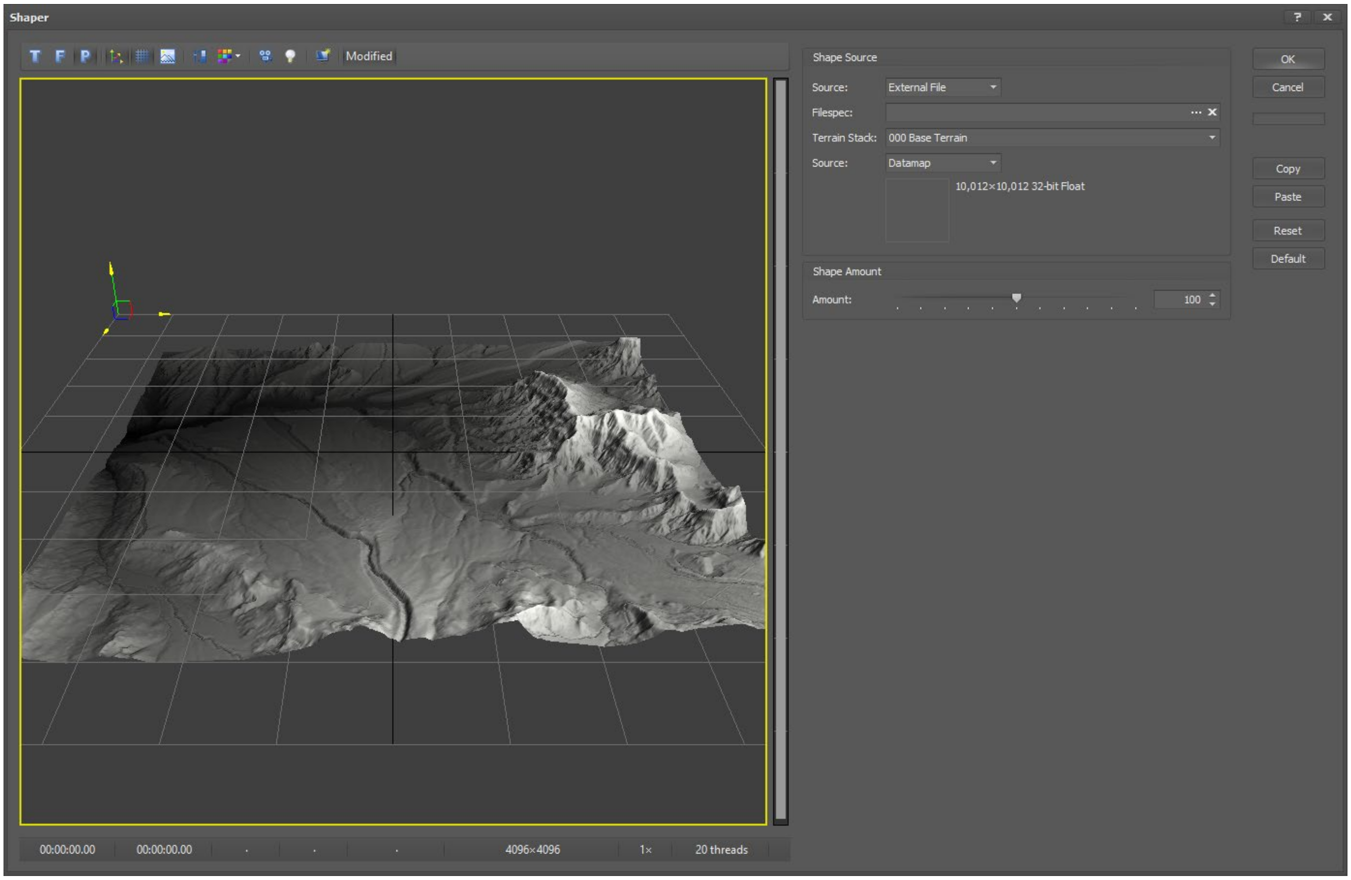
Notes

This device does not preserve the original altitude data.

This device is multi-threaded.
This device requires 1 additional datamap memory allocations.

Geology: Shaper

Use a mask to create an island shape.



Shape Source

Source: The shaper mask source.
External File: use an external file as the mask source.
Terrain Stack: use a terrain stack item datamap as the mask source.

Filespec: The shaper mask source file specification.

Terrain Stack: The shaper mask source terrain stack index datamap.

Source: The terrain stack datamap source.

Shape Amount

Amount: The blend amount for the shaper mask.

Notes

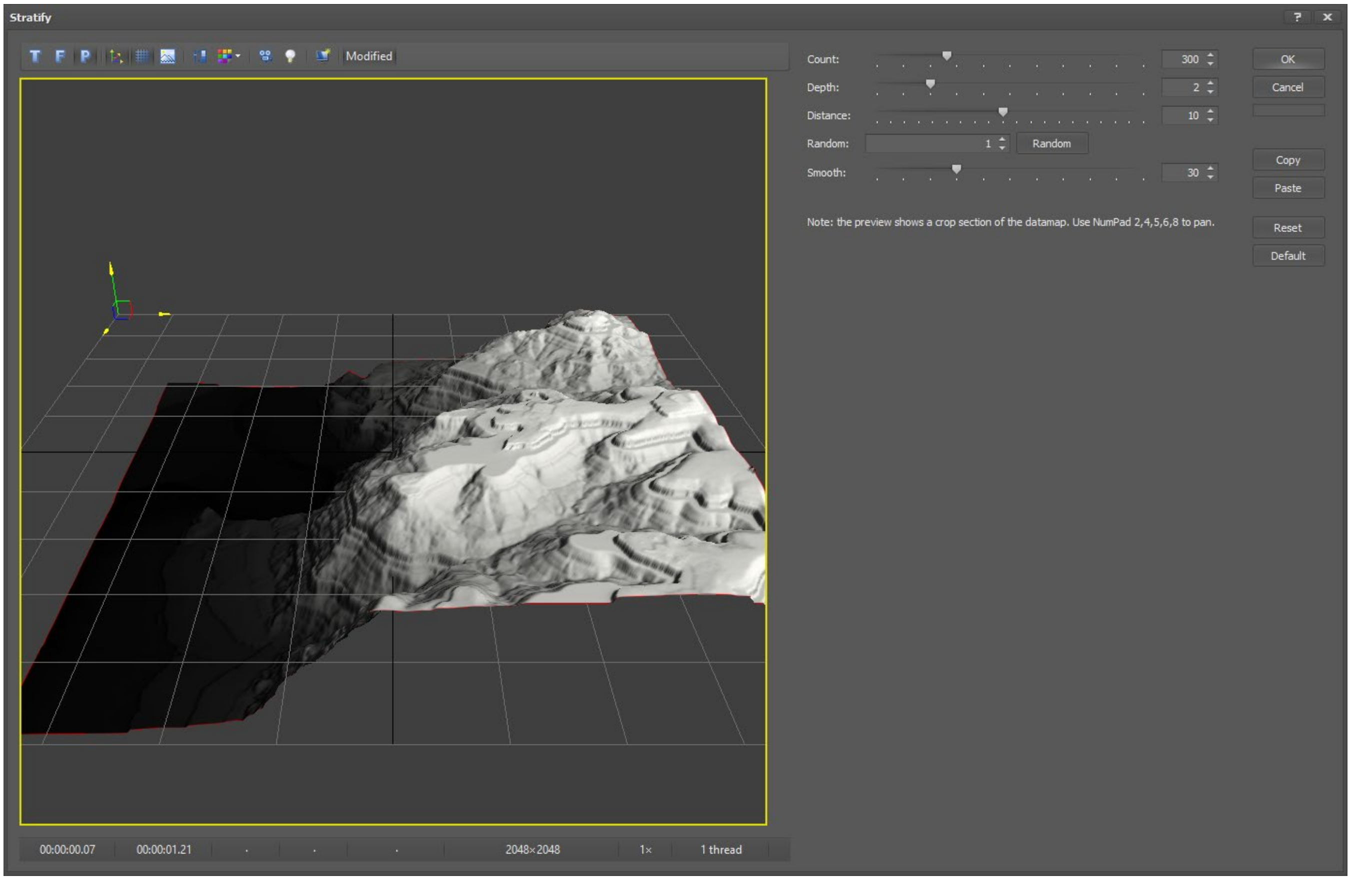
A mask file can be created in external software such as Photoshop. The external file should be the same dimensions as the main editor datamap, it will be resampled if it is a different size.
A Generator Filled Shape can be distorted and used as a Terrain Stack datamap item for the mask source.

This device does not preserve the original altitude data.

This device is multi-threaded.
This device requires 0 additional datamap memory allocations.

Geology: Stratify

Create rock face stratification on the datamap.



Count:	The number of stratification levels. This determines the maximum number of “cuts” in the terrain.
Depth:	The stratification depth.
Distance:	The distance between stratification cuts. This value will be random based on the seed.
Random	The random number seed value for the stratification distances.
Random	Generate a new random seen value.
Smooth:	Smoothen the datamap.

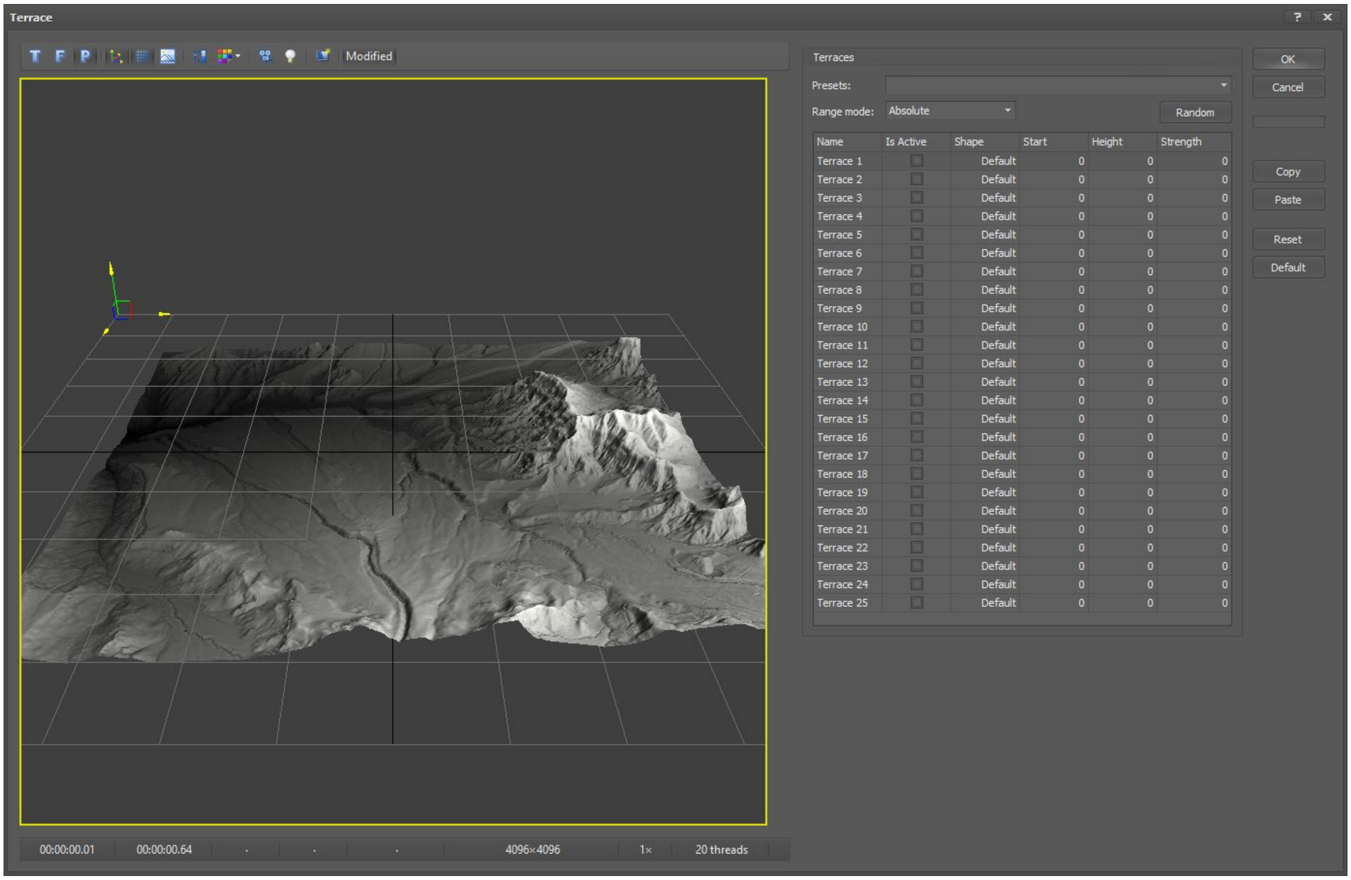
Notes

This device does not preserve the original altitude data.

This device is single-threaded.
This device requires 0 additional datamap memory allocations.

Geology: Terrace

Creates geological terraces on the datamap.



Presets: Choose from a large number of typical terrace preset types.

Range mode: Whether the terrace start and height values are absolute or relative to the datamap altitude.

25 Terrace Items

Is Active: Whether this terrace item is active.

Shape: The terrace item shape.

Start: The terrace item start altitude.

Height: The terrace item height.

Strength: The terrace item strength.

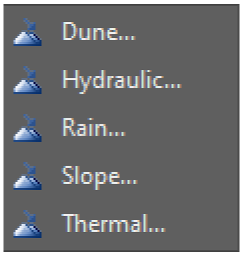
Notes

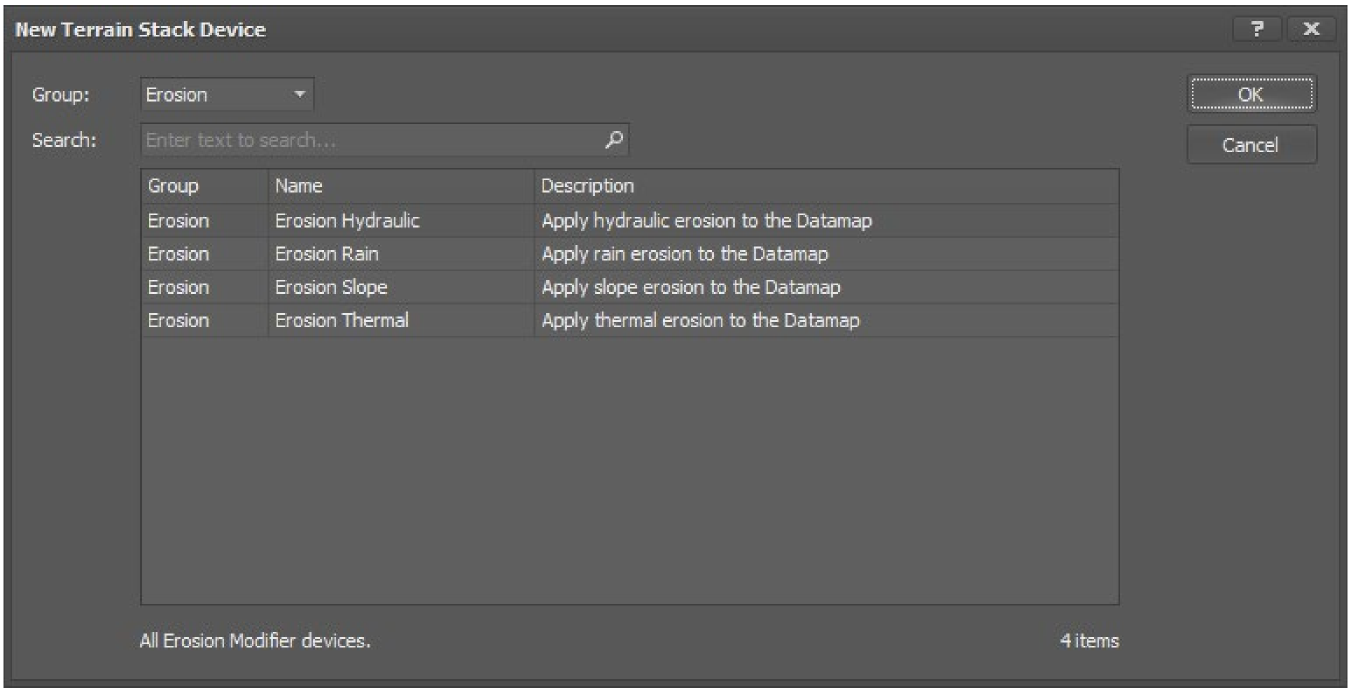
This device does not preserve the original altitude data.

This device is multi-threaded.
This device requires 0 additional datamap memory allocations.

Erosion Menu: Devices

The Erosion menu contains devices that modify the heightmap or mask datamap with geological erosion.





Erosion Overview

Applies an erosion algorithm over the datamap to simulate real-world erosion effects.

Some of the erosion algorithms are extremely computation and memory intensive and can therefore take many hours to complete on large datamaps. It is always best to try a less intense erosion first to determine whether it produces the desired effects.

The erosion algorithms are not a fast immediate real-time operation, so the Preview button must be used to generate an erosion preview, followed by a wait until the erosion function is complete, as indicated on the preview progress bar.

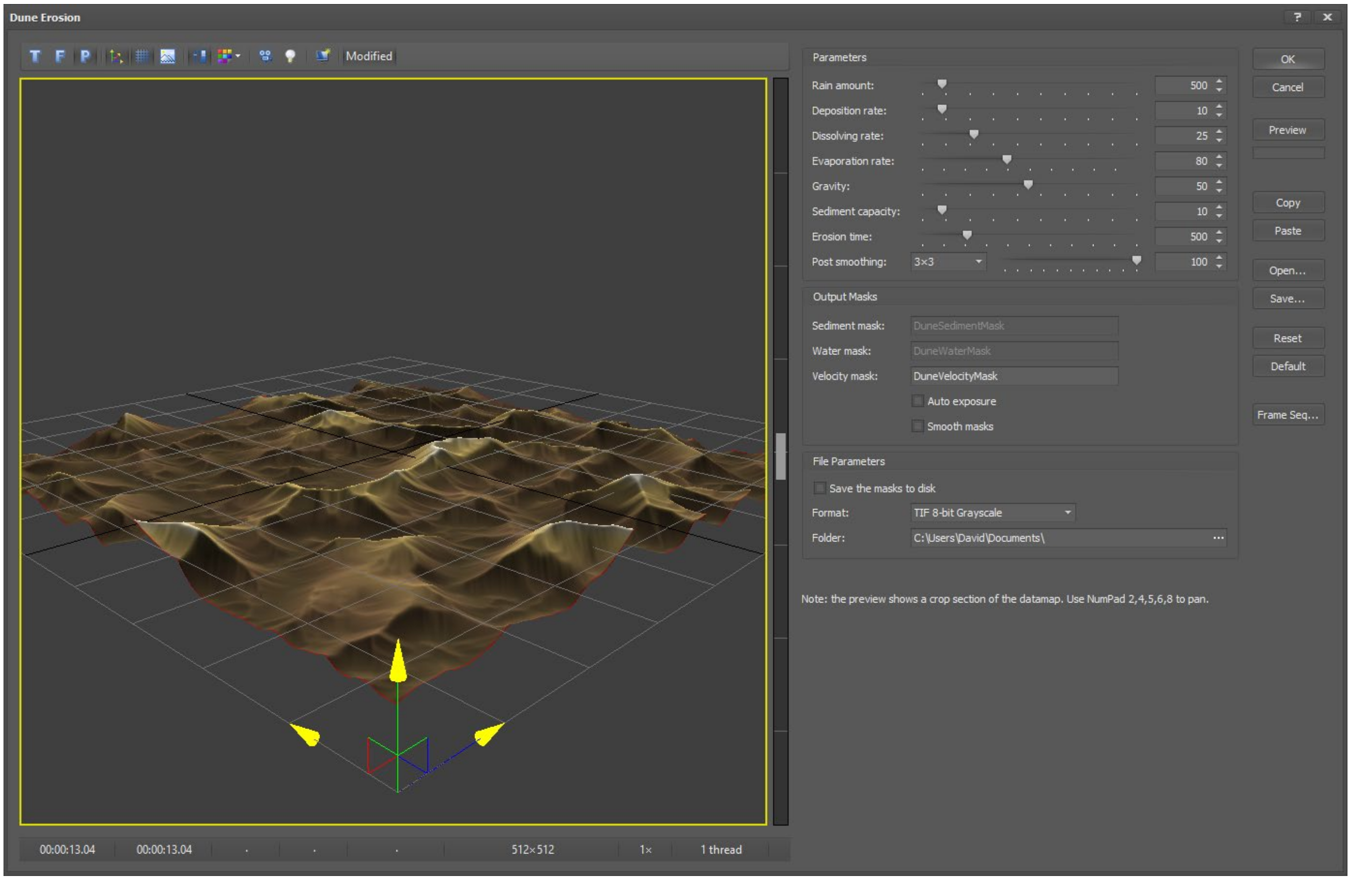
Different erosion types produce different erosion results. Each erosion type is suited for specific visual looks and different terrain layouts.

Masks are created during the erosion process, which can be saved as files and used for texture weightmaps, splatmap textures, or image editing masks.

The Erosion devices include Frame Sequence Output Saving for generating videos of the erosion process. See the chapter on Frame Sequence.

Erosion: Dune

Dune erosion simulates the movement and sluffing of terrain on downhill slopes.



Rain Amount: The amount of rain that falls on each time iteration.
Deposition Rate: The sediment deposition rate.
Dissolving Rate: The sediment dissolving rate.
Evaporation Rate: The water evaporation rate.
Gravity: The downhill slope gravity.
Sediment Capacity: The sediment capacity of the water.
Erosion Time: The erosion time iterations.
Post Smoothing: Smooth the heightmap after erosion.

Velocity mask: The Velocity mask file name.

Save the masks Save the masks to disk.
Format: The mask file format to save as.
Folder: The file folder where the masks are saved.

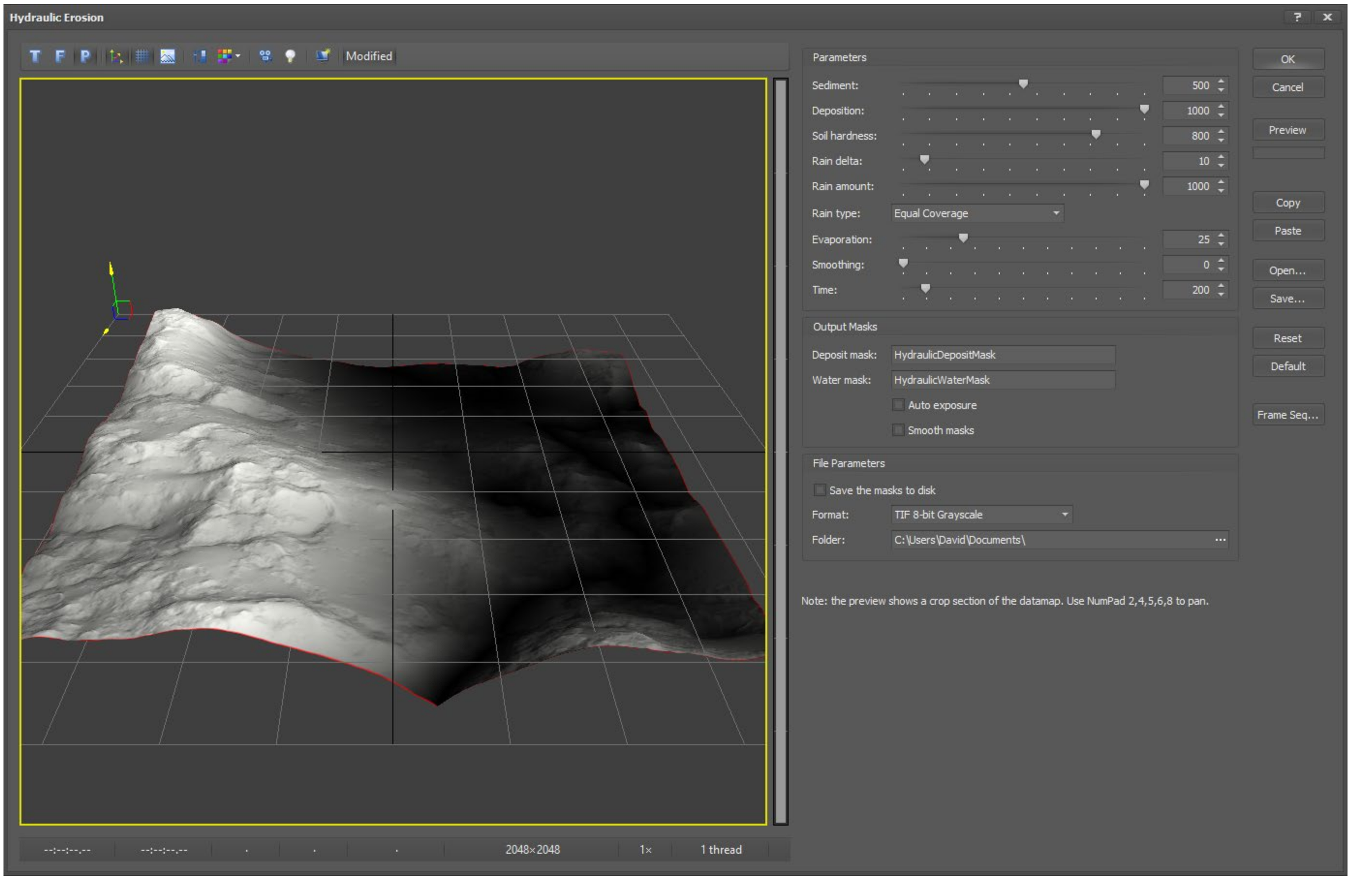
Notes

This device does not preserve the original altitude data.

This device is single-threaded.
This device requires 3 datamap masks.

Erosion: Hydraulic

Hydraulic erosion simulates rainfall with soil erosion and movement from higher altitudes to lower altitudes.



Sediment:	The amount of sediment that the water can carry.
Deposition:	The sediment deposit rate.
Soil hardness:	The rate at which soil converts to sediment.
Rain delta:	The amount of time between each rainfall.
Rain amount:	The amount of rain that falls for each time step.
Rain type:	The rainfall type: - Equal coverage = the rain amount is equal over the entire map. - Adiabatic weighted = more rainfall at higher altitudes (natural). - Inverse Adiabatic weighted = more rainfall at lower altitudes (unnatural).
Evaporation:	The rate of rain water evaporation at each time step.
Smoothing:	The amount of smoothing applied after the erosion.
Time:	The number of erosion passes to simulate the amount of time passed.
Deposit mask:	The Deposit mask file name.
Water mask:	The Water mask file name.
Save the masks	Save the masks to disk.
Format:	The mask file format to save as.
Folder:	The file folder where the masks are saved.

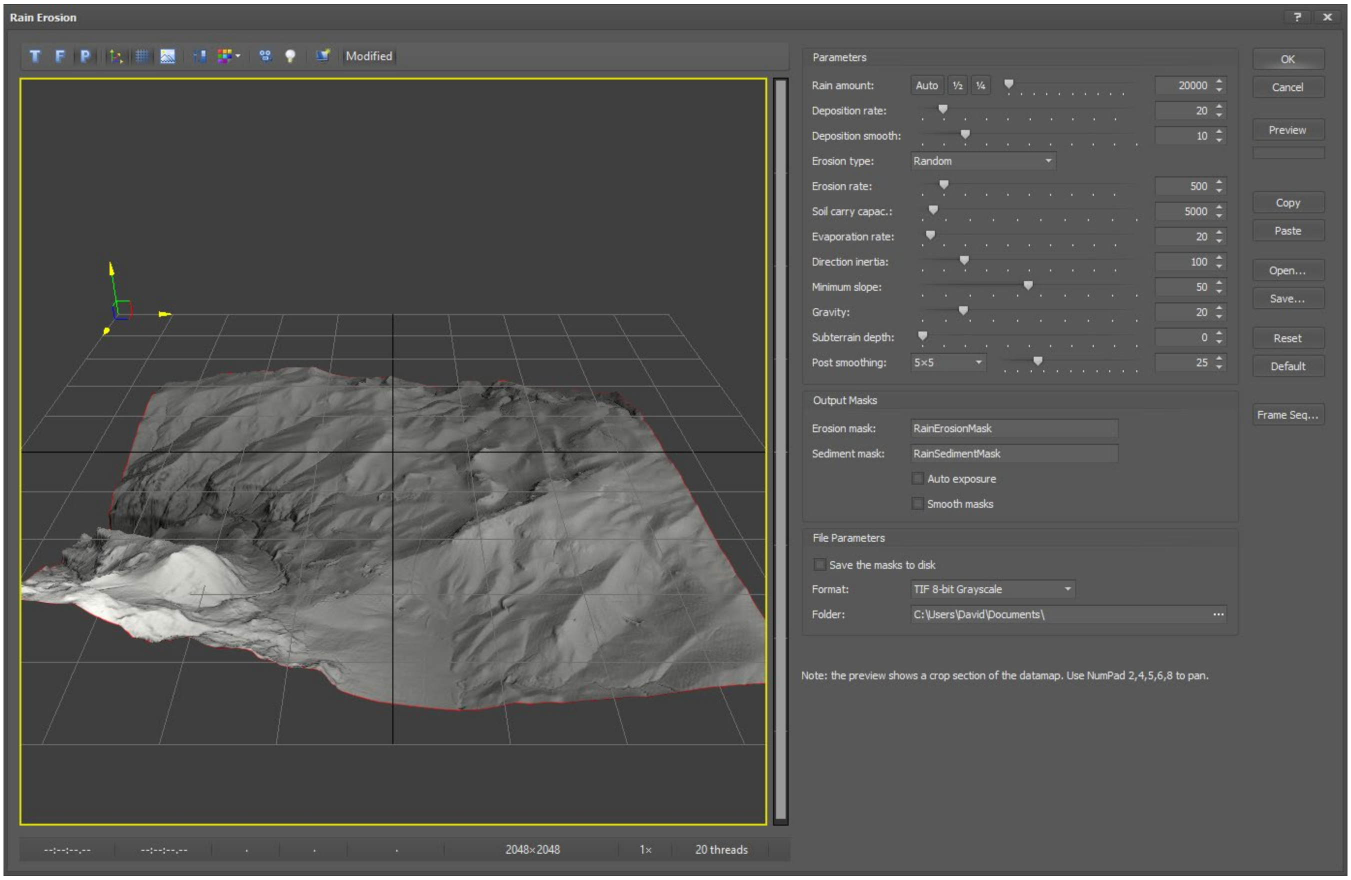
Notes

This device does not preserve the original altitude data.

This device is multi-threaded.
This device requires 2 datamap masks and 4 temporary datamaps.

Erosion: Rain

Rain erosion simulates particles of rain that carve out erosion flow maps on the datamap.



Rain amount:	The number of rain particles.
Deposition rate:	The sediment deposit rate.
Deposition smooth:	Smoothing applied after sediment is dropped.
Erosion type:	The erosion particle type.
Erosion rate:	The erosion rate, the hardness of the terrain rock.
Soil carry capacity:	The amount of soil that can be carried within a particle.
Evaporation rate:	The particle water evaporation rate.
Direction inertia:	The speed that the particle can change direction.
Minimum slope:	The minimum slope where the particle stops moving.
Gravity:	The amount of gravity affecting the particle velocity.
Subterrain depth:	How much the particles can take the terrain below altitude 0.
Post smoothing:	Smoothening applied to the datamap after the erosion.
Erosion mask:	The erosion mask file name.
Sediment mask:	The sediment mask file name.
Save the masks to disk:	Whether to save the masks to disk.
Format:	The mask file format.
Folder:	The mask file folder.

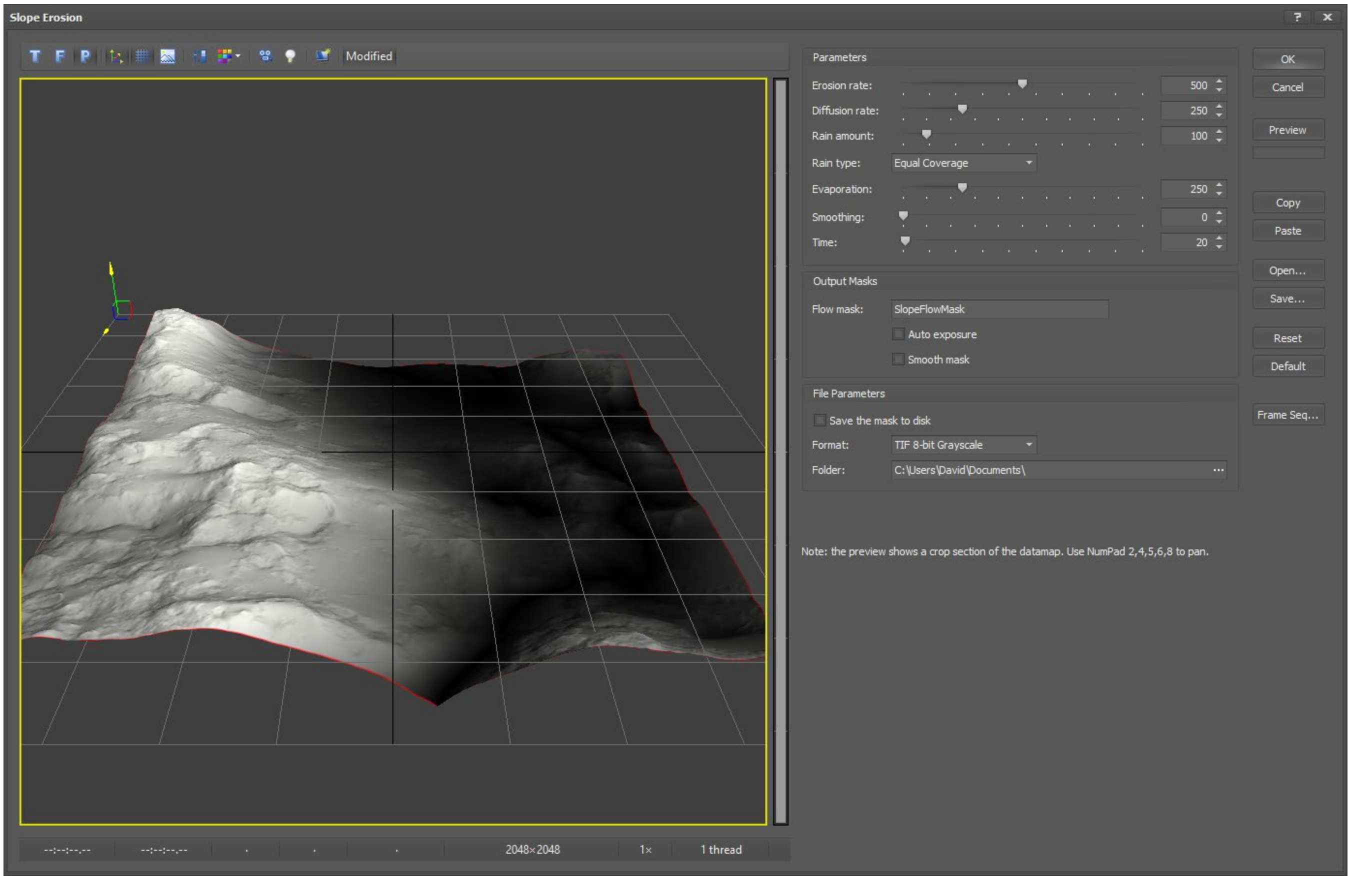
Notes

This device does not preserve the original altitude data.

This device is multi-threaded.
This device requires 2 datamap masks and 0 temporary datamaps.

Erosion: Slope

Slope erosion simulates water flowing down the slope of each patch of the terrain, carving a fluvial path downhill.



Erosion rate:	The rate of cellular erosion for each time step.
Diffusion rate:	The rate of cellular diffusion for each time step.
Rain amount:	The amount of rain that falls for each time step.
Rain type:	The rainfall type: - Equal coverage = the rain amount is equal over the entire map. - Adiabatic weighted = more rainfall at higher altitudes (natural). - Inverse Adiabatic weighted = more rainfall at lower altitudes (unnatural).
Evaporation:	The rate of rain water evaporation for each time step.
Smoothing:	The amount of smoothing applied after the erosion.
Time:	The number of erosion passes to simulate the amount of time passed.
Flow mask:	The Flow mask file name.
Save the masks	Save the masks to disk.
Format:	The mask file format to save as.
Folder:	The file folder where the masks are saved.

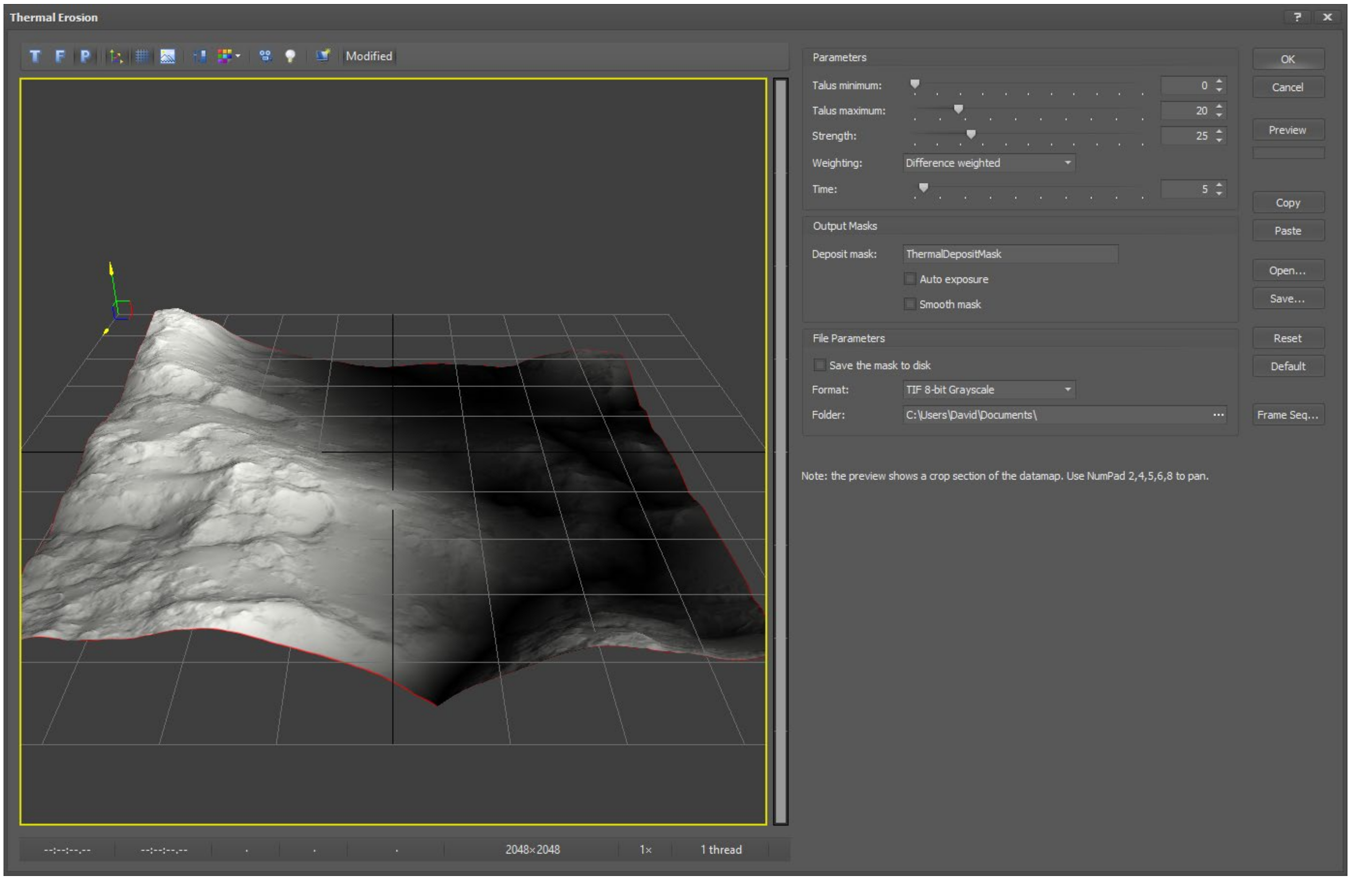
Notes

This device does not preserve the original altitude data.

This device is multi-threaded.
This device requires 1 datamap mask and 5 temporary datamaps.

Erosion: Thermal

Thermal erosion simulates the breaking up of soil due to thermal expansion and contracting.



Talus min:	The minimum altitude difference before erosion occurs.
Talus max:	The maximum altitude difference when erosion occurs.
Strength:	The erosion strength
Weighting:	The erosion deposit weighting type: - Difference weighted. - Maximum average weighted.
Time:	The number of erosion passes to simulate the amount of time passed.
Deposit mask:	The Deposit mask file name.
Save the masks	Save the masks to disk.
Format:	The mask file format to save as.
Folder:	The file folder where the masks are saved.

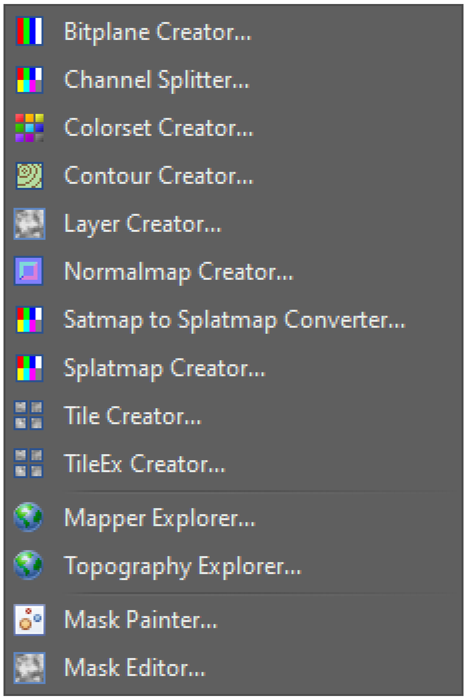
Notes

This device does not preserve the original altitude data.

This device is multi-threaded.
This device requires 1 datamap mask and 2 temporary datamaps.

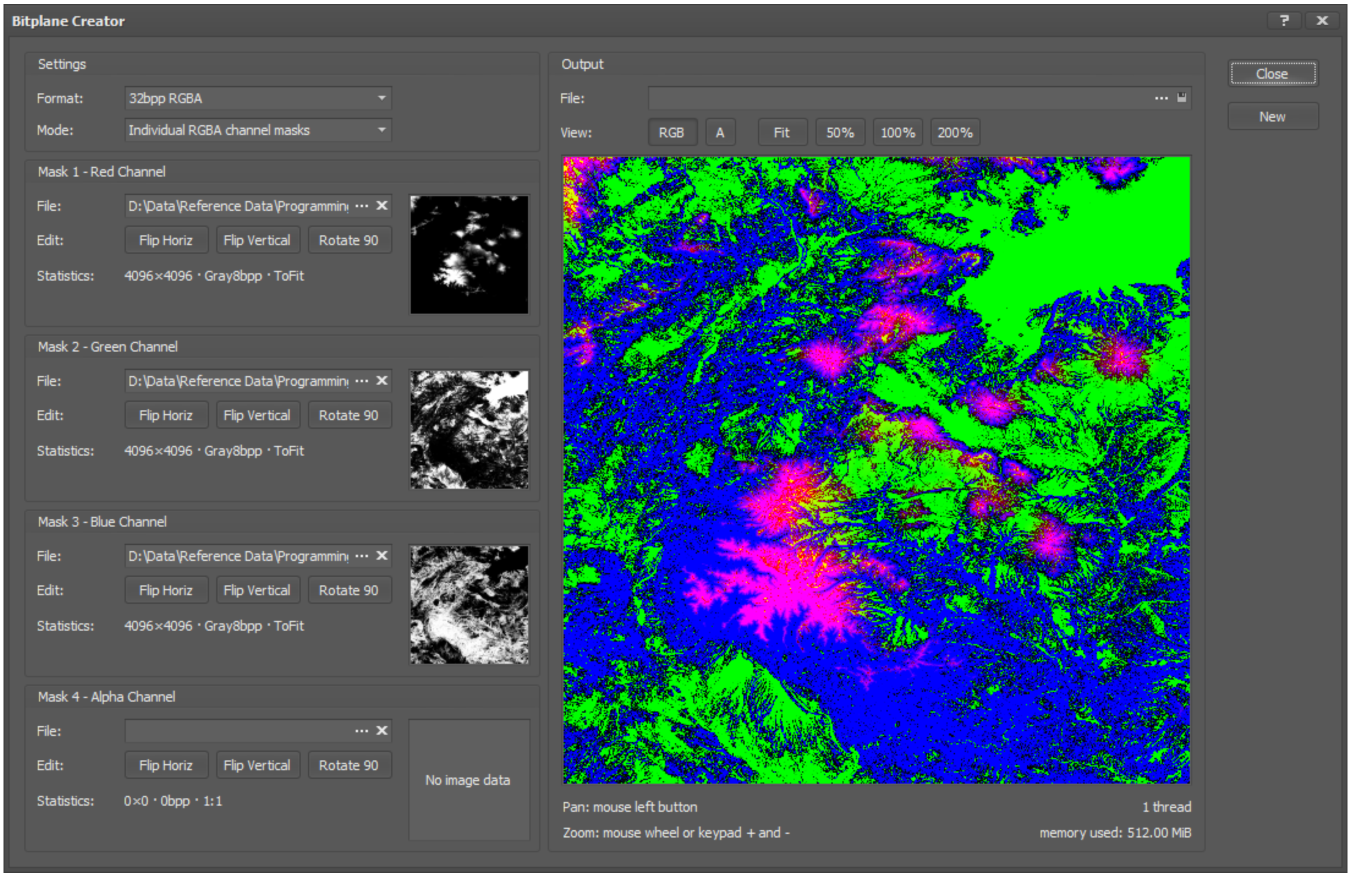
Create Menu

The create menu contains tools that are used for creating image and texture and video game assets.



Bitplane Creator

Pack up to four grayscale masks into a single RGBA texture.

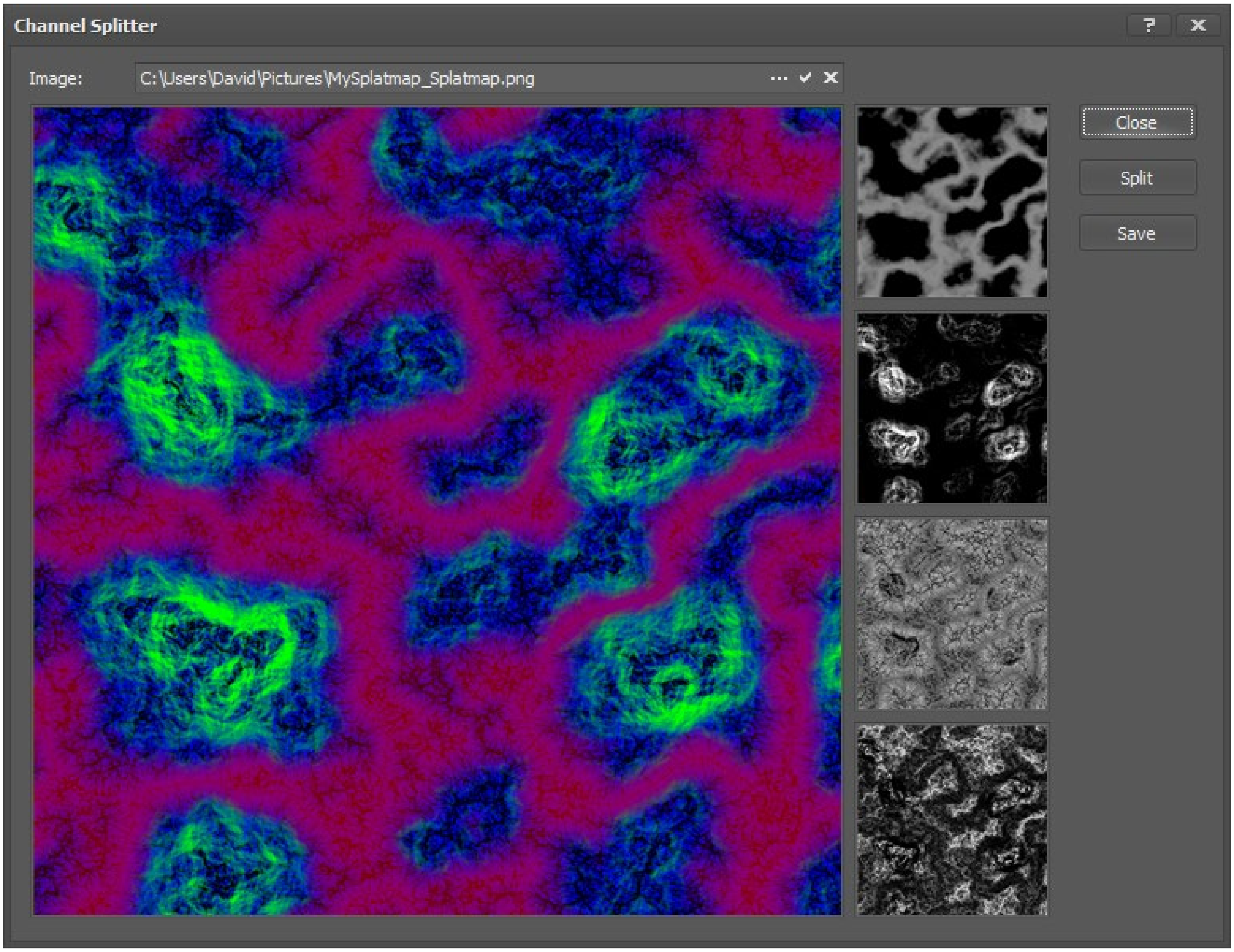


Notes

The image tools are basically designed for creating 3D DirectX and OpenGL textures up to 16384 × 16384.
There are maximum image resolutions imposed by the Microsoft Windows Imaging APIs.
The 24-bit RGB texture format has a resolution limit of 26754 × 26754.
The 32-bit RGBA texture format has a resolution limit of 23170 × 23170.

Channel Splitter

Split a bitmap into its red, green, blue, alpha channels, typically used for getting weightmaps from a splatmap.



This tool can split any color image into its bitplane red, green, blue, and alpha channels.

Click on the browse button "…" to open a bitmap file.
Click on the Split button to split the bitmap into channels.
Click on the Save button to save the channel files.

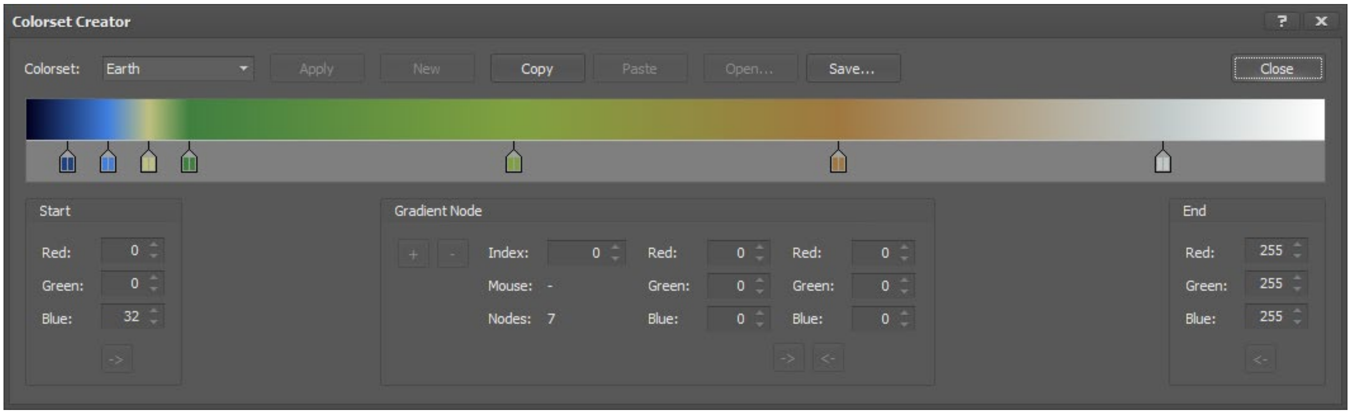
The channel files will be saved in the same folder as the bitmap file, with the channel color appended to the file name.

Notes

The image tools are basically designed for creating 3D DirectX and OpenGL textures up to 16384 × 16384.
There are maximum image resolutions imposed by the Microsoft Windows Imaging APIs.
The 24-bit RGB texture format has a resolution limit of 26754 × 26754.
The 32-bit RGBA texture format has a resolution limit of 23170 × 23170.

Colorset Creator

Create custom colorsets for the main editor terrain rendering.

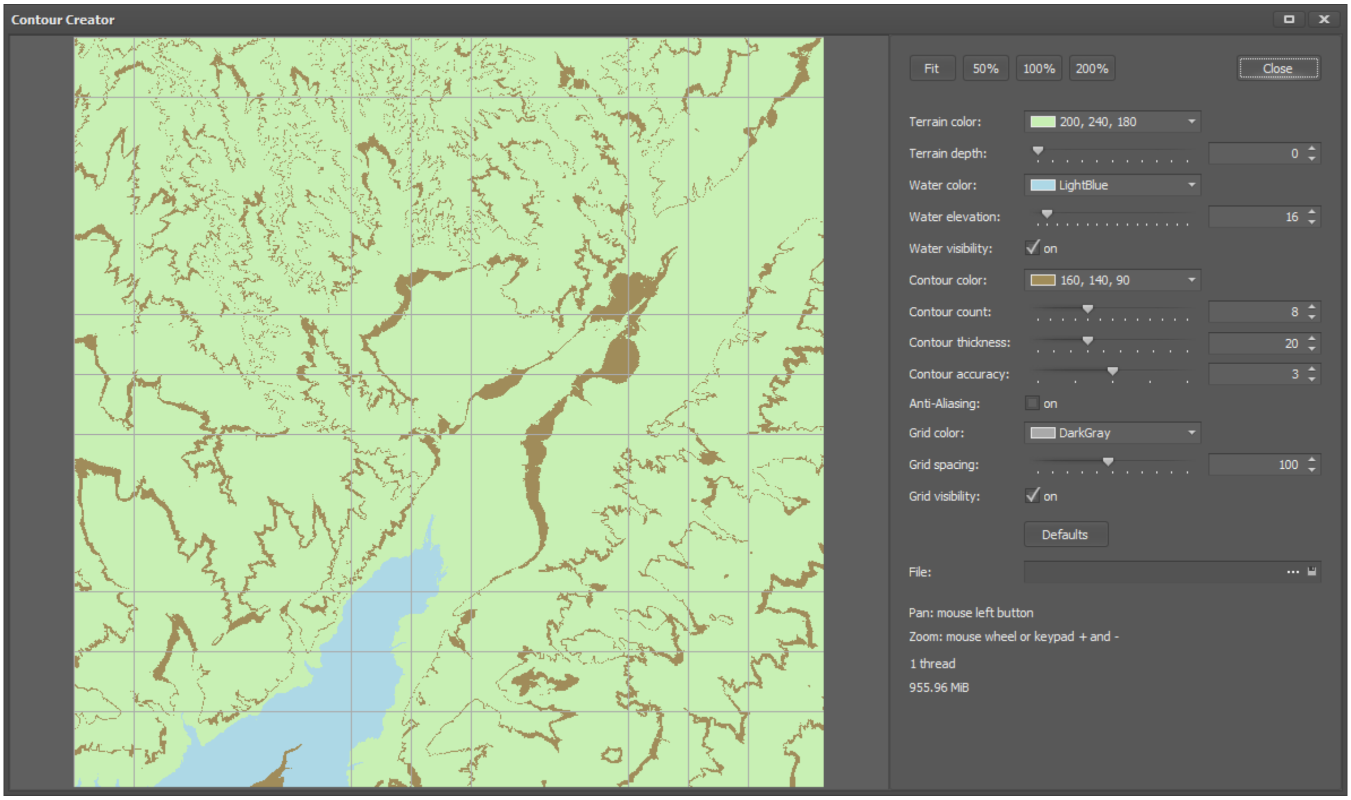


Notes

The Colorset Creator supports up to four Custom Colorsets.

Contour Creator

Convert the main editor datamap into a contour map.

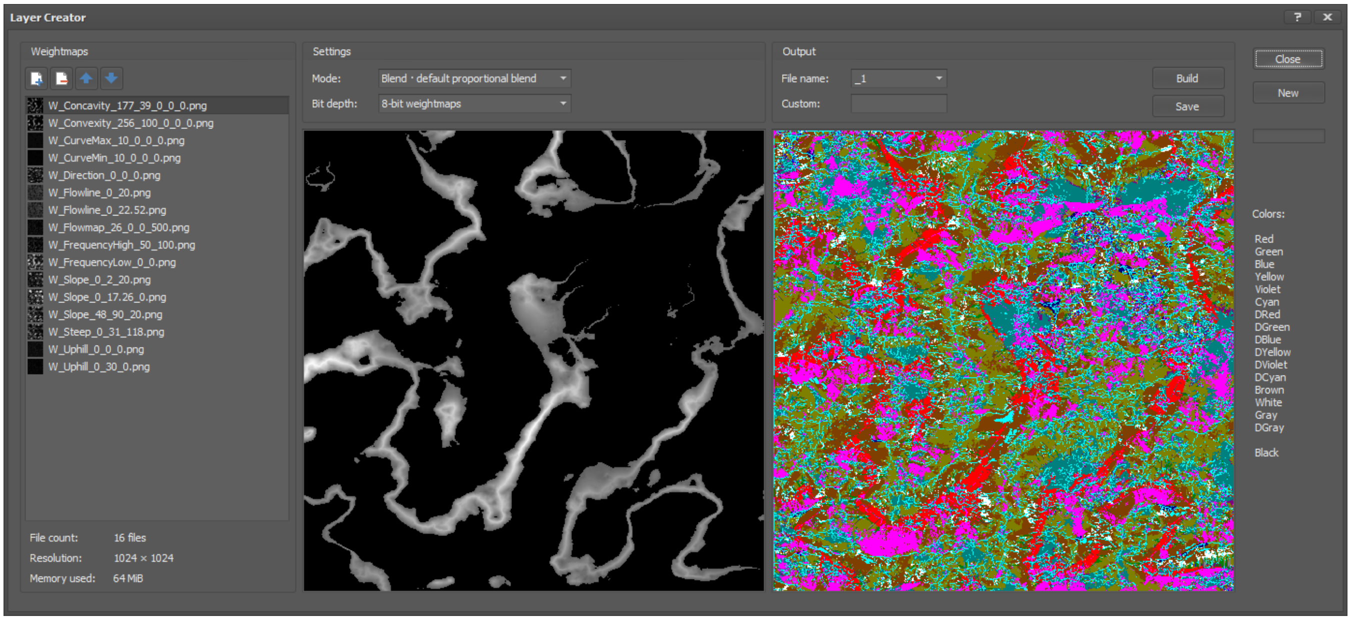


Notes

The image tools are basically designed for creating 3D DirectX and OpenGL textures up to 16384 × 16384.
There are maximum image resolutions imposed by the Microsoft Windows Imaging APIs.
The 24-bit RGB texture format has a resolution limit of 26754 × 26754.
The 32-bit RGBA texture format has a resolution limit of 23170 × 23170.

Layer Creator

Convert up to 16 Mask files into blended Weightmaps.



This tool blends up to sixteen Mask files into 100% pixel-weighted Weightmap files.
For every pixel in every mask, they are adjusted so that the total weight of all pixels at X,Y are summed together across all masks to equal 100%.

Some video game engines utilize weightmaps for terrain material blending. This tool allows you to properly blend up to sixteen masks into weighted weightmaps.

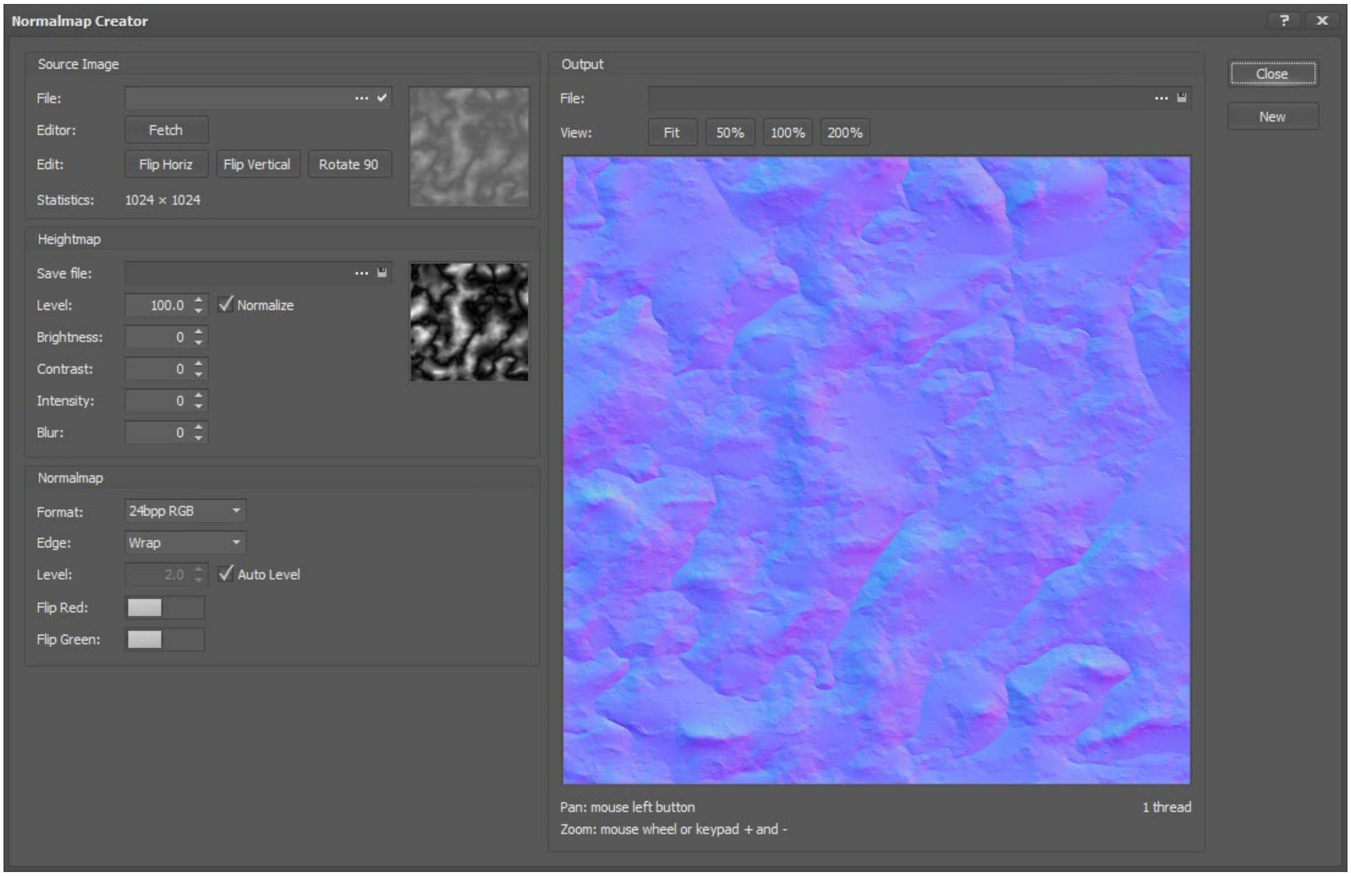
When saving the final blended weightmaps to file, the “File name” string will be appended to the original mask file name, in order to not overwrite the original mask file.

The output preview Colormap is also saved to a file and can be used for certain pixel color purposes.

Open	Open one or more mask files. This feature supports multiple file selection.
Delete	Delete the currently selected mask file item.
Move Up	Move the currently selected mask file item up the list, this changes only its colormap color.
Move Down	Move the currently selected mask file item down the list, this changes only its colormap color.
Blend Mode	Choose the weightmap blend mode.
Bit depth	Choose the weightmap output file bit-depth, 8-bit or 16-bit grayscale files.
File name	Choose the string that is appended to the mask file name for the saved weightmap files.
Custom	Enter in a custom append string.
Build	Build the weightmaps and output preview colormap.
Save	Save the weightmaps and output preview colormap.
New	Clear the currently loaded mask files.

Normalmap Creator

Convert any color or grayscale image into a Normalmap.



The Normalmap Creator opens a Source image file or can fetch the current heightmap from the Editor.
The Source image can be flipped or rotated.

The Source image is then converted to a Heightmap image.
The Heightmap can be adjusted with multiple modifiers including brightness, contrast, and intensity.
The modified Heightmap can then be optionally saved to a file.

The Heightmap image is then converted to a Normalmap.
The Normalmap supports 24-bit RGB and 32-bit RGBA file formats, edge methods, and auto-level.
The Red and Green channels can also be flipped.

The Output file area saves the Normalmap to a file.

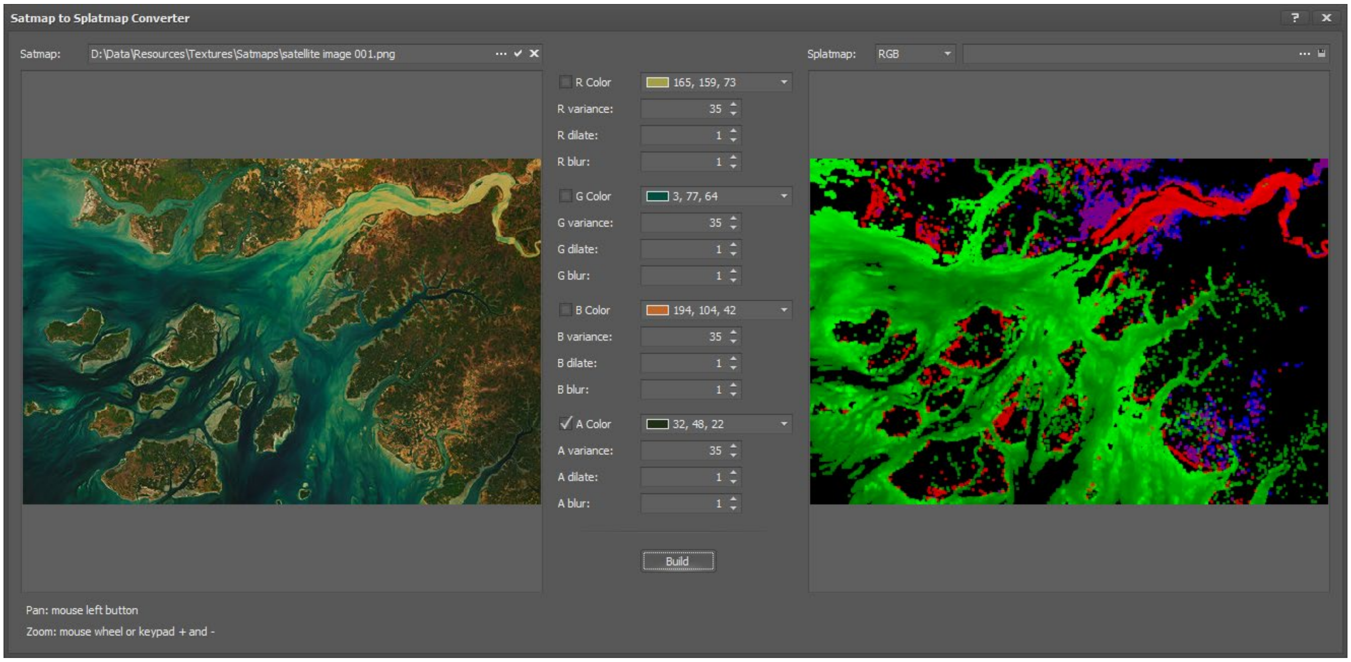
Notes

The highest quality will be from a 16-bit or 32-bit source image.

The image tools are basically designed for creating 3D DirectX and OpenGL textures up to 16384 × 16384.
There are maximum image resolutions imposed by the Microsoft Windows Imaging APIs.
The 24-bit RGB texture format has a resolution limit of 26754 × 26754.
The 32-bit RGBA texture format has a resolution limit of 23170 × 23170.

Satellite Map to Splatmap Converter

Convert a color satellite image into a splatmap.



Open an image using the Satmap file control.
Use the browse button "…" to browse for a file.
Use the open button checkmark to open a file name that you have manually entered into the text region.
Use the delete button "X" to clear the text control.

The next step is to choose three or four colors from the satellite image using the controls in the center of the dialog, three colors for an RGB three-plane Splatmap, and four colors for an RGBA four-plane Splatmap.
Click on the R Color checkbox control, it will change to a checkmark, which puts the editor into a color-picking state. You can click any number of times in the satellite image to get exactly the color that you desire.
Once you have the red plane color, click on the G Color checkbox control, it will now become the checkmarked control and active for choosing colors from the satellite image.
Continue performing the same color picking for the B Color and A Color.
When the three or four colors are chosen, click on the last Color checkbox control to uncheck all of them.

The next step is to set the Color Variance, Dilate hole filling, and Blur edge smoothing control values.
The Variance controls specify the amount of variance in the color RGB values between 0 and 255.
The Dilate controls specify the dilation size in pixel, this usually is a small number between 0 and 5.
The Blur controls specify the pixel size of the blur region between 0 and 256 pixels.

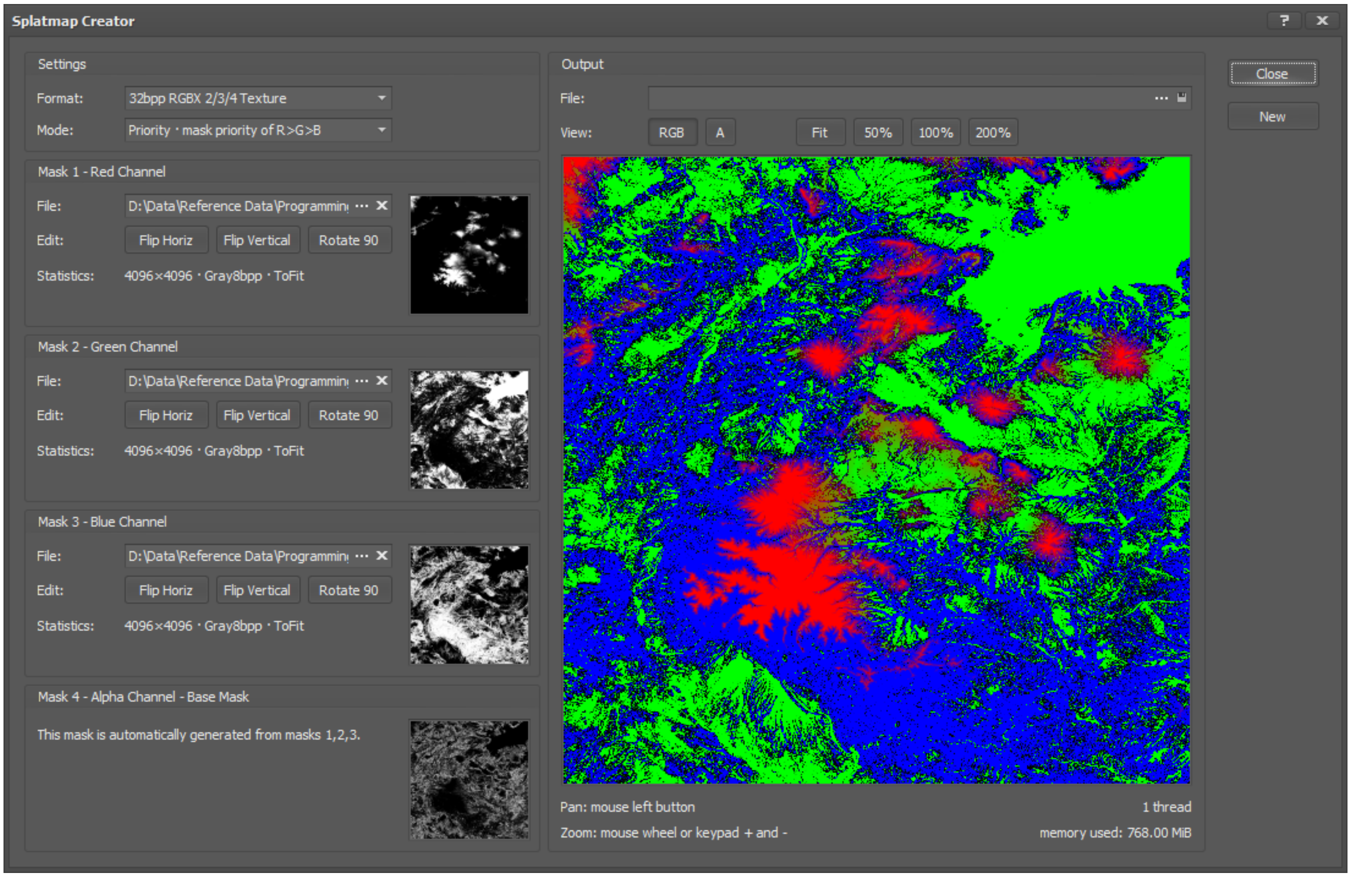
Click on the Build button to build the splatmap.
You can Build repeatedly until the desired splatmap layout is created.

Choose the splatmap type, either three-plane RGB or four plane RGBA.
The splatmap will be created with a K color as well, for black, so the actual splatmap types created are RGBK and RGBAK.

Use the Splatmap file controls to save the splatmap image.
Use the browse button "…" to browse for a file.
Use the save button disk to save a file name that you have manually entered into the text region.

Splatmap Creator

Create splatmap texture files for RG, RGB, RGBA, and RGBAK splatmaps.



Choose the Splatmap Format desired. Splatmaps from two-layer RG to five-layer RGBAK can be created.

Three Weightmap Blend Modes are available, Blend, Priority, and Solid.
Blend – default proportional blend, each weightmap is blended by percent so that all four weightmaps = 100%.
Priority – mask priority of R>G>B>A, the Red weightmap color is mixed first, then Green, then Blue, then Alpha.
Solid – highest value becomes solid, the highest RGB color becomes a solid color, this created a Colormap.

Load the Weightmap files into the Mask 1 to 4 areas using the File controls to browse and open the file.

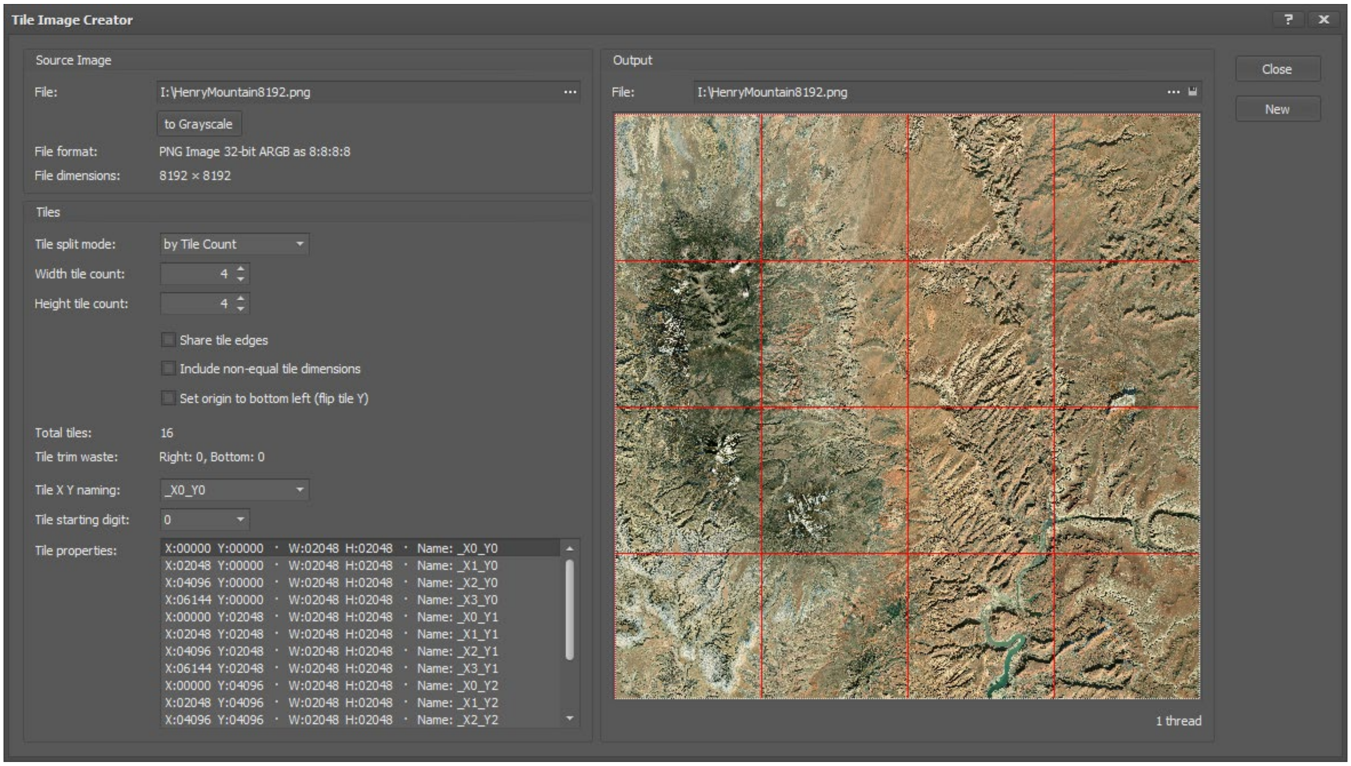
Click on the Output File "…" button to browse for an output Splatmap file to save, and then click on the "disk" button to save.

Notes

The image tools are basically designed for creating 3D DirectX and OpenGL textures up to 16384 × 16384.
There are maximum image resolutions imposed by the Microsoft Windows Imaging APIs.
The 24-bit RGB texture format has a resolution limit of 26754 × 26754.
The 32-bit RGBA texture format has a resolution limit of 23170 × 23170.

Tile Image Creator

Split any grayscale or RGB texture file or the main editor Datamap into tiles.



File – Choose the file to split into tiles.

Tile split mode – Split by Tile Count or by Tile Size.
Width tile count – Width tile count (this changes to Tile Size for that mode).
Height tile count – Height tile count (this changes to Tile Size for that mode).
Share tile edges – Whether the edge pixels or vertices are shared on the tiles.
Include non-equal tile dimensions – Whether only the tiles with equal sizes are saved.
Set origin to bottom left – Set the tile origin to the bottom left of the Datamap instead of the top left.
Tile X Y naming – The X,Y tile naming system.
Tile starting digit – The tile starting digit.

Output file – The base output tile file name.

Close – Close the dialog.
New – Start a new tiling session.

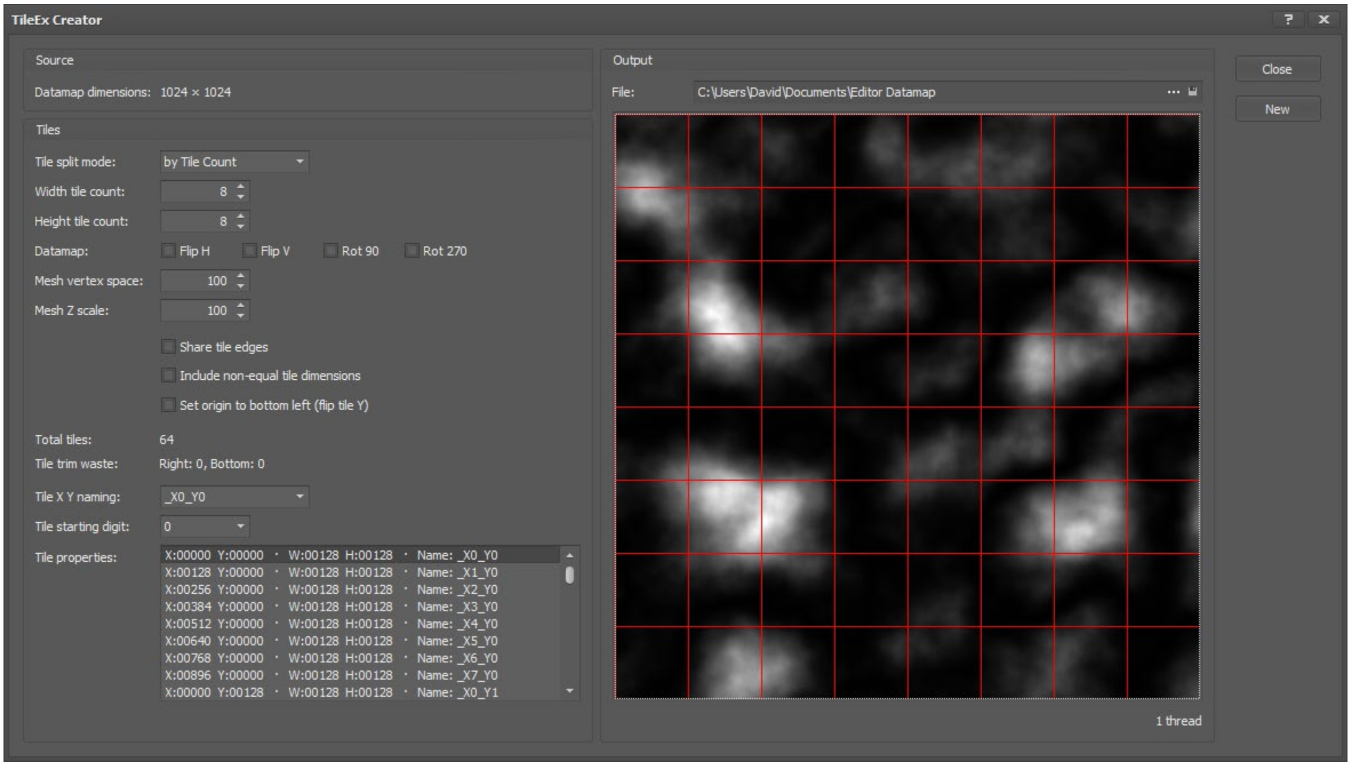
Notes

The maximum number of tiles is 1000 × 1000, which is 1,000,000 tiles.
The maximum number of alphanumeric tiles is 52 × 52, which is 2704 tiles.

The image tools are basically designed for creating 3D DirectX and OpenGL textures up to 16384 × 16384.
The PNG and TIF file formats support large images, PNG up to 1 million, TIF up to 240,000.
There are maximum image resolutions imposed by the Microsoft Windows Imaging APIs for BMP GIF JPG.
The 24-bit BMP GIF JPG RGB texture format has a resolution limit of 26754 × 26754.
The 32-bit BMP GIF JPG RGBA texture format has a resolution limit of 23170 × 23170.

Tile Datamap Creator

Split the main editor Datamap into tiles.



Tile split mode – Split by Tile Count or by Tile Size.
Width tile count – Width tile count (this changes to Tile Size for that mode).
Height tile count – Height tile count (this changes to Tile Size for that mode).
Datamap Flip H – This option flips the Datamap horizontally before tiling.
Datamap Flip V – This option flips the Datamap vertically before tiling.
Datamap Rot 90 – This option rotates the Datamap 90 degrees before tiling.
Datamap Rot 270 – This option rotates the Datamap 270 degrees before tiling.
Mesh vertex space – The FBX and OBJ mesh output format vertex spacing.
Mesh Z scale – The FBX and OBJ mesh output format Z axis scale in percent.
Share tile edges – Whether the edge pixels or vertices are shared on the tiles.
Include non-equal tile dimensions – Whether only the tiles with equal sizes are saved.
Set origin to bottom left – Set the tile origin to the bottom left of the Datamap instead of the top left.
Tile X Y naming – The X,Y tile naming system.
Tile starting digit – The tile starting digit.

Output file – The base output tile file name.

Close – Close the dialog.
New – Start a new tiling session.

Notes

The maximum number of tiles is 1000 × 1000, which is 1,000,000 tiles.
The maximum number of tiles is 52 × 52, which is 2704 tiles.

The TileEx Creator uses the TerreSculptor Datamap format and BigPNG and BigTIF file formats to support resolutions up to 1 million × 1 million.

Unreal Engine 4/5 Mesh Tiles:

To export OBJ mesh tiles to Unreal Engine 4 or 5 use the following settings:
- Width Tile Count = X number
- Height Tile Count = Y number
- Datamap Flip V enabled
- Datamap Rot 270 enabled
- Mesh Vertex Space: default 100 (cm) = 1 meter
- Mesh Z Scale: default 100 (%) this is usually set to the Terrain Properties Spacing Y x 2 x 100.
- Share Tile Edges enabled
- Tile XY Naming: _X0_Y0 preferably
- OBJ File Format

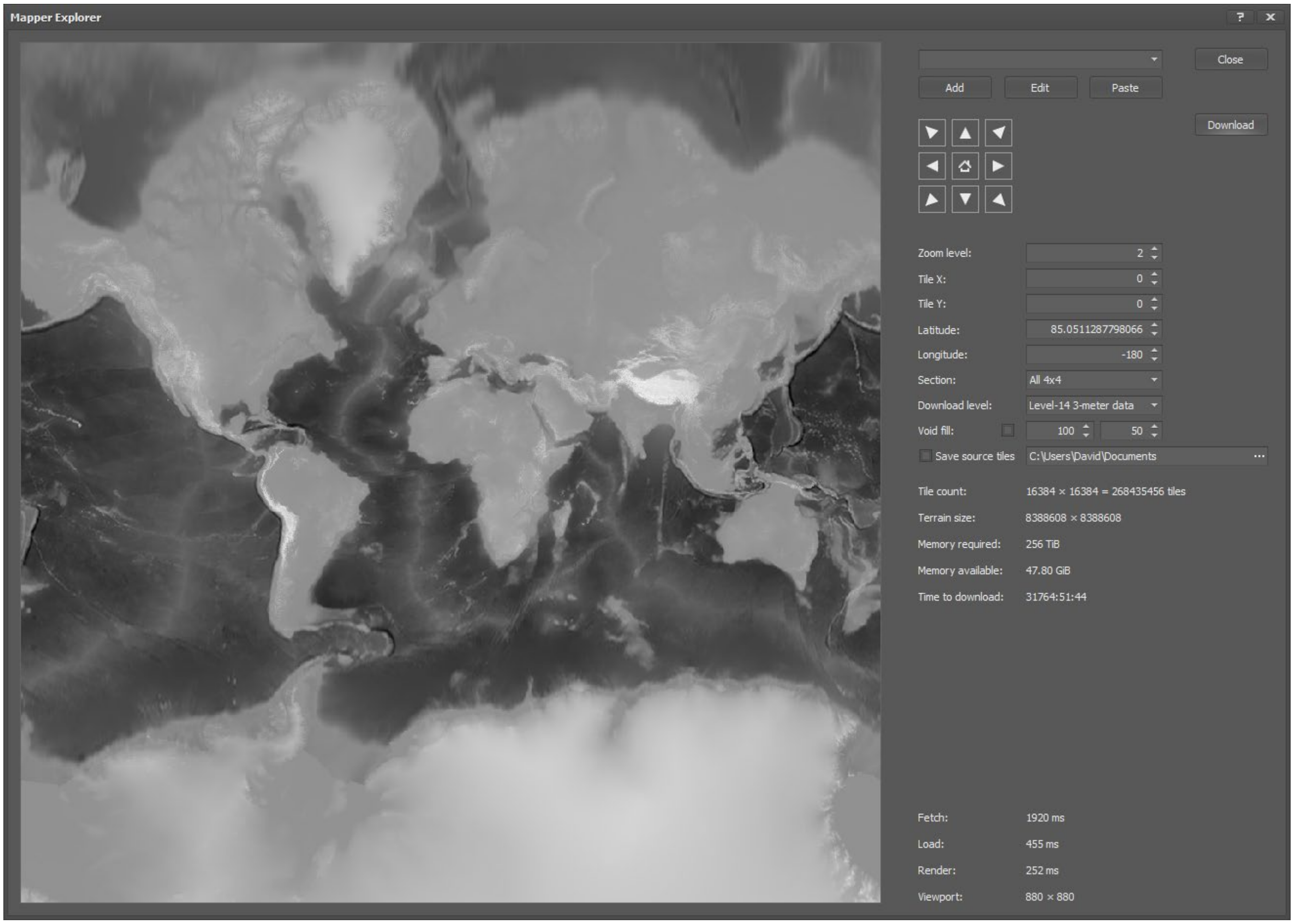
Note that using the Flip V and Rot 270 on the source datamap will also mean that the textures and normalmap also have to be flipped and rotated. If you don't want to play with adjusting the textures, then leave the Flip and Rotate off and the mesh will simply be aligned to a different axis. The texture will still typically need to be flipped vertically since the OBJ importer in UE5 always flips the axis direction.

Note that when importing the tiles into UE4/5 that the pivot points are all at the same origin, and the tile order is bottom-right to top-left.

Note that the Mesh Z Scale is typically Spacing Y x 2 x 100 if the Scale is Centimeters.
For a DEM Heightmap that has a Spacing Y of 400, then the Tile Creator Mesh Z Scale will be 400 x 2 x 100 = 80,000.

Mapper Explorer

Explore and download Digital Elevation Models of the earth.



Use the Navigation Buttons or Tile X/Y or Latitude/Longitude controls to navigate the earth.
Zoom in until the desired terrain feature is in the entire viewport. Verify the Terrain size and Memory required.
Click on Download to retrieve the tiles for the visible region.
The Terrain Size information displays the total heightmap size that will be downloaded and required memory.

Favorites – choose from a saved favorite location.
Add button -- add the current Zoom/X/Y location to the Favorites list.
Edit button -- edit the Favorites list, delete, rename, and sort the items.
Paste button – paste a CSV Favorite item from the clipboard to the list.

Navigation – use the movement navigation buttons to scroll around the earth preview.
Download button – start downloading the current tile set for the section.

Zoom level – zoom in and out.
Tile X – specify the X tile coordinate. These numbers range from 0 to 16383 depending on Zoom Level.
Tile Y – specify the Y tile coordinate. These numbers range from 0 to 16383 depending on Zoom Level.
Latitude – specify the real-world latitude coordinate. -90 degrees to +90 degrees.
Longitude – specify the real-world longitude coordinate. -180 degrees to +180 degrees.
Section – specify the download section of the terrain in the viewport, all of the tiles or a quadrant section.
Download level – choose to download larger 3-meter GeoTIF tiles or smaller 6-meter PNG tiles.
Void fill – fill void holes in the terrain, specify the void threshold in meters and the hole fill search distance.
Save source tiles – save the tile files in the specified folder. This uses the file naming of Tile_X0_Y0.tif.

Tile count – the number of tiles in the current viewport that will be downloaded.
Terrain size – the terrain heightmap size of the tiles in the current viewport that will be downloaded.
Memory required – the amount of computer memory required to download all of the tiles.
Memory available – the amount of computer memory available.
Time to download – the estimated time to download all of the tiles. This is based on the last fetch of nine tiles.

Notes

Create a new project before starting the Mapper dialog, any size will work such as 1024x1024.
Be sure that the computer has enough memory to download the size of the terrain that is selected in the viewport.

The Mapper Explorer and Topography Explorer share the same Favorites. Changes on one will affect the other.

The Mapper preview is a 3x3 Tile layout at the current Zoom Level. The downloaded heightmap will be a multiple of 3x512 pixels for 3-meter tiles times the zoom level, such as 1536, 3072, 6144, 12288, etc., and a multiple of 3x256 pixels for 6-meter tiles times the zoom level, such as 768, 1536, etc.
Using the Section drop-down-control you can select to download only the top-left, top-right, bottom-left or bottom-right 2x2 set of Tiles in the viewport. In this case, the downloaded heightmap will be a multiple of 2x512 pixels for 3-meter tiles times the zoom level, such as 1024, 2048, 4096, 8192, 16384, etc., and 2x256 pixels for 6-meter tiles times the zoom level, such as 512, 1024, etc.
This allows for greater flexibility in download section sizes, from power-of-two sizes to intermediate sizes.
The heightmap can be further cropped after downloading into the main editor.

You can use the Topography Explorer or Earth Explorer, Google Maps, Google Street Maps, or https://tools.geofabrik.de/map/ as references for the earth and the tile numbers of coordinates to locate.
The Tile X,Y values for the Topography Explorer are identical to the Mapper Explorer.

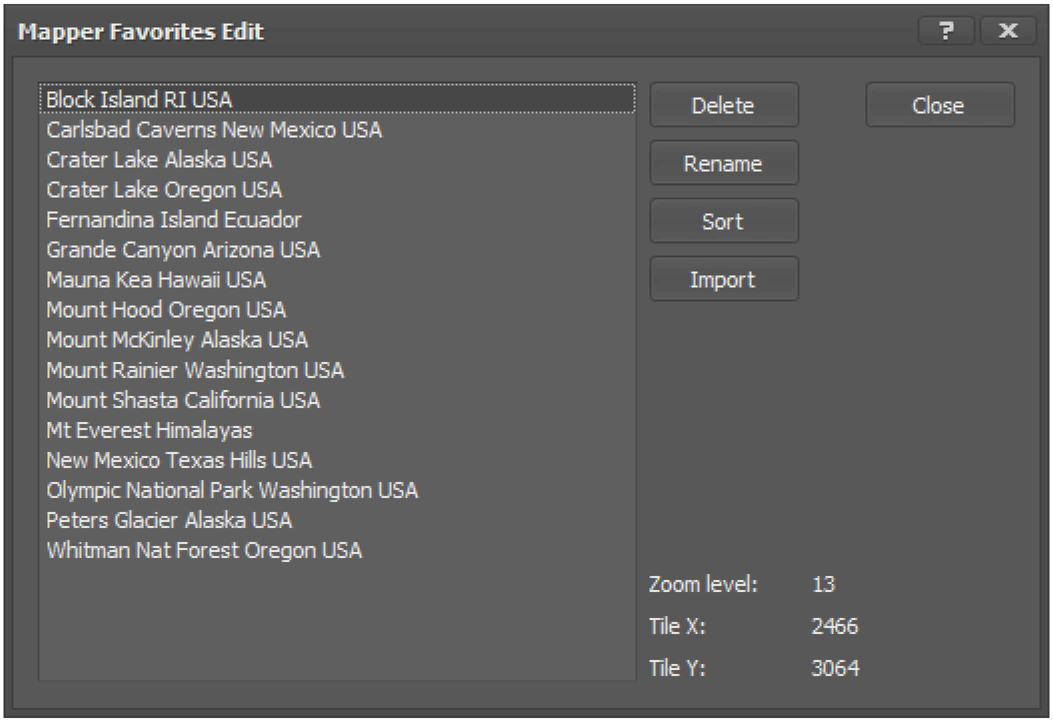
Mapper fully supports the File Scale and GIS systems built into TerreSculptor. Downloading a heightmap using Mapper will automatically set the File Scale low and high values for the elevation range of the heightmap downloaded and it will also fill the GIS panel relevant information. If the 3-meter tile size is also chosen, the GeoTIF Tags will be set, and saving the heightmap as a GeoTIF format file will retain those Tags. After downloading, check the Terrain Properties File Scale to see if the range looks correct, for typical terrain regions it may be between 1000 and 2500 meters of range. Then use the GeoScale dialog and select the “Set Spacing XZ Y to GIS values” option to automatically adjust the elevation range of the terrain.

When choosing the 3-meter Download level, GeoTIF tile files will be retrieved from the server, which contain GeoTIF Tags for Geolocation data. Those Tags will be retained after the download so that saving the heightmap as a GeoTIF File Format will save those GeoTIF Tags in the GeoTIF file. That way the saved GeoTIF can be correctly used in GIS software for further purposes.

The Free Assets Google Drive contains a Mappers Favorites.csv file to get you started with some landmarks.

Mapper Explorer Favorites

The Mapper Explorer Favorites Edit dialog.

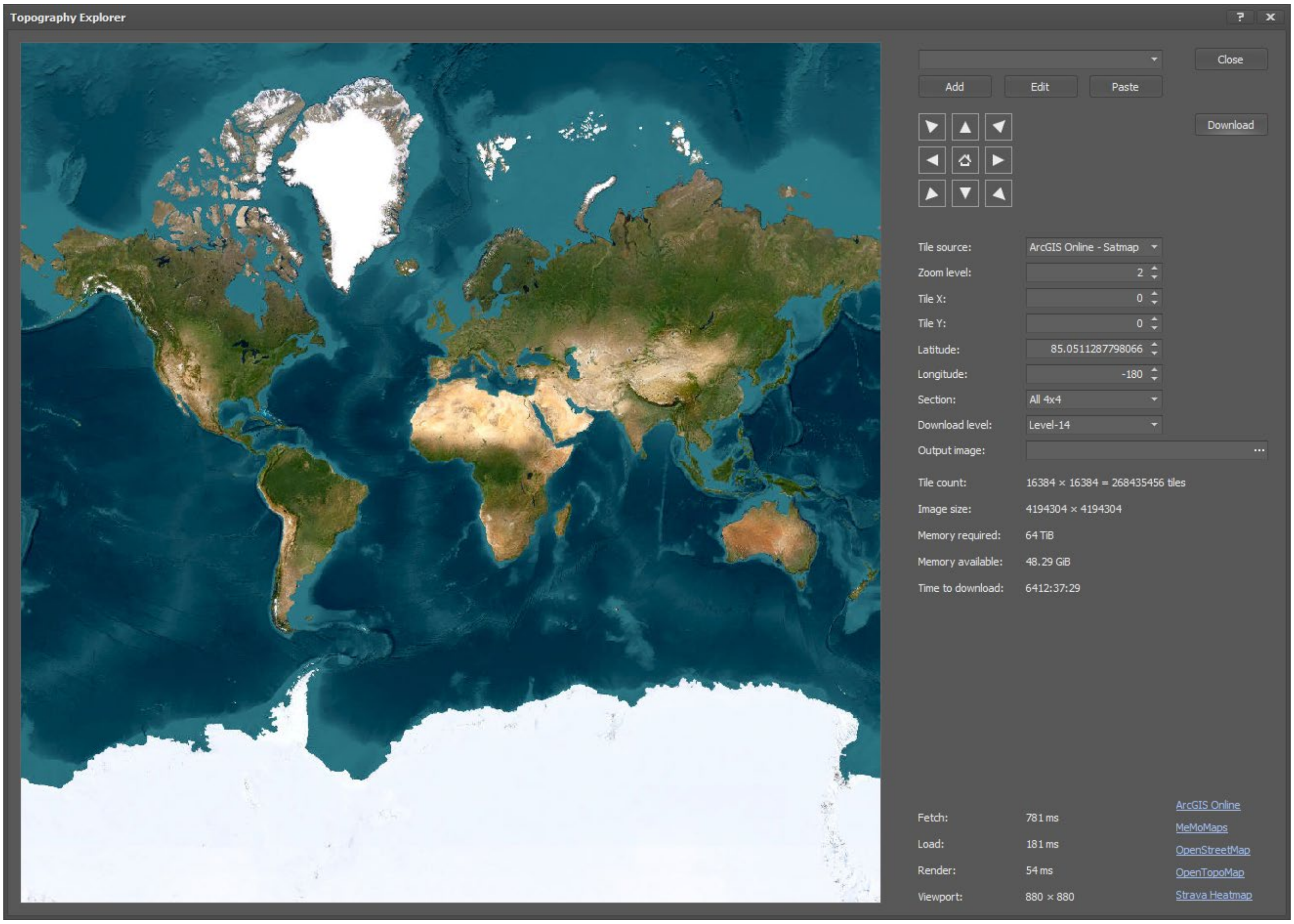


Use the Favorites Edit dialog to Delete, Rename, and Sort the favorites list.
The importing of CSV and Text file favorites lists is also possible.

The Mapper Explorer and Topography Explorer share the same Favorites. Changes on one will affect the other.

Topography Explorer

Explore and download satellite, street, topo maps with contour lines of the earth.



Use the Navigation Buttons or Tile X/Y or Latitude/Longitude controls to navigate the earth.
Zoom in until the desired terrain feature is in the entire viewport. Verify the Image size and Memory required.
Click on Download to retrieve the tiles for the visible region.
The Image Size information displays the total texture size that will be downloaded and the required memory.

Navigation – use the movement navigation buttons to scroll around the earth preview.
Download button – start downloading the current tile set for the section.

Zoom level – zoom in and out.
Tile X – specify the X tile coordinate. These numbers range from 0 to 16383 depending on Zoom Level.
Tile Y – specify the Y tile coordinate. These numbers range from 0 to 16383 depending on Zoom Level.
Latitude – specify the real-world latitude coordinate. -90 degrees to +90 degrees.
Longitude – specify the real-world longitude coordinate. -180 degrees to +180 degrees.
Output image – save the texture file in the specified folder.

Tile count – the number of tiles in the current viewport that will be downloaded.
Image size – the terrain texture size of the tiles in the current viewport that will be downloaded.
Memory required – the amount of computer memory required to download all of the tiles.
Memory available – the amount of computer memory available.
Time to download – the estimated time to download all of the tiles. This is based on the last fetch of nine tiles.

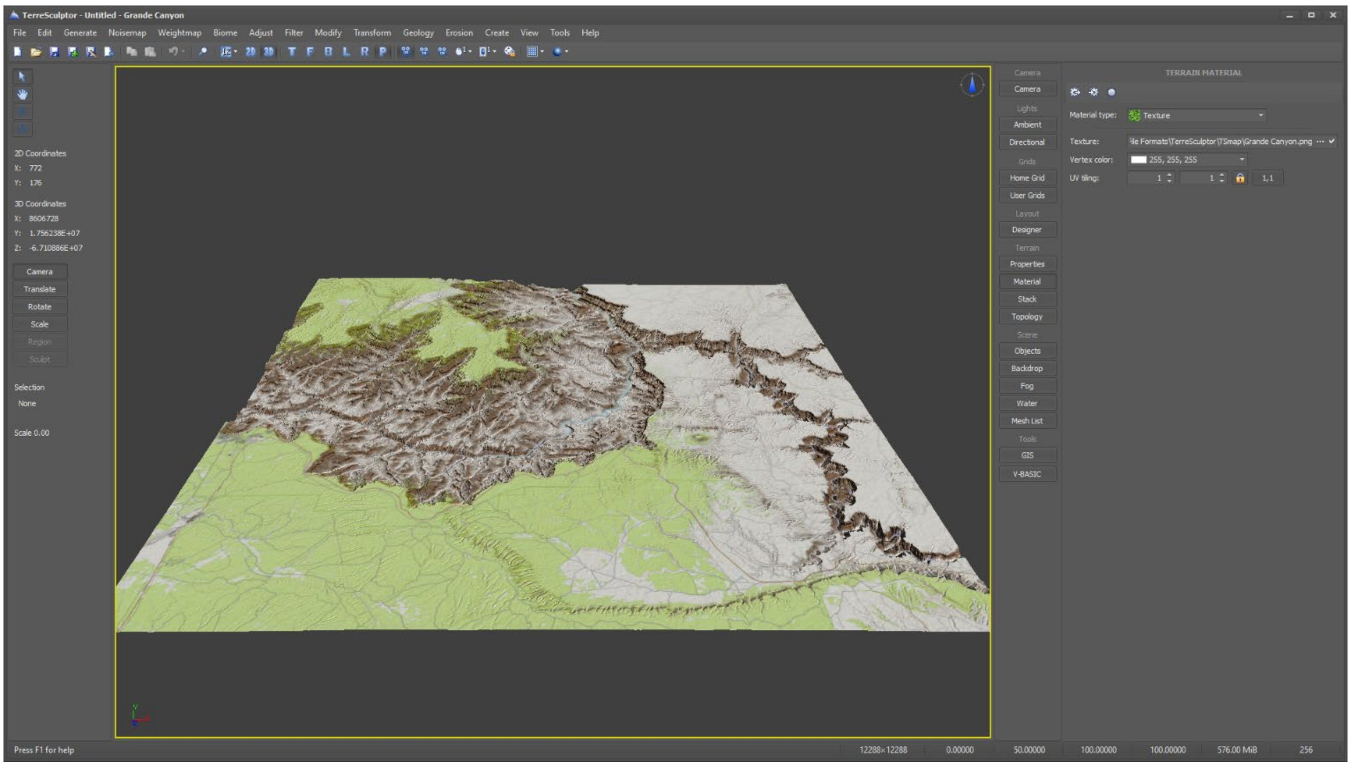
Notes

Create a new project before starting the Topography dialog, any size will work such as 1024x1024.
Be sure that the computer has enough memory to download the size of the texture that is selected in the viewport.

The Mapper Explorer and Topography Explorer share the same Favorites. Changes on one will affect the other.

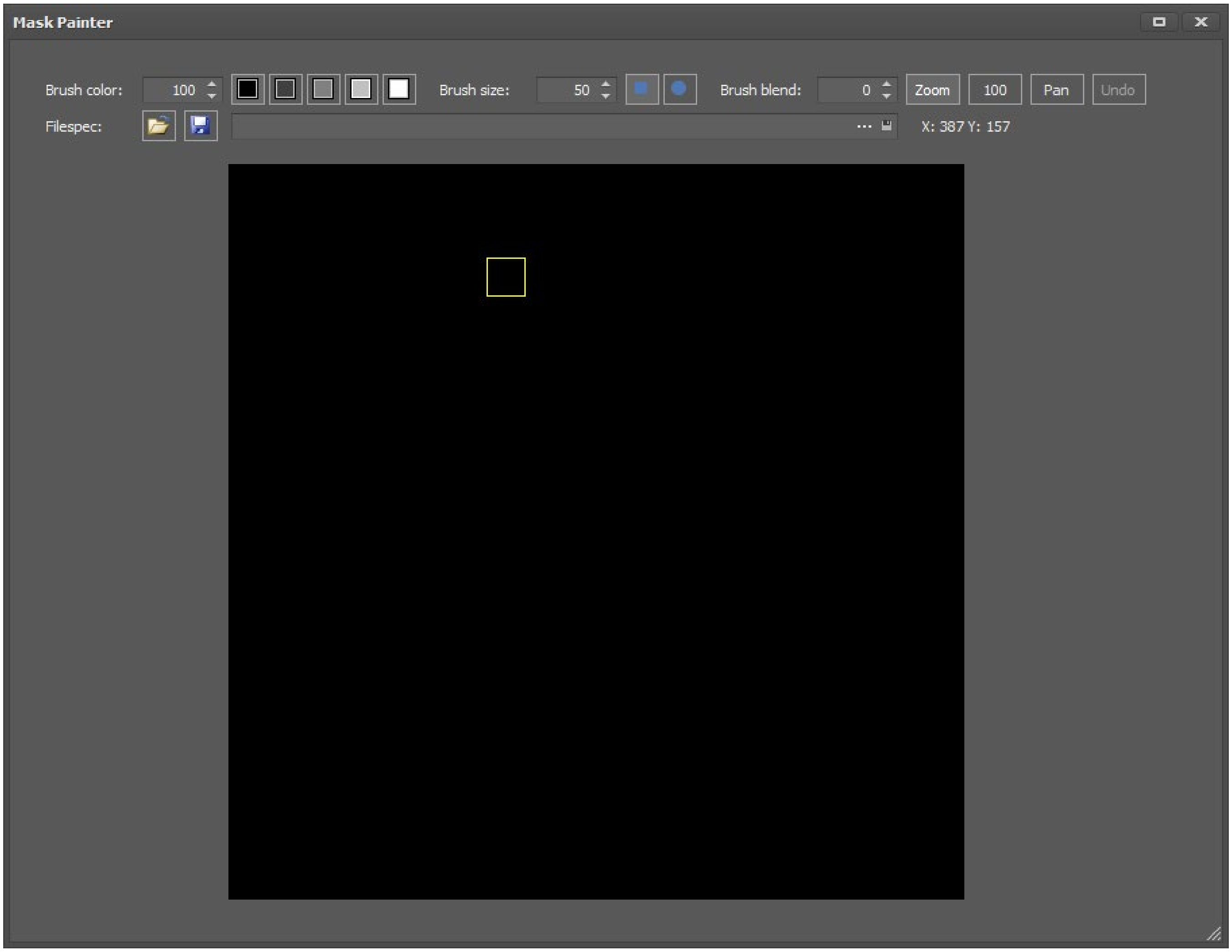
The Explorer preview is a 3x3 Tile layout at the current Zoom Level. The downloaded texture will be a multiple of 3x256 pixels times the zoom level, such as 768, 1536, 3072, 6144, 12288, etc.
The texture can be further cropped and edited after downloading using image editing software.

The texture that is downloaded is 1:1 tiled with the Mapper Explorer tiles. Both Explorers use the same Tile X,Y numbers for earth locations.
This also means that the Topography texture can be used in the Terrain Material as a Texture on the Mapper download.



Mask Painter

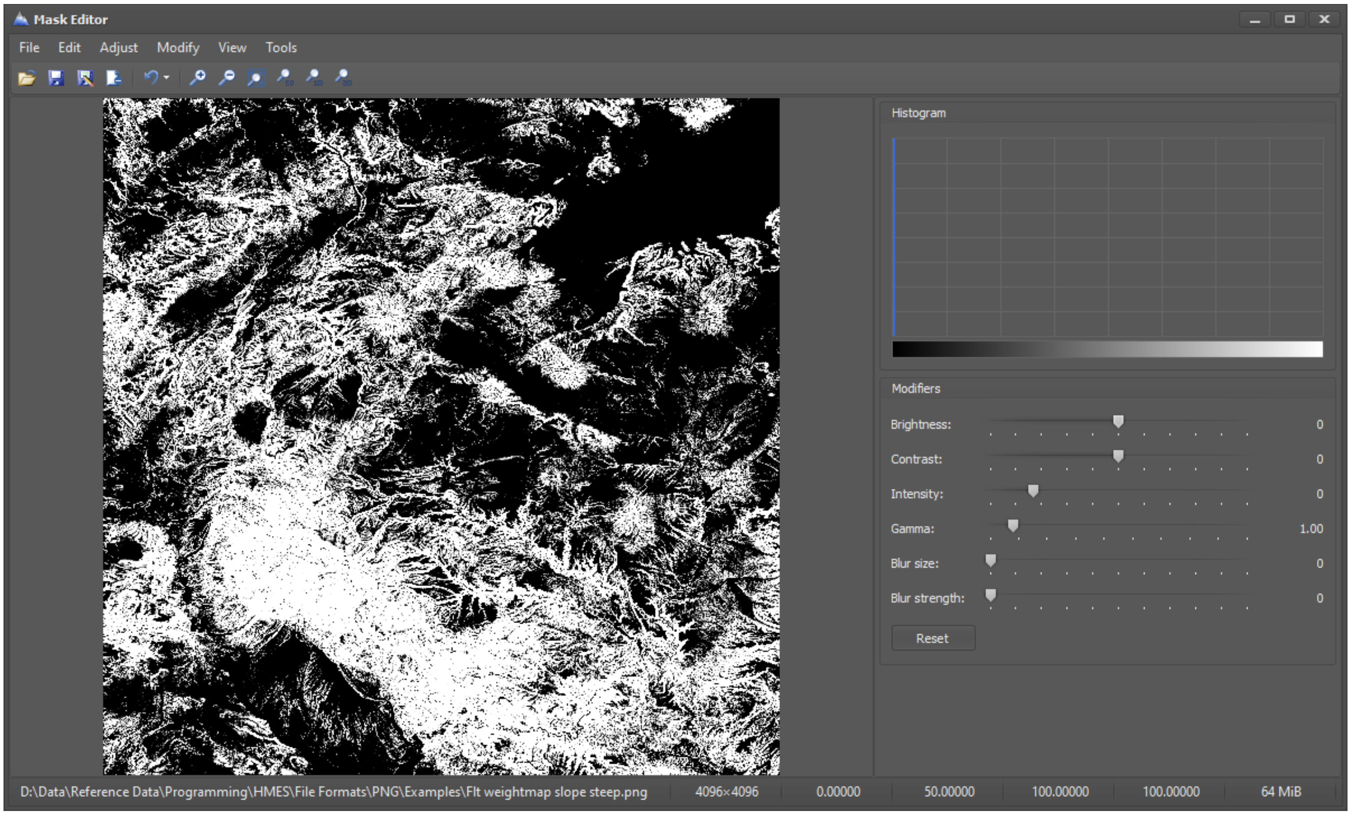
Hand-paint grayscale masks.



This tool is under development.

Mask Editor

Edit grayscale masks.

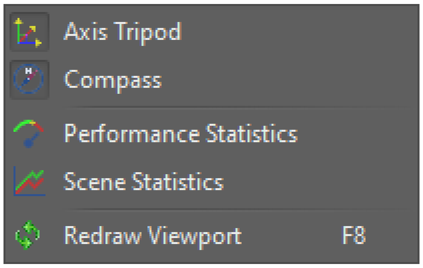


Notes

The image tools are basically designed for creating 3D DirectX and OpenGL textures up to 16384 × 16384.
There are maximum image resolutions imposed by the Microsoft Windows Imaging APIs.
The 24-bit RGB texture format has a resolution limit of 26754 × 26754.
The 32-bit RGBA texture format has a resolution limit of 23170 × 23170.

View Menu

The view menu toggles various widget icons and displays on the main editor viewport.



Axis Tripod – Toggle the editor viewport axis tripod visibility.
The axis tripod can be disabled in the Settings Scene settings.

Compass – Toggle the editor viewport compass icon visibility.

Performance Statistics – Display the viewport rendering performance statistics.
The performance statistics include the frame render time.
See the chapter on *Viewport Statistics*.

Scene Statistics – Display the viewport rendering scene statistics.
See the chapter on *Viewport Statistics*.

Redraw Viewport – Redraw the viewport scene.

The statistics display font can be changed in the Settings Viewport settings.
The performance statistics and scene statistics can be enabled in the Settings Scene settings.
The performance statistics units can be changed in the Settings Scene settings.

Viewport Statistics

The viewport statistics display technical information regarding the current scene.

Performance Statistics

The performance statistics display the current scene render time (RT) and frame time (FT).
The render time is the amount of time spent preparing, batching and rendering the scene objects.
The frame time is the delta-time interval between subsequent calls to render the scene.

The performance statistics can be displayed in either milliseconds or frame per seconds.
Milliseconds is a more accurate statistical value as frames per second in a non-linear function.

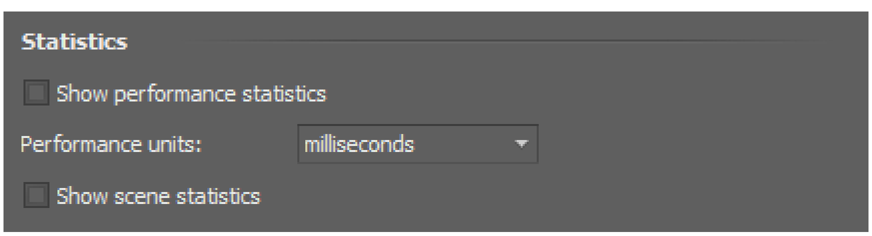
The render engine is not a constant iterative loop method and is only updated when camera or scene changes occur. The frame time delta value is relevant only if the scene is constantly updated such as constant camera movement.

Scene Statistics

The scene statistics display information regarding the scene objects, which includes:
- The number of scene objects rendered.
- The number of terrain sections rendered.
- The number of terrain triangles rendered.

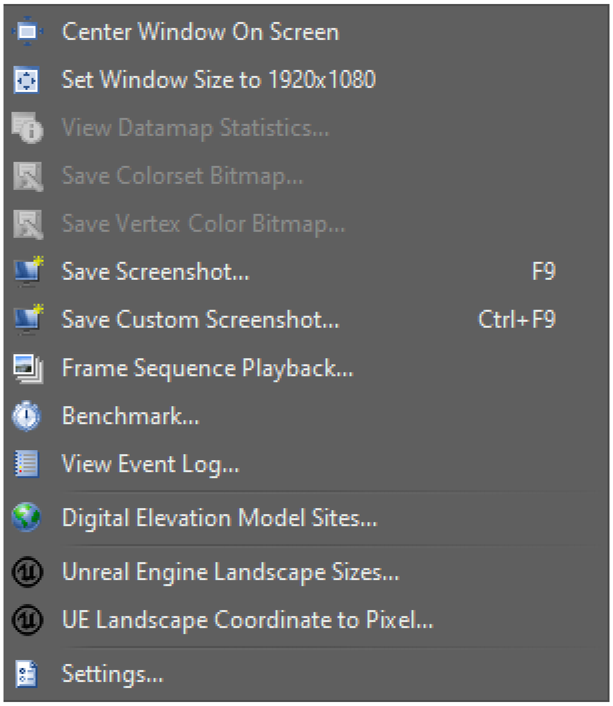
Viewport Statistics Options

The viewport stats display is managed through the Settings dialog Scene tab settings.
The performance statistics and scene statistics can be shown or hidden.
The performance statistics can be displayed as either milliseconds or frames per second.



Tools Menu

Contains special tools items.



Center Window on Screen – Center the application window on the screen.
This properly handles multi-monitor setups.

Set Window Size to 1920x1080 – Set the main window size to 1920x1080.

View Datamap Statistics – View the statistics for the selected terrain stack datamap.

Save Colorset Bitmap – Save the heightmap colorset material as an image file.

Save Vertex Color Bitmap – Save the terrain mesh colorset material as an image file.

Save Screenshot – Save the current contents of the viewport as an image file.
This function is valid for all orthogonal and perspective views.

Save Custom Screenshot – Save the current contents of the viewport as an image file of the specified resolution.
This function is valid for all orthogonal and perspective views.

Frame Sequence Playback – Open and render a Frame Sequence to PNG files for creating a video.
See the chapter on *Frame Sequence*.

Benchmark – Run a computer system performance benchmark.

View Event Log – View the application event log file contents.

Digital Elevation Model Sites – Display a dialog with links to common DEM sites.

Unreal Engine Landscape Sizes – Launch the Unreal Engine 3/4/5 Landscape Sizes dialog.

UE Landscape Coordinate to Pixel – Launch the Unreal Engine 3/4/5 Landscape Coordinate to Pixel dialog.

Settings – Display the application settings dialog.
Information on the *Settings* is provided in another chapter in this document.

View Datamap Statistics

To display the Datamap Statistics, choose the View Datamap Statistics item on the Tools menu.

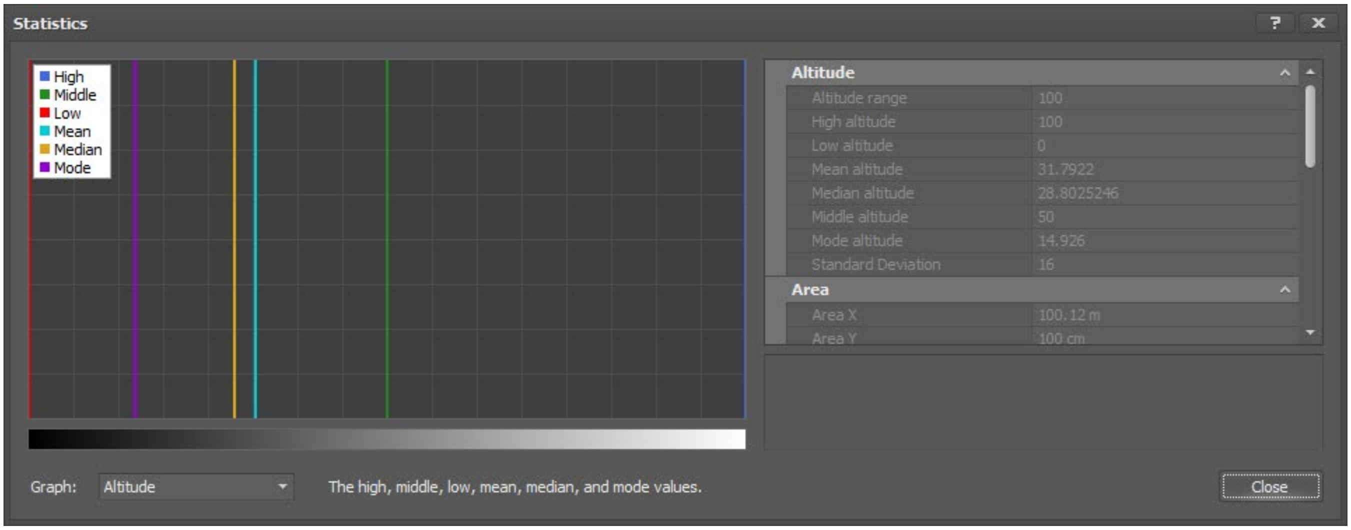
The Statistics dialog displays a set of statistical values for the current base datamap, along with a variety of statistical graphing functions.

The statistical values list contains in-depth information on the current base datamap.
The available graph types include Altitude, Deviation, Histogram, and Range.
Each graph is based on a horizontal altitude from 0.0 to 100.0 with the gradient bar indicator referencing 0.0 as black and 100.0 as white.

Altitude Statistics

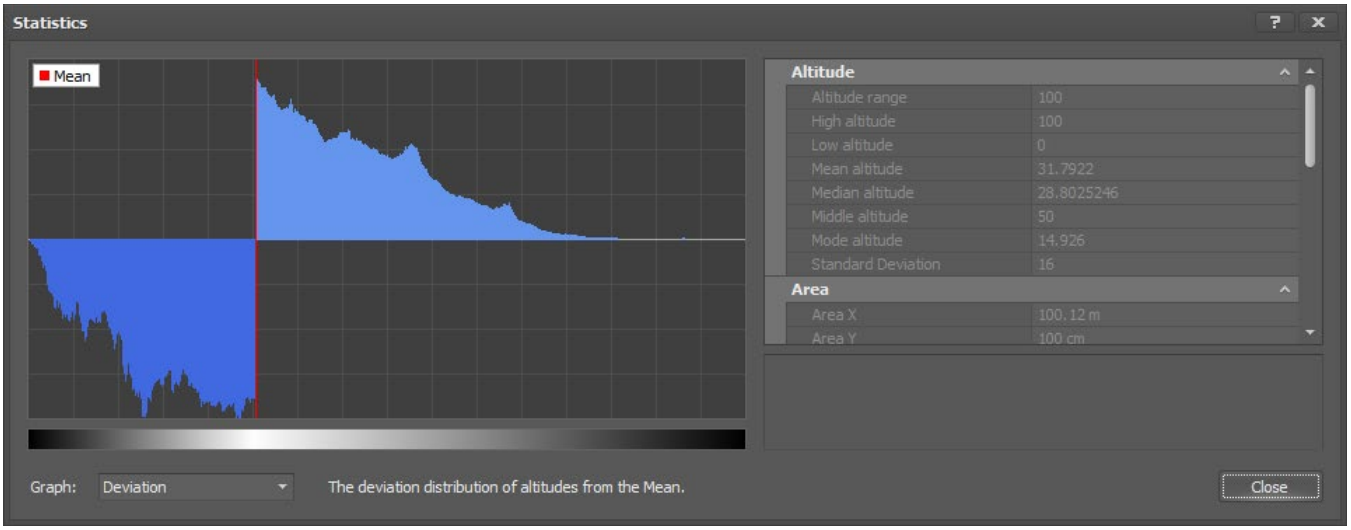
This graph displays the datamap altitude values of high, low, mean, median, and mode.

High: the highest altitude.
Low: the lowest altitude.
Mean: the mean altitude, the mathematical average value.
Median: the median altitude, the midpoint value.
Mode: the mode altitude, the most frequently occurring value.



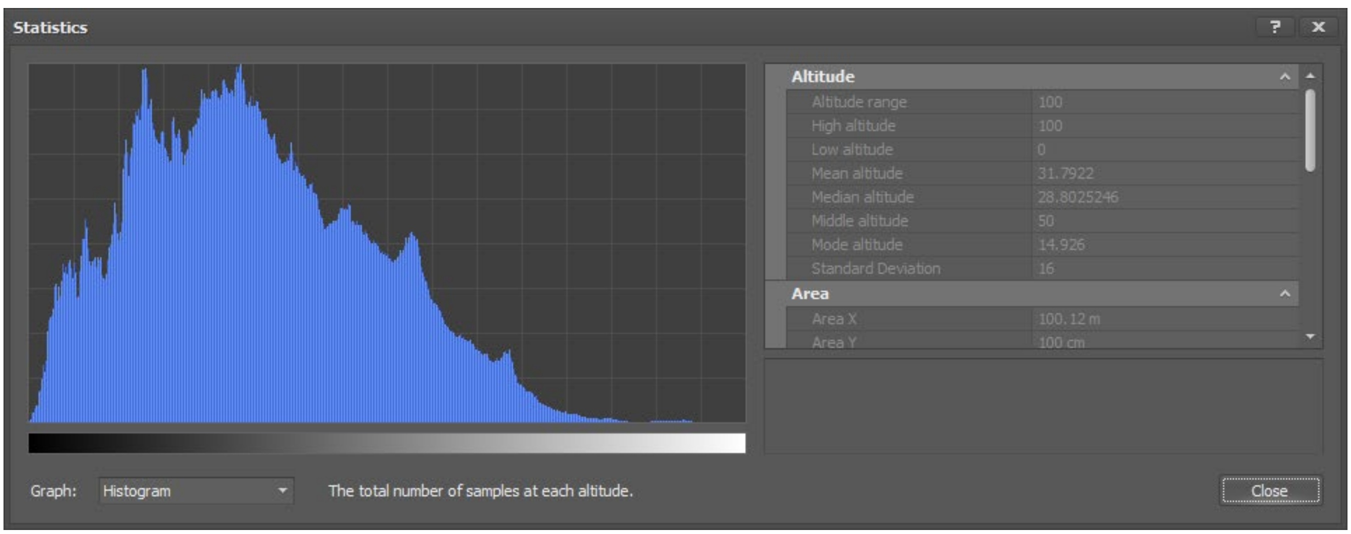
Deviation Statistics

This graph displays a deviation curve of the datamap data.
The statistical deviation is the distribution of all of the datamap altitudes, positive and negative, from the Mean mathematical average value.



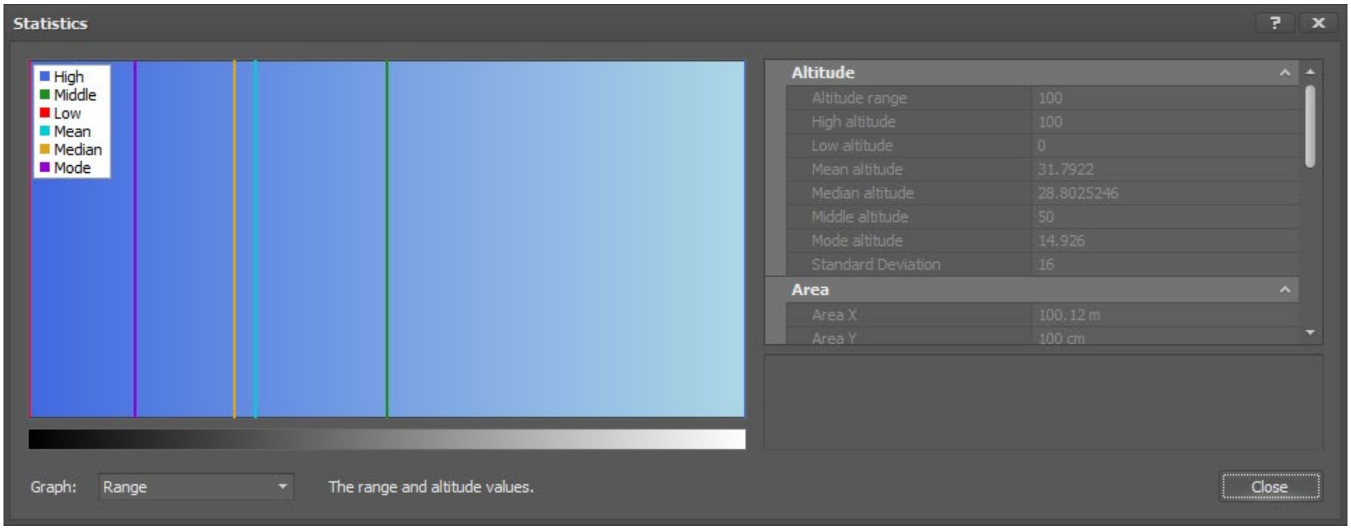
Histogram Statistics

This graph displays a histogram curve of the datamap data.
The histogram is the frequency distribution of the data, which is a total count of each individual altitude.



Range Statistics

This graph is similar to the Altitude graph but includes a gradient region that depicts the full range of the datamap data.

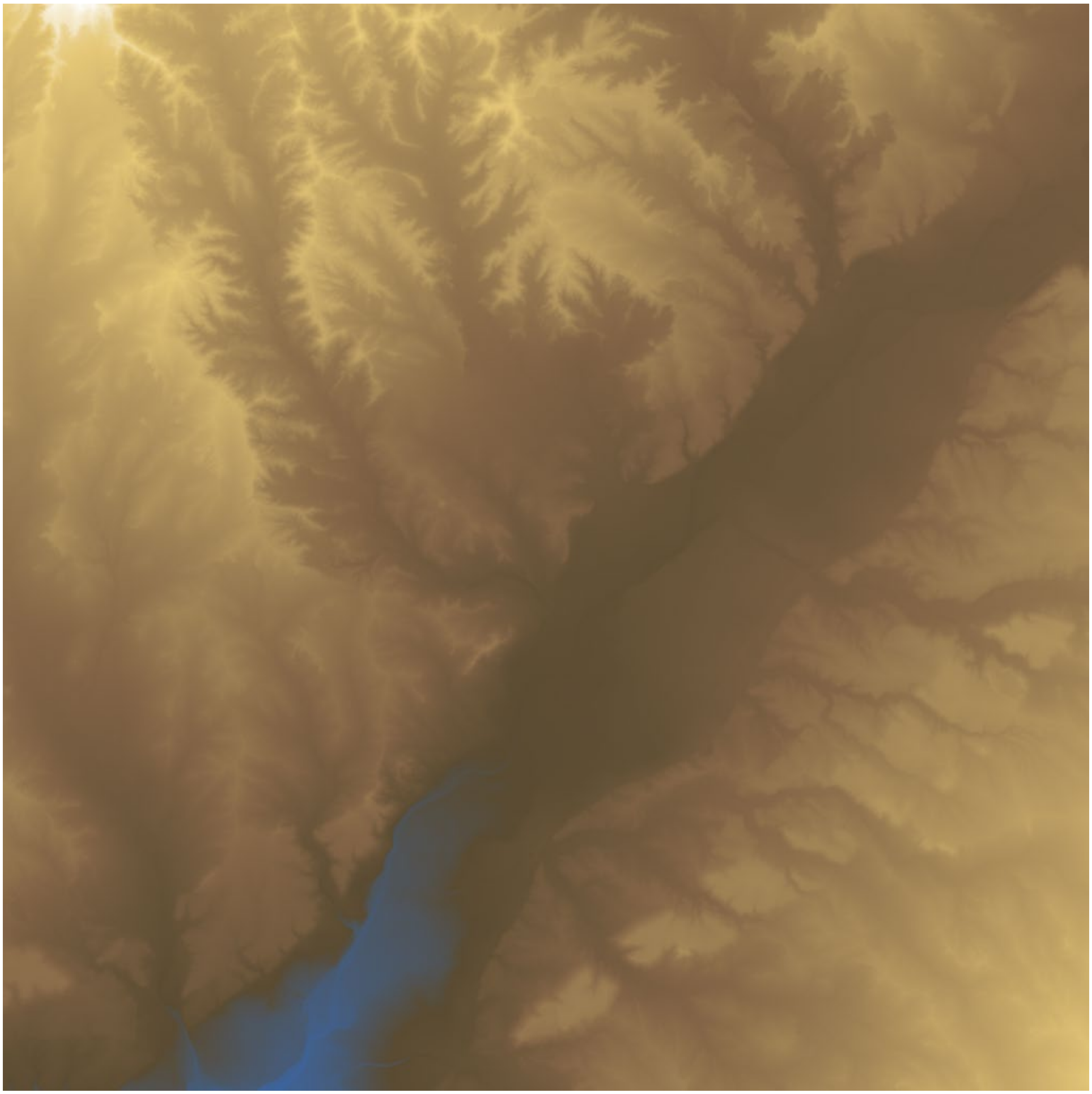


Save Colorset Bitmap

To save the current colorset bitmap, choose the Save Colorset Bitmap item on the Tools menu.
This bitmap image can be used as an overlay texture on a terrain mesh in a video game engine or 3D software.

The Save Colorset Bitmap saves the current Datamap Colorset as an image file on disk.
This is the full size Datamap that is saved. If the Datamap is 10012x10012 then the bitmap will be that same resolution.

An example image saved from this feature:

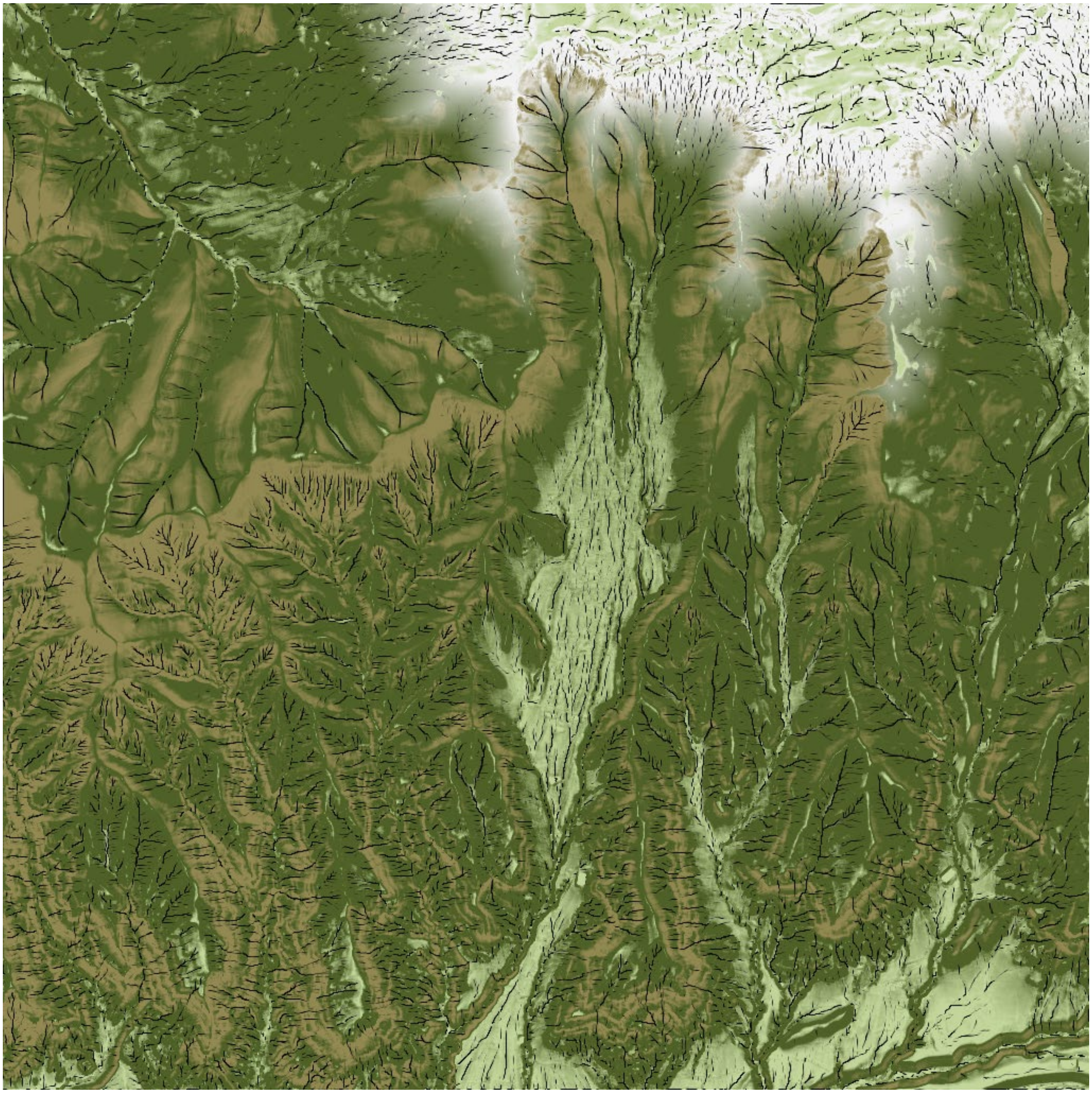


Save Vertex Color Bitmap

To save the current terrain mesh vertex colors bitmap, choose the Save Vertex Color Bitmap item on the Tools menu. This bitmap image can be used as an overlay texture on a terrain mesh in a video game engine or 3D software.

The Save Vertex Color Bitmap item saves the Vertex Colors of the current 3D Viewport Terrain Mesh, so the resolution is limited to the Terrain Mesh LOD value, which is typically 1024 or 4096.

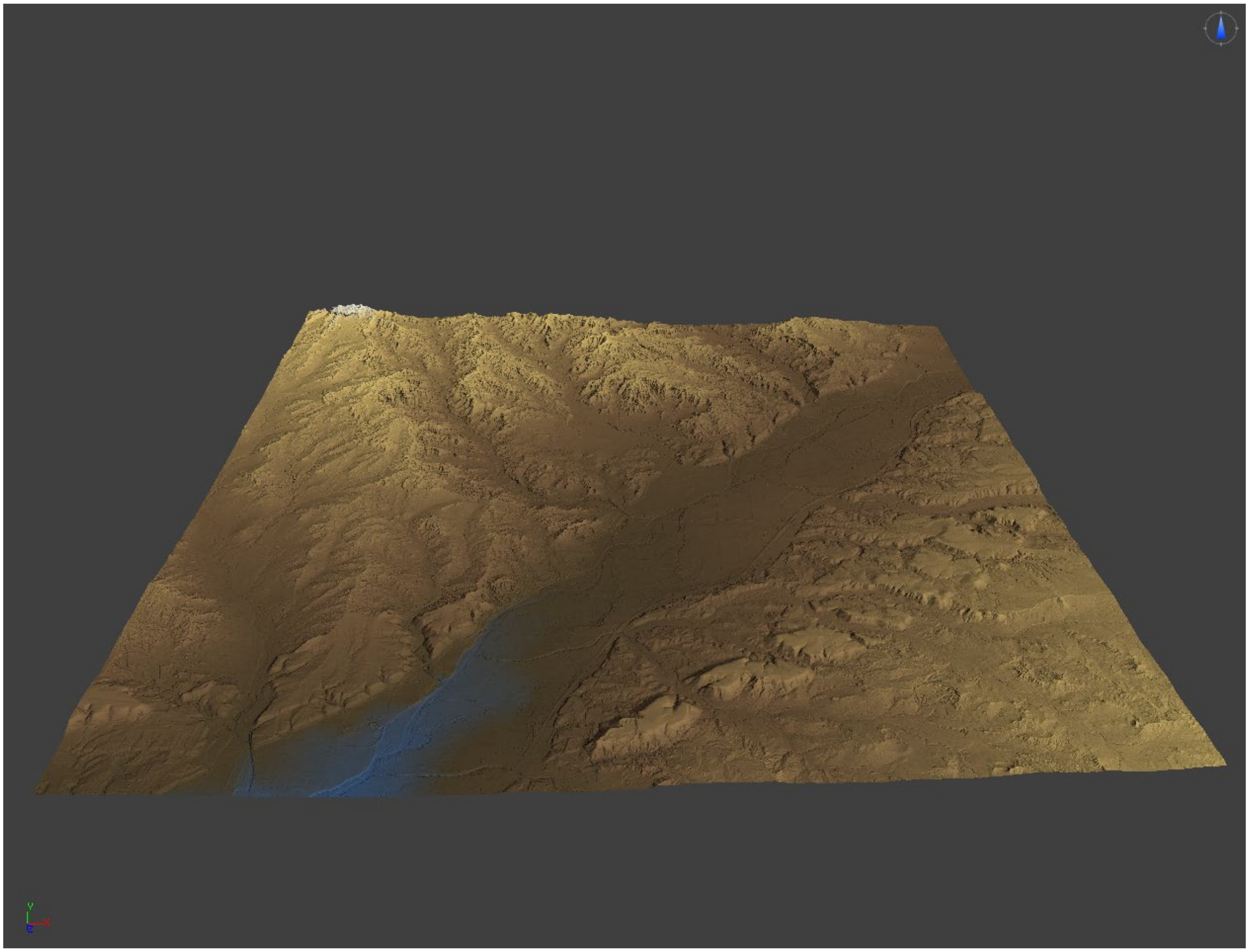
An example image saved from this feature:



Save Screenshot

To save a screenshot of the current main viewport contents, choose the Save Screenshot or Save Custom Screenshot item on the Tools menu.

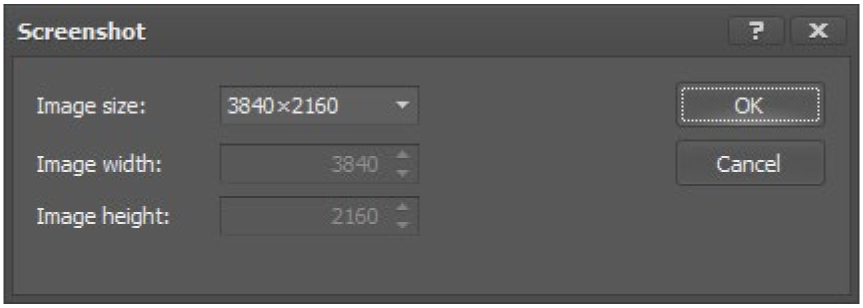
The Save Screenshot item saves an image file of the current main viewport, at the current resolution of the main viewport. The widget icons and statistics are included in the screenshot if they are enabled in the View menu items.



Save Custom Screenshot

The Save Custom Screenshot item allows for saving a screenshot that is a custom resolution. This is useful when the image is used for print.

The Save Custom Screenshot item displays a resolution dialog that includes common display resolutions.



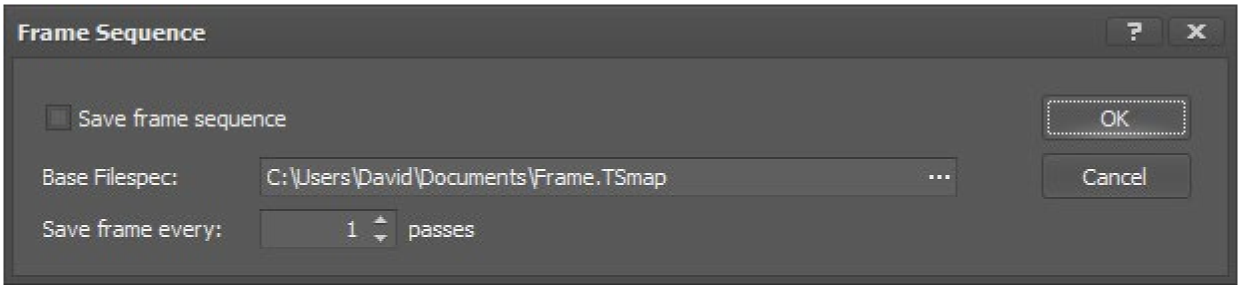
Frame Sequence

The frame sequence system saves TSmap format heightmaps from Devices that support the Frame Sequence system. These TSmap heightmaps can then be converted to PNG images for an image sequence for creating videos. This system fully supports the visualization system in TerreSculptor, including backdrops and fog and auto-materials.

Note that currently the only Devices that support Frame Sequence are the Erosion Devices, and TerreSculptor must be running in single-threaded mode for the frame sequences to be written.

Frame Sequence Dialog

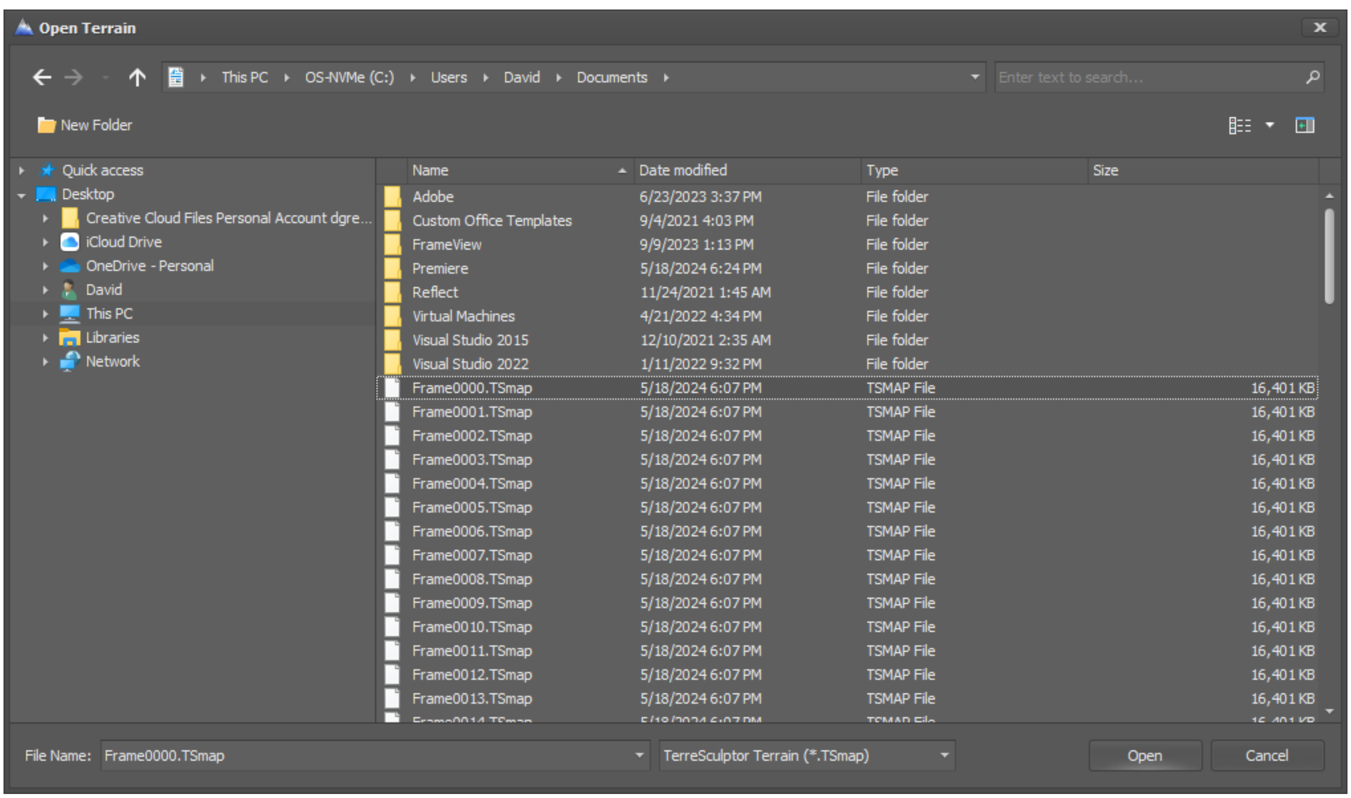
On Devices that have a Frame Sequence button, click on the button to display the Frame Sequence dialog.



Save frame sequence	Enable this to save the frame sequence.
Base filespec	The base filespec for the frames, the files will be appended with 0000 to 9999.
Save frame every	Choose the interval for frame saving, for example 100 frames from 1000 passes.

Frame Sequence Playback

Choose the Frame Sequence Playback item on the Tools menu to load a frame sequence and save it as PNG screenshots of the main editor viewport.



Creating a Frame Sequence

To create a frame sequence video of an erosion process follow these basic steps.

Click on Tools Settings, click on the System Tab, and set the Scaling Threads to 1.
The Erosion Devices must be in single-threaded more for the frames to be written out.
Note that this means that the erosion device execution time will be significantly longer.

Create your heightmap terrain as you desire.
The Frame Sequence works best on a Normalized heightmap with the correct Spacing Y set for the elevation range.
Click on the Erosion menu and choose the desired erosion device.
On the erosion device dialog, click on the Frame Seq… button to display the Frame Sequence dialog.
Enable the Save Frame Sequence checkbox and set the Interval to the number of frames that you want recorded.
If the erosion device time is 10,000 and you wish to have only 100 frames, the Interval will be set to every 100th frame.

Click on the Frame Sequence dialog OK button to close the dialog.
Click on the erosion device OK button to execute the device.
The erosion will be processed on the heightmap terrain, and the TSmap files will be saved for each nth pass.
Looking in the Documents folder there should be the desired number of Frame0000.TSmap to FrameNNNN.TSmap files.
Note that during the Erosion Frame Sequence process, the progressbar on the progress dialog will flicker, this is normal.

Set up the main editor with the desired look for visualization, including backdrop and fog and terrain material.

On the Tools menu, choose the Frame Sequence Playback item, this will display a file open dialog where you can choose the first Frame0000.TSmap file from the Documents folder.
The frames will now be loaded, and screenshots in PNG file format will be written out to the same folder.

This sequence of PNG files can be imported into software such as Adobe Premiere as an image sequence, in order to create an animated movie video of the erosion process.

Benchmarking System Performance

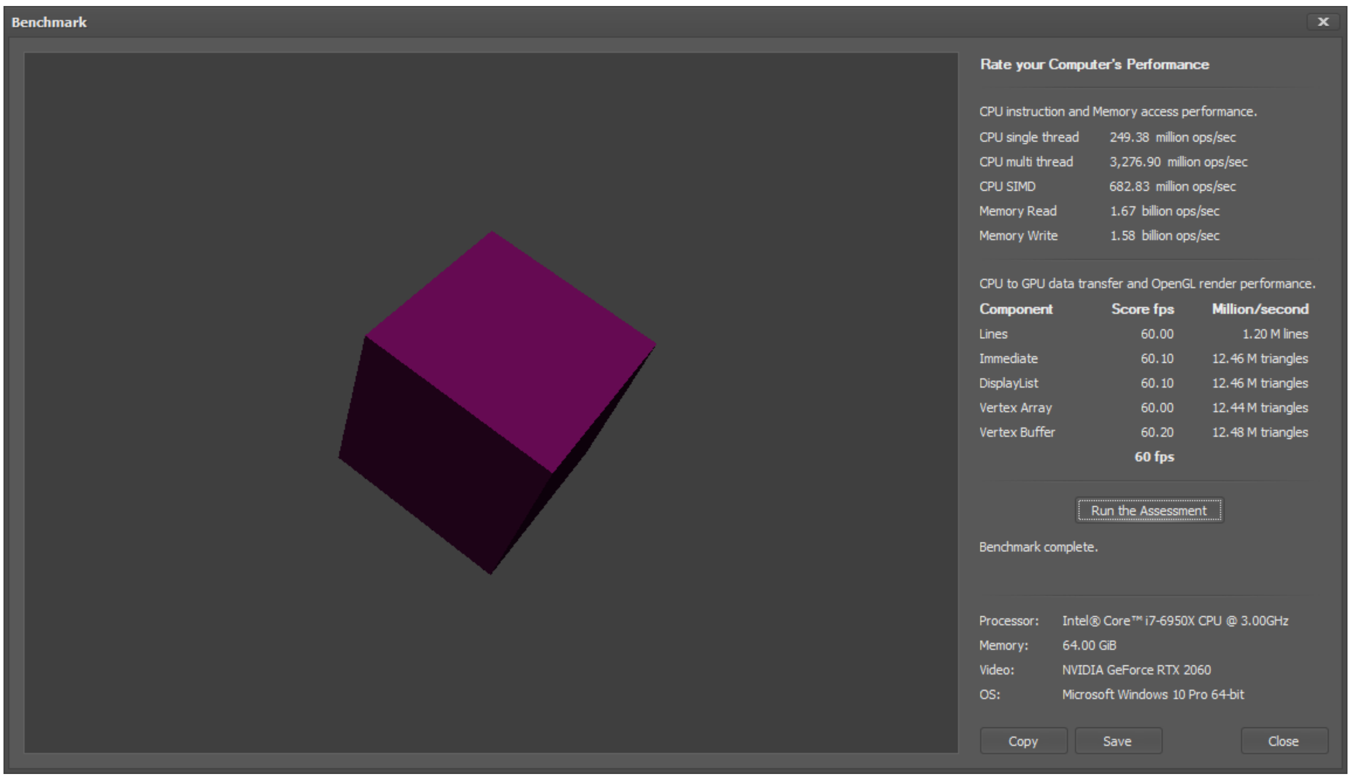
To display the Benchmark dialog, choose the Benchmark item on the Tools menu.

The benchmark dialog runs a test of the computer system's data transfer and rendering performance.

Click on the *Run the Assessment* button to start the benchmark. The benchmark process will require approximately one minute to complete.

The score fps is the number of frames per second achieved while rendering a specific component type.
The million/second is the millions of lines or triangles rendered per second.
The computer system's final benchmark score number will be displayed in the speedometer graphic.
The score number is an average of all of the results from the individual component tests.

The most important rating in the benchmark is the Vertex Buffer score as this is the most common 3D entity type used by TerreSculptor.



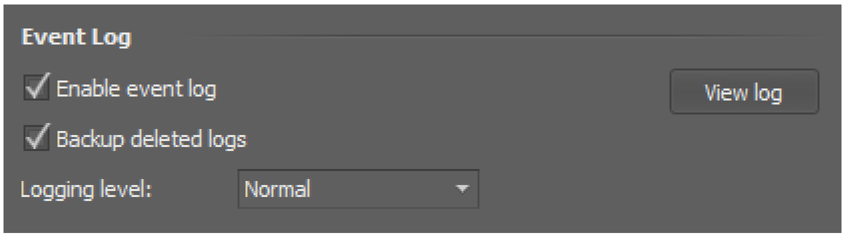
Application Event Log

To display the Event Log choose the View Event Log item on the Tools menu.

TerreSculptor includes an event log system that is useful for both troubleshooting software issues and for obtaining general application operational status information.

Event Log Settings

The application Options dialog includes a number of settings for controlling the operation of the event log. The event log settings are located on the Settings dialog's System tab.



Enable event log	Enable writing of events to the application event log file.
Backup deleted logs	Create a backup copy of prior event logs that are deleted on startup.
Logging level	The level of events that are logged: Errors only, Warnings and Errors, Verbose Information, Enhanced Debug.
View log	Open the Event Log Viewer dialog.

The View Log button allows for opening the Event Log Viewer dialog while in the Options. The Event Log Viewer dialog is typically accessed through the Tools menu.

Event Log Levels

The event log contains a variety of application events that fall into five different levels of event importance.

System:	Important events that are always written to the event log.
Debug:	Extended information for application debugging purposes.
Error:	Fatal errors that halt the execution of the application or cause an app crash message.
Warning:	Non-fatal warnings for severe events that the application attempts to handle.
Information:	General verbose messages for the operation and status of the application.

On slower computers or systems with smaller hard drive space it is recommended to set the Logging Level option to *Errors only* or *Warnings and Errors* only. Setting the Logging Level option to *Verbose Information* or *Enhanced Debug* will cause the application to spend additional processing time writing to the log file, and the log file size will increase substantially.

Event Log File Format

The event log file contains an identification header line followed by the event entries.
It is not recommended to edit the event log file while the application is running.

The general format of the event log file entries is:

Event Date and Time	Event Level	Event ID	Source Class	Event Message
yyyy.mm.dd hh:mm:ss	see above	32-bit ID number	class name	event text message

Event Log File Location

The event log file is located in the same folder as the application ini file.
The parent folder may be hidden in Windows Explorer by default.
For Windows XP this folder is located at:
C:\Documents and Settings\<user>\Local Settings\Application Data\TerreSculptor
For Windows Vista and Windows 7 this folder is located at:
C:\Users\<user>\AppData\Local\TerreSculptor

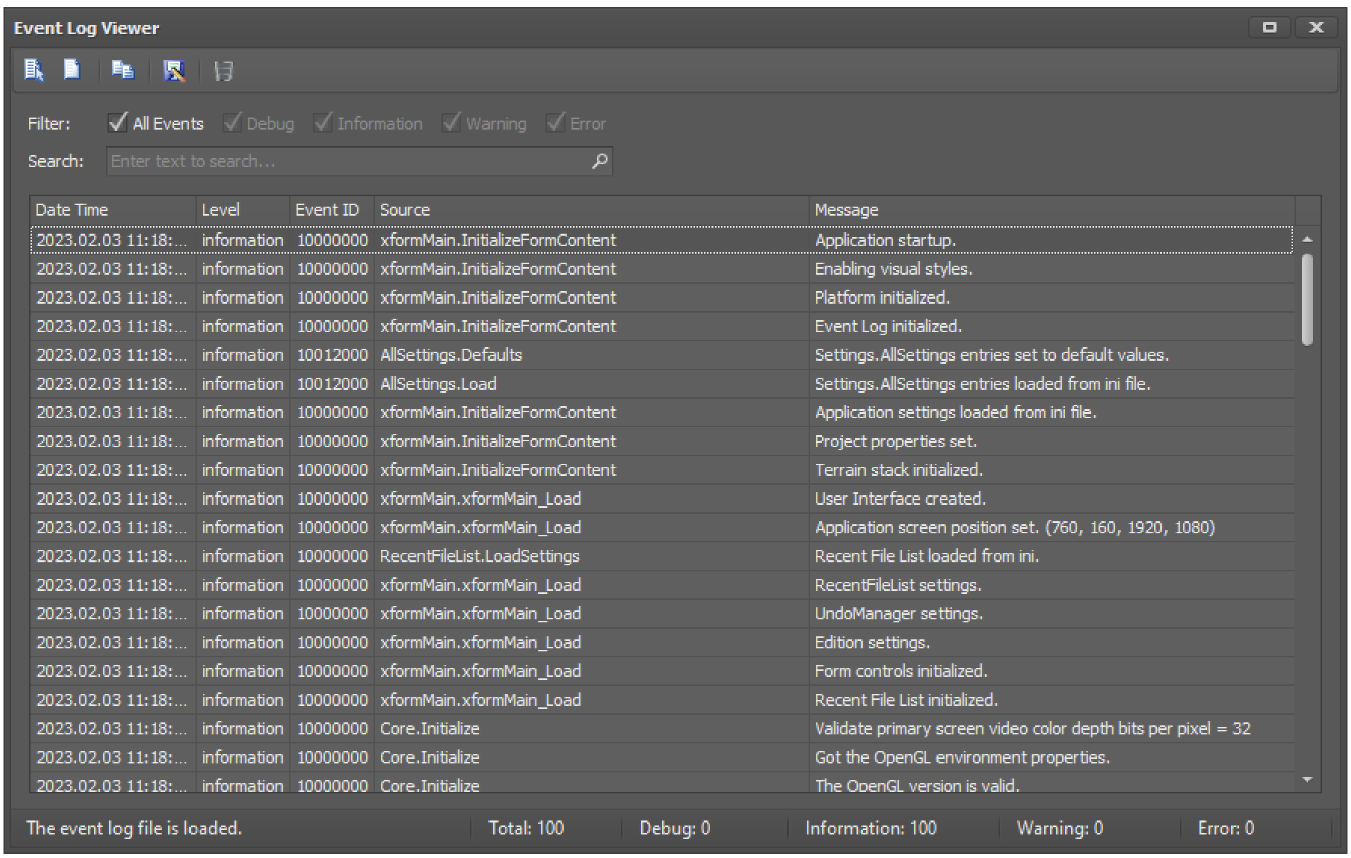
The name of the log file is TerreSculptor.log.

A new log file is generated every time that the TerreSculptor application is ran, and the previous log file is deleted and overwritten. If the *Backup deleted logs* option is enabled, the previous event log file is renamed as a backup by appending the file extension *.bak*. And any prior event log backup file will be sent to the recycle bin.

Viewing the Event Log

The Event Log Viewer is displayed by either choosing the View Event Log item on the Tools menu, or by clicking on the View Log button in the application Options System tab.

The Event Log Viewer dialog contains four regions of controls: the filter options, the edit toolbar, the event list, and the status bar.



Filter Options

The filter options allow you to filter the event levels that appear in the event list.
Selecting the All Events checkbox displays all events in the list.
Deselecting the All Events checkbox and selecting any combination of Debug, Information, Warning, or Error, displays only those event level types in the list.

Edit Toolbar

The edit toolbar contains functions for working with the event list.

Select all	Select all of the events in the list.
Select none	De-select all of the events in the list.
Copy events	Copy the selected events to the clipboard.
Save events	Save the selected events to a text file.
Clear event log	Clear the entire event log.

Event List

The event list contains all of the current event log entries, as specified by the Filter selections.
The event log entries are color-coded by event level, and include a customized icon for each event type.

A mouse button right-click on the event list will display a context-sensitive menu that contains most of the edit toolbar functions.

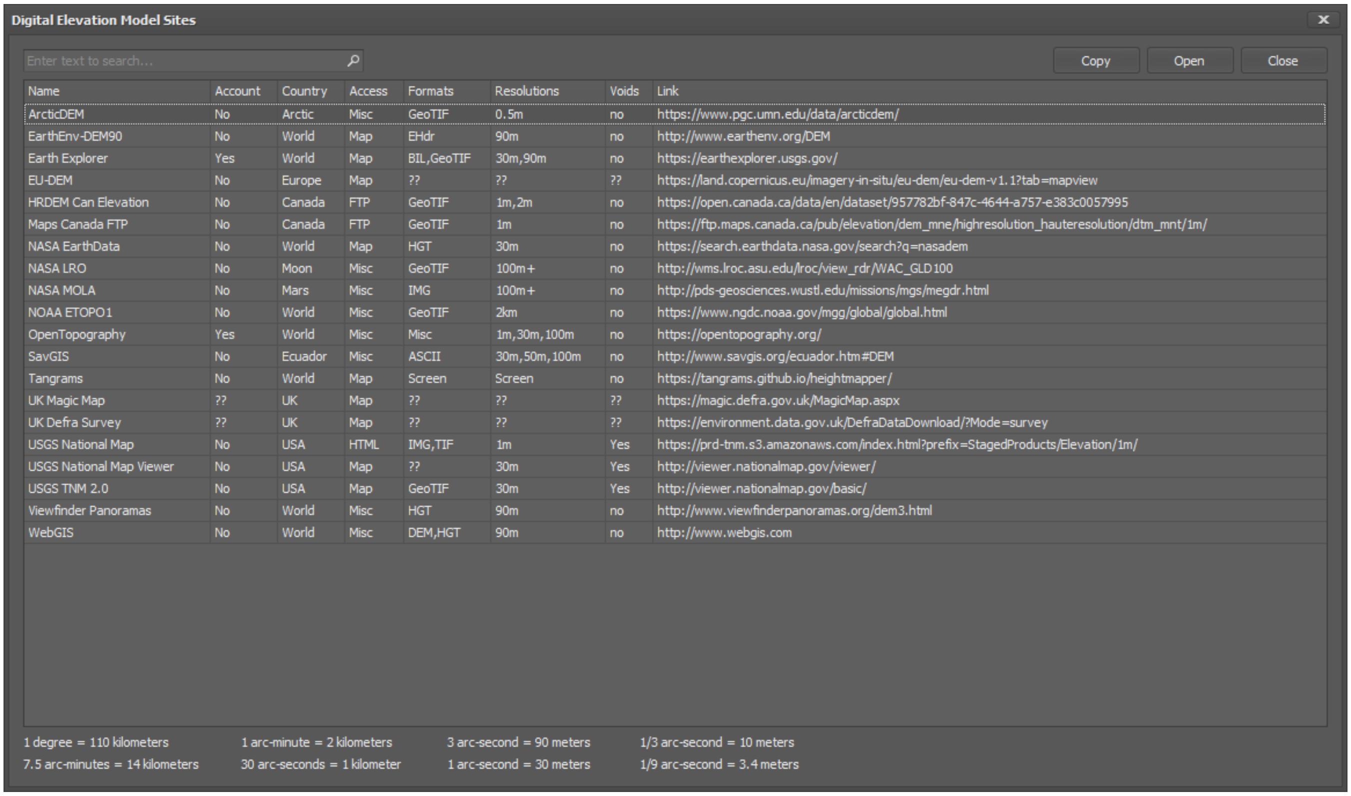
Status bar

The status bar contains information and statistics on the current event log entries.

Digital Elevation Model Sites

To display the Digital Elevation Model Sites dialog, choose the Digital Elevation Model Sites item on the Tools menu. This dialog contains a listing of current common Digital Elevation Model sites on the Internet.

Select a site in the list and click on the Copy button to copy its Internet Address to the clipboard.
Select a site in the list and click on the Open button to launch its Internet Address in the default browser.
Click on the Close button to close the dialog.



Name	Account	Country	Access	Formats	Resolutions	Voids	Link
ArcticDEM	No	Arctic	Misc	GeoTIF	0.5m	no	https://www.pgc.umn.edu/data/arcticdem/
EarthEnv-DEM90	No	World	Map	EHdr	90m	no	http://www.earthenv.org/DEM
Earth Explorer	Yes	World	Map	BIL,GeoTIF	30m,90m	no	https://earthexplorer.usgs.gov/
EU-DEM	No	Europe	Map	??	??	??	https://land.copernicus.eu/imagery-in-situ/eu-dem/eu-dem-v1.1?tab=mapview
HRDEM Can Elevation	No	Canada	FTP	GeoTIF	1m,2m	no	https://open.canada.ca/data/en/dataset/957782bf-847c-4644-a757-e383c0057995
Maps Canada FTP	No	Canada	FTP	GeoTIF	1m	no	https://ftp.maps.canada.ca/pub/elevation/dem_mne/highresolution_hauteresolution/dtm_mnt/1m/
NASA EarthData	No	World	Map	HGT	30m	no	https://search.earthdata.nasa.gov/search?q=nasadem
NASA LRO	No	Moon	Misc	GeoTIF	100m+	no	http://wms.lroc.asu.edu/lroc/view_rdr/WAC_GLD100
NASA MOLA	No	Mars	Misc	IMG	100m+	no	http://pds-geosciences.wustl.edu/missions/mgs/megdr.html
NOAA ETOPO1	No	World	Misc	GeoTIF	2km	no	https://www.ngdc.noaa.gov/mgg/global/global.html
OpenTopography	Yes	World	Misc	Misc	1m,30m,100m	no	https://opentopography.org/
SavGIS	No	Ecuador	Misc	ASCII	30m,50m,100m	no	http://www.savgis.org/ecuador.htm#DEM
Tangrams	No	World	Map	Screen	Screen	no	https://tangrams.github.io/heightmapper/
UK Magic Map	??	UK	Map	??	??	??	https://magic.defra.gov.uk/MagicMap.aspx
UK Defra Survey	??	UK	Map	??	??	??	https://environment.data.gov.uk/DefraDataDownload/?Mode=survey
USGS National Map	No	USA	HTML	IMG,TIF	1m	Yes	https://prd-tnm.s3.amazonaws.com/index.html?prefix=StagedProducts/Elevation/1m/
USGS National Map Viewer	No	USA	Map	??	30m	Yes	http://viewer.nationalmap.gov/viewer/
USGS TNM 2.0	No	USA	Map	GeoTIF	30m	Yes	http://viewer.nationalmap.gov/basic/
Viewfinder Panoramas	No	World	Misc	HGT	90m	no	http://www.viewfinderpanoramas.org/dem3.html
WebGIS	No	World	Misc	DEM,HGT	90m	no	http://www.webgis.com

1 degree = 110 kilometers	1 arc-minute = 2 kilometers	3 arc-second = 90 meters	1/3 arc-second = 10 meters
7.5 arc-minutes = 14 kilometers	30 arc-seconds = 1 kilometer	1 arc-second = 30 meters	1/9 arc-second = 3.4 meters

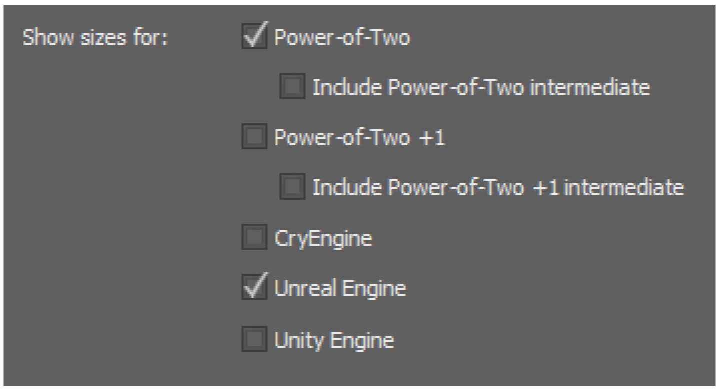
Unreal Engine Landscape Sizes

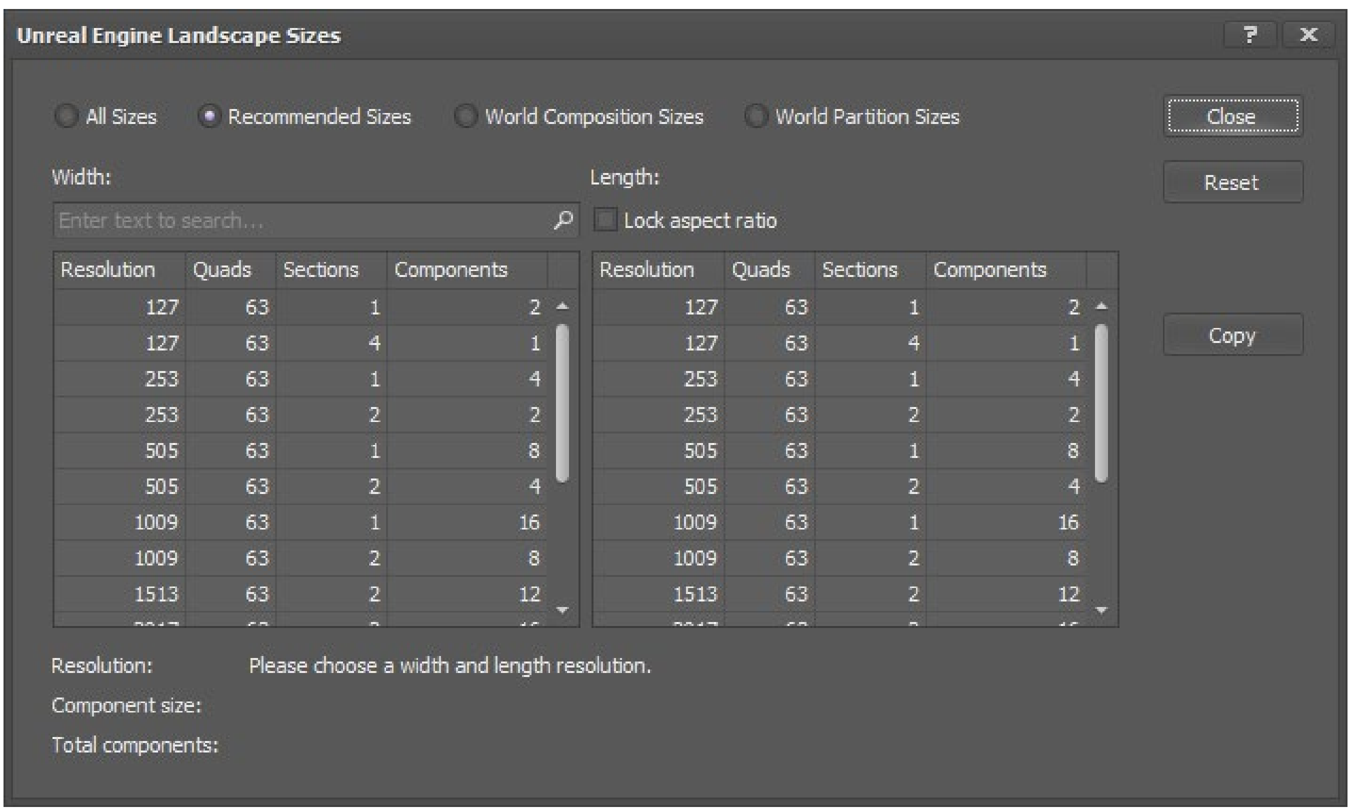
To display the Unreal Engine Landscape Sizes dialog, choose the Unreal Engine Landscape Sizes item on the Tools menu, or the UE button on the New, Resample, and Size dialogs.

The Unreal Engine Landscape Sizes dialog allows choosing a datamap resolution that is compatible with the Epic Unreal Engine 3/4/5 Landscape actor.

The Unreal Engine Landscape Sizes dialog is available in the Editor when creating a New project or in the Editor when Resampling or Sizing the current heightmap.

The Unreal Engine Landscape Sizes button will be available on the New and Resample and Size dialogs only when the Unreal Engine option is enabled on the Settings tab Dimensions group.





All Sizes	Display all Landscape sizes from 127 through 8161.
Recommended Sizes	Display the Landscape Recommended sizes from 127 through 8129.
World Composition Sizes	Display the UE4/5 World Composition Sizes with Tile Counts up to 52×52.
World Partition Sizes	Display the UE5 World Partition Sizes from 511 through 65281.

Width:	The datamap width dimension.
Length:	The datamap length dimension.
Lock aspect ratio:	Locks the Length value to the Width value.
Status lines:	Displays the selected resolution and Landscape component information.
Close	Close the dialog (displayed when the dialog is chosen from the Tools menu)
OK	Choose the selected resolution (when the dialog is displayed from the UE button).
Cancel	Cancel the dialog (when the dialog is displayed from the UE button).
Reset	Reset the dialog controls to their initial values.
Copy	Copy the current resolution information to the clipboard.

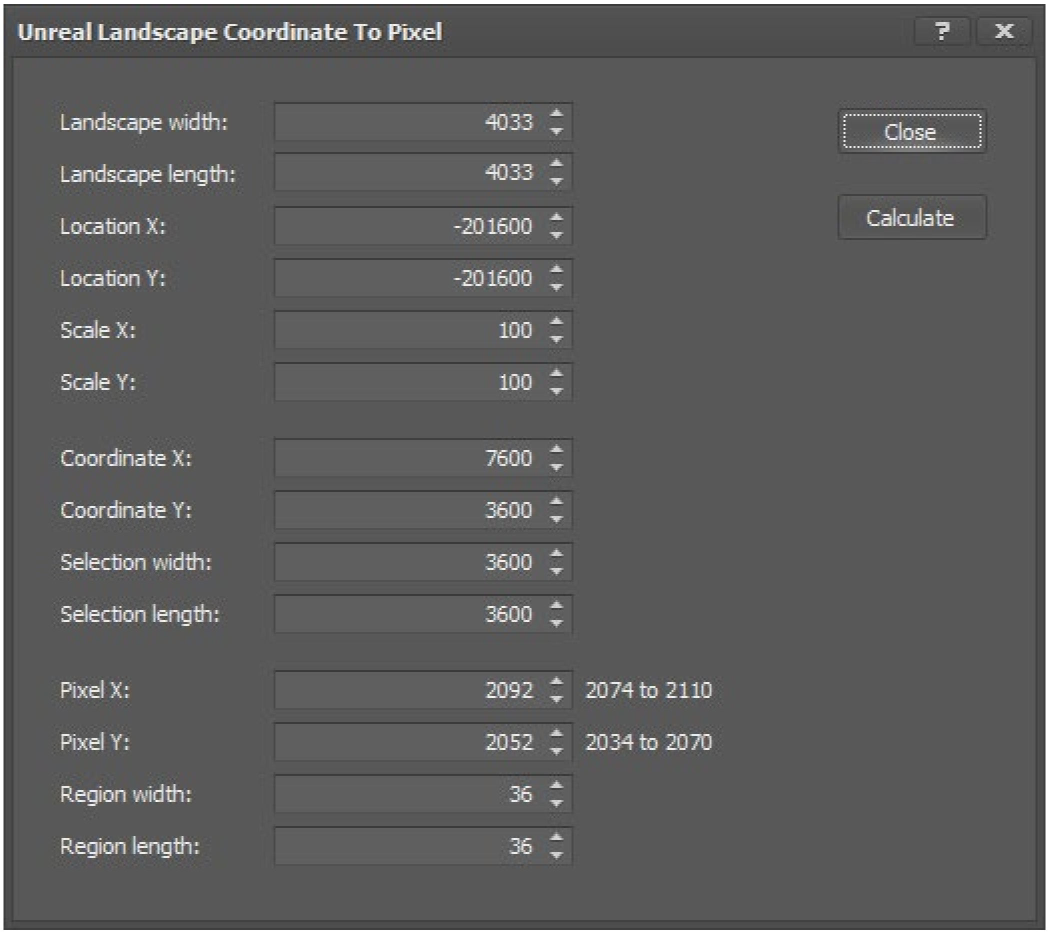
To use the Unreal Engine Landscape Sizes dialog, first choose the desired Width dimension. The Length list will then fill with all of the length dimensions that are compatible with the chosen width. Choose the desired Length dimension. If the Total number of components listed in the status area is more than 1024, choose a different set of dimensions.

See the Epic Unreal Engine Landscape documentation for additional information on using Landscape.

UE Landscape Coordinate to Pixel

This dialog converts Unreal Engine Landscape Coordinates to Heightmap or Weightmap pixels.

The Landscape actor is a mesh that is using centimeters spacing between vertices.
This dialog will convert those vertex spacing coordinates to the underlying pixel coordinate for the heightmap or material weightmap.



Close	Close the dialog.
Calculate	Calculate the Pixel and Region values.
Landscape width	The pixel width of the Landscape, for example, 2017 or 4033 or 8129.
Landscape length	The pixel length of the Landscape, for example, 2017 or 4033 or 8129.
Location X	The Landscape actor world Location X value, this can be found on the actor properties.
Location Y	The Landscape actor world Location Y value, this can be found on the actor properties.
Scale X	The Landscape Scale X value, this can be found on the actor properties, eg 100.
Scale Y	The Landscape Scale Y value, this can be found on the actor properties, eg 100.
Coordinate X	The world Coordinate X that you want the pixel value for.
Coordinate Y	The world Coordinate Y that you want the pixel value for.
Selection width	The world area width, eg 4000, this is used to calculate pixel region ranges.
Selection length	The world area length, eg 4000, this is used to calculate pixel region ranges.
Pixel X	The calculated Pixel X value for the heightmap or weightmap.
Pixel Y	The calculated Pixel Y value for the heightmap or weightmap.
Region width	The calculated Pixel Region Width from the Selection Width.
Region length	The calculated Pixel Region Length from the Selection Length.

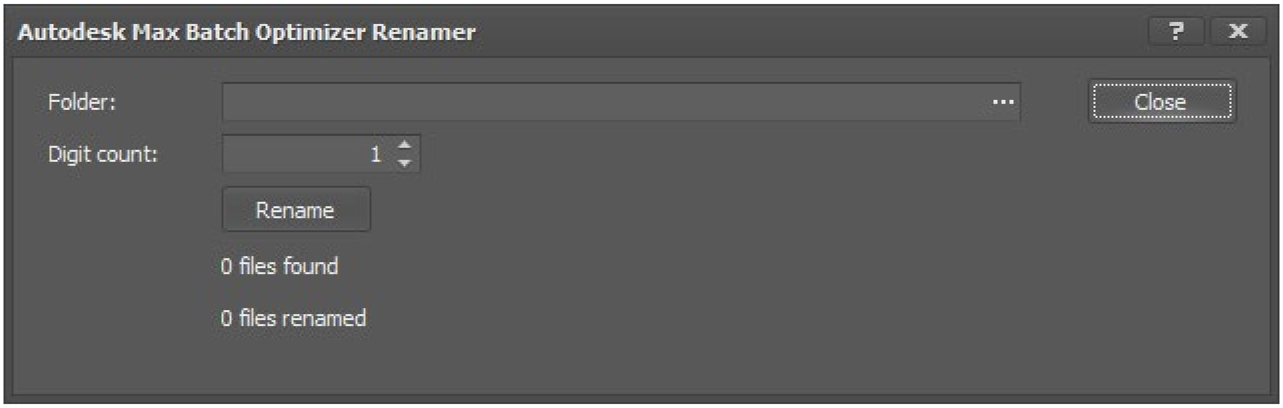
Utilities Menu

Contains special purpose utilities.

Max File Renamer – Rename Autodesk Max Batch Pro Optimizer output files.

Max File Renamer

Rename Autodesk Max Batch Pro Optimizer output files.



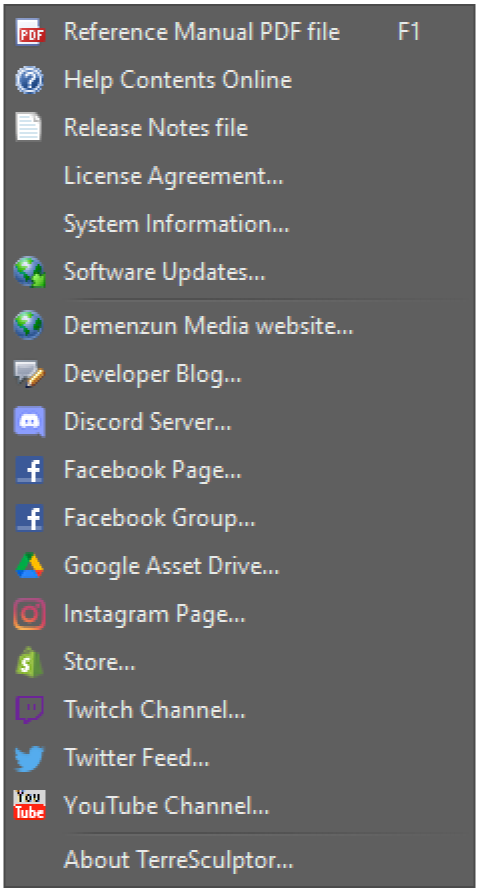
Folder	The folder that contains the OBJ files from the Max Batch Optimize.
Digit count	The number of digits to remove and truncate from the file names.
Rename	Process the files
Files found	The number of files found in the folder.
Files renamed	The number of files renamed.

Notes:

All files in the specified folder will have their file names truncated by the number of digits in the Digit Count. For example, the following file name “Tile_X0_Y099.obj” with a Digit Count of 2 will be renamed to “Tile_X0_Y0.obj”.

Help Menu

Contains help and social media links.



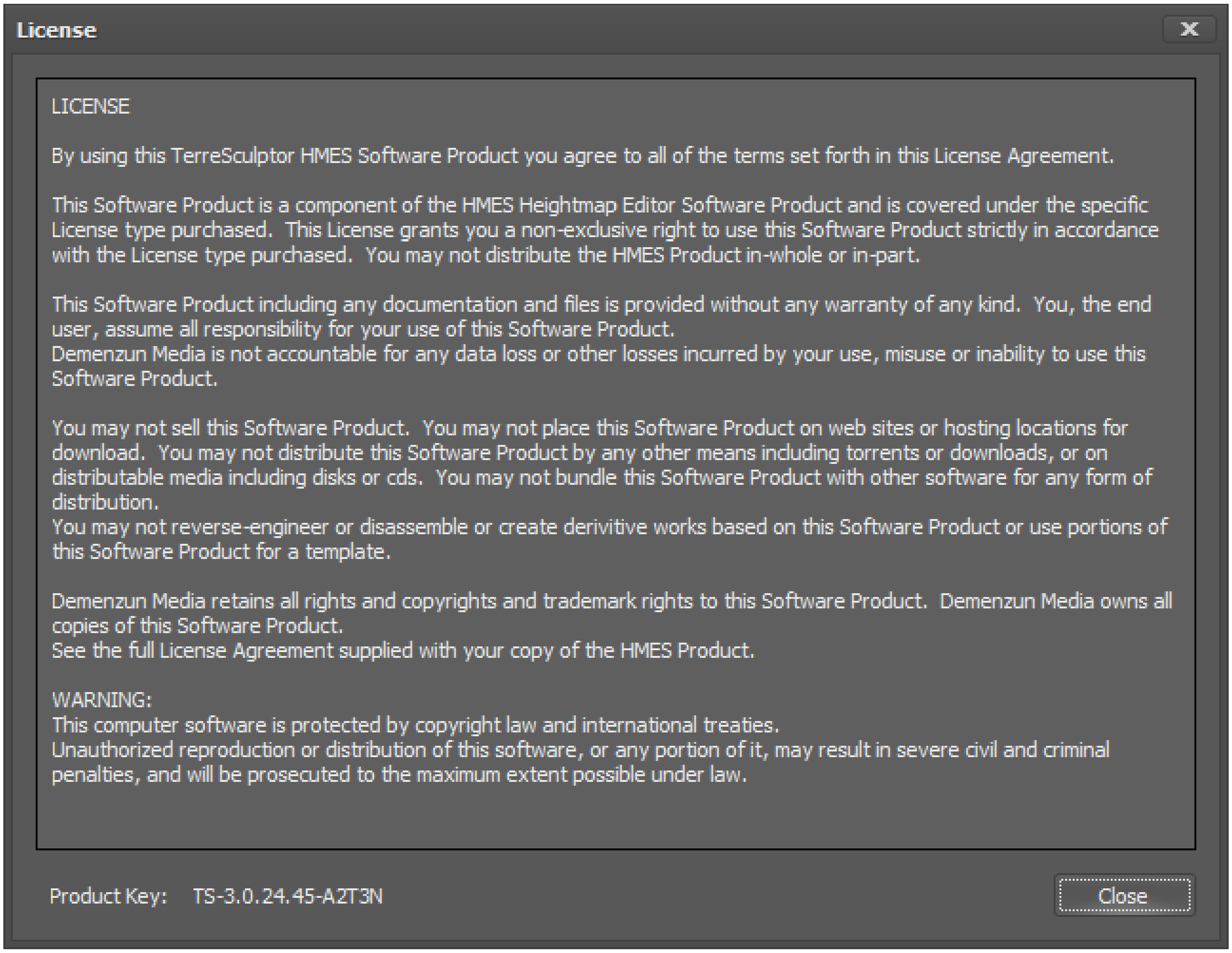
Reference Manual PDF file – Launch the reference manual PDF file.
Help Contents Online – Display the application online reference manual file.
Release Notes file – Display the application release notes file.
License Agreement – Display the software license agreement.
System Information – Display the system information dialog.
Software Updates – Check the Internet for application updates and new versions. See the chapter on *Software Updates*.

Demenzun Media website – Connect to the software main website.
Developer Blog – Connect to the developer blog site.
Discord Server – Connect to the Discord server.
Facebook Page – Connect to the software Facebook web page.
Facebook Group – Connect to the software Facebook group.
Google Asset Drive – Connect to the Google Drive that contains free asset files.
Instagram Page – Connect to the company Instagram web page.
Store – Connect to the company Shopify Store page.
Twitch Channel – Connect to the company Twitch channel.
Twitter Feed – Connect to the company Twitter feed.
YouTube Channel – Connect to the software YouTube channel for video tutorials.

About TerreSculptor – Display the about and copyright dialog.

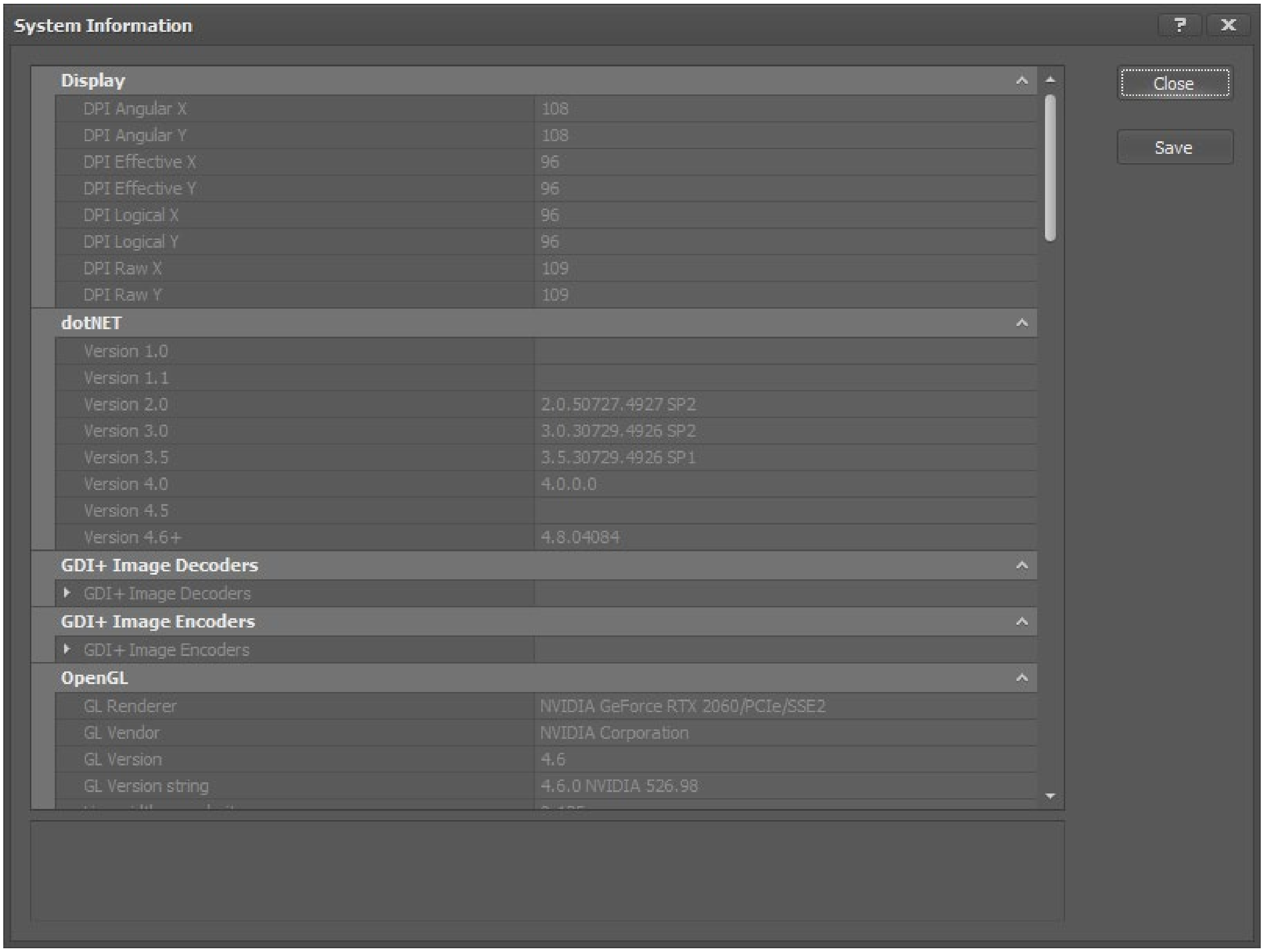
License Agreement

Displays the software license agreement.



System Information

Displays the computer system hardware and software system information.
This information can be used for troublsehooting or knowledge.



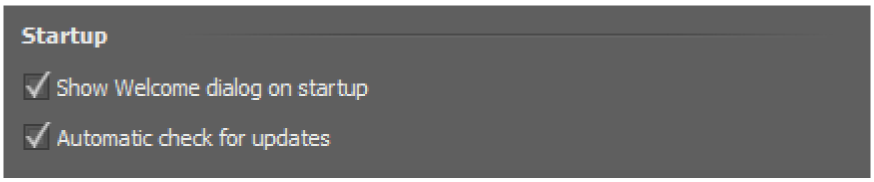
Software Updates

TerreSculptor includes a feature for checking the Internet for build updates and new versions of the software.

The software update check can be performed manually by choosing the *Software Updates* item on the Help menu, or by enabling the automatic check for updates in the application settings.

Software Update Settings

The application Settings dialog includes a setting for enabling the automatic check for software updates.
The software update setting is located on the Settings dialog's General tab.



Automatic Software Update Checks

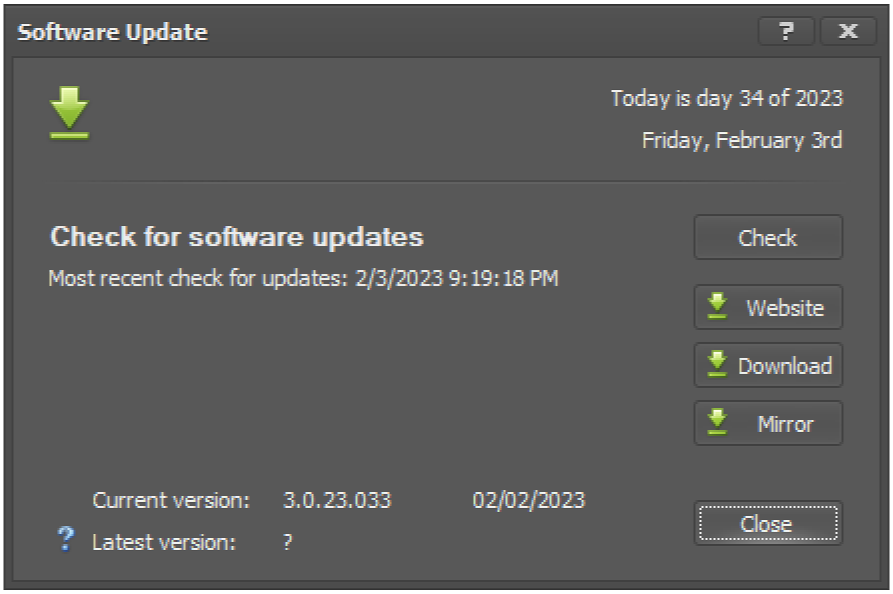
The software update checks will occur automatically if the setting has been enabled in the settings.
The first check occurs sixty seconds after the software has been launched, and then every hour after that if the software update notification icon is ignored.
If the software update notification icon is either clicked or double-clicked with the mouse, the automatic update checks are turned off until the next time TerreSculptor is ran.

 This icon will appear on the right side of the editor toolbar when a download is available.

 This icon will appear on the right side of the editor toolbar when an error occurred checking.

Software Update Dialog

The software update dialog can be displayed by choosing the *Software Updates* item on the Help menu, or by double-clicking on the automatic software update notification icon if it is visible.
Displaying this dialog does not automatically check for software updates, the Check button must be chosen.



Check Check the Internet for an update or new software version.
Website Launch the default web browser to the main website software download page.
Download Launch the default web browser to the main Google Drive download page.
Mirror Launch the default web browser to the secondary Google Drive download page.
Close Close the software update dialog.

Settings

The application settings are available on a multi-tabbed dialog that is launched from the Editor's Tools menu. The settings allow the end-user to specify the default settings and values for a number of the application functions.

The application ini file that contains the application startup defaults can also be set back to its original "new" state and contents by clicking on the *Defaults* button and restarting the application.

Command Buttons

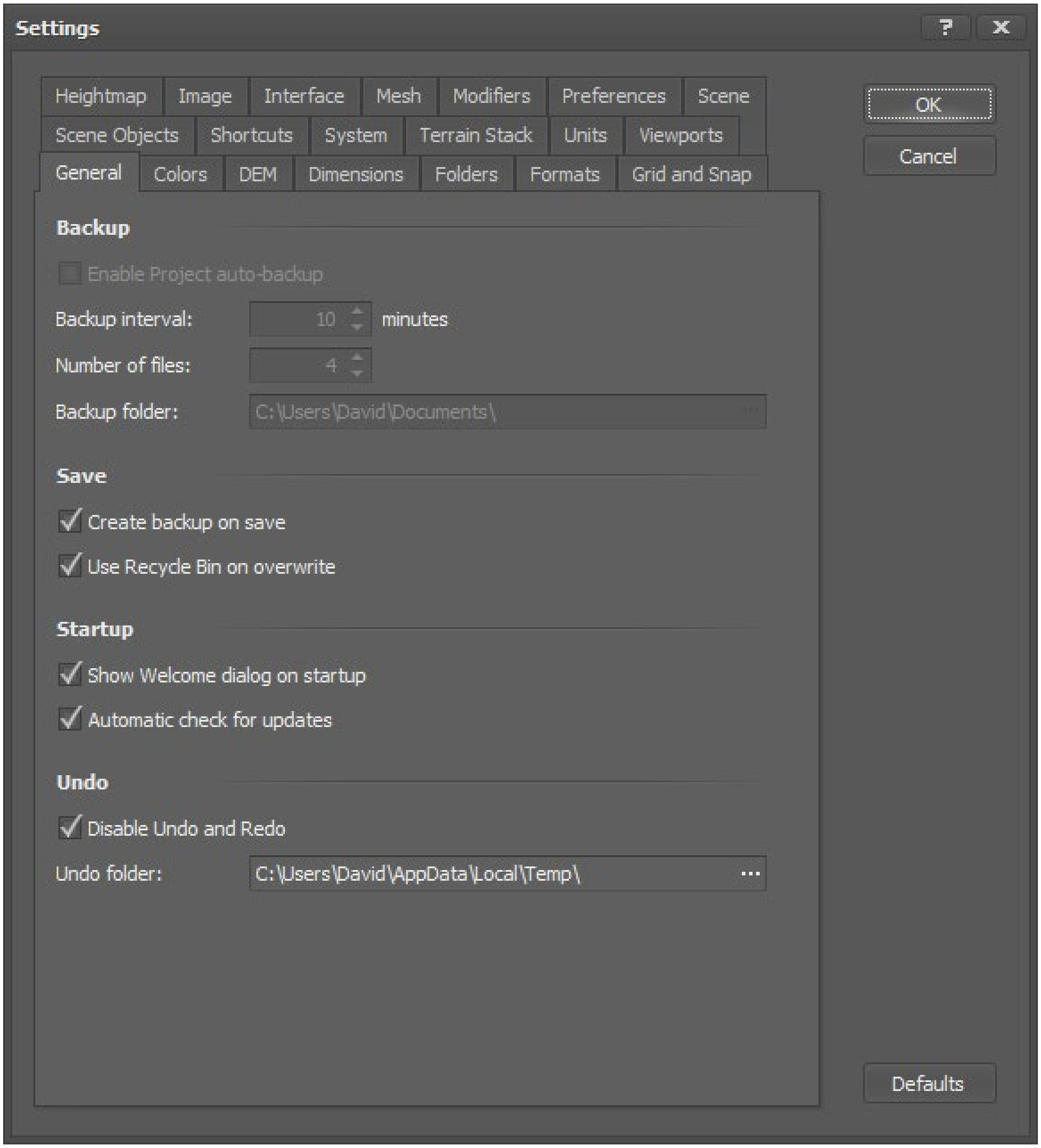
Accept the current settings and close the dialog.

Cancel and close the dialog.

Set all application ini settings to the default values. This requires an application restart.

Settings: General

This tab contains the application general settings.



Backup

Enable Project auto-backup:	Enable or disable the auto backup feature (future feature).
Backup interval:	The time in minutes between backup file creation.
Number of files:	The number of backup files to maintain, older files are deleted.
Backup folder:	The folder where the backup files are saved. Default is the Documents folder.

Save

Create backup on save:	Whether to create a backup file when saving will result in a file overwrite.
Use Recycle Bin on overwrite:	Whether to move files to the Windows Recycle bin that are being overwritten.

Startup

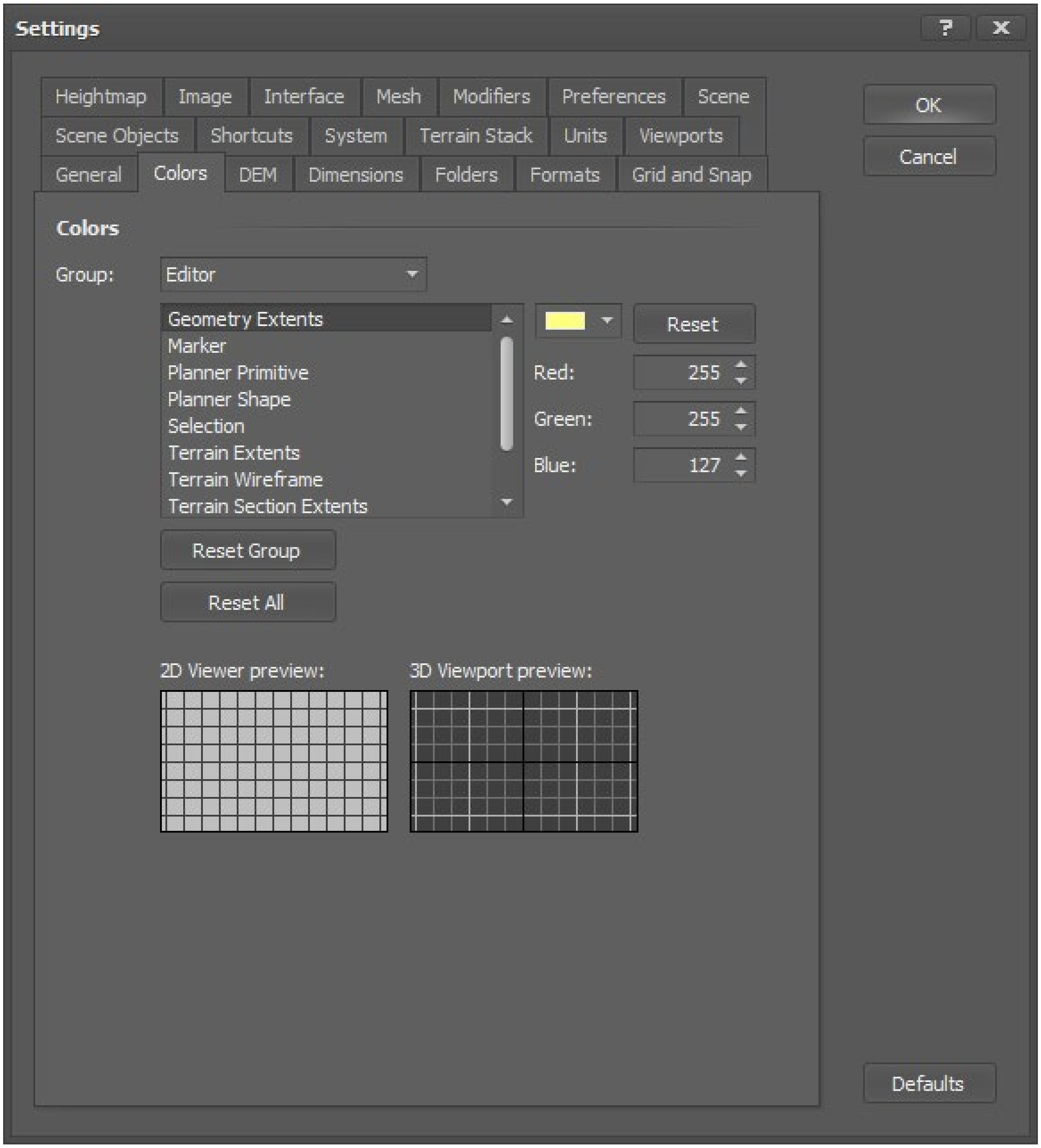
Show Welcome on startup:	Whether the Welcome dialog is displayed on application startup.
Automatic check for updates:	Whether TerreSculptor checks for software updates automatically.

Undo

Disable Undo and Redo:	Whether to disable the Edit menu undo system.
Undo folder:	The system folder where the undo and redo files are temporarily saved.

Settings: Colors

This tab contains the application object colors settings.
This tab and its controls allow for customization of the colors for various application editors and objects.

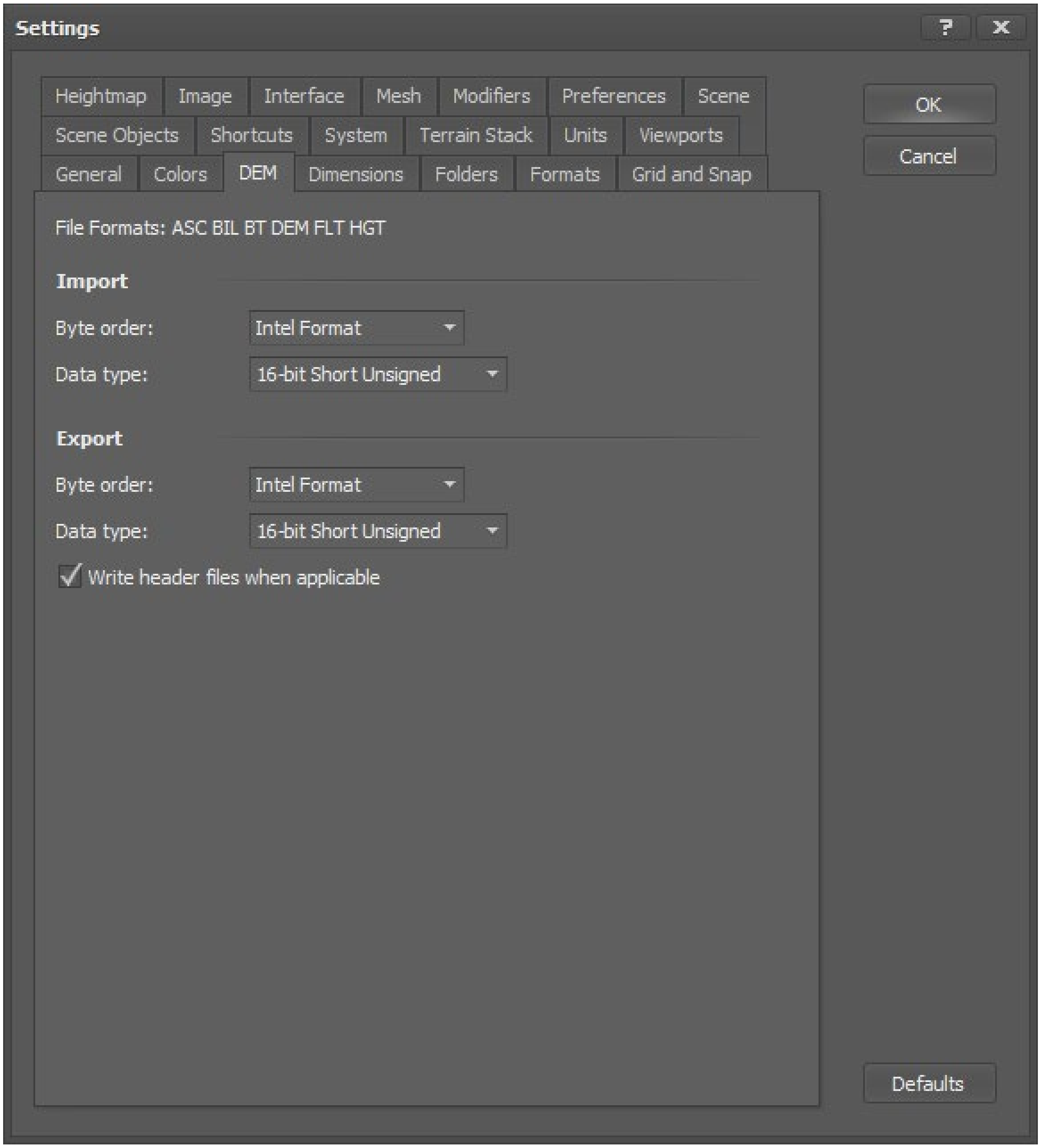


Colors

Group:	The application group.
Object list:	The list of objects with the group.
Color button:	The current color of the selected object in the group.
Red, Green, Blue:	The current color red, green, and blue values for the selected object in the group.
Reset:	Reset the selected object to its default color.
Reset Group:	Reset all objects in the group to their default colors.
Reset All:	Reset all objects to their default colors.
Viewer preview:	A visual graphical preview of the 2D viewer and grid coloring.
Viewport preview:	A visual graphical preview of the 3D viewport and grid coloring.

Settings: DEM

This tab contains the settings for the Digital Elevation Model file formats.



Import

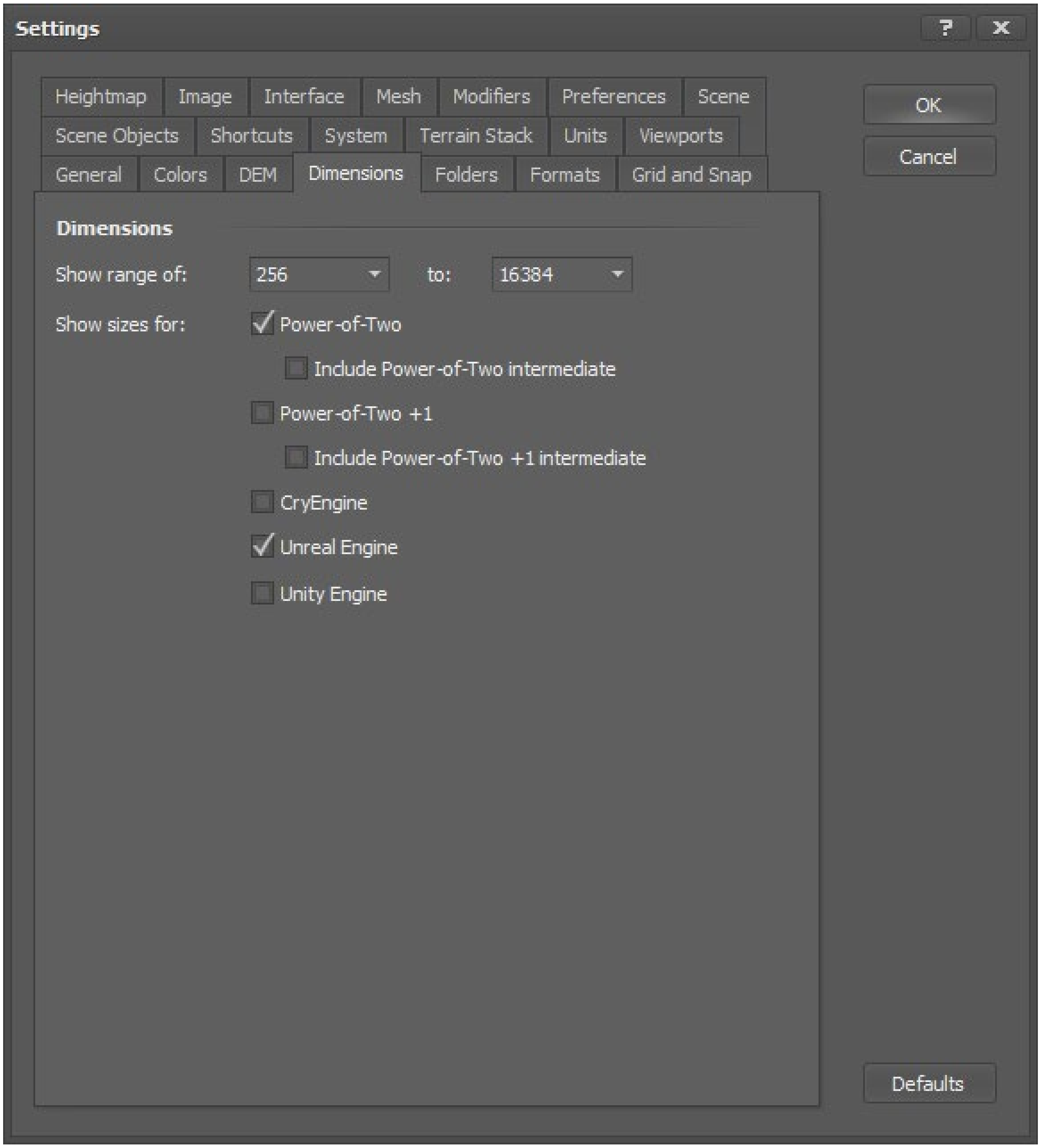
Byte order:	The default byte order.
Data type:	The default data type.

Export

Byte order:	The default byte order.
Data type:	The default data type.
Write header files:	Write out the text header files for the DEM formats that support header files.

Settings: Dimensions

This tab contains the application heightmap and mask dimensions settings.
The properties specify the dimension range that is shown on certain dialogs.



Dimensions

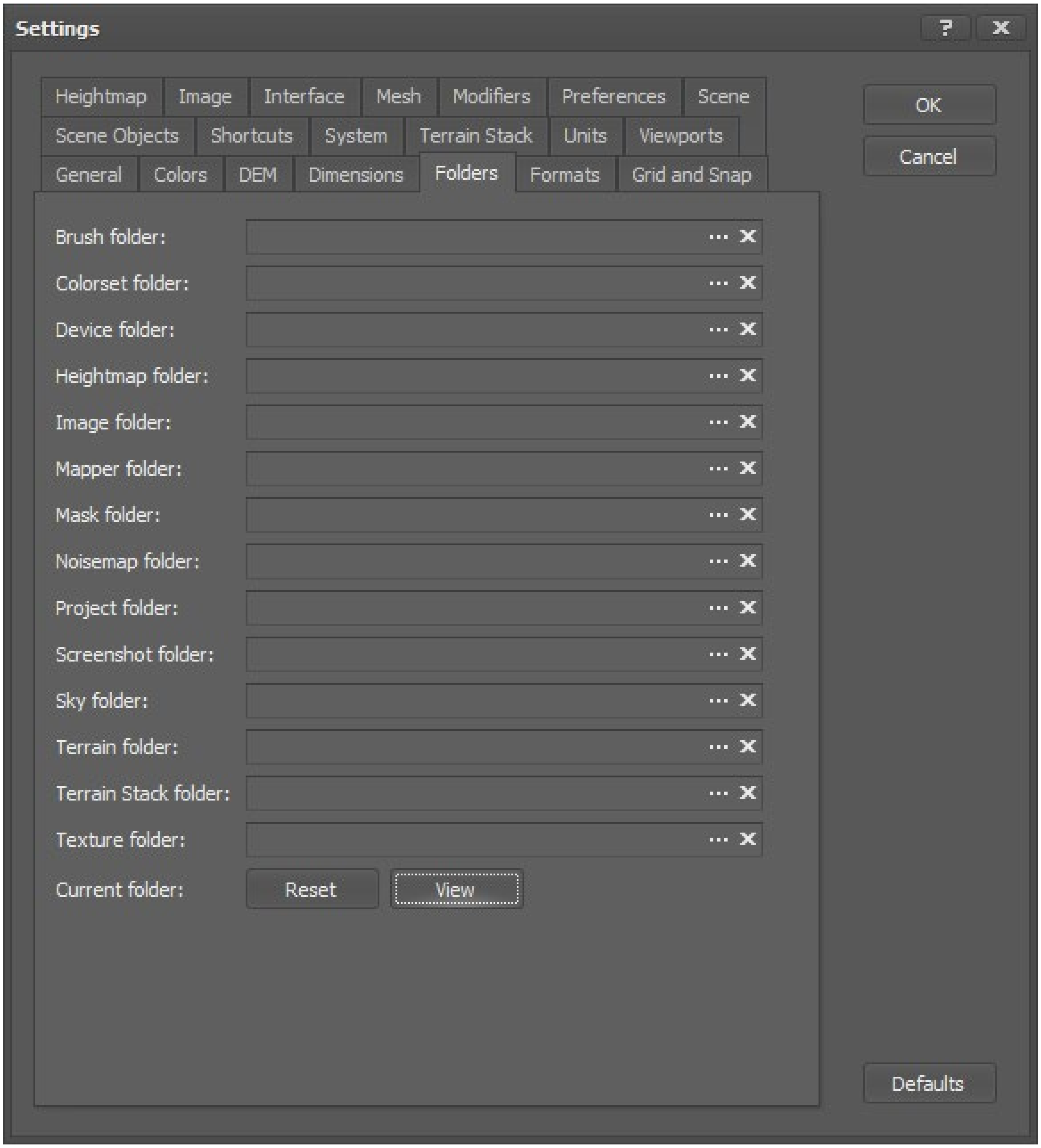
Show range of:	Specify the dimension range to show on specific dialogs such as New. This allows you to specify only those values that are used in your projects.
Power-of-Two:	Whether the New and Resample dialogs display power-of-two dimensions. Power-of-two dimensions are values that are 2^n where n = 1, 2, 3, 4, etc., such as 2^8 = 256, 2^10 = 1024, 2^12 = 4096. Power-of-two dimensions result in terrain meshes that are power-of-two -1 quads, 2^8 = 256 dimension = 256 vertices = 255 terrain quads.
Include PoT intermediate:	Whether to include the Power-of-two intermediate values.

Intermediate values include those that are multiples of power-of-two values, such as 96, 192, 384, 768, etc., which lay typically between p-o-t value.

Power-of-Two +1:	Whether the New and Resample dialogs display power-of-two +1 dimensions. Power-of-two +1 dimensions are values that are 2^n +1 where n = 1, 2, 3, etc., such as 2^8 +1 = 257, 2^10 + 1 = 1025, 2^12 + 1 = 4097. Power-of-two +1 dimensions result in terrain meshes that are power-of-two quads, 2^8 +1 = 257 dimension = 257 vertices = 256 terrain quads.
Include PoT intermediate:	Whether to include the Power-of-two + 1 intermediate values. Intermediate values include those that are multiples of power-of-two + 1 values, such as 97, 193, 385, 769, etc., which lay typically between p-o-t+1 value.
CryEngine:	Whether the New and Resample dialogs display CryEngine dimensions.
Unreal Engine:	Whether the New and Resample dialogs display UE Landscape dimensions. A common set of UE Landscape dimensions are provided, plus a UE size dialog. See the UE online documentation for additional dimension procedures.
Unity Engine:	Whether the New dialog displays Unity terrain dimensions.

Settings: Folders

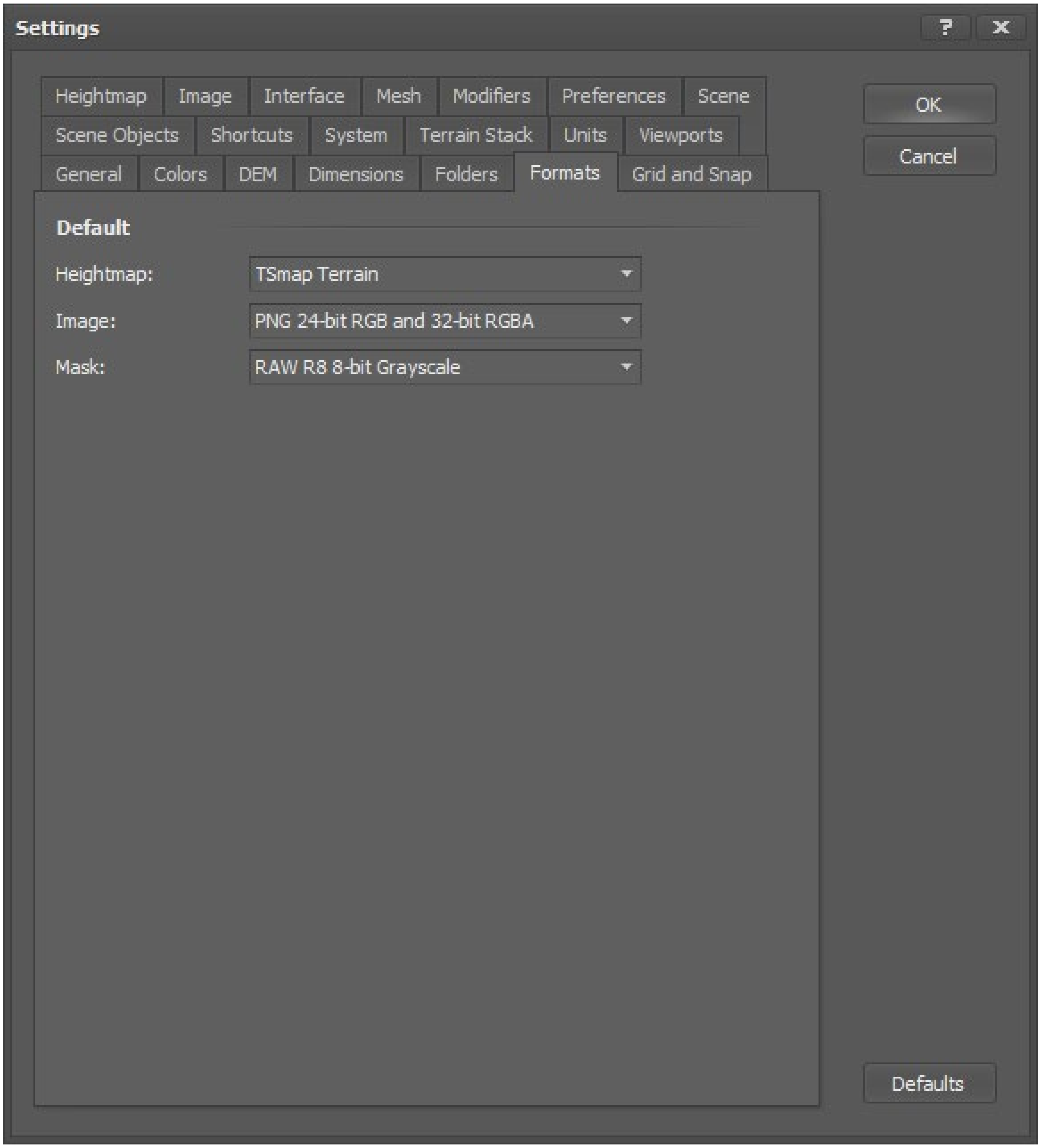
This tab contains the folder paths for the Fixed Folder and Last Folder Memory system.
See the chapter on Fixed Folders and Last Folder Memory.



Folder:		Browse to a Fixed Folder path location. Clear for a Last Folder Memory path location.
Current folder:	Reset	Resets all of the folder paths to their default system folder locations. See the *Fixed Folders and Last Folder Memory* chapter.
	View	View button displays a dialog with all current folder paths.

Settings: Formats

This tab contains the application default file formats settings.

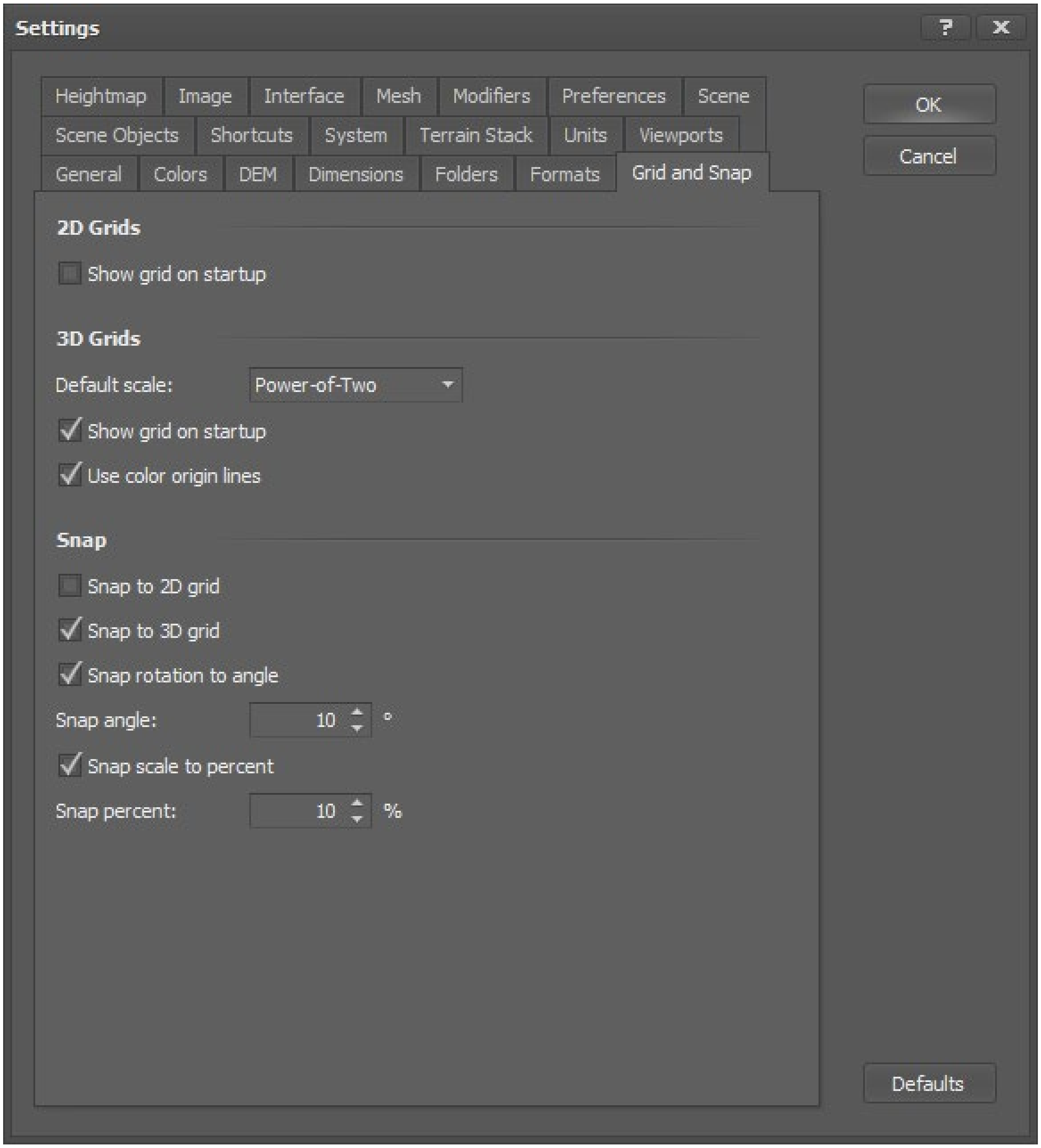


Default Formats

Heightmap:	The default heightmap file format.
Image:	The default image file format (screenshot, etc.).
Mask;	The default mask file format.

Settings: Grid and Snap

This tab contains the application settings for the grids and object snapping.



2D Grids

Show grid on startup:	Whether to show the 2D grids on application startup.

3D Grids

Default scale:	Set the default values used by the grid to Power-of-Two sizes or Meters sizes.
Show grid on startup:	Whether to show the 3D grids on application startup.
Use color origin lines:	Whether the 3D grid origin lines will be color-coded to their X,Y,Z axis color.

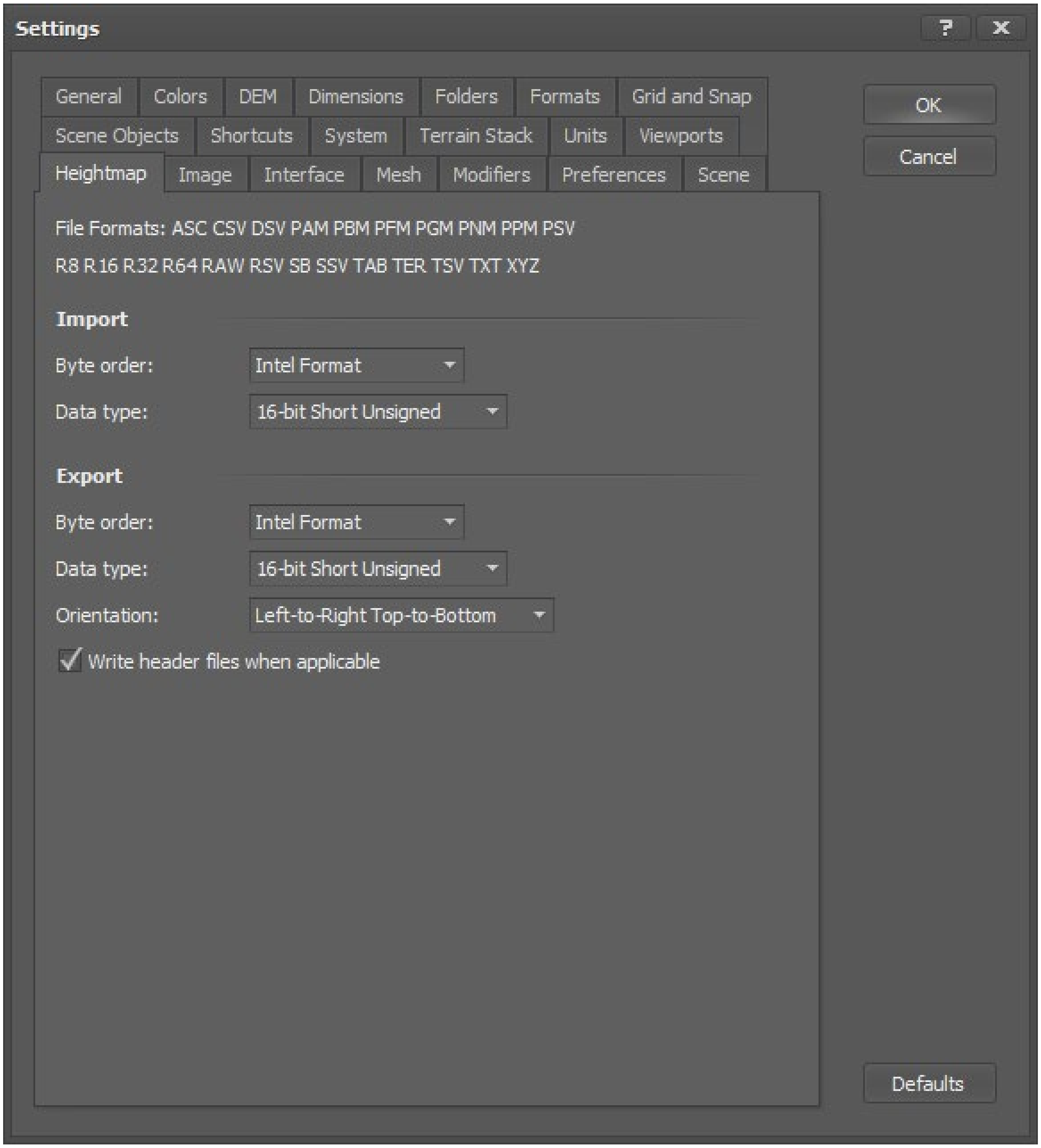
Snap

Snap to 2D grid:	future feature.

Snap to 3D grid:	future feature.
Snap rotation to angle:	future feature.
Snap angle:	future feature.
Snap scale to percent:	future feature.
Snap percent:	future feature.

Settings: Heightmap

This tab contains the application settings for the default import and export settings for heightmap type files. The individual option usage varies by the specific file format importer/exporter.



Import

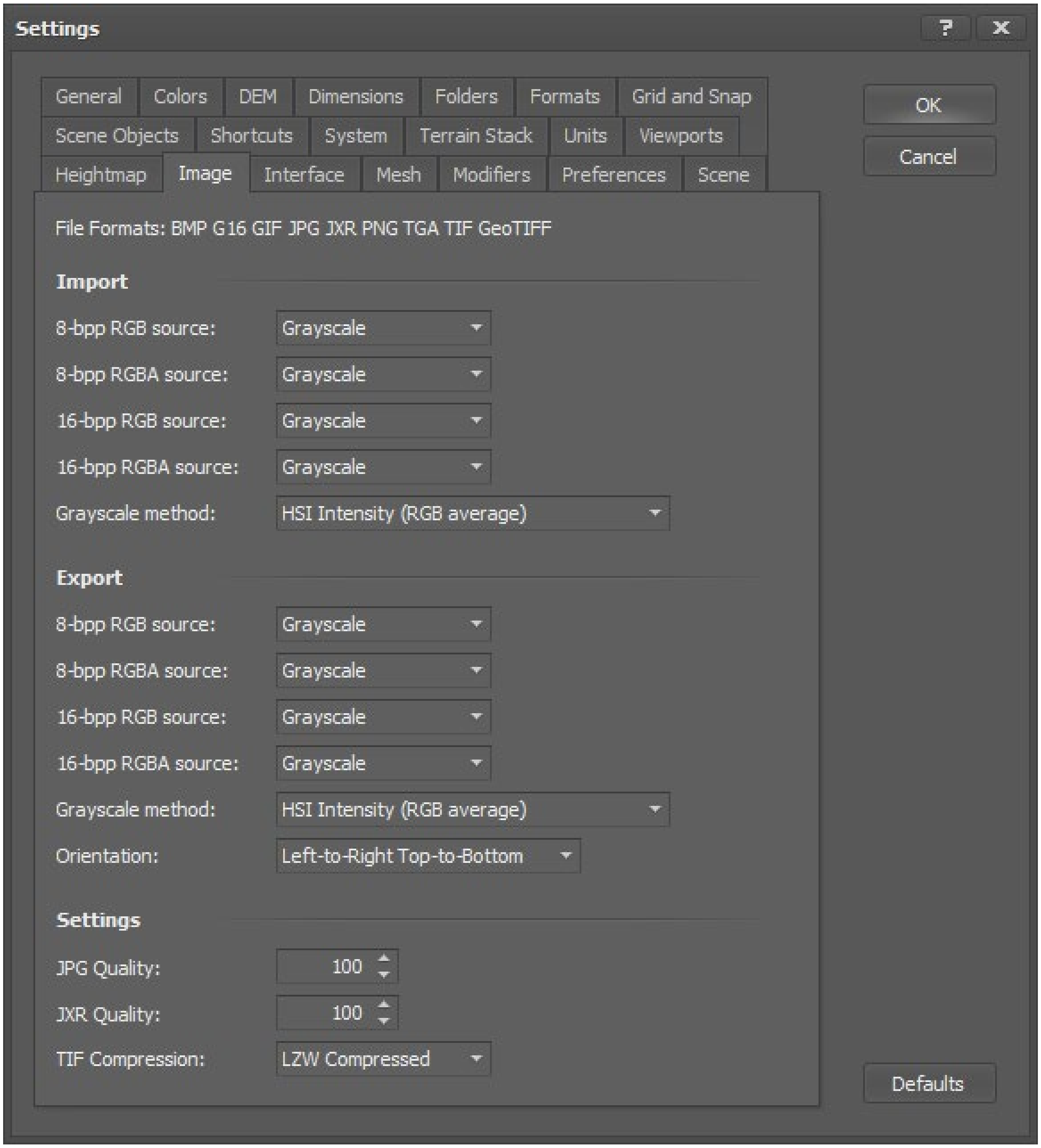
Byte order:	The integer or float data byte order: Motorola (big-endian) or Intel (little-endian).
Data type:	The data type: 8-bit, 16-bit, 32-bit, 64-bit, Integer and Float, Signed and Unsigned.

Export

Byte order:	The integer or float data byte order: Motorola (big-endian) or Intel (little-endian).
Data type:	The data type: 8-bit, 16-bit, 32-bit, 64-bit, Integer and Float, Signed and Unsigned.
Orientation:	The orientation of the data in the file.
Write header:	Whether a separate header file is written for header-less file formats.

Settings: Image

This tab contains the application settings for the default import and export settings for image type files. The individual option usage varies by the specific file format importer/exporter.



Import

8-bpp RGB Source:	The color plane to use for the import source on 8-bit-per-pixel RGB files.
8-bpp RGBA Source:	The color plane to use for the import source on 8-bit-per-pixel RGBA files.
16-bpp RGB Source:	The color plane to use for the import source on 16-bit-per-pixel RGB files.
16-bpp RGBA Source:	The color plane to use for the import source on 16-bit-per-pixel RGBA files.
Grayscale method:	The algorithm method to use when converting color to grayscale.

Export

8-bpp RGB Source:	The color plane to use for the export source on 8-bit-per-pixel RGB files.
8-bpp RGBA Source:	The color plane to use for the export source on 8-bit-per-pixel RGBA files.

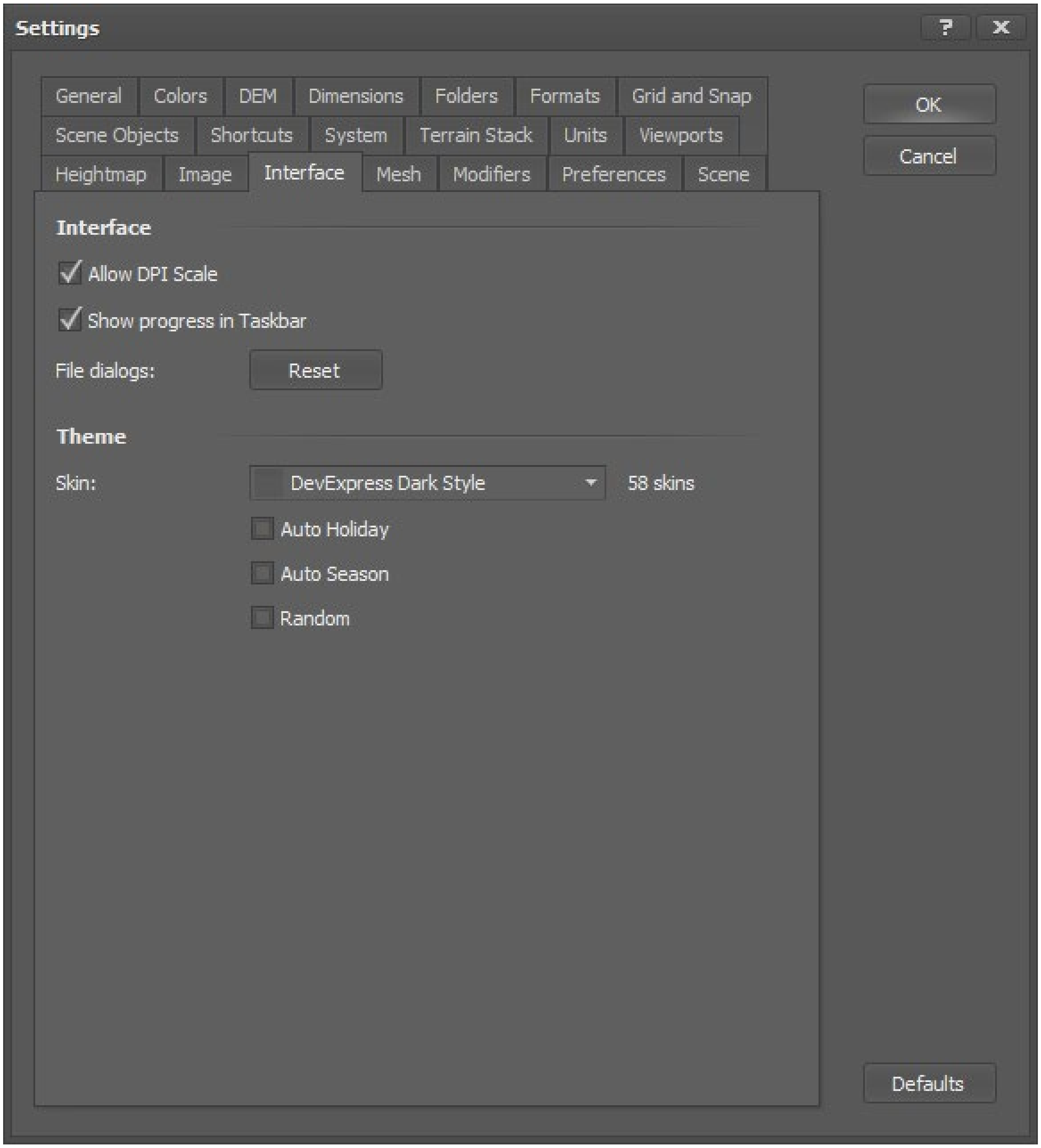
16-bpp RGB Source:	The color plane to use for the export source on 16-bit-per-pixel RGB files.
16-bpp RGBA Source:	The color plane to use for the export source on 16-bit-per-pixel RGBA files.
Grayscale method:	The algorithm method to use when converting color to grayscale.
Orientation:	The orientation of the data in the file.

Settings

JPG Quality:	The JPG file format compression quality.
JXR Quality:	The JXR file format compression quality.
TIF Compression:	The TIF file format compression type.

Settings: Interface

This tab contains optional settings for the user interface.



Interface

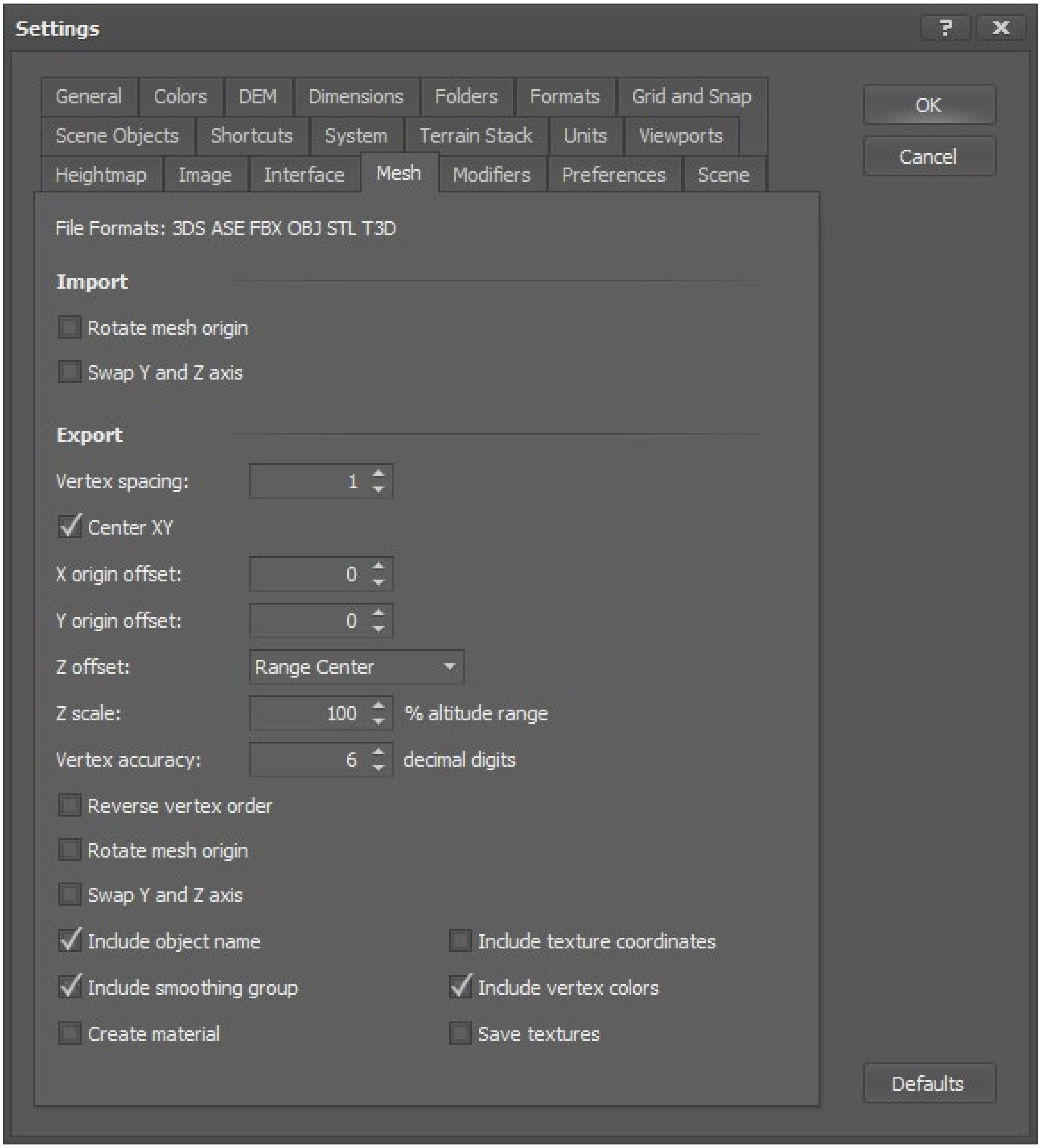
Allow DPI Scale:	Allow DPI Scaling Mode on High DPI 4K displays.
Show progress in Taskbar:	Show the progress bar graph on the application taskbar icon.
File dialogs:	Reset all file dialog settings.

Theme

Skin:	The software application skin theme.
Auto Holiday:	Automatically display the skin themes during holidays like Christmas.
Auto Season:	Automatically display the skin themes for the four seasons.
Random:	Use a random skin each time the software is launched.

Settings: Mesh

This tab contains the application settings for the default import and export settings for mesh type files.
The individual setting usage varies by the specific file format importer/exporter.
Mesh files are typically stored as a rectangular grid-plane of constant-spaced XY coordinates with Z axis altitudes.



Import

Rotate mesh origin:	Whether to rotate the mesh origin by 90 degrees clockwise.
Swap Y and Z axis:	Whether to swap the mesh Y and Z axis for meshes that are using Z-up coordinates.

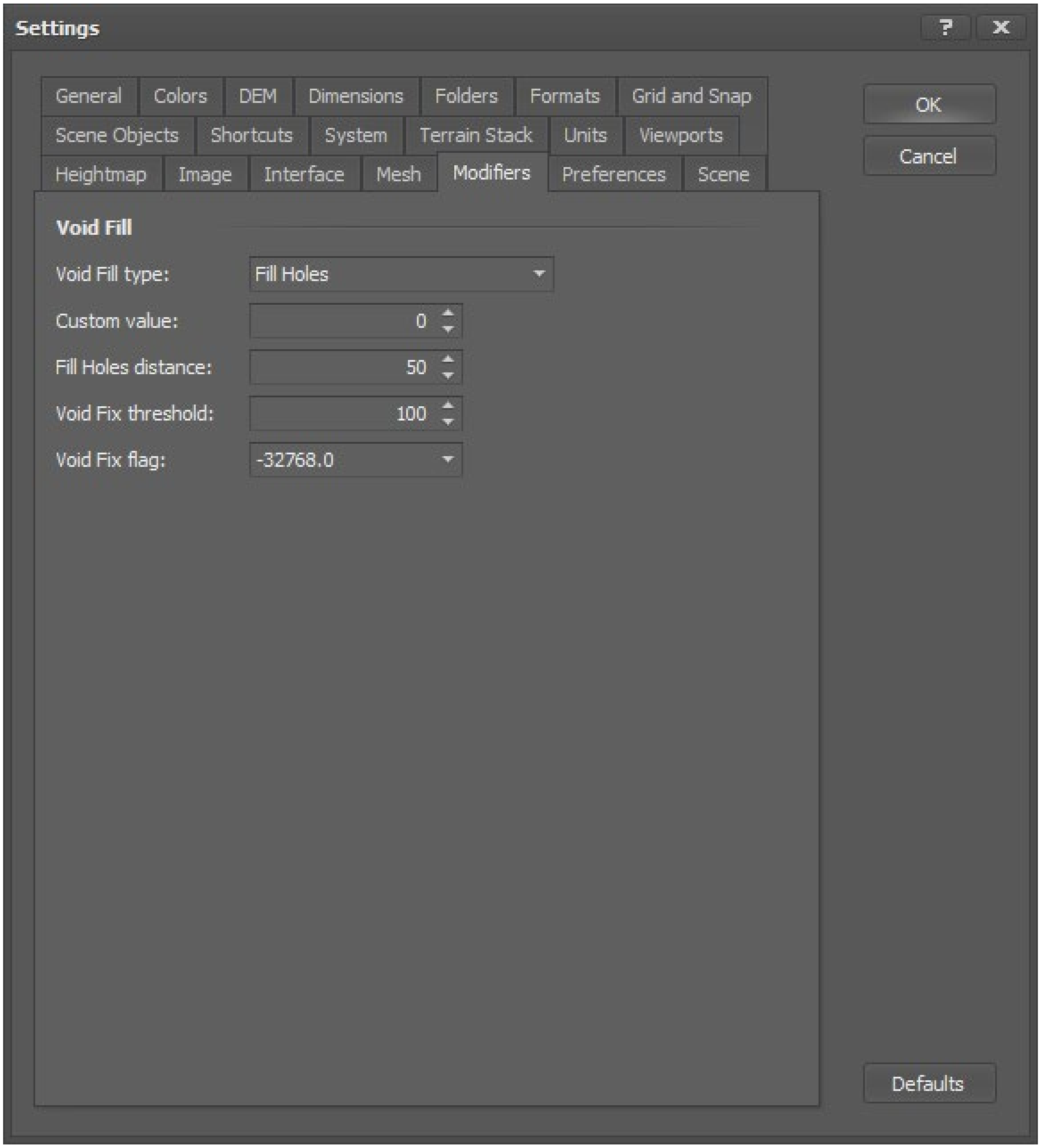
Export

Vertex spacing:	The vertex spacing multiplier.
Center XY:	Center the mesh on the XY axes.
X origin offset:	The amount to offset the X origin.
Y origin offset:	The amount to offset the Y origin.

Z offset:	Whether to offset the mesh Z axis data.
Z scale:	Whether to scale the mesh Z axis data.
Vertex accuracy:	The number of digits of numerical accuracy for text-format mesh files.
Reverse vertex order:	Whether the triangle vertex order is reversed to flip the face orientation.
Rotate mesh origin:	Whether to rotate the mesh origin by 90 degrees clockwise.
Swap Y and Z axis:	Whether to swap the mesh Y and Z axis for meshes that are using Z-up coordinates.
Include object name:	Whether the object name property is included in the file.
Include smoothing group:	Whether the smoothing group properties are included in the file.
Include texture coordinates:	Whether to include texture coordinates.
Include vertex colors:	Whether to include vertex colors using the terrain colorset.
Create material	Whether to create a mesh material.
Save textures	Whether to save the texture files.

Settings: Modifiers

This tab contains the application settings for the specified modifiers.

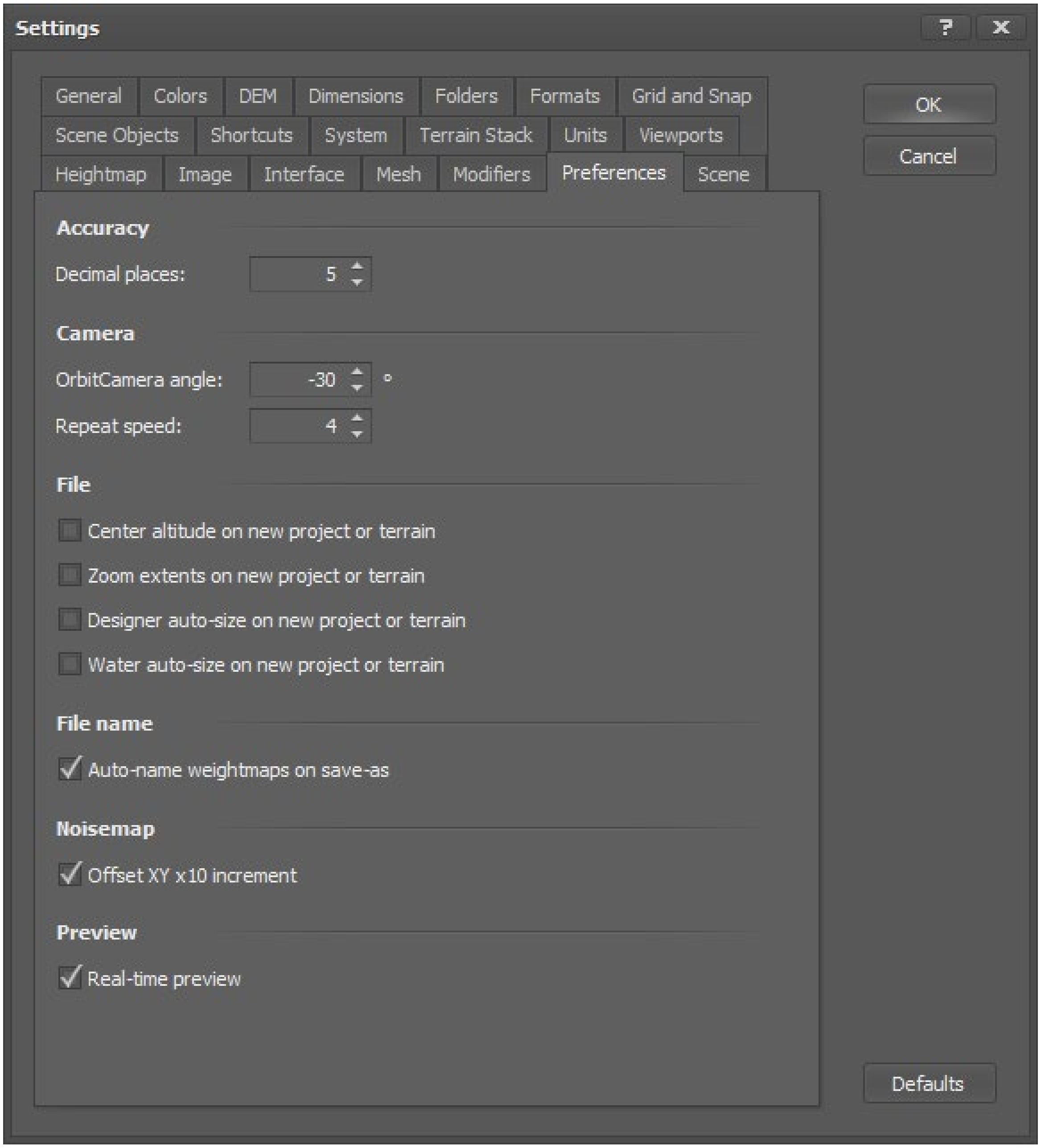


Void Fill

Void fill type:	The default type of void fill to use.
Custom value:	The void fill value for the Custom Fill Value style.
Fill Holes distance:	The Fill Holes algorithm distance to scan for valid hole edges.
Void Fix threshold:	The Void Fix algorithm elevation change threshold before pixel is deemed a void.
Void Fix flag:	The Void Fix algorithm value to set a pixel deemed a void to.

Settings: Preferences

This tab contains the application user preferences.



Accuracy

Decimal places:	The number of decimal places that the numeric up-down controls will show.

Camera

OrbitCamera angle:	The orbit camera navigation pad angle in degrees.
Repeat speed:	The camera navigation pad repeat speed.

File

Center altitude on import:	Whether imported heightmaps are moved to the centered altitude.
Zoom extents on New or Import:	Whether the orbit camera zooms to extents on New or Import.

Designer auto-size on New or Import: Whether the Designer plane auto-sizes on New or Import.
Water auto-size on New or Import: Whether the Water plane auto-sizes on New or Import.

File name

Auto-name weightmaps: Whether to automatically name weightmaps with the dialog control settings.

Noisemap

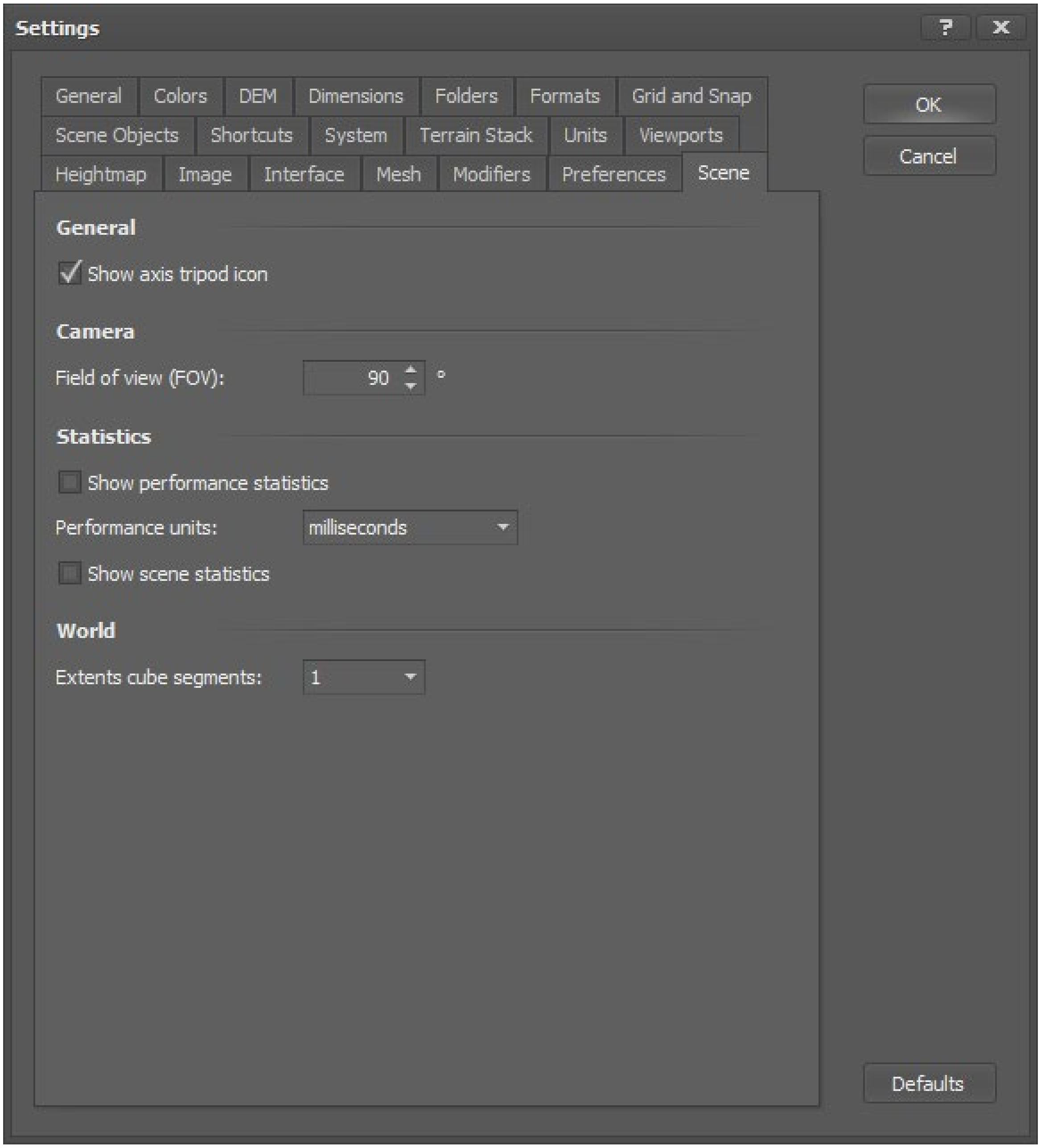
Offset XY x10 increment: Whether the Noise Generator Offset X/Y controls increment by 10 times the value.

Preview

Real-time preview: Whether the preview window updates automatically or requires user interaction. Real-time preview should be set to off for slower computers.

Settings: Scene

This tab contains the application settings for the Editor scene.



General

Show axis tripod icon: Whether the XYZ axis icon is displayed in the viewport lower-left corner.

Camera

Field of view (FOV): Determines the Editor viewport camera FOV (field of view).
The range is 60 to 120 degrees. The default is 90 degrees.
Smaller values are narrow-angle lenses.
Larger values are wide-angle lenses.

Statistics

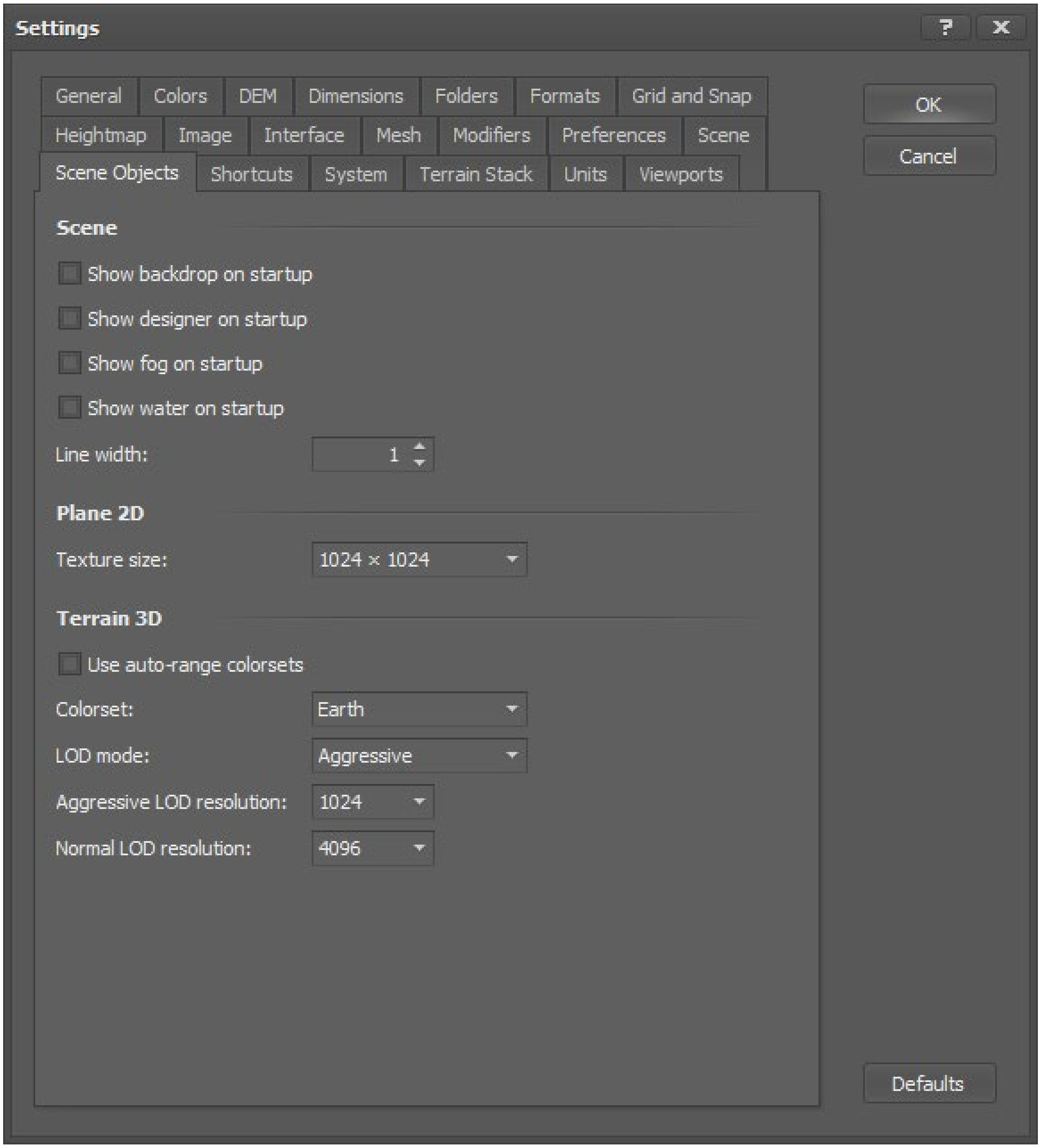
Show performance statistics:	Whether the render engine performance statistics are shown on the viewport.
Performance unit:	The performance statistics units.
Show scene statistics:	Whether the render engine scene statistics are shown on the viewport.

World

Extents cube segments:	The number of wireframe segments in the world extents cube.

Settings: Scene Objects

This tab contains the application options for the Editor scene objects.



Scene

Show backdrop on startup:	Whether the backdrop is shown on application startup.
Show designer on startup:	Whether the designer plane is shown on application startup.
Show fog on startup:	Whether the fog is shown on application startup.
Show water on startup:	Whether the water plane is shown on application startup.
Line width:	The width of rendered lines, this is typically increased for large screenshots.

Plane 2D

Texture size:	The default texture size for the 2D Plane view.

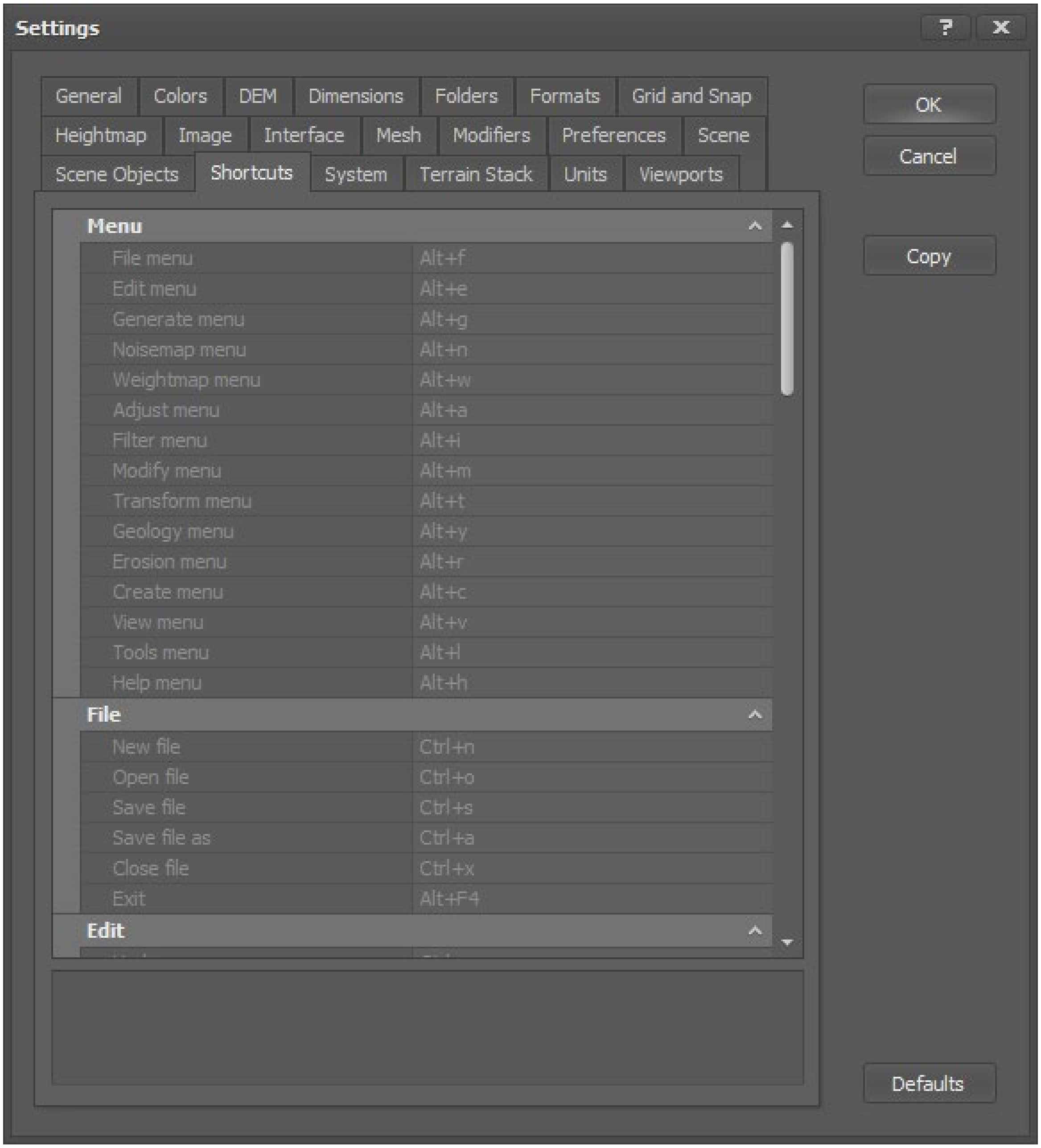
Terrain 3D

Use auto-range colorsets:	Whether to use auto-range colorsets by default.
Colorset:	The terrain mesh default colorset.
LOD mode:	The default terrain level of detail mode.
Aggressive LOD resolution:	The maximum dimensions of the terrain in aggressive lod mode.
Normal LOD resolution:	The maximum dimensions of the terrain in normal lod mode.
Progressive LOD distance:	future feature.

Settings: Shortcuts

This tab contains the application shortcut accelerator keys information.

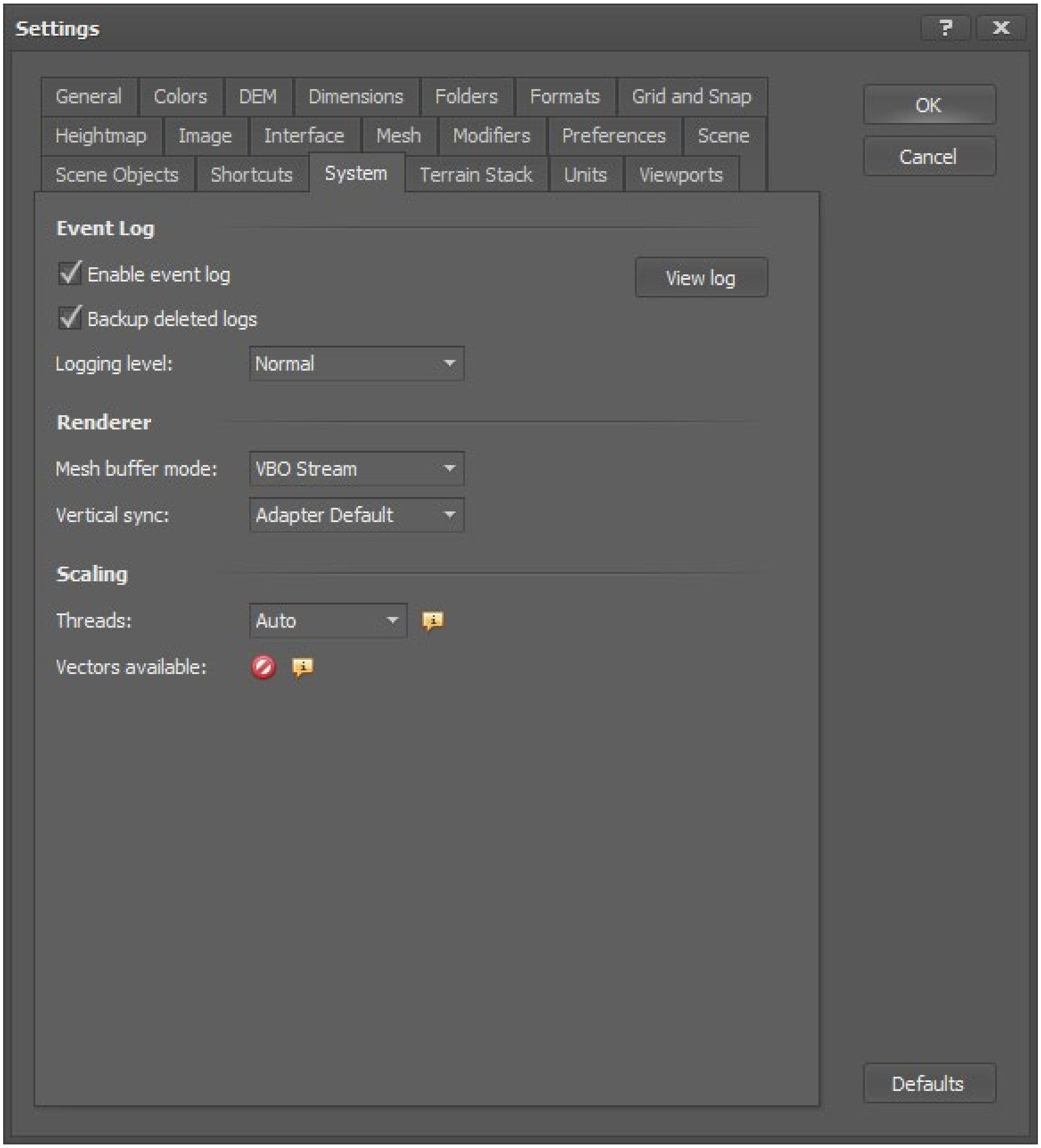
The combination keys include lowercase and uppercase letter versions which determine whether the Shift key is pressed. eg. Ctrl+b = press the Ctrl key and B key, Ctrl+B = press the Ctrl key and Shift key and B key.



There are no user-configurable settings on this tab.

Settings: System

This tab contains the application system settings.
These are settings related to the low-level operation of the system processor and video hardware rendering.



Event Log

Enable event log:	Enable writing of events to the application event log file.
Backup deleted logs:	Create a backup copy of prior event logs that are deleted on startup.
Logging level:	The level of events that are logged: Errors, Errors and Warnings, Verbose Information, Enhanced Debug.
View log:	Open the Event Log Viewer dialog.

Renderer

Mesh buffer mode:	This is for handling special rendering circumstances and should not be changed.
Vertical sync:	Whether the rendering context waits for the display vertical sync.

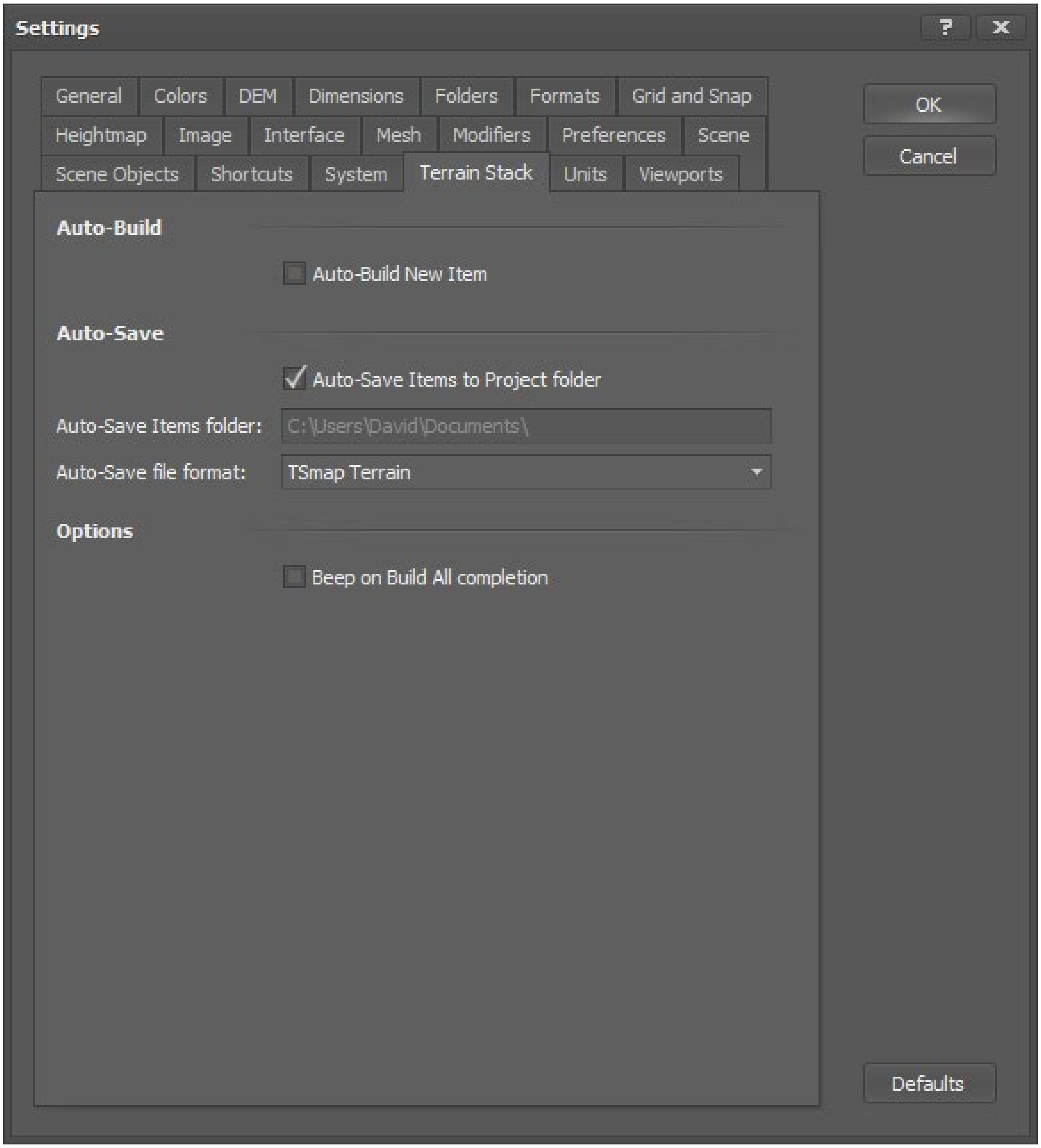
Note that this setting will not override the vsync setting in the system video driver. The video driver vsync typically must be set to Application Control for this to work.

Scaling

Threads:	The number of processor threads to use for running specific intensive algorithms. This option should be set to *Auto* to allow TerreSculptor to choose the best setting. When choosing a specific threads value, typically use the number of logical processors. This option can be set to a lower number than the number of available system threads to allow concurrent applications to run faster.
Vectors available:	Whether the SIMD Vector Registers are available on the computer system (future).

Settings: Terrain Stack

This tab contains settings and options for the Terrain Stack.



Auto-Build

Auto-Build New Item:	Automatically build devices as they are added to the stack.

Auto-Save

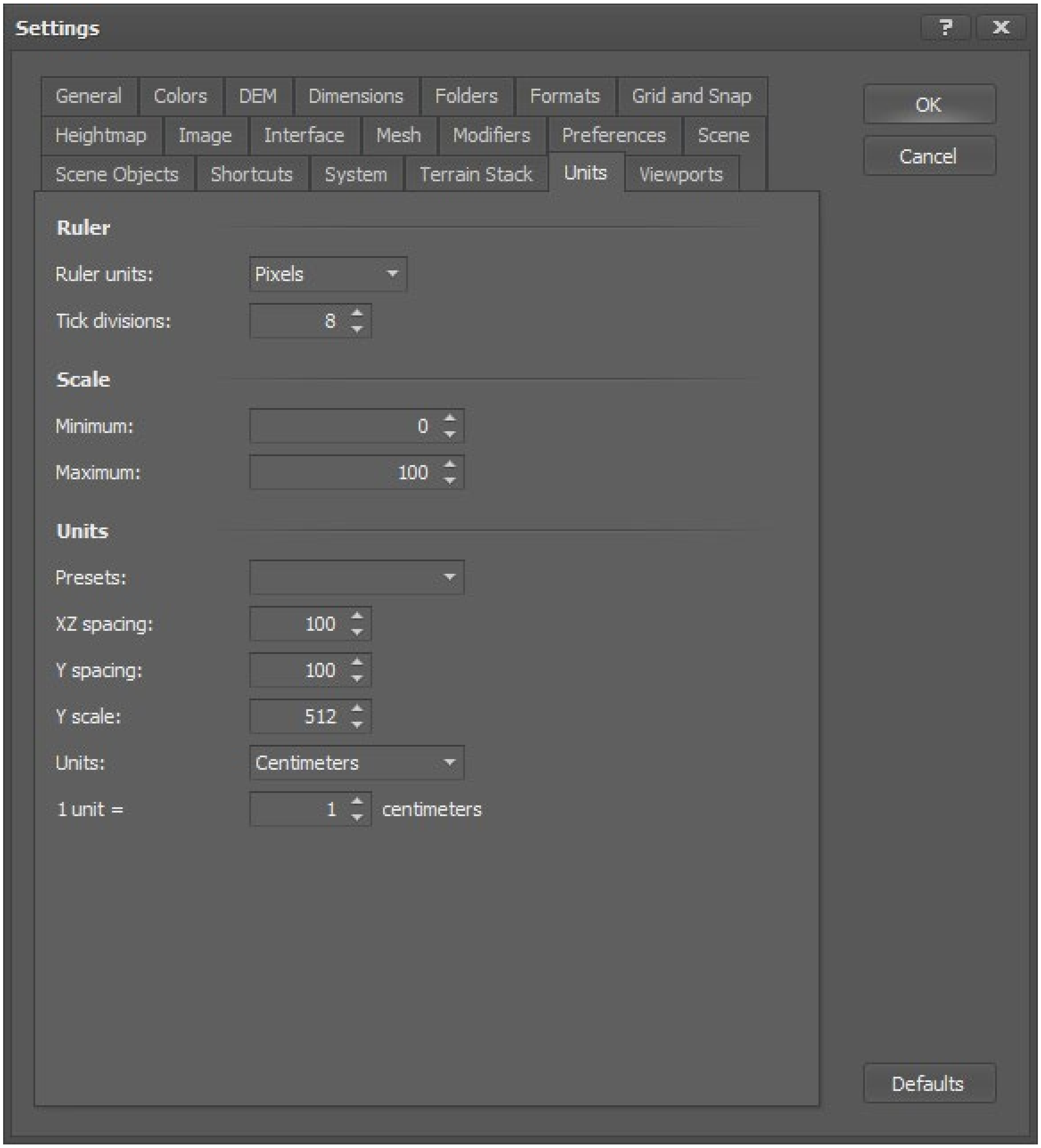
Auto-Save to Project folder:	Automatically save Item Datamaps to the Project file folder.
Auto-Save Items folder:	Specify the Item Datamaps save folder.
Auto-Save file format:	The file format to save auto-saved Datamaps as.

Options:

Beep on Completion:	Whether to beep the computer speaker on Build All completion.

Settings: Units

This tab contains the application settings for the ruler measuring system and the engine dimensioning units.



Ruler

Ruler units:	The Heightmap Editor ruler units.
Tick divisions:	The Heightmap Editor ruler tick divisions.

Scale

Minimum:	The file scale system minimum value.
Maximum:	The file scale system maximum value.

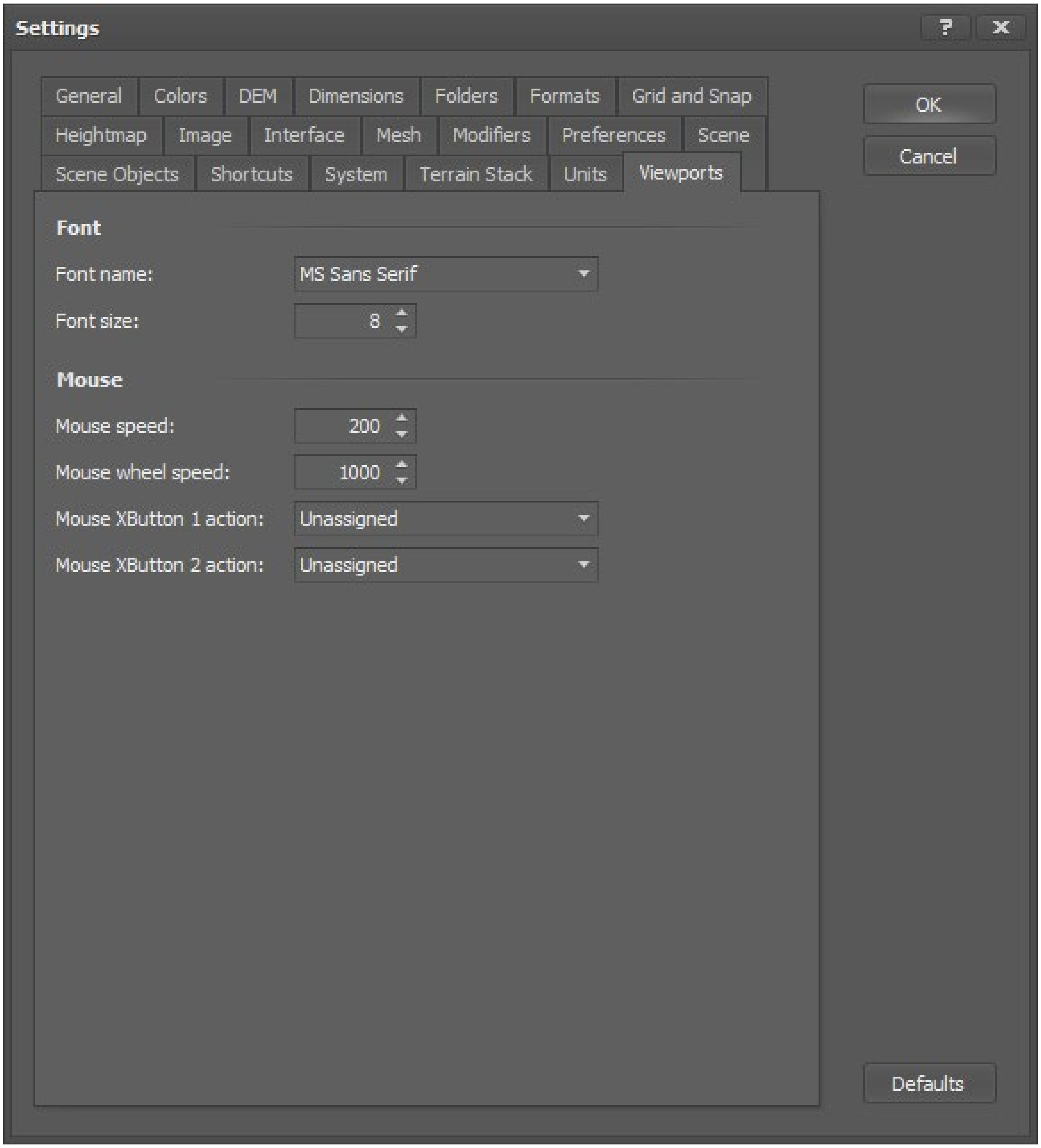
Units

Presets:	Units presets for common video game engine matching.

XZ spacing:	The default engine spacing on the XZ axes.
Y spacing:	The default engine spacing on the Y axis.
Y scale:	The default Y axis scaling so that an equal XYZ value set creates a cubic area.
Units:	The engine dimensioning base unit type.
1 unit = n:	The engine dimensioning unit.

Settings: Viewports

This tab contains the application settings for the 3D viewports.



Font

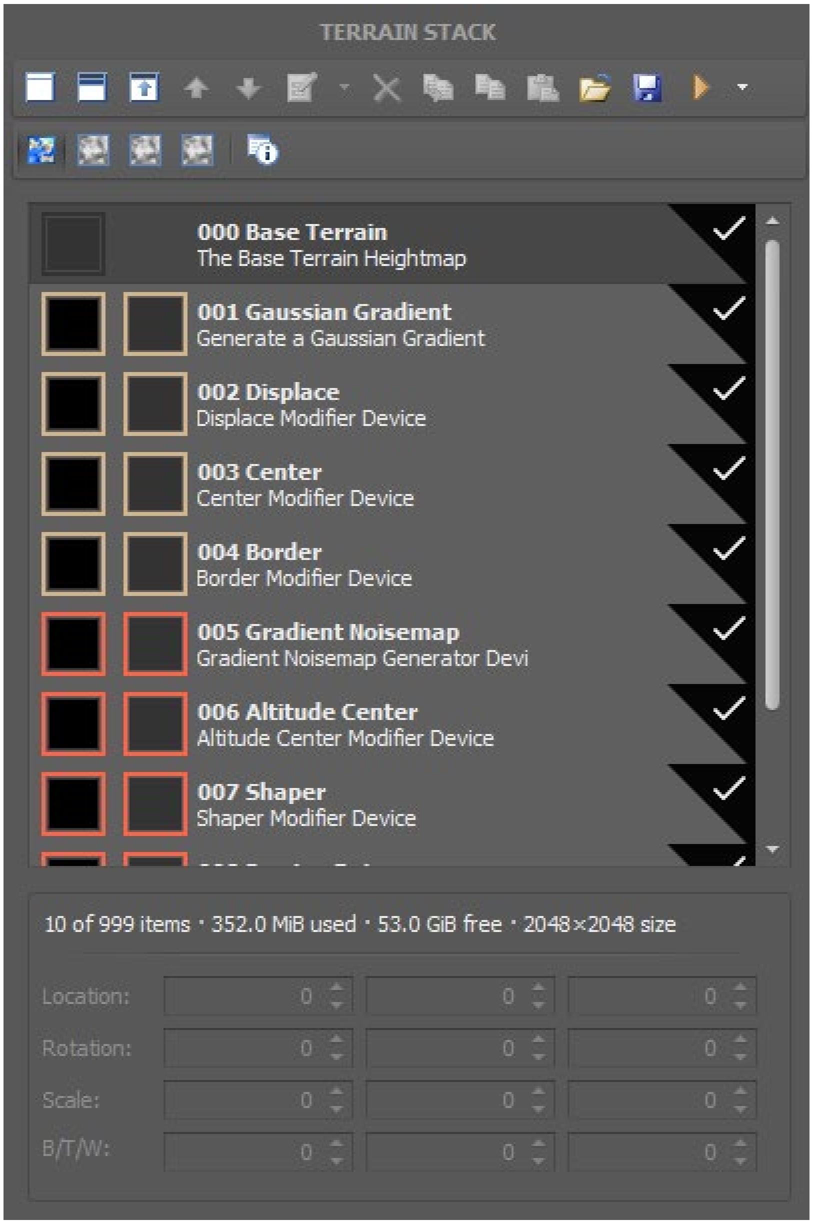
Font name:	The viewport text font name.
Font size:	The viewport text font size.

Mouse

Mouse speed:	The base mouse movement speed.
Mouse wheel speed:	The base mouse wheel speed.
Mouse XButton 1 action:	The action assigned to mouse X-button 1. A 5+ button mouse is required.
Mouse XButton 2 action:	The action assigned to mouse X-button 2. A 5+ button mouse is required.

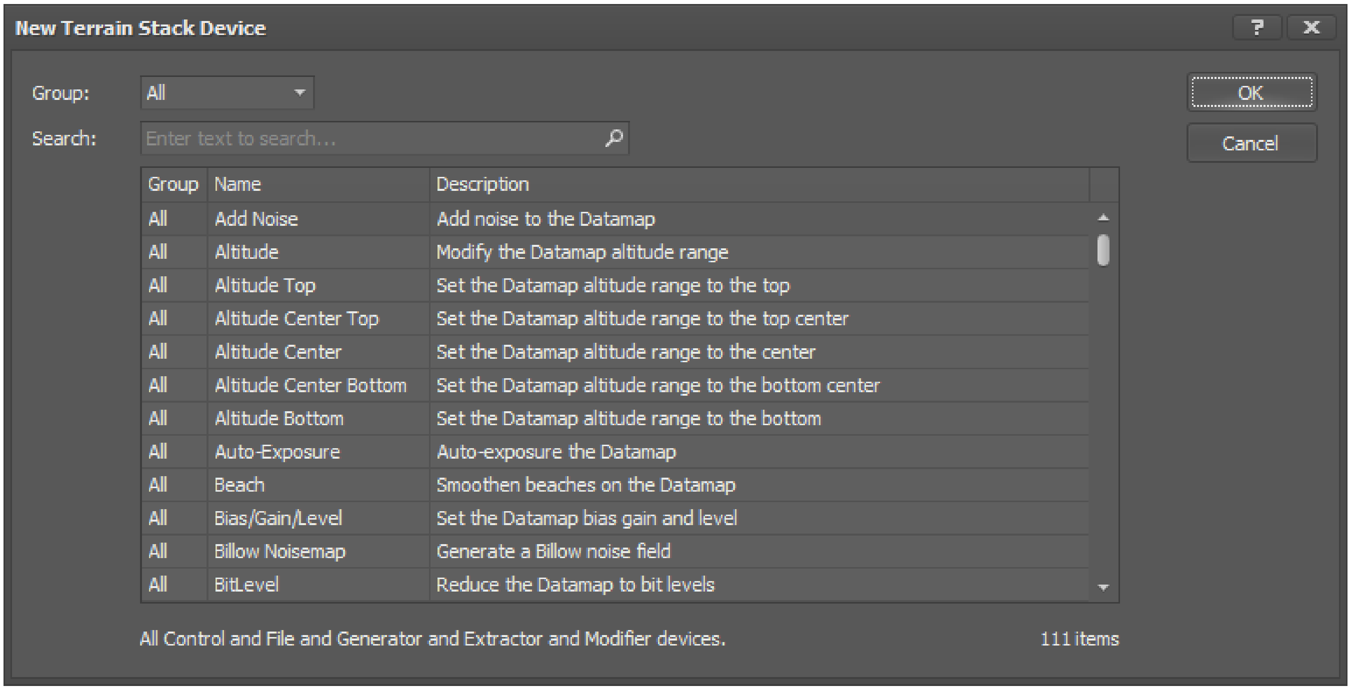
The Terrain Stack

The terrain stack provides a non-destructive method for creating complex terrain systems.



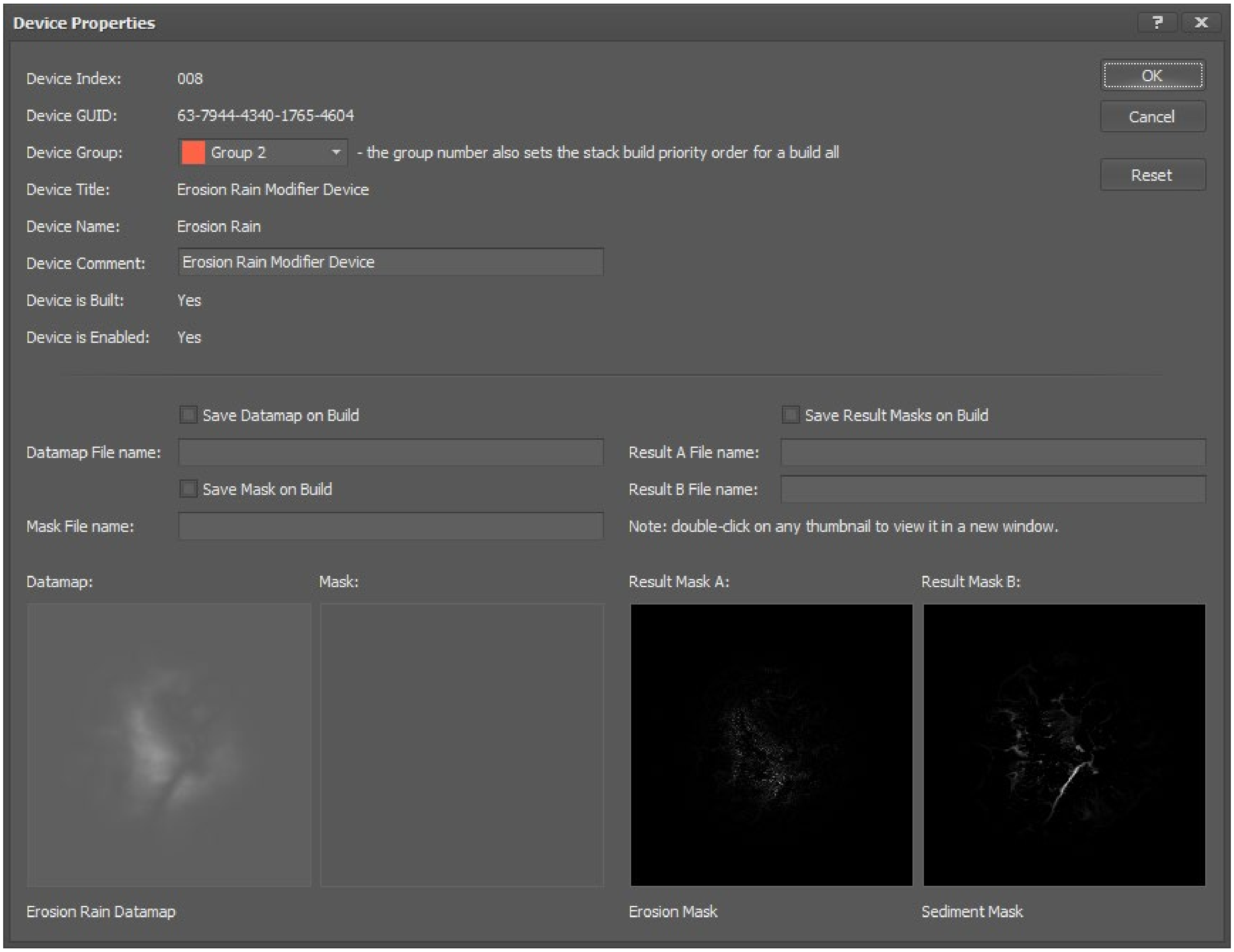
Add New Device

Click on the New Device toolbar button to add a new device to the terrain stack.



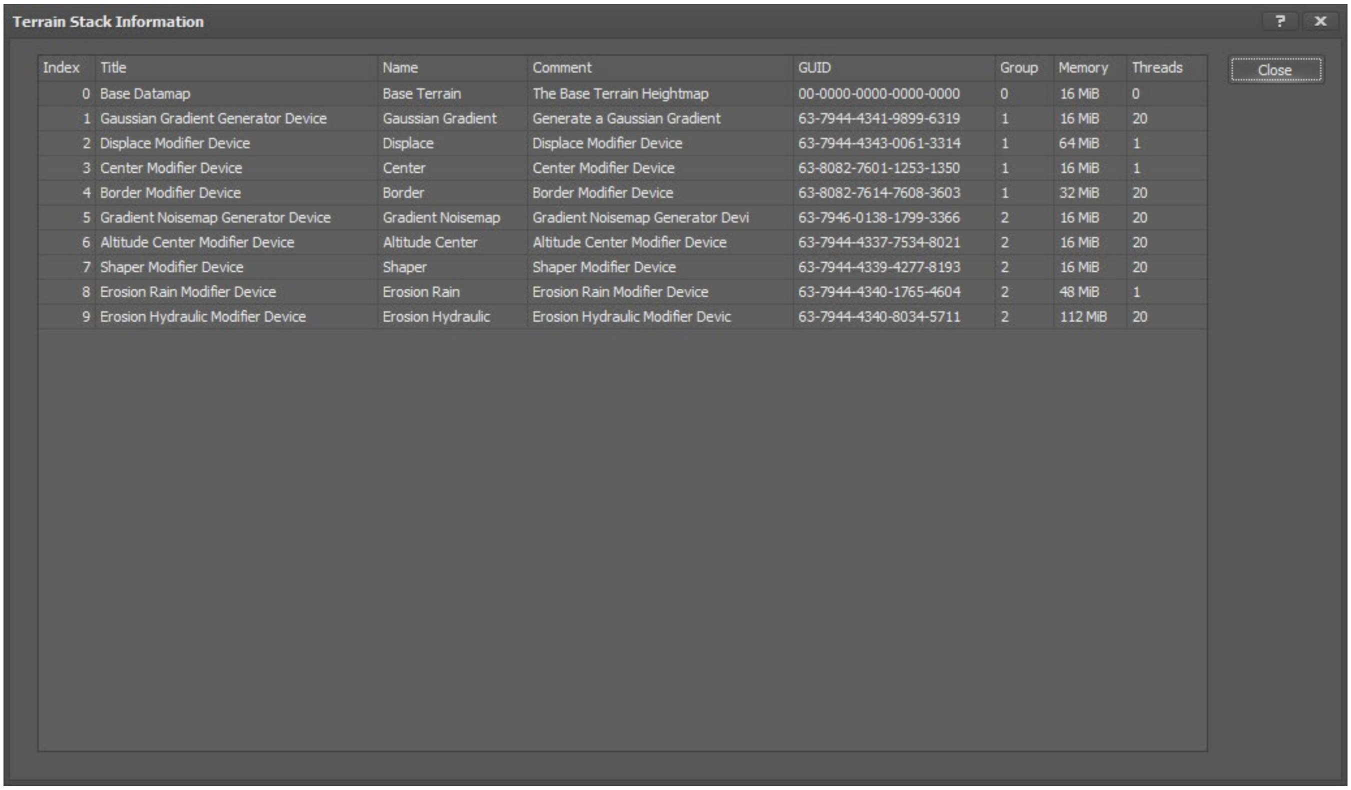
Display Device Properties

Double-Click on a terrain stack device item to display the Properties dialog.



Terrain Stack Items Information

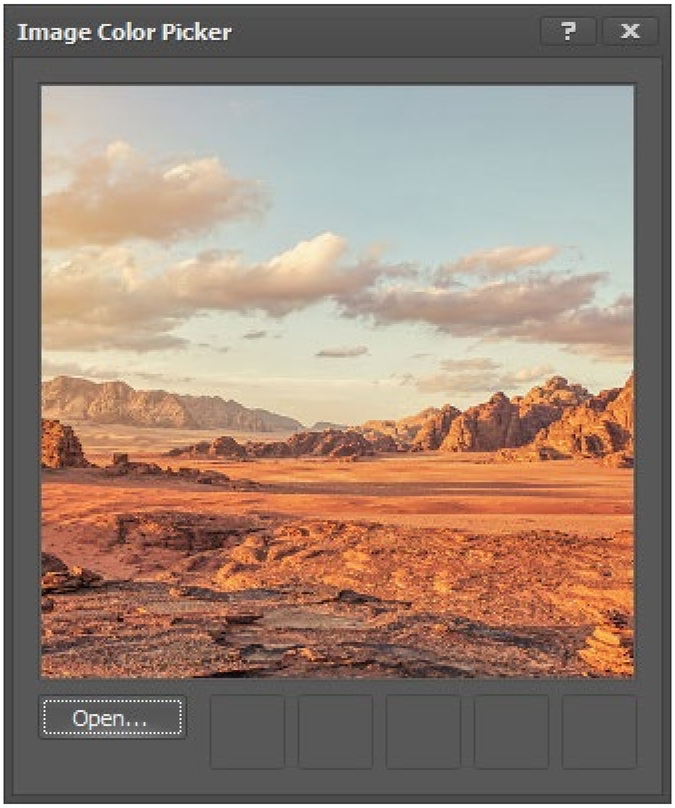
Click on the terrain stack Information toolbar button to display the Items Information dialog.



Index	Title	Name	Comment	GUID	Group	Memory	Threads
0	Base Datamap	Base Terrain	The Base Terrain Heightmap	00-0000-0000-0000-0000	0	16 MiB	0
1	Gaussian Gradient Generator Device	Gaussian Gradient	Generate a Gaussian Gradient	63-7944-4341-9899-6319	1	16 MiB	20
2	Displace Modifier Device	Displace	Displace Modifier Device	63-7944-4343-0061-3314	1	64 MiB	1
3	Center Modifier Device	Center	Center Modifier Device	63-8082-7601-1253-1350	1	16 MiB	1
4	Border Modifier Device	Border	Border Modifier Device	63-8082-7614-7608-3603	1	32 MiB	20
5	Gradient Noisemap Generator Device	Gradient Noisemap	Gradient Noisemap Generator Devi	63-7946-0138-1799-3366	2	16 MiB	20
6	Altitude Center Modifier Device	Altitude Center	Altitude Center Modifier Device	63-7944-4337-7534-8021	2	16 MiB	20
7	Shaper Modifier Device	Shaper	Shaper Modifier Device	63-7944-4339-4277-8193	2	16 MiB	20
8	Erosion Rain Modifier Device	Erosion Rain	Erosion Rain Modifier Device	63-7944-4340-1765-4604	2	48 MiB	1
9	Erosion Hydraulic Modifier Device	Erosion Hydraulic	Erosion Hydraulic Modifier Devic	63-7944-4340-8034-5711	2	112 MiB	20

Image Color Picker

The Image Color Picker allows for loading any common bitmap image up to 23170x23170 for the purpose of choosing colors within the image for use with Color controls on the Colormap and Auto-Material materials.



Use

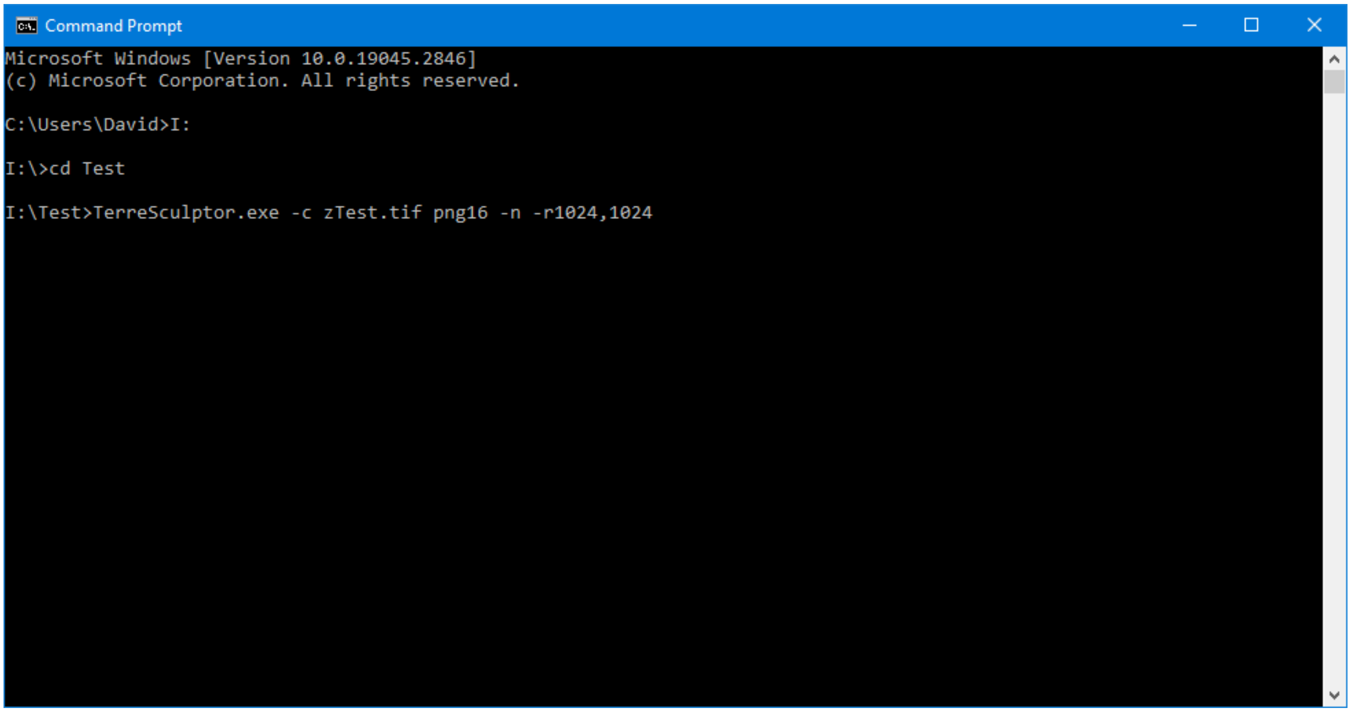
Click on the Open button to load an image file of the supported formats BMP, GIF, JPG, PNG, and TIF.
Zoom and Pan the image using the mouse wheel and left mouse button.
Left click on one of the five color chips to go into pick mode and click on a pixel in the image to get its color.
Right click on one of the five color chips and drag it over to the Colormap or Auto-Material colors.

Notes

The Image Color Picker is a modeless floating dialog that can be positioned anywhere on the screen.
It is possible to shift the dialog behind other windows or the main TerreSculptor editor.

Command Line Interpreter

TerreSculptor supports a powerful Command Line Interpreter that can be used to load files or convert between file formats or perform basic file edits. This feature is normally utilized from a command prompt window. Batch files are also supported.



Command Line Syntax

The Command Line Interpreter is typically accessed by executing the application exe with a set of commands. These commands are not case sensitive, but the command switch order must be followed.

Command Switches

The following switches are currently supported:

-h	Display the Help dialog.
-p	Load the specified TSworld Project file upon application startup.
-t	Load the specified TSmap Terrain file upon application startup.
-c	Convert the specified file to another format, with normalize and resample options.
-e	Edit the specified file using the specified modifier.
-s	Bypass the Application startup tests for CPU and Memory and OS Version.

Displaying Help

The full syntax is: TerreSculptor.exe -h

Loading a Project

The full syntax is: TerreSculptor.exe -p MyProject.TSworld
Replace MyProject with the name of the project file that you wish to load on startup, the file extension is required. TerreSculptor will launch, and after the Welcome dialog it will load the specified project file.

Loading a Terrain

The full syntax is: TerreSculptor.exe -t MyTerrain.TSmap
Replace MyTerrain with the name of the terrain file that you wish to load on startup, the file extension is required.
TerreSculptor will launch, and after the Welcome dialog it will load the specified terrain file.

Converting a File

The full syntax is: TerreSculptor.exe -c InputFile OutputFormat [-n] [-rWidth,Length]
Or: TerreSculptor.exe -c InputFile OutputFormat [-n] [-rWidthxLength]
The InputFile is the full path and filename to the source file that you wish to convert.
The OutputFormat is the output file format that you wish to convert to. See the list below.
Note that the output file will have the same file name as the input file, but the output file extension.
-n to optionally normalize the output file before saving.
-r with its width and length to optionally resample the output file to the specified dimensions.

For example, to simply convert a file from TIF to PNG 16-bit format:

TerreSculptor.exe -c heightmap.tif png16

If you wanted to optionally normalize the file before saving, you would use:

TerreSculptor.exe -c heightmap.tif png16 -n

If you wanted to optionally resample the file before saving, you would use:

TerreSculptor.exe -c heightmap.tif png16 -r1024,1024
TerreSculptor.exe -c heightmap.tif png16 -r1024x1024

If you wanted to optionally normalize and resample the file before saving, you would use:

TerreSculptor.exe -c heightmap.tif png16 -n -r1024,1024
TerreSculptor.exe -c heightmap.tif png16 -n -r1024x1024

In all of these examples, the file heightmap.tif will be converted to a file called heightmap.png in 16-bit grayscale format. Note that the output file will be overwritten if it already exists in the folder, no file backup will be created, so be sure that you want the output file overwritten if it exists.

By using batch files, an entire folder of files can be parsed and sent to the TerreSculptor command line interpreter to convert all of the files. See the example batch scripts below.

Editing a File

The full syntax is: TerreSculptor.exe -e File -Modifier
The File is the full path and filename to the file that you wish to edit.
The supported Modifier includes: -autoexposure, -fliphorz, -flipvert, -normalize, -rotate90, -rotate180, -rotate270.

For example, to flip a file horizontally:

TerreSculptor.exe -e heightmap.png -fliphorz

The only supported file formats at this time are PNG, TIF, and TSmap.

Bypassing Startup Tests

When TerreSculptor initializes itself after startup, it checks the computer system's hardware information for CPU and Memory and OS Version. This is to obtain the number of CPU Cores and Threads for determining multi-threading settings, and to obtain the amount of Memory for determining array allocations.

If the Windows Operating System DLLs are damaged or corrupt, these API calls will return 0 CPUs and/or 0 Memory, which will prevent the software from correctly functioning.

As a temporary work-around, these startup tests can be bypassed by using the "-s" command-line switch.
In most cases the Windows Operating System has to be reinstalled to repair these corrupt System DLL issues.

Command Line Interpreter Result Code

The Command Line Interpreter returns a result code to the command shell depending on what has transpired.
If the command line argument and switch parsing was successful, the result code is "0".
If there is a syntax error in the command line argument, or one of the called methods in TerreSculptor failed with an error, then the result code is "1".

Supported Conversion Output Formats

The following output file formats are supported. The name is not case sensitive.

ascf = ESRI ASC float
asci = ESRI ASC integer
bil8 = BIL 8-bit byte
bil16s = BIL 16-bit signed
bil16u = BIL 16-bit unsigned
bil32 = BIL 32-bit float
bmp8 = BMP 8-bit gray
bmp16 = BMP 16-bit gray Epic
bmp24 = BMP 24-bit rgb
bmp32 = BMP 32-bit rgba
bt16 = BT 16-bit
bt32f = BT 32-bit float
bt32i = BT 32-bit integer
csv = CSV comma separated text float
flt8 = FLT 8-bit byte
flt16 = FLT 16-bit ushort
flt32 = FLT 32-bit float
gif = GIF 8-bit gray
hgt8 = HGT 8-bit byte
hgt16 = HGT 16-bit ushort
hgt32 = HGT 32-bit float
jpg8 = JPG 8-bit gray
jpg24 = JPG 24-bit rgb
jxr8 = JXR 8-bit gray
jxr16 = JXR 16-bit gray
jxr24 = JXR 24-bit rgb
jxr32f = JXR 32-bit float gray
jxr32 = JXR 32-bit rgba
jxr48 = JXR 48-bit rgb
jxr64 = JXR 64-bit rgba
jxr128 = JXR 128-bit rgba
pam16 = PAM 16-bit gray
pam32 = PAM 32-bit float
pfm16 = PFM 16-bit gray
pfm32 = PFM 32-bit float

pgm16	= PGM 16-bit gray
pgm32	= PGM 32-bit float
png8	= PNG 8-bit gray
png16	= PNG 16-bit gray
png24	= PNG 24-bit rgb
png32	= PNG 32-bit rgba
png48	= PNG 48-bit rgb
png64	= PNG 64-bit rgba
psv	= PSV pipe separated text float
r8	= RAW 8-bit byte
r16	= RAW 16-bit unsigned
r32f	= RAW 32-bit float
r32i	= RAW 32-bit unsigned int
r64f	= RAW 64-bit double
r64i	= RAW 64-bit unsigned long
ssv	= SSV semicolon separated text float
ter	= TER terragen terrain
tga8	= TGA 8-bit gray
tga16	= TGA 16-bit gray
tga24	= TGA 24-bit rgb
tga32	= TGA 32-bit rgba
tif8	= TIF 8-bit gray
tif16s	= TIF 16-bit signed
tif16u	= TIF 16-bit unsigned
tif32f	= TIF 32-bit float
tif32s	= TIF 32-bit signed
tif32u	= TIF 32-bit unsigned
tif24	= TIF 24-bit rgb
tif32	= TIF 32-bit rgba
tif48	= TIF 48-bit rgb
tif64	= TIF 64-bit rgba
tsmap	= TSmap TerreSculptor Heightmap
tsv	= TSV tab separated text float

Batch File Scripts

Batch files can be used to loop over all files in a folder and convert them all from one format to another or edit them using the edit commands.
A few example basic batch file scripts would be as follows.

This script loops over all files in the current folder and converts them from their source file format to 16-bit grayscale PNG files, resampled to 2048x2048.

Note that TerreSculptor will simply skip over file formats that it doesn't recognize, so if you have other files in the folder, including the TerreSculptor application exe and dlls and the batch file itself, they will simply be skipped in the conversion.

```
@echo off
for %%f in (*) do (
   echo "name: %%~nf"
   TerreSculptor.exe -c %%f png16 -r2048,2048
)
echo "done"
```

This script loops over all files in the current folder, but the batch file can be located anywhere as it references the installed TerreSculptor exe program with its full path.

```
@echo off
for %%f in (*) do (
   echo "name: %%~nf"
   "C:\Program Files\Demenzun Media\TerreSculptor 4.0\TerreSculptor.exe" -c %%f png16 -r1024x1024
)
echo "Done"
```

This script loops over all files in the specified folder, and references the installed TerreSculptor exe program with its full path.

```
@echo off
for %%f in (I:\Test\*) do (
   echo "name: %%~nf"
   "C:\Program Files\Demenzun Media\TerreSculptor 4.0\TerreSculptor.exe" -c %%f png16 -r1024x1024
)
echo "Done"
```

This script loops over all files in the specified folder, and references the installed TerreSculptor exe program with its full path, and autoexposures all files.

```
@echo off
for %%f in (I:\Test\*) do (
   echo "name: %%~nf"
   "C:\Program Files\Demenzun Media\TerreSculptor 4.0\TerreSculptor.exe" -e %%f -autoexposure
)
echo "Done"
```

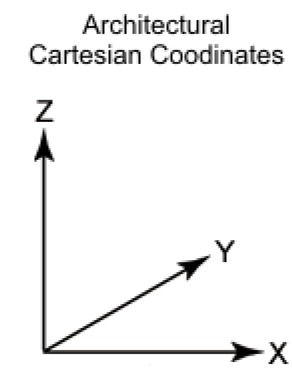
Cartesian Coordinate Systems

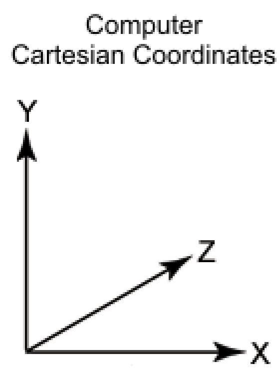
A Cartesian coordinate system specifies a unique point location by its numerical coordinates within a set of planes. The numerical coordinates are the signed (positive or negative) distance from the fixed plane origin to the point's location.

In a 3D coordinate system, the three mutually perpendicular planes are called the X, Y, and Z plane axes, and their point of intersection is called the origin. The origin location is at the X,Y,Z coordinate of 0,0,0, with signed (positive and negative) coordinates at distances from the origin.

Coordinate Categories

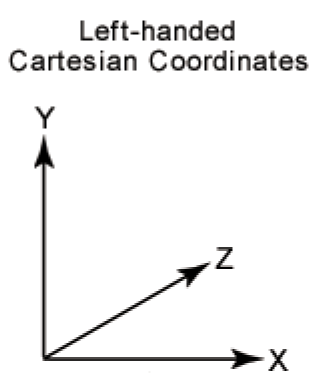
3D Cartesian coordinate systems fall into two basic categories: architectural and computer.
The architectural coordinate system began years ago from hand-drafting where X and Y are the width and length of the paper lying flat on the drafting desk and Z is the imaginary altitude extending upward out of the paper.
The computer coordinate system began with the development of 3D rendering engines where X is across the width of the screen, Y is across the height of the screen, and Z is in and out of the screen. An easy way to remember the computer coordinate system is that the Z axis moves along the 3D renderer *Z-buffer* (depth buffer).

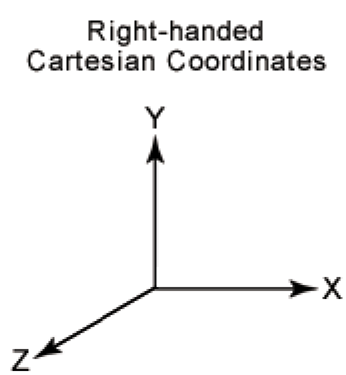




All 3D software applications support one or more Cartesian coordinate systems. The chosen coordinate system sometimes depends on the purpose of the software. For example, drafting software such as Autodesk AutoCAD will typically use the architectural coordinate system instead of the default computer coordinate system, since it is an architectural application that is used instead of, or in addition to, hand-drafting. Most software applications and 3D engines use the computer coordinate system.

The computer coordinate system is divided into two layouts, where the only difference is the signed positive direction of the Z axis. The layout where positive Z goes into the screen is called left-handed. DirectX uses the left-handed layout. The layout where positive Z goes out of the screen is called right-handed. OpenGL uses the right-handed layout. The "-handed" terminology comes from the fact that holding your hand in the positive X direction with the fingers curved up in the positive Y direction, then the thumb becomes the positive Z direction.



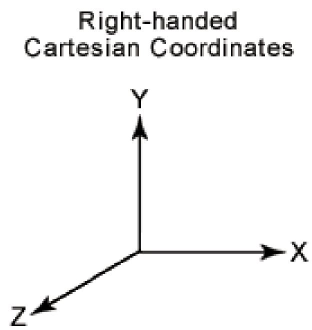


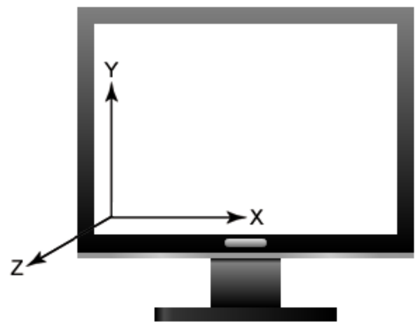
Other common 3D software coordinate default layouts include:

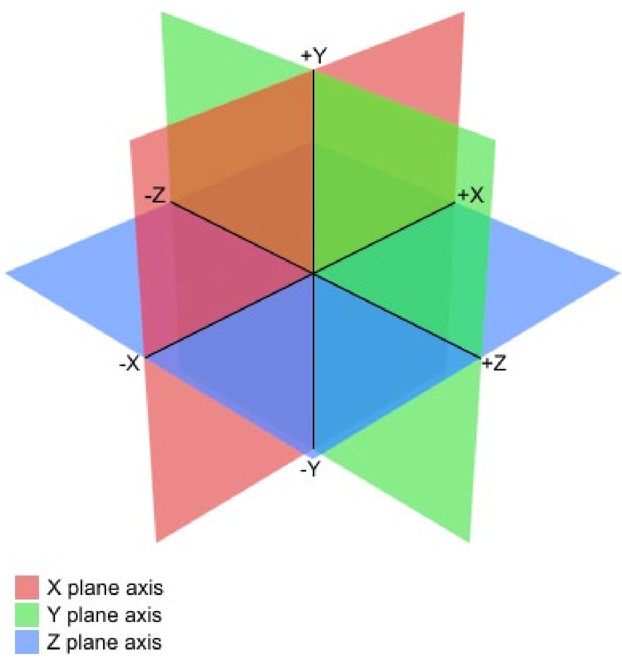
- Autodesk 3DS Max uses the architectural system with +Z up, +X right, +Y in.
- Blender uses Autodesk Max style coordinates.
- Autodesk Maya uses the OpenGL right-handed system with +Y up, +X right, +Z out.
- TerreSculptor uses the OpenGL right-handed system with +Y up, +X right, +Z out.
- Unreal Engine uses its own backwards architectural coordinate system of +Z up, +Y right, +X in, which is why meshes and heightmaps must be pre-rotated prior to import or they do not face the proper direction.

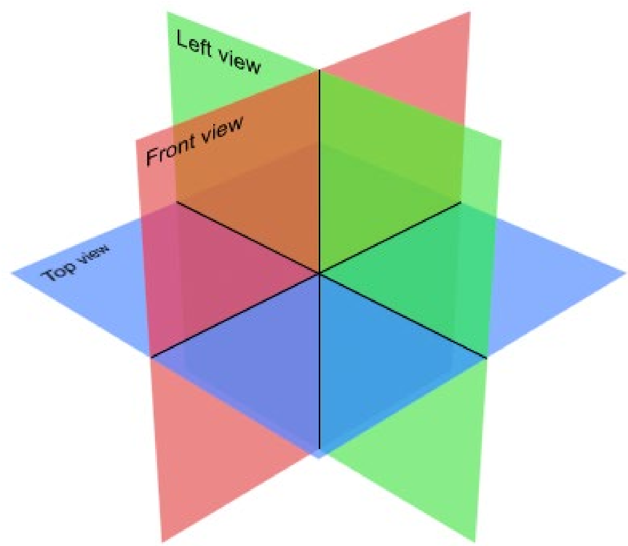
TerreSculptor's Coordinate System

TerreSculptor uses the standard OpenGL right-handed coordinate system with +Y up, +X right, and +Z out.
The X,Y,Z origin 0,0,0 is located at the intersection of the three planes.









Display Performance

TerreSculptor contains a number of features to help adjust the performance of the 2D and 3D render display output. The performance features can be set to provide a balance between visual quality and render time.

The performance features are typically set depending on the visual quality requirements and the performance level of the computer hardware.

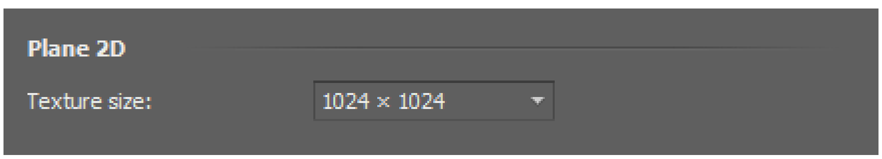
Editor Performance Settings

The main editor viewport terrain can be viewed as either a 2D Texture Plane or as a 3D Terrain Mesh.
The 2D Texture Plane is typically used for viewing masks and weightmaps.
The 3D Terrain Mesh is typically used for viewing heightmaps.

2D Texture Plane

The Editor 3D scene includes performance settings for the visual quality and resolution of the rendered texture plane.
The texture plane is a basic set of quads that provide a double-sided texture plane.
The texture resolution can be selected, which changes the amount of memory required and the render performance of the texture plane. The texture resolution can be set from 512×512 pixels to 16384×16384 pixels.
The uncompressed without mipmaps texture memory usage is 786kb for a 512×512 pixel texture and 805mb for a 16384×16384 pixel texture

The default Texture Plane texture resolution can be chosen in the Settings Scene Objects tab.



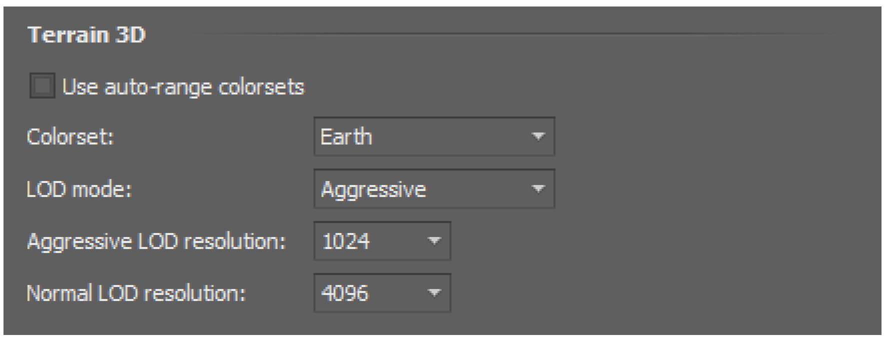
The main toolbar contains a drop-down where the 2D Texture Plane texture resolution can be changed during editing, from 512 to 16384.

3D Terrain

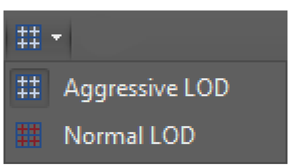
The Editor 3D scene includes performance settings for the visual quality and resolution of the rendered terrain mesh.
The terrain mesh can be set so that it is a lower resolution proxy version of the actual heightmap data, whenever the heightmap exceeds a specific resolution. This feature is called Aggressive LOD.

When the heightmap resolution exceeds the aggressive resolution value, a smaller version of the heightmap is used to render the terrain mesh. This prevents the mesh triangle count from exceeding the specified maximum, which results in better 3D rendering performance.

The aggressive LOD resolution value can be adjusted on the Settings dialog's Scene tab in the Terrain 3D group. Choose the desired largest aggressive LOD resolution, and whenever a heightmap is loaded that is larger than this resolution, it will instead be rendered at this specified resolution.
For example, the default aggressive LOD resolution value of 1024 would result in a 2048×2048 or 3072×3072 or 4096×4096 heightmap being rendered at a mesh resolution of 1024×1024. This can be a significant performance savings since a 4096×4096 terrain mesh is more than 33 million triangles, while a 1024×1024 terrain mesh is only 2 million triangles, only 1/16 the amount of mesh data required to render.



The aggressive LOD resolution setting is used in conjunction with the Terrain LOD drop-down menu on the main toolbar. The available terrain LOD modes are chosen on this menu.



Favorites and Presets Files

The following areas of TerreSculptor include favorites or preset files:

Material Color Presets – RGBAK color presets
Mapper Favorites – Earth location favorites

The Favorites and Presets are saved in CSV (Comma Separated Value) text database files.
These files are located in the AppData\Local\Demenzun Media\TerreSculptor\ folder.
Since these files are plain ASCII text they can be edited with software such as Microsoft Excel or Notepad.

File Backup

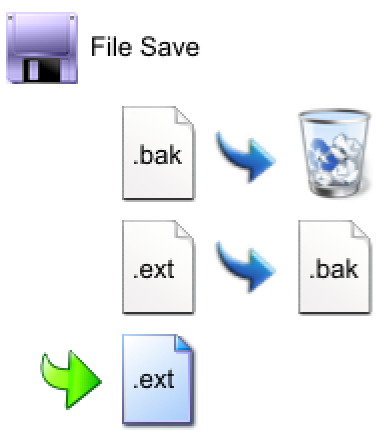
Whenever a file is saved that may cause an overwrite condition, the following actions will occur.

If the application option for *Create backup on save* is enabled, the original file will be renamed from "filename.ext" to "filename.ext.bak". The characters .bak will be appended to the original file name. This style of action is chosen instead of replacing the original file extension in order that the original file's format type differentiated by its extension is still obvious.

If a file already exists in the folder that is named "filename.ext.bak", then it will be deleted, unless the *Use Recycle Bin on overwrite* option is enabled in which case the existing .bak file will be moved to the Windows Recycle Bin.

If the application option for *Create backup on save* is **not** enabled, the original file will be deleted, unless the *Use Recycle Bin on overwrite* option is enabled in which case the original file will be moved to the Windows Recycle Bin.

A flowchart for the operations of both *Use Recycle Bin on overwrite* and *Create backup on save* enabled.



Fixed Folders and Last Folder Memory

TerreSculptor supports configuring a set of application common folders as fixed paths or last memory paths. The folders are specified on the Tools, Settings, Folder tab.

Specifying a direct folder path in a Settings Folders path textbox will result in a Fixed Folder that always opens and saves to that path location, while leaving a Settings Folders path empty (blank) or setting the text to %Memory% will result in that path using the Last Folder Memory system.

TerreSculptor maintains a memory for the last folder that was accessed for the file open and save dialogs. Whenever the software is executed, it always remembers the last folders accessed, and during a session the last folder accessed is always updated to the current folder location that is browsed to. This essentially retains a memory to the last folder used for that specific folder file type.

Fixed Folders and Last Folder Memory is tracked independently for each of the following file areas:

- Current Brush Folder	defaults to Documents
- Current Colorset Folder	defaults to Documents
- Current Device Folder	defaults to Documents
- Current Heightmap Folder	defaults to Documents
- Current Image Folder	defaults to Pictures
- Current Mapper Folder	defaults to Documents
- Current Noisemap Folder	defaults to Documents
- Current Project Folder	defaults to Documents
- Current Screenshot Folder	defaults to Pictures
- Current Sky Folder	defaults to Documents
- Current Terrain Folder	defaults to Documents
- Current Terrain Stack Folder	defaults to Documents
- Current Texture Folder	defaults to Documents

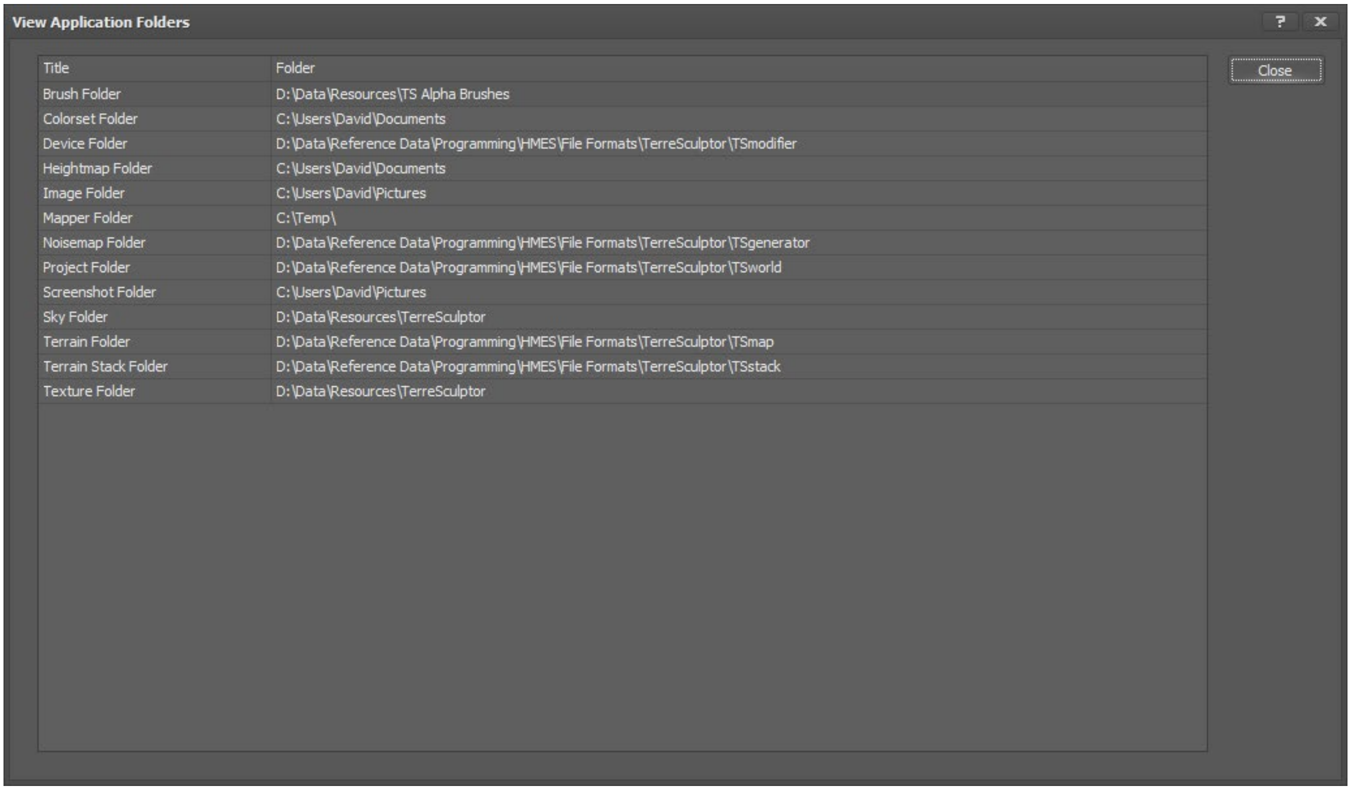
Notes:

The folder settings can be reset to the default folder locations by clicking the Reset button in the Settings on the Folders tab.

The fixed folder and last folder memory value is reset whenever the ini file is reset to defaults through the Settings dialog. The last folder memory values can also be modified by manually editing the ini file.

When the last folder memory for a file area is at its default ‘blank’ value, the current user account *Documents* folder is used for all files except image and screenshot which use the current user account *Pictures* folder.

The list of fixed folders and last folder memory paths can be viewed by clicking on the View button.


View Application Folders
Close
Title
Folder
Brush Folder
D:\Data\Resources\TS Alpha Brushes
Colorset Folder
C:\Users\David\Documents
Device Folder
D:\Data\Reference Data\Programming\HMES\File Formats\TerreSculptor\TSmodifier
Heightmap Folder
C:\Users\David\Documents
Image Folder
C:\Users\David\Pictures
Mapper Folder
C:\Temp\
Noisemap Folder
D:\Data\Reference Data\Programming\HMES\File Formats\TerreSculptor\TSgenerator
Project Folder
D:\Data\Reference Data\Programming\HMES\File Formats\TerreSculptor\TSworld
Screenshot Folder
C:\Users\David\Pictures
Sky Folder
D:\Data\Resources\TerreSculptor
Terrain Folder
D:\Data\Reference Data\Programming\HMES\File Formats\TerreSculptor\TSmap
Terrain Stack Folder
D:\Data\Reference Data\Programming\HMES\File Formats\TerreSculptor\TSstack
Texture Folder
D:\Data\Resources\TerreSculptor

Texture Support

TerreSculptor supports texture mapping on a number of its 3D editor scene objects. The texture image files that can be opened and applied to these scene objects include a subset of standard power-of-two sizes.

The phrase "power-of-two" is often used to specify texture dimensions. Power-of-two numbers are those that are calculated from the formula 2^n where n is any number from 1 and higher. So, 2^1 = 2. 2^2 = 4. 2^3 = 8. 2^4 = 16, 2^8 = 256, 2^10 = 1024, 2^12 = 4096. etc. Common power-of-two values used for textures include 64, 128, 256, 512, 1024, 2048, 4096, 8192, and 16384. TerreSculptor supports texture dimension values of 32 through 16384 for the 3D Scene objects as outlined below.

32-bit texture files that include an alpha channel will correctly render with alpha transparency.
If a texture file is opened that has an unsupported resolution, the Texture Resize dialog will appear.

The supported texture file formats include:

Windows Bitmap ".bmp"
- 8-bit palette color (also known as 256-color)
- 24-bit RGB color

Graphics Interchange Format ".gif"
- 8-bit palette color (also known as 256-color)

Joint Photographic Experts Group ".jpg"
- 8-bit palette color (also known as 256-color)
- 24-bit RGB color

Portable Network Graphics ".png"
- 8-bit palette color (also known as 256-color)
- 24-bit RGB color
- 32-bit ARGB color

Targa Image Format ".tga"
- 8-bit palette color (also known as 256-color)
- 24-bit RGB color
- 32-bit ARGB color

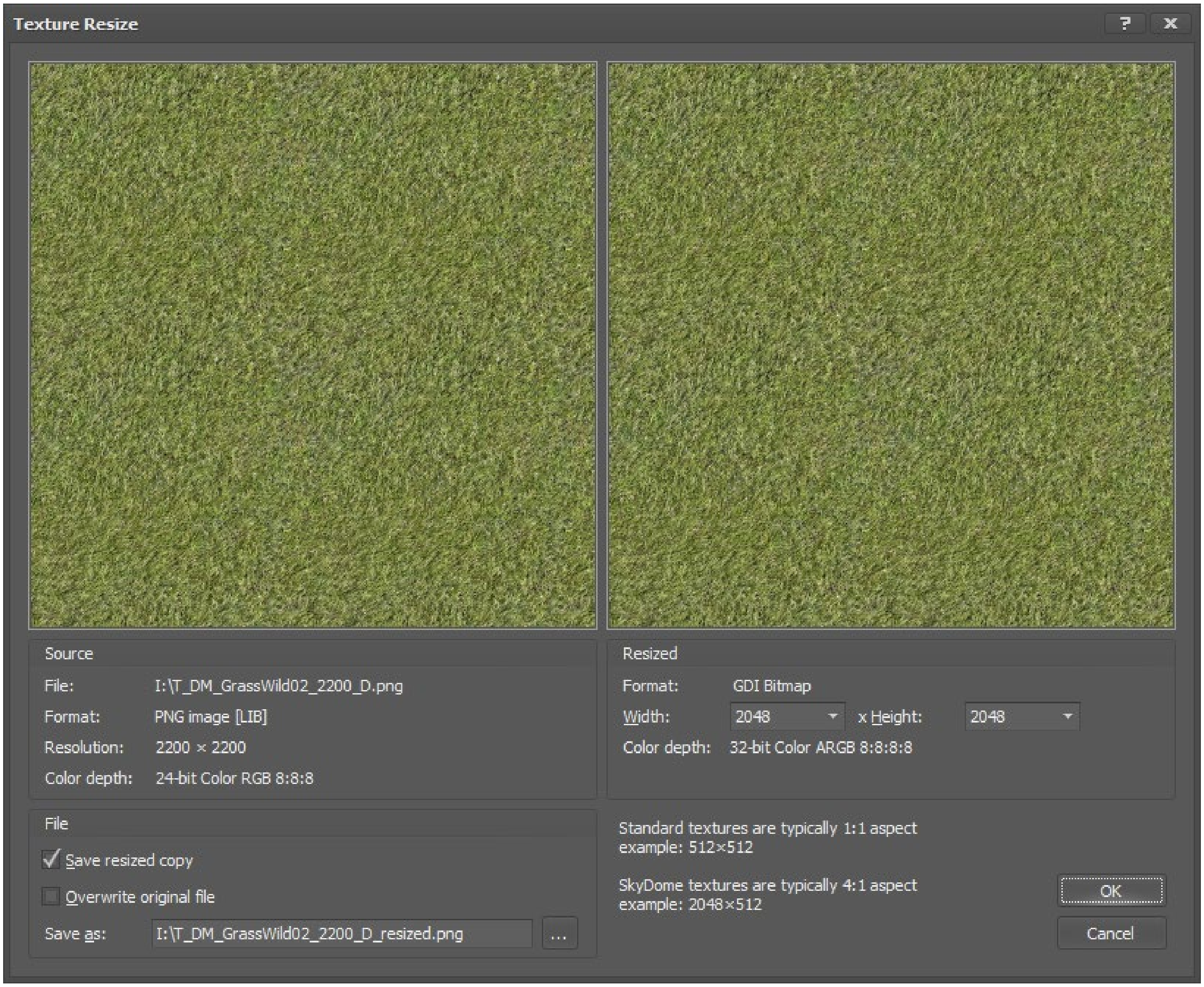
Tagged Image Format ".tif"
- 8-bit palette color (also known as 256-color)
- 24-bit RGB color
- 32-bit ARGB color

The supported texture file resolutions for each scene object are:

Backdrop Cube	32×32 through 16384×16384
Backdrop Skydome	32×32 through 16384×16384 with a 4:1 aspect ratio eg. 2048×512
Backdrop Skyplane	32×32 through 16384×16384
Designer	32×32 through 16384×16384
Water	32×32 through 16384×16384

Texture Resize Dialog

The texture resize dialog supports interactive resampling of texture files that are not one of the supported texture resolutions.



Resized

Resolution – Choose one of the available supported resolutions.

File

Save resized copy – Enable this to save a copy of the resized texture file. If this is not enabled, no resized copy is saved to disk, and resizing will have to be performed again if the original texture is opened at a later time.

Overwrite original file – Enable this to overwrite the original texture file with the resized version. A backup of the original file will be made if file backups is enabled in the application settings.

Save as – Specifies the new name for the saved resized copy. By default the resized copy has the same file name as the original file with the word "_resized" appended to the file name.

Terrain Design

TerreSculptor supports creation of a wide variety of visual styles of terrain, from imported DEM digital elevation models, to complex noise generation, to mixing and masking of multiple sources. TerreSculptor utilizes the heightmap based terrain system that can visually depict hills, valleys, mountains, rivers, and roads. Plus the creation of multiple types of weightmaps for a multiple layer terrain texture system that supports real-world texture files such as dirt, rock, sand and mud. The weightmap alphamap masks determine where the textures are blended onto the terrain mesh such as on flatlands or steep mountain sides.

Terrain Use

Terrain can be used for small areas such as city lots, enclosed courtyards and even to simulate piles of debris; or the entire game map may be based on a large outdoor terrain design that incorporates a variety of geological features such as mountains and valleys.

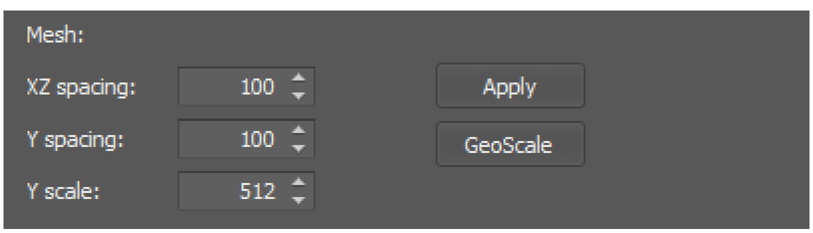
The terrain is often used in conjunction with specifically-designed geological meshes for large boulders, buttes, cliffs, and water planes. Additional meshes are also used for the variety of foliage that may appear on the terrain, such as grass, weeds, flowers, shrubs and bushes, and trees. Video game map designs and layouts using terrain will often utilize the terrain's ability to create impassable mountains or cliffs around the circumference of the play area, in order to restrict the movement of the game player and prevent them from leaving the game area or falling out of the game world.

The terrain system essentially renders an X × Z array of mesh triangles whose vertex Y value determines the altitude of the triangles at each vertex intersection. The vertex Y values are derived from each heightmap pixel altitude or the pixel grayscale level value.

One of the challenges that video game level designers face is choosing the appropriate layout and resolution of this terrain mesh in order to provide the best visual quality versus performance setting.

Terrain Properties Mesh Spacing and Scale

The Terrain Properties on the Function panels provides access to the Mesh Scale settings for the terrain mesh.

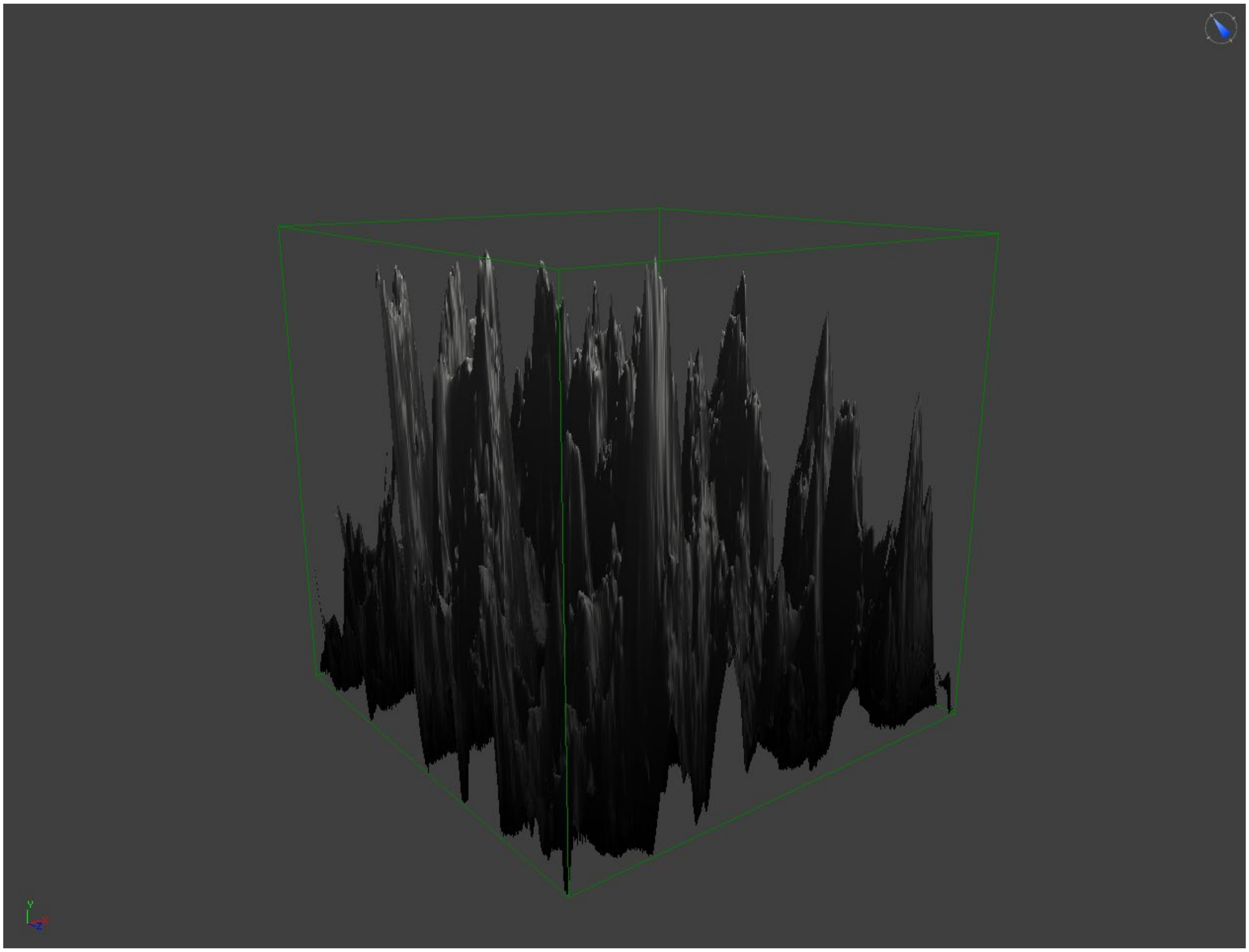


These properties include:

XZ Spacing: The terrain mesh spacing on the XZ axes, which determines the width and length area.
Y Spacing: The terrain mesh spacing on the Y axis, which determines the altitude height range.
Y Scale: A scale multiplier for the Y axis that provides scaling differences for specific game engines.

The units that these Scale and Spacing values use is set in the Settings Units and is typically in centimeters or inches.

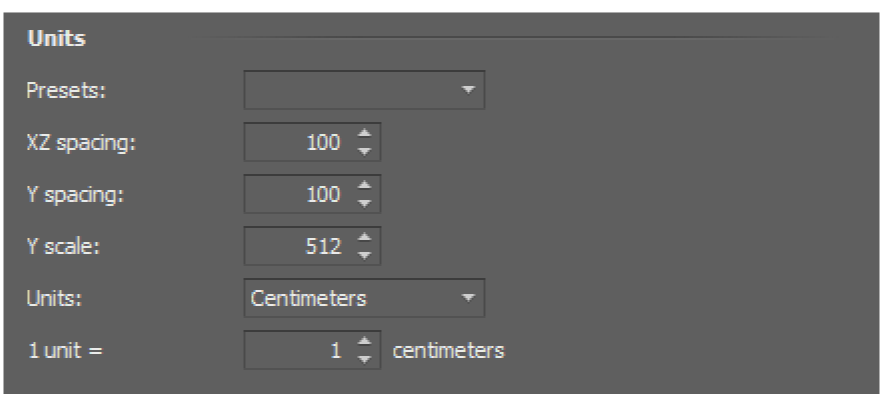
The Y Scale value is typically set in the Settings Units and never usually changed on the Terrain Properties.
The Y Scale value determines the number of world units that are required to make a cubic terrain mesh. For example, a 512×512 normalized heightmap that is set to Y Scale of 512 will fill a cubic region in 3D space, when the XYZ Spacing values are all equal value such as 100.
If Y Scale is set to 512 and Y Spacing is set to 100 cm, then a normalized heightmap will have a height of 512 meters.



An example of a cubic terrain mesh that is a 512x512 normalized heightmap with a Y Scale of 512.

Settings Units

The units that are used for the terrain mesh scaling are set in the Tools Settings Units.
These units are typically set to centimeters or inches.



A set of presets for common video game engines are provided, that will match up the viewport to the engine. Typical units values are shown in the image, which results in world and terrain units that are in centimeters and meters and kilometers.

Y Scale is a multiplier that is set for each specific game engine. For generic use, it can be set to any typical value such as 100 or 256 or 512 which may make altitude range calculations easier.

Terrain Size

TerreSculptor supports a maximum world size of 10Million × 10Million × 10Million (10485760 × 10485760 × 10485760) generic units, although terrain meshes twice this size can still be created or edited but may result in renderer distance clipping. This is equivalent to a 104.86km × 104.86km area when using the Units settings of 1 unit = 1 cm.

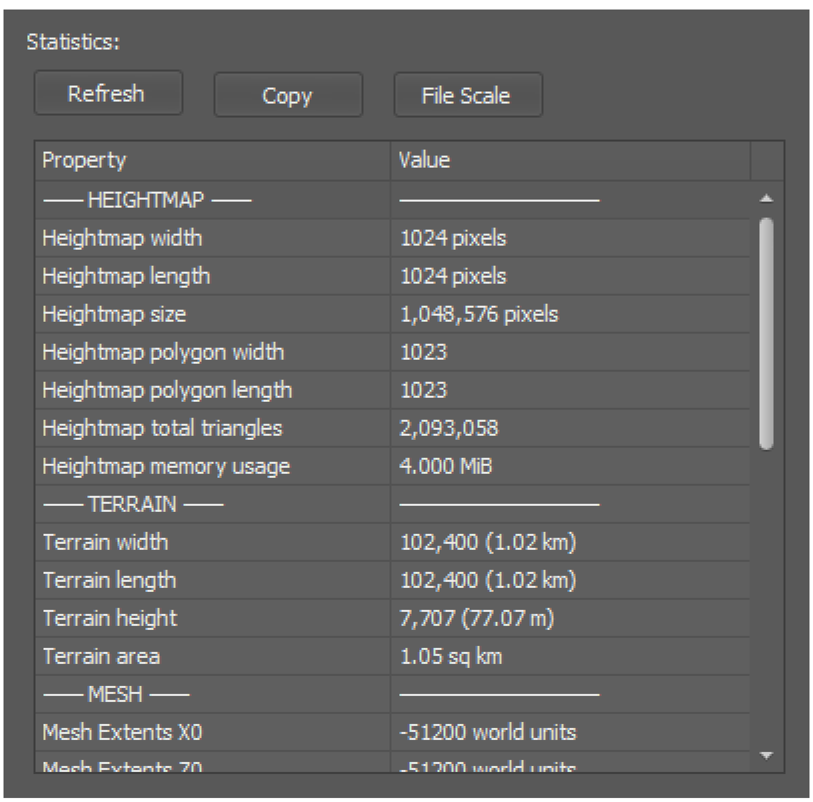
This maximum world size is independent of the heightmap resolution, such that a 2048×2048 heightmap with a Units XZ vertex spacing of 128 will result in a 256k × 256k area, while the same 2048×2048 heightmap with a Units XZ vertex spacing of 256 will result in a 512k × 512k area.

The Units XZ vertex spacing value determines the size of each terrain quad, along with the terrain heightmap resolution in pixels ultimately determining the total area of the terrain mesh. The total area is calculated as heightmap resolution × Units XZ vertex spacing along each dimension. Choosing the most effective set of values for heightmap resolution and vertex spacing is required to obtain the best balance between terrain detail and rendering performance.

In most cases the Units XZ vertex spacing will be 100, which in centimeters is 1 meter, which provides a good balance between quad size and terrain mesh density. The heightmap resolution will then be chosen to fulfill the requirement for the overall terrain size such as the area in meters or kilometers.
Care should be exercised when choosing heightmaps larger than 1024×1024 for both performance and file size reasons: a 2048×2048 heightmap is 8MB of heightmap data and a terrain mesh of 8 million triangles; a 3072×3072 heightmap is 18MB of heightmap data and a terrain mesh of 18 million triangles; and a 4096×4096 heightmap is 32MB of heightmap data and a terrain mesh of 32 million triangles.

Terrain Properties Statistics

The Terrain Properties on the Function panels also contains a grid with a listing of the current terrain statistics.
This listing includes information on the heightmap, the terrain, and the terrain mesh.
Information such as the terrain width and length in kilometers, and the terrain height in meters can be found here.



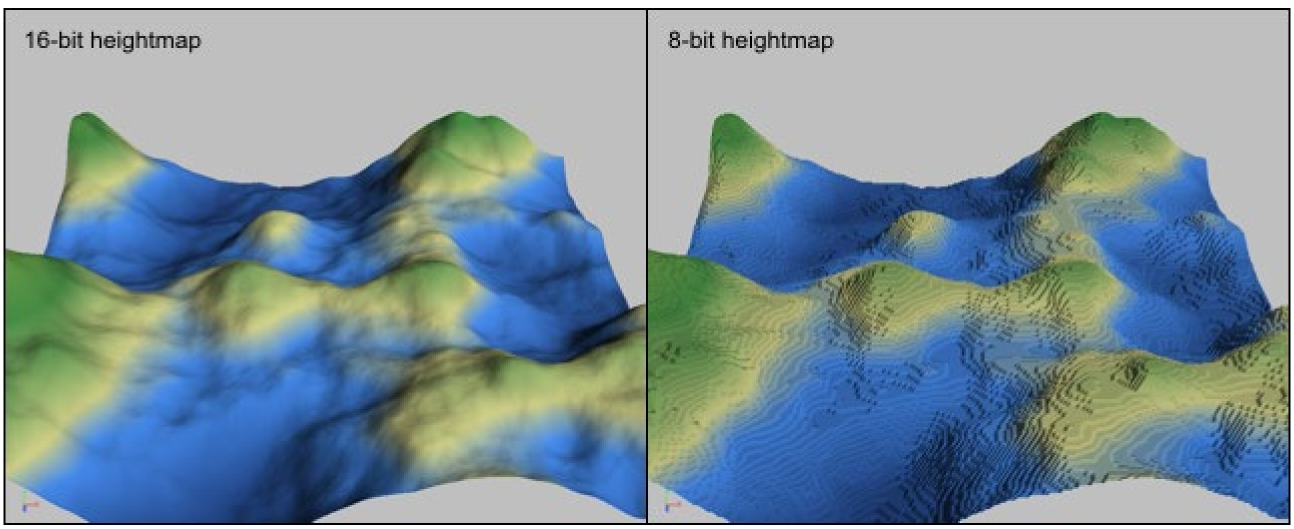
Power-of-Two

When working with heightmaps the phrase "power-of-two" is often used to specify the heightmap dimensions. Power-of-two numbers are those that are calculated from the formula 2^*n* where *n* is any number from 1 and higher. So 2^1 = 2. 2^2 = 4. 2^3 = 8. 2^4 = 16, 2^8 = 256, 2^10 = 1024, 2^12 = 4096. etc.
Common power-of-two values used for heightmaps include 64, 128, 256, 512, 1024, 2048, and 4096. Plus-half values are also commonly used, which are those half-way between a power-of-two pair, such as 384, 768, 1536, and 3072.

Heightmap Bit-depth

When developing heightmap files for use with current video game engines, be sure to always work with the proper 16-bit heightmap format and files. Choosing to work with 8-bit grayscale heightmap files for ease of support in standard paint software will result in terrains that are using only 1/256th of the available altitude range. This normally causes an undesirable stair-stepped terracing look to the terrain.

When working with heightmap files, it is not recommended to attempt to paint detail on the heightmap using standard paint software, as it can only edit and display 8-bits of grayscale on current video hardware. This means that for every single color of gray that is painted on an 8-bit display system, there are actually 256 levels of altitude that cannot be seen visually. In other words, on an 8-bit grayscale display, the value 0 (black) is actually the 16-bit values from 0 to 255; the 8-bit value 1 is actually 16-bit 256 to 511, etc. So there is no visual accuracy to the values that are being painting to.



Units Vertex Spacing

The Units vertex spacing includes individual properties for the XZ and Y directions of the terrain mesh. Units XZ are locked together to create square quads (triangle pairs) only, and affect the width and length of the terrain mesh, while Units Y affects the height (altitude range) of the terrain mesh.

Units XZ

The size of each terrain quad (triangle pair) is determined by the current Units XZ vertex spacing value.
The Units XZ value should be adjusted to modify the quad size for the required minimum visual surface resolution.

The Units XZ value chosen will depend on two factors, the desired terrain mesh detail quality, and the desired rendering performance. Higher terrain mesh detail requires a smaller Units XZ value which results in a greater number of quads for a specified terrain area, while faster rendering requires fewer quads for a specified terrain area which is accomplished with a larger Units XZ value.

Units Y

The Units Y vertex spacing value determines the granularity for each terrain mesh vertex position along the Y axis direction (altitude or up and down). The smaller the Units Y value, the finer the terrain altitude steps. The larger the Units Y value, the larger the altitude steps. Since the heightmap data is floating-point values between 0.0 and 100.0, the Units Y vertex spacing also determines the total available altitude range for the terrain.

Terrain Quad Size

The size of each terrain quad is determined by the Units XZ vertex spacing property.
This table shows the approximate size in equivalent feet and meters based on the ratio of 1 Unit XZ equals 2 centimeters.
Imperial to metric conversion is 1 inch = 2.54 cm.

Units XZ vertex spacing	Terrain mesh quad	Quad size in Meters	Quad size in Feet
64	64 units	1.28 m (128 cm)	4.20 ft (50.39 in)
80	80 units	1.60 m (160 cm)	5.25 ft (62.99 in)
96	96 units	1.92 m (192 cm)	6.30 ft (75.59 in)
112	112 units	2.24 m (224 cm)	7.35 ft (88.19 in)
128	128 units	2.56 m (256 cm)	8.40 ft (100.79 in)
160	160 units	3.20 m (320 cm)	10.50 ft (125.98 in)
192	192 units	3.84 m (384 cm)	12.60 ft (151.18 in)
224	224 units	4.48 m (448 cm)	14.70 ft (176.38 in)
256	256 units	5.12 m (512 cm)	16.80 ft (201.57 in)
288	288 units	5.76 m (576 cm)	18.90 ft (226.77 in)
320	320 units	6.40 m (640 cm)	21.00 ft (251.97 in)
352	352 units	7.04 m (704 cm)	23.10 ft (277.17 in)
384	384 units	7.68 m (768 cm)	25.50 ft (302.36 in)
512	512 units	10.24 m (1024 cm)	33.60 ft (403.15 in)

Terrain Area Size

This table lists the real-world equivalent area of the terrain for various common values of heightmap resolution and Units XZ vertex spacing.

The terrain area is calculated as:

> Heightmap Resolution × Units XZ vertex spacing = total area in units
> Total area in units × units type and size = total terrain area

For example: (1024 resolution × 256 units = 262144 units) × (1 unit = 2 cm) = 524288 cm = 5.24288 km

For this table data: 1 Unit XZ = 2cm. 1 foot = 30.48cm or 0.3048 meters. 1 meter = 3.280839895 feet. 1000 meters = 1 kilometer. 5280 feet = 1 mile.

To determine the total desired area for a terrain, look up the width and length from this table in meters/kilometers or feet/miles to get the required heightmap resolution and Units XZ vertex spacing.

Heightmap Res.	Units XZ	Length in Units	Meters	Feet
64	128	8192	163.84 (0.16 km)	537.532808
64	192	12288	245.76 (0.25 km)	806.299213
64	256	16384	327.68 (0.33 km)	1075.06562
128	128	16384	327.68 (0.33 km)	1075.06562
128	192	24576	491.52 (0.5 km)	1612.59843
128	256	32768	655.36 (0.66 km)	2150.13123
256	128	32768	655.36 (0.66 km)	2150.13123
256	192	49152	983.04 (0.99 km)	3225.19685
256	256	65536	1310.72 (1.3 km)	4300.26247
384	128	49152	983.04 (0.99 km)	3225.19685
384	192	73728	1474.56 (1.5 km)	4837.79528
384	256	98304	1966.08 (2.0 km)	6450.3937 (1.2mi)
512	128	65536	1310.72 (1.3 km)	4300.26247
512	192	98304	1966.08 (2.0 km)	6450.3937 (1.2mi)
512	256	131072	2621.44 (2.6 km)	8600.52493 (1.6mi)
768	128	98304	1966.08 (2.0 km)	6450.3937 (1.2mi)
768	192	147456	2949.12 (2.9 km)	9675.59055 (1.8mi)
768	256	196608	3932.16 (3.9 km)	12900.7874 (2.4mi)
1024	128	131072	2621.44 (2.6 km)	8600.52493 (1.6mi)
1024	192	196608	3932.16 (3.9 km)	12900.7874 (2.4mi)
1024	256	262144	5242.88 (5.2 km)	17201.0499 (3.3mi)
1536	128	196608	3932.16 (3.9 km)	12900.7874 (2.4mi)
1536	192	294912	5898.24 (5.9 km)	19351.1811 (3.7mi)
1536	256	393216	7864.32 (7.7 km)	25801.5748 (4.9mi)
2048	128	262144	5242.88 (5.2 km)	17201.0499 (3.3mi)
2048	192	393216	7864.32 (7.9 km)	25801.5748 (4.9mi)
2048	256	524288	10485.76 (10.5 km)	34402.0997 (6.5mi)
3072	128	393216	7864.32 (7.9 km)	25801.5748 (4.9mi)
3072	192	589824	11796.48 (11.8 km)	38702.3622 (7.3mi)
3072	256	786432	15728.64 (15.8 km)	51603.1496 (9.8mi)
4096	128	524288	10485.76 (10.5 km)	34402.0997 (6.5mi)
4096	192	786432	15728.64 (15.8 km)	51603.1496 (9.8mi)
4096	256	1048576	20971.52 (21 km)	68804.1995 (13 mi)

Creating Heightmaps for Unreal Engine 2

Performance

Unreal Engine 2 terrains perform sector frustum culling for performance. Terrains do not include any intrinsic occluding functionality, so AntiPortals should be placed beneath large hills and mountains to perform occlusion culling.

X and Y Dimensions

Each sample point in the heightmap image corresponds to a mesh vertex in the terrain. The Unreal Engine 2 TerrainInfo actor only supports power-of-two dimensions, such as 256 × 256. The number of terrain mesh quads generated will always be the dimension -1. A 256 × 256 heightmap therefore results in a 255 × 255 terrain mesh.

Altitude and TerrainScale.Z

When developing heightmaps for use in Unreal Engine 2, rarely will a heightmap utilize the entire 16-bit range of altitude values from 0 to 65535. The Unreal Engine 2 TerrainInfo actor's TerrainScale.Z determines the maximum altitude range that is available. A heightmap can use all 65536 altitude values, but it is usually easier to develop a heightmap that is using its real-world altitude layout in order to more easily visualize the terrain. In most cases, a heightmap with an altitude range that is between 10,000 and 40,000 of the available 16-bits is sufficient.

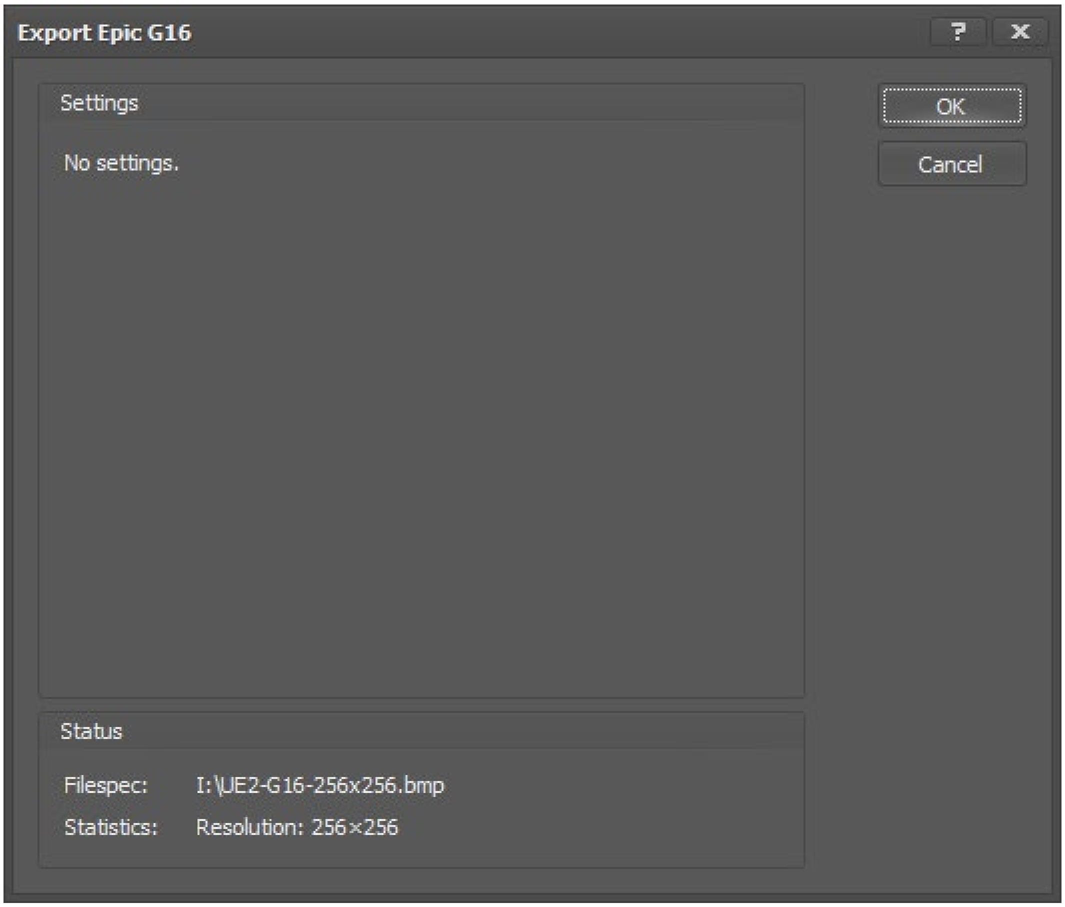
Exporting a Heightmap for Unreal Engine 2

The Unreal Engine 2 TerrainInfo actor supports heightmap importing using the 16-bit G16 format.

Unreal Engine 2 terrain is limited to power-of-two sizes, with common terrain resolutions of 64 × 64, 128 × 128, and 256 × 256. Terrains that are 512 × 512 or larger are not recommended for performance reasons. Terrains should also be square aspect.

The TerreSculptor heightmap must be the proper dimensions for one of the supported Terrain resolutions. Use the Resample tool to modify the heightmap dimensions before exporting if required.

To create a heightmap file that is compatible with the Unreal Engine 2 TerrainInfo importer, export the TerreSculptor heightmap to the Epic G16 file format. This file format has no additional export properties.



Creating Heightmaps for Unreal Engine 3 UDK

Performance

Large terrains should always be designed with sufficient intrinsic occluding capabilities to provide culling of a large portion of the terrain sections (sectors). This is accomplished by using numerous tall mountains or cliffs in the terrain design so that only a short view-distance is ever rendered in the frustum.

X and Y Dimensions

Each sample point in the heightmap image corresponds to a mesh vertex in the terrain. In order to obtain a terrain that is an even power-of-two size, such as 256 × 256 patches (quads), it is necessary to provide a heightmap that is *size+1* in dimensions. A 256 × 256 patch terrain therefore requires a 257 × 257 heightmap.

Altitude and DrawScale3D.Z

When developing heightmaps for use in Unreal Engine 3, rarely will a heightmap utilize the entire 16-bit range of altitude values from 0 to 65535. The Unreal Engine 3 Landscape/Terrain actor's DrawScale3D.Z determines the maximum altitude range that is available. A heightmap can use all 65536 altitude values, but it is usually easier to develop a heightmap that is using its real-world altitude layout in order to more easily visualize the terrain. In most cases, a heightmap with an altitude range that is between 10,000 and 40,000 of the available 16-bits is sufficient.

Heightmap Altitude Range	DrawScale3D.Z	Unreal Altitude	Altitude Range *
16384 to 49152 (= 32768)	256	65536 units (-32768 to 32768)	1310.72 m or 4300.26 ft
	128	32768 units (-16384 to 16384)	655.36 m or 2150.13 ft
	64	16384 units (-8192 to 8192)	327.68 m or 1075.06 ft
	32	8192 units (-4096 to 4096)	81.92 m or 268.77 ft
	16	4096 units (-2048 to 2048)	40.96 m or 134.38 ft
24576 to 40960 (= 16384)	256	32768 units (-16384 to 16384)	655.36 m or 2150.13 ft
	128	16384 units (-8192 to 8192)	327.68 m or 1075.06 ft
	64	8192 units (-4096 to 4096)	81.92 m or 268.77 ft
	32	4096 units (-2048 to 2048)	40.96 m or 134.38 ft
	16	2048 units (-1024 to 1024)	20.48 m or 67.19 ft

* Based on the default UE3 engine setting of 1 unreal unit = 2 cm.

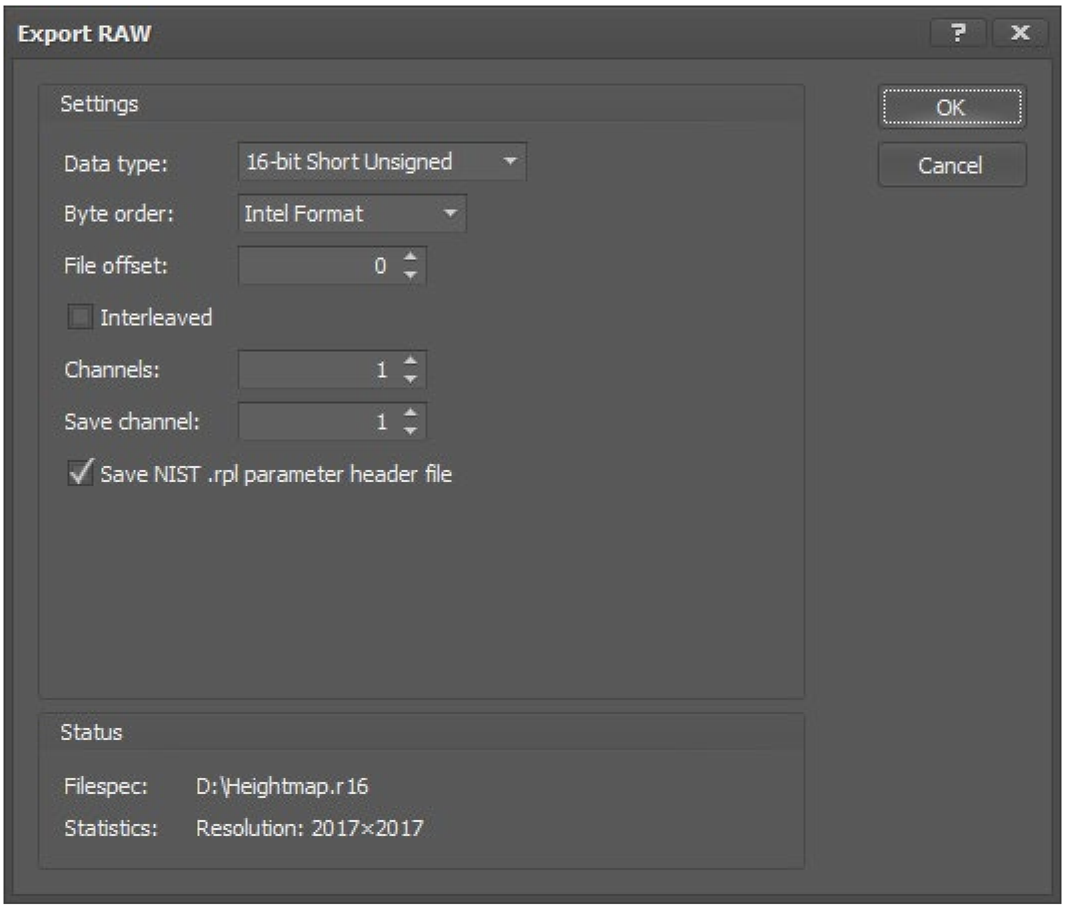
Exporting a Heightmap for UDK Landscape

The UDK Landscape actor supports heightmap importing using the 16-bit RAW .r16 format.

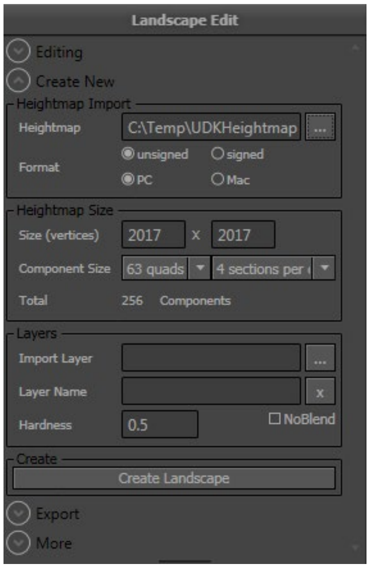
Landscape has an unintuitive method of managing the supported heightmap resolutions. There are only a limited number of resolutions that work, and even fewer that are properly optimized. It is recommended that UDK users seek help regarding this from the UDN documentation and the Epic forums, as Landscape resolution calculations will not be covered in this document.

The TerreSculptor heightmap must be the proper dimensions for one of the supported Landscape resolutions. Use the Resample tool to modify the heightmap dimensions before exporting if required.

To create a heightmap file that is compatible with the UDK Landscape importer, export the TerreSculptor heightmap to the 16-bit RAW .r16 file format using the following export properties: *Unsigned*, *Intel format*. Optionally the *Signed* or *Mac Format* may also be used, just be sure to use the identical format options on the UDK Landscape Edit dialog importing.



The exported heightmap file is then imported into UDK Landscape using the Landscape Edit dialog.
In the Landscape Edit dialog's *Create New* group, browse for the .r16 file in the *Heightmap Import* group, and set the Format options accordingly: *Unsigned*, *PC*.
Choose the *Create Landscape* button to create a new Landscape with the imported heightmap.



Notes

- To match the viewport terrain rendering scale between TerreSculptor and UDK, be sure to set the TerreSculptor Units properties on the Options dialog to the UDK Units that your specific engine version is using. The default UE3 UDK Units are available in the Units Preset drop-down combobox as *Unreal Engine 3*.

- If the Landscape heightmap requires updating, the entire existing Landscape actor must be deleted and the heightmap import process repeated.

- If the Landscape is to include Layer weightmap files, they must be imported at the same time as the heightmap. If any Landscape weightmap requires updating, the entire existing Landscape actor must be deleted and the heightmap and weightmap import process repeated. See the chapter on *Exporting a Weightmap for UDK Landscape*.

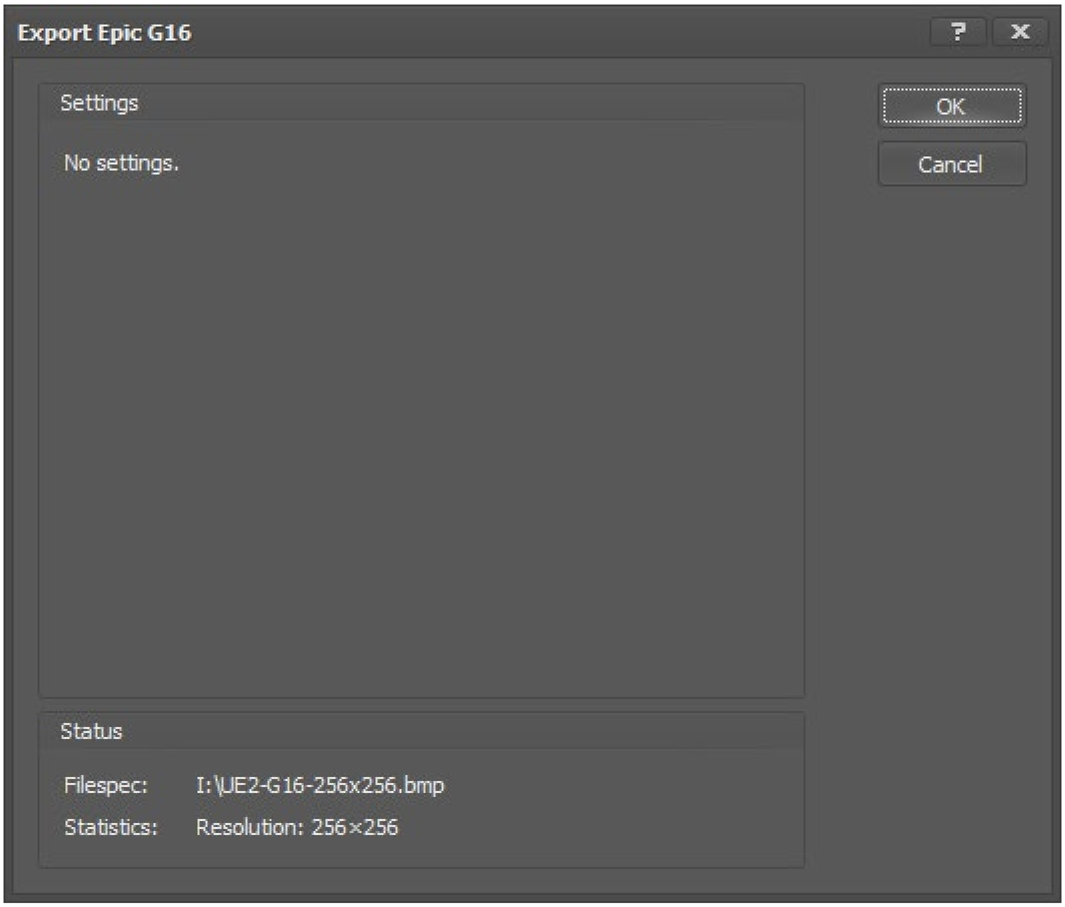
Exporting a Heightmap for UDK Terrain

The UDK Terrain actor supports heightmap importing using the Epic G16 .bmp format.

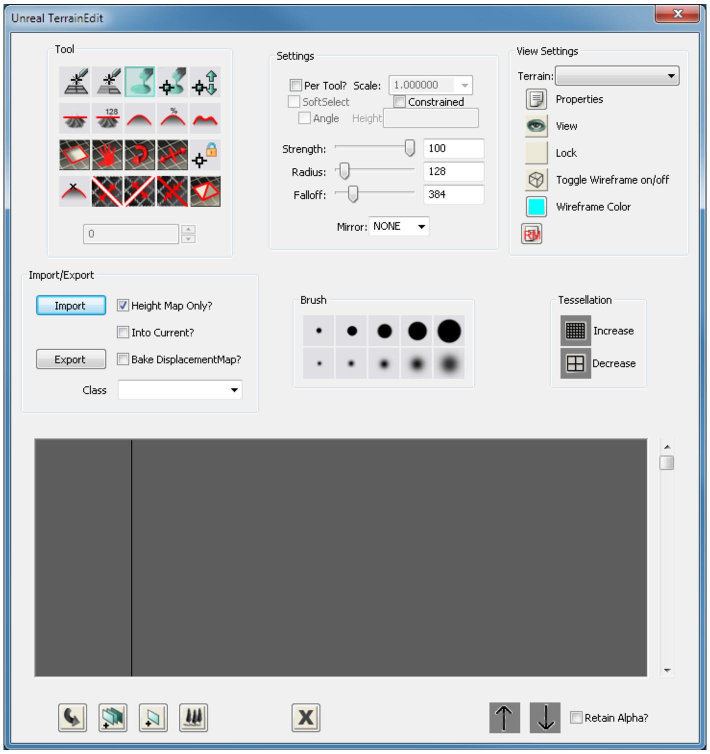
The Terrain actor supports any resolution from 2 × 2 up to 1024 × 1024. It is not recommended to use Terrain actors larger than 1024 due to performance overhead.

The TerreSculptor heightmap must be the proper dimensions for the desired Terrain actor resolution. Use the Resample tool to modify the heightmap dimensions if required before exporting.

To create a file that is compatible with UDK Terrain, export the TerreSculptor heightmap to the Epic G16 format. There are no additional property settings for this format.



The exported file is then imported into UDK Terrain using the Terrain Edit dialog.
Under the Import/Export group, enable the Height Map Only checkbox and then Import the G16 .bmp file.



Notes

- To match the viewport terrain rendering scale between TerreSculptor and UDK, be sure to set the TerreSculptor Units properties on the Options dialog to the UDK Units that your specific engine version is using. The default UE3 UDK Units are available in the Units Preset drop-down combobox as *Unreal Engine 3*.

- If the Terrain heightmap requires updating, perform the import process again with the Terrain actor selected and set the *Into Current?* option enabled.

Creating Weightmaps for Unreal Engine 3 UDK

Unreal Engine 3 weightmaps are 8-bit grayscale alphamaps used to determine the placement of texture materials on the terrain.

TerreSculptor has intrinsic functions for creating weightmaps that are fully compatible with UE3. These weightmaps can be based on limits of the terrain's altitude range, the direction that terrain triangles are facing, the terrain triangle slope, and composite weightmaps that are any combination of these.

Weightmaps based on altitude range can be used for snow-capped mountains and ocean floors. Weightmaps based on direction can be used to simulate where solar or weather effects have affected the surface. Weightmaps based on slope can be used for rock cliff edges or grass filled plains.

Each weightmap should be unique, in that its coverage should not overlap any other weightmaps.
For example, a weightmap for cliff faces would use a slope range between ~70 and 90 degrees, whereas a weightmap for grassy plains would use a slope range between 0 and ~30 degrees.

It is possible to mix algorithmically generated weightmaps with hand-painted layers. Care must be exercised when performing the hand-painting in order that the algorithmic weightmap is not inadvertently modified.

Exporting a Weightmap for UDK Landscape

The UDK Landscape actor supports layer weightmap importing using the 8-bit RAW .r8 format.

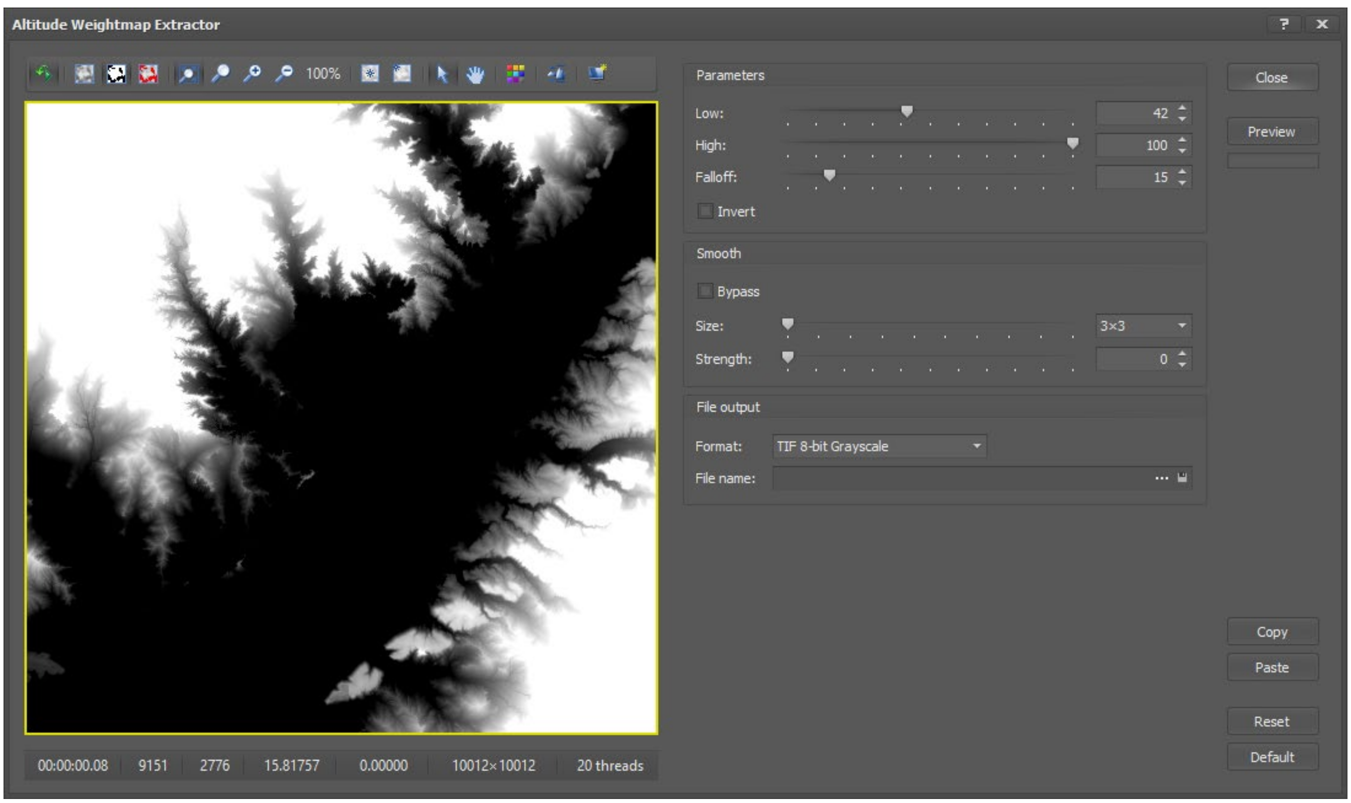
Landscape layer weightmaps must be the same resolution as the RAW heightmap file that is imported into the Landscape Edit dialog. If the TerreSculptor heightmap was resampled prior to exporting for use in Landscape, then the weightmaps must be extracted from the resampled heightmap, or resampled manually in the Weightmap Editor or third-party paint software.

For immediate mode, choose the Weightmap Extrasctor from the toolbar, create the desired weightmap type by choosing the appropriate dialog control properties, set the required *File Parameters*, and choose the *Save* button to save the weightmap file to disk.

For terrain stack mode, add a new Weightmap Extractor object to the Terrain Stack, edit the object and create the desired weightmap type by choosing the appropriate dialog control properties, set the required *File Parameters*, and choose whether to *Auto-save* the weightmap file after each build or to manually save the weightmap file by choosing the *Save* button.

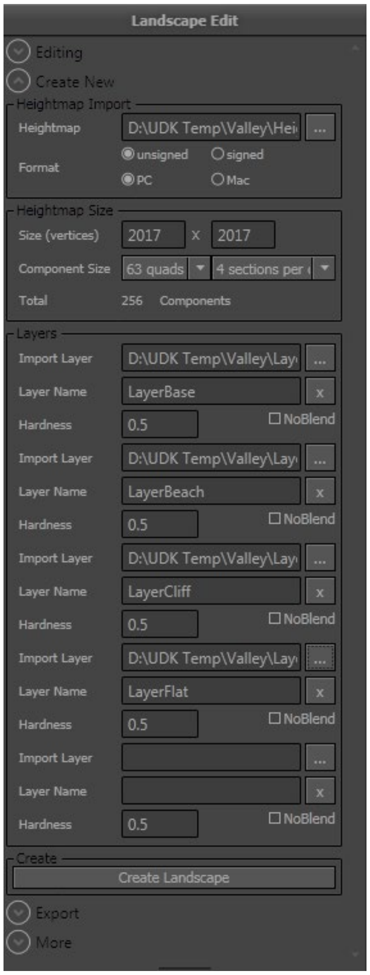
To create a weightmap file that is compatible with UDK Landscape's importer, save the TerreSculptor weightmap to the 8-bit RAW .r8 file format using the Weightmap Generator dialog's File Properties:

- Format: R8 8-bit grayscale
- File name: the desired layer name which should relate to the weightmap type, eg. LayerFlatland.raw
- Folder: the folder where the UDK heightmap and weightmap project is being created



The exported weightmap file is then imported into UDK Landscape using the Landscape Edit dialog.
When importing layer weightmaps, the entire heightmap and all layer weightmaps must be imported at the same time.

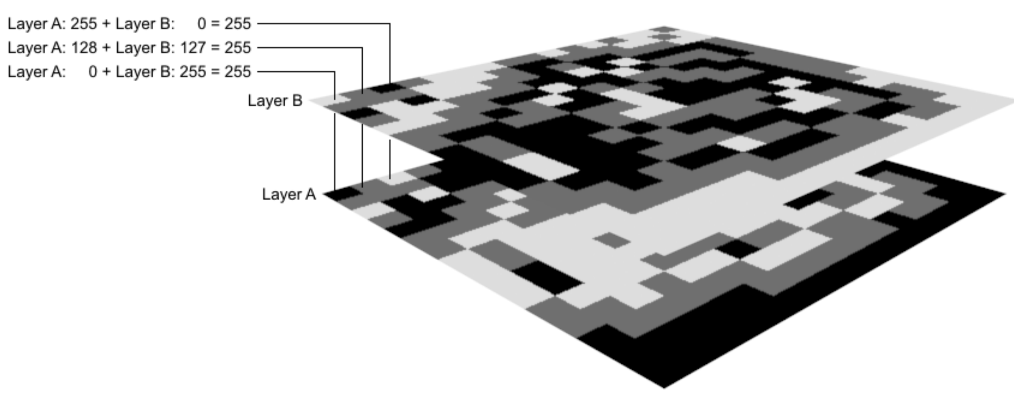
In the Landscape Edit dialog's *Create New* group, browse for the .r16 file in the *Heightmap Import* group, and set the Format options accordingly, then for each layer weightmap, browse for the .raw file in the *Layers* group, and set the layer properties as desired. The *Layer Name* property will be the weightmap file name by default. Choose the *Create Landscape* button to create a new Landscape with the imported heightmap and weightmaps.



Notes

- A proper Landscape layer weightmap setup requires that each weightmap be unique regarding its mask alphamap data. In other words, there is no weightmap layering order, and each weightmap pixel when layered one weightmap on top of each other, should add up to a value of 255 (1.0).

For example, if there are four weightmaps named A, B, C, and D, and the pixel value at XY 0,0 on weightmap A is 255, then the pixel value at XY 0,0 on weightmaps B, C, and D must be 0. If the pixel value at XY 0,1 on weightmap A is 155, then the combined pixel values at XY 0,1 on weightmaps B, C, and D must be 100.



This prerequisite for additive layer weighting in Landscape requires that the final weightmap files be modified and composited correctly using the Weightmap Editor or third-party paint software. See the chapter on *UDK Landscape Layer Compositing* for the required steps to create a proper weightmap layer set.

- The Landscape Layer weightmap files must be imported at the same time as the heightmap. If any Landscape weightmap requires updating, the entire existing Landscape actor must be deleted and the heightmap and weightmap import process repeated.

Creating Heightmaps for Unreal Engine 4

Creating Heightmaps for Unreal Engine 4 is a relatively simple process with only a few strict guidelines. The main guideline is that the resolution of the heightmap must be selected from a set of Recommended Landscape Sizes. If invalid size importing is attempted, the Landscape system will pad out the heightmap with a stretched edge.

Unreal Engine 4 supports both 16-bit Grayscale PNG and 16-bit RAW for heightmap file formats.
The heightmap in TerreSculptor should always be Normalized before exporting to PNG or RAW.

Landscape

Landscape supports Recommended Sizes from 127 through 8129.
The Recommended Sizes include: 127, 253, 505, 1009, 1513, 2017, 3025, 4033, 6097, and 8129.
Landscapes are typically square in shape, although rectangular sizes are supported, so long as both dimensions are chosen from the recommended sizes.

World Composition

World Composition is a Level Streaming system that supports terrains up to virtually any size.
Each Streaming Level Heightmap Tile must be one of the Recommended Sizes, such as 16x16 tiles of 1009x1009, or 8x8 tiles of 4033x4033.
The recommended maximum Landscape size is 32x32 tiles of 8129x8129, which is a terrain that is 1024 tiles and 260km by 260km at default 1 meter Scale (260,128 x 260,128 = 67,666,576,384 square kilometers).

Note that when creating the main heightmap for splitting into tiles, each tile has shared edges.
Note that it is possible to import tiles in batches and rearrange the existing tiles in the world outliner.
Note that importing more than 1024 tiles at one time can cause the editor to crash.
Note that a tile size of 8129 might hitch on low to medium level computer hardware.

Real-World Dimensions

The default Landscape Scale XY is 100 world units, which are in centimeters. So, a Scale XY value of 100 is 1 meter between terrain vertices. A Scale XY of 200 is 2 meters between terrain vertices.

Note that if TerreSculptor's Settings Units are set to Unreal Engine 4, then the Terrain Property Spacing XZ is the same values as Unreal Engine Landscape Scale XY.

Real-World Elevation Values

Unreal Engine 4 uses an internal Landscape scale factor of 512. This means that a Scale Z value of 100 is 512 meters of elevation range. The formula for calculating the real-world elevation range is:

real_world_elevation_range_in_meters \ 512 *scale factor* x 100 *cm in one meter* = Scale Z

Or simply: *elevation* \ 512 x 100 = Scale Z

For example, 1000 meters \ 512 x 100 = 195.3125 Scale Z
And 2500 meters \ 512 x 100 = 488.28125 Scale Z

Note that if TerreSculptor's Settings Units are set to Unreal Engine 4, then the Terrain Property Spacing Y is the same value as Unreal Engine Landscape Scale Z.

Creating Heightmaps for Unreal Engine 5

Creating Heightmaps for Unreal Engine 5 is a relatively simple process with only a few strict guidelines. The main guideline is that the resolution of the heightmap must be selected from a set of Recommended Landscape Sizes. If invalid size importing is attempted, the Landscape system will pad out the heightmap with a stretched edge.

Unreal Engine 5 supports both 16-bit Grayscale PNG and 16-bit RAW for heightmap file formats.
The heightmap in TerreSculptor should always be Normalized before exporting to PNG or RAW.

Landscape

Landscape supports Recommended Sizes from 127 through 8129.
The Recommended Sizes include: 127, 253, 505, 1009, 1513, 2017, 3025, 4033, 6097, and 8129.
Landscapes are typically square in shape, although rectangular sizes are supported, so long as both dimensions are chosen from the recommended sizes.

World Composition

World Composition is a Level Streaming system that supports terrains up to virtually any size.
Each Streaming Level Heightmap Tile must be one of the Recommended Sizes, such as 16x16 tiles of 1009x1009, or 8x8 tiles of 4033x4033.
The recommended maximum Landscape size is 32x32 tiles of 8129x8129, which is a terrain that is 1024 tiles and 260km by 260km at default 1 meter Scale (260,128 x 260,128 = 67,666,576,384 square kilometers).

Note that when creating the main heightmap for splitting into tiles, each tile has shared edges.
Note that it is possible to import tiles in batches and rearrange the existing tiles in the world outliner.
Note that importing more than 1024 tiles at one time can cause the editor to crash.
Note that a tile size of 8129 might hitch on low to medium level computer hardware.

World Partition

World Partition is a Cell Streaming system that supports terrains up to 16384x16384 maximum size.
The PNG-16 file does not have to be tiled and can be imported as a single large heightmap file.
World Partition uses a very strict calculation for Landscape sizes which is (511 x N) - (N - 1)
Where N is each half kilometer distance.

For example, a 10 kilometer heightmap would be (511 x 20) - (20 - 1) = 10,201 x 10,201
And a 16 kilometer heightmap would be (511 x 32) – (32-1) = 16,321 x 16,321

Note that the largest valid size is 16321x16321 which is 16km x 16km at default 1 meter Scale.

Real-World Dimensions

The default Landscape Scale XY is 100 world units, which are in centimeters. So, a Scale XY value of 100 is 1 meter between terrain vertices. A Scale XY of 200 is 2 meters between terrain vertices.

Note that if TerreSculptor's Settings Units are set to Unreal Engine 5, then the Terrain Property Spacing XZ is the same values as Unreal Engine Landscape Scale XY.

Real-World Elevation Values

Unreal Engine 5 uses an internal Landscape scale factor of 512. This means that a Scale Z value of 100 is 512 meters of elevation range. The formula for calculating the real-world elevation range is:

real_world_elevation_range_in_meters \ 512 *scale factor* x 100 *cm in one meter* = Scale Z

Or simply: *elevation* \ 512 x 100 = Scale Z

For example, 1000 meters \ 512 x 100 = 195.3125 Scale Z
And 2500 meters \ 512 x 100 = 488.28125 Scale Z

Note that if TerreSculptor's Settings Units are set to Unreal Engine 5, then the Terrain Property Spacing Y is the same value as Unreal Engine Landscape Scale Z.

Creating Heightmaps for Unity Engine 2020-2022

Heightmap Sizes

Heightmaps for Unity Engine must be Power-of-Two+1 for the standard Terrain object.
This includes sizes such as 257, 513, 1025, 2049, and 4097.

When using the Terrain Tools plugin, the heightmaps must be Power-of-Two values.
This includes sizes such as 256, 512, 1024, 2048, 4096, 8192, and 16384.

Exporting Heightmaps

Unity uses RAW 16-bit Unsigned Intel format heightmap files.
Do not use PNG format since Unity only supports PNG 8-bit, and the resulting terrain will be of lower quality.

Always Normalize the heightmap in TerreSculptor before exporting.

On the File menu choose the Export Terrain item.
On the export dialog choose the RAW Binary file type.
On the RAW settings dialog make sure the settings are RAW 16-bit Unsigned and Intel format.

Tutorial: How to Convert a Heightmap file format

This is an *Immediate Mode* tutorial.

Converting a heightmap involves opening a file of one specific format and saving it to another format.
This is often performed when sourcing files from one application for use in a second application. For example: converting digital elevation model files for use with Unreal Engine 3 terrains.

Using the 3D Editor

Import the source heightmap file:

Note: imported heightmaps automatically use the Terrain Stack Base Heightmap slot and will overwrite any data there.

1. Choose the **Import Terrain** item on the File menu.
2. Select the source file format from the Import Dialog's **Files of type** drop-down list.
3. Select the desired file.
4. Select the **OK** button on the dialog.
5. Many of the file formats will include an import dialog where various format properties and options are chosen.

Export the destination heightmap file:

1. Choose the **Export Terrain** item on the File menu.
2. Select the destination file format from the Export Dialog's **Files of type** drop-down list.
3. Type in the destination file name.
4. Select the **OK** button on the dialog.
5. Many of the file formats will include an export dialog where various format properties and options are chosen.

Using the Command-Line

See the chapter on using the Command-Line.

Tutorial: How to Open, Edit, and Save a Heightmap file

This is an *Immediate Mode* tutorial.

Editing a heightmap is often required if the size or altitude range or other heightmap property must be adjusted.

Using the 3D Editor

Import the source heightmap file:

Note: imported heightmaps automatically use the Stack Base Heightmap slot and will overwrite any data there.

1. Choose the **Import Terrain** item on the File menu.
2. Select the source file format from the Import Dialog's **Files of type** drop-down list.
3. Select the desired file.
4. Select the **OK** button on the dialog.
5. Many of the file formats will include an import dialog where various format properties and options are chosen.

Edit the heightmap data:

1. Choose the desired editing functions on the **Adjust, Modify, Transform** menus.
   This includes transforms, altitude, filter, resample, size, etc.

Export the destination heightmap file:

1. Choose the **Export Terrain** item on the File menu.
2. Select the destination file format from the Export Dialog's **Files of type** drop-down list.
3. Type in the destination file name.
4. Select the **OK** button on the dialog.
5. Many of the file formats will include an export dialog where various format properties and options are chosen.

Tutorial: How to create Weightmaps from an existing Heightmap file

This is an *Immediate Mode* tutorial.

Weightmaps, also called alphamaps or masks, are commonly used in video game terrain systems to define the locations of the various texture materials that cover the surface of the terrain.
Weightmaps can be algorithmically generated or hand-painted. Common algorithmically generated weightmaps include alpha selection by altitude or slope, and are used for such terrain features as rock cliff faces, grass flatlands, and lake beds. TerreSculptor supports a number of algorithmic functions and options for weightmap creation.

Open the heightmap file:

1. Choose the **Open Terrain** or **Import Terrain** item on the File menu.
2. Select the source file format from the Open Dialog's **Files of type** drop-down list.
3. Select the desired file.
4. Select the **OK** button on the dialog.
5. Many of the file formats will include an import dialog where various format properties and options are chosen.

Create a weightmap:

1. Choose the Weightmap Extractor type on the menus.
2. Modify the weightmap parameters as desired, using the preview as a guide.

Save the weightmap file:

The File Parameters for the weightmap generator will always default to the same folder as the imported heightmap file.

1. Choose the weightmap format in the File Parameters group.
2. Type in the weightmap destination file name.
3. Change the default weightmap file folder if desired.
4. Select the **Save** button to launch the File Save dialog and save the weightmap file to disk.

Appendix A: TerreSculptor File Formats

TerreSculptor creates a number of new file formats that are specific to the software and its functionality.
This appendix lists the custom file formats and their functions.

TSworld

The main TerreSculptor Project file format.
This file format is used when a project is opened or saved using the Open Project and Save Project items.

This file format includes the following data:

Identifier
Header
Thumbnail
Project Properties
Scene Objects Settings
Terrain Materials Settings
Terrain Stack
Weightmap Extractors Immediate Mode Settings
Shape Generators Immediate Mode Settings
Noisemap Generators Immediate Mode Settings
Modifiers Immediate Mode Settings
Base Datamap
Terrain Stack Masks

TSmap

The TerreSculptor terrain heightmap file format.
This file format is used when a terrain is opened or saved using the Open Terrain and Save Terrain As items.

This file format includes the following data:

Identifier
Header
Comment
Thumbnail
Floating-point Heightmap Data, either raw or GZip compressed

TSstack

The TerreSculptor terrain stack file format.
This file format is used when a terrain stack is opened or saved using the Open and Save items.

This file format includes the following data:

Identifier
Header
Stack
Devices
Base Datamap
Terrain Stack Masks

Generator

The TerreSculptor Generators can open and save their current properties to file.
The following are the Noisemap Generator file formats.

nzbillow	Billow Noisemap Generator
nzboxmuller	BoxMuller Noisemap Generator
nzgaussian	Gaussian Noisemap Generator
nzgradient	Gradient Noisemap Generator
nzperlin	Perlin Noisemap Generator
nzrandom	Random Noisemap Generator
nzridged	Ridged Noisemap Generator
nzsimplex	Simplex Noisemap Generator
nzvalue	Value Noisemap Generator
nzvoronoi	Voronoi Noisemap Generator

These file formats include the following data:

Identifier
Header
Properties

Device

Some of the TerreSculptor Devices can open and save their current properties to file.
The following are the Device file formats.

devconv	Filter Convolution device
erodehydra	Erosion Hydraulic device
eroderain	Erosion Rain device
erodeslope	Erosion Slope device
erodetherm	Erosion Thermal device

These file formats include the following data:

Identifier
Header
Properties

Appendix B: Custom File Formats

TerreSculptor supports a number of custom file formats including extended versions of common file formats.

RAW File Format

RAW File Format RPL Raw Parameter List Header File Additional Entries:

Sample-type = signed-byte, unsigned-byte, signed-short, unsigned-short, signed-integer, unsigned-integer, signed-long, unsigned-long, signed-single, unsigned-single, signed-double, unsigned-double

Interleaved = no or false, yes or true

Channels = 1 to 256

TerreSculptor TSmap File Format

The TSmap file format is a basic headered binary format for storing a floating-point heightmap.

File ID	16 byte	string
Type ID	16 byte	string
Version	4 byte	int32
Width	4 byte	int32
Length	4 byte	int32
Compression	4 byte	enum
DataType	4 byte	enum
ScaleX	4 byte	int 32
ScaleY	4 byte	int 32
ScaleZ	4 byte	int 32
Comment	32 byte	string
Thumbnail	16384 byte	raw 8-bit bitmap
Data	<binary> .. <binary>	

File ID: “TerreSculptor”000, string padded with nulls
Type ID: “TSmap”00000000000, string padded with nulls
Version: 0x0200
Width: datamap width 32-bit signed integer, 0 to 2,147,483,647
Length: datamap length 32-bit signed integer, 0 to 2,147,483,647
Compression: whether the file data is compressed, 0 = no compression (default), 1 = gzip compression
DataType: 0 = 32-bit floating-point
Scale X,Y,Z: units scale size for the pixels, default 100,100,100 cm
Comment: a 32-character comment string, padded with nulls
Thumbnail: a 128×128 raw 8-bit grayscale bitmap
Data: either a stream of flat datamap float values or a gzip binary compressed byte stream

Truevision Targa TGA 16-bit Grayscale and 32-Bit Float Formats

Note: Photoshop does not support these Extended TGA File Formats of 16-Bit Grayscale and 32-Bit Grayscale.

TGA Extended File Dimensions

– The header properties of the TGA format use signed shorts for the ImageWidth and ImageLength, which sets the maximum image width or length as 32767 pixels. Since the dimensions cannot be a negative number, TerreSculptor supports values that are unsigned for ImageWidth and ImageLength, and therefore a maximum image width or length of 65535.

TGA 16-bit Grayscale

– The header properties already natively support the necessary values to support this extended file format.
– The ImageType header property should be set to ‘3’ Black & White Uncompressed or ’11’ Black & White RLE Compressed depending on compression usage.
– The Bits-Per-Pixel header property should be set to ’16’.
– The Image Data block should contain ImageWidth x ImageLength Unsigned 16-bit Integers (UShorts) with a value range of 0…65535 per pixel.

TGA 32-bit Grayscale Float

– The header properties already natively support the necessary values to support this extended file format.
– The ImageType header property should be set to ‘3’ Black & White Uncompressed or ’11’ Black & White RLE Compressed depending on compression usage.
– The Bits-Per-Pixel header property should be set to ’32’.
– The Image Data block should contain ImageWidth x ImageLength Unsigned 32-bit Singles (Floats) with a value range of 0.0…1.0 per pixel. Other value ranges should not be used.

Appendix C: LibTIF TIF Image Library

TerreSculptor uses the BitMiracle LibTIF DLL Library to obtain superior TIF and GeoTIF file management than what the Microsoft Windows GDI and WIC .NET APIs provide.

DLL "BitMiracle.LibTiff.NET" Version 2.4.649.0 dated 2021

The tested maximum image sizes for this library are as follows.

File Read Size Limitations:

LibTIF is limited on its import/read uncompressed image maximum size to the following approximate values:

8-bit Integer format	240,000 × 240,000 (57,600,000,000 bytes)	errors at 250,000 × 250,000
16-bit Integer format	80900 × 80900 (13,089,620,000 bytes)	errors at 90000 × 90000
32-bit Integer format	40100 × 40100 (6,432,040,000 bytes)	errors at 40200 × 40200
64-bit Integer format	28300 × 28300 (6,407,120,000 bytes)	errors at 28400 × 28400

LibTIF is limited on its import/read LZW compressed image maximum size to the following approximate values:

LibTIF is able to read a 28000 × 28000 32-bit LZW file (3,464,282 bytes) from Photoshop without error.
Photoshop has a maximum 4GB TIF LZW size, so it cannot create larger compressed images.

File Write Size Limitations:

LibTIF is limited on its export/write uncompressed image maximum size to the following approximate values:

8-bit Integer format maximum write image size tested is 240,000 × 240,000 (57,600,000,000 bytes)
16-bit Integer format maximum write image size tested is 120,000 × 120,000 (28,800,000,000 bytes)
32-bit Integer format maximum write image size tested is 120,000 × 120,000 (57,600,000,000 bytes)
64-bit Integer format maximum write image size tested is 120,000 × 120,000 (115,200,000,000 bytes)

This is the largest I could test on my computer system, so LibTIF has the ability to write even larger image files.

LZW Write Encoder Buffer 2GB Limitation:

LibTIF only supports an LZW Encoding array buffer up to 2GB (2,147,483,647) for the LZW Compression type encoded data. If the LZW array buffer is greater than 2GB, the LZW data is corrupt and the file cannot be read back, the file contains garbage.
We should be able to use a SquareRoot-of-2GB size safely, but that fails with the 16-bit and 32-bit formats as it creates a file larger than 2GB on highly random data, which is then corrupt, so we set a "safe size" value instead for those two sizes.

8-bit formats	46340 × 46340
16-bit formats	28000 × 28000
24-bit formats	26754 × 26754
32-bit formats	21000 × 21000
48-bit formats	18918 × 18918
64-bit formats	16383 × 16383

Appendix D: PNGCS PNG Image Library

TerreSculptor uses the PNGCS DLL Library to obtain superior PNG file management than what the Microsoft Windows GDI and WIC .NET APIs provide.

DLL "pngcs" for .NET 4.5 Version 1.1.4.1

The tested maximum image sizes for this library are as follows.

File Read Size Limitations:

PNGCS was tested for file read up to the following maximum sizes.

8-bit Grayscale	250,000 × 250,000 (62,500,000,000 bytes) tested
16-bit Grayscale	250,000 × 250,000 (125,000,000,000 bytes) tested

Image sizes up to 1,000,000 × 1,000,000 or larger should be possible.

File Write Size Limitations:

PNGCS was tested for file write up to the following maximum sizes.

8-bit Grayscale	250,000 × 250,000 (62,500,000,000 bytes) tested
16-bit Grayscale	250,000 × 250,000 (125,000,000,000 bytes) tested

Image sizes up to 1,000,000 × 1,000,000 or larger should be possible.

Appendix E: File Format Export and Import Options

TerreSculptor supports a wide range of file formats including digital elevation model, heightmap, image, mesh and raw data. Each file format may support a number of other exporting and importing features as outlined below.

Auto-scale

Type: Import
Applies to: image, heightmap
Settings: True or False
Description: Automatically scales the imported 8-bit data into the 0.0 to 100.0 range.

Byte Order

Type: Import and Export
Applies to: image, dem, heightmap
Settings: Intel (PC, little-endian) or Motorola (Mac, big-endian)
Description: Determines the byte-order of 16-bit and 32-bit data as per Intel or Motorola format.

Data Type

Type: Import and Export
Applies to: image, dem, heightmap
Settings: 8-bit Unsigned Byte, 16-bit Signed and Unsigned Short,
32-bit Signed and Unsigned Integer, 64-bit Signed and Unsigned Long,
32-bit Signed and Unsigned Single float, 64-bit Signed and Unsigned Double Float.
Description: Determines the data type size and Signed or Unsigned format.

Format

Type: Import and Export
Applies to: image, dem, heightmap, mesh
Settings: vary by the file type
Description: Selects a specific format type for a file, such as Grayscale or RGB, or ASCII or Binary.

Float Range

Type: Import and Export
Applies to: image, heightmap
Settings: Real (0.0…100.0) or Scaled (0.0…1.0)
Description: Determines whether the 32-bit data is stored as Real or Scaled range.

Include Object Name

Type: Export
Applies to: mesh (.obj)
Settings: True or False
Description: Determines whether the mesh information includes a Mesh Object Name.

Include Smoothing Group

Type: Export
Applies to: mesh (.obj)
Settings: True or False
Description: Determines whether the mesh information includes a Smoothing Group.

Integer Range

Type: Import and Export
Applies to: image, heightmap
Settings: 8-bit (0…255) or 16-bit (0…65535)
Description: Determines whether the float data is stored in 8-bit or 16-bit range.

Line Length

Type: Export
Applies to: dem, heightmap, mesh
Settings: up to 393216 (384k) characters per line, but usually Heightmap Width * 4 (8-bit) or * 6 (16-bit)
Description: Specifies the maximum number of text characters per line for text format files.

Optimized 8-bit

Type: Export
Applies to: image, heightmap
Settings: True or False
Description: Scales the float data into an optimized 8-bit range.

Orientation

Type: Export
Applies to: image
Settings: Left-to-Right, Right-to-Left, Top-to-Bottom, Bottom-to-Top
Description: Determines the orientation (rotation or flip) of the image data.

Reverse Vertex Order

Type: Export
Applies to: mesh
Settings: True or False
Description: Determines whether the mesh vertices are written counterclockwise (False) or clockwise (True).

Rotate Mesh Origin

Type: Import and Export
Applies to: mesh
Settings: True or False
Description: Determines whether the mesh is oriented bottom-left (False) or top-left (True).

Source (color plane)

Type: Import and Export
Applies to: image
Settings: Grayscale, Red, Green, Blue, or Alpha
Description: Determines the data color plane to read from or write to.

Text Encoding

Type: Import and Export
Applies to: dem, heightmap, mesh
Settings: ASCII, Unicode, UTF-8
Description: Determines the text character format to read from or write to.

Type Conversion

Type: Import and Export
Applies to: image, heightmap
Settings: Real, Scaled, or Auto
Description: Determines the method for conversion between data types.

Vertex Accuracy

Type: Export
Applies to: mesh
Settings: 1…6
Description: Determines the number of decimal places of accuracy for the mesh vertices.

Vertex Spacing

Type: Export
Applies to: mesh
Settings: 1…65536
Description: Determines the number of units spacing along the X and Y between each mesh vertex.

Void Fill

Type: Import
Applies to: dem
Settings: Fill Style, Flag Value, Fill Value
Description: Fills voids, which are missing sample point data, in a digital elevation model data set.

Write Header

Type: Export
Applies to: dem, heightmap
Settings: True or False
Description: Writes a header or parameter file for those file types that have optional headers.

Z offset

Type: Export
Applies to: mesh
Settings: Absolute, Altitude Center, Heightmap Midpoint
Description: Determines the mesh location along the Z axis.

Z scale

Type: Export
Applies to: mesh
Settings: 0.01% … 1000.00%
Description: Scales the heightmap altitude range values by the specified percentage.

Appendix F: File Formats

TerreSculptor supports a wide range of file formats including digital elevation model, heightmap, image, mesh and raw data. Each file format may support a number of additional importing and exporting features and sub-formats.

There are currently 46 file formats supported, in a total of 150+ data formats.

Note that not all file formats support the large width and height dimensions supported by TerreSculptor.
See the file formats marks as Big Size for those that support the TerreSculptor 1 million resolution.

Ext.	Description	Type	Data Formats	Big Size
.3ds	Autodesk 3D Studio	mesh	1	
.asc	ASCII Text	heightmap		
.asc	ESRI ASCII DEM	digital elevation model		
.ase	Autodesk 3D Studio ASCII	mesh	1	
.bil	band interleaved by line	digital elevation model	9	
.bmp	Windows Bitmap	image	4	
.bmp	Epic Unreal G16 Heightmap	heightmap	1	
.bt	Binary Terrain	heightmap	3	Yes
.csv	comma separated value	heightmap	1	
.dem	GTOPO30 DEM	digital elevation model		
.dem	VistaPro 4 binary DEM	digital elevation model	2	
.dsv	separated value	heightmap		
.flt	GridFloat DEM	digital elevation model	2	
.gif	Graphics Interchange Format	image	2	
.grd	ESRI ASCII DEM	digital elevation model		
.hgt	SRTM height	digital elevation model	1	
.jpg	JPEG Image Format	image		
.jxr	JXR Image Format	image		
.obj	Alias Object	mesh	1	
.pam	Portable AnyMap	image or heightmap	3	
.pbm	Portable BitmapMap	image or heightmap		
.pfm	Portable FloatMap	image or heightmap		
.pgm	Portable GrayMap	image or heightmap	4	
.png	Portable Network Graphics	image	4	Yes
.ppm	Portable PixMap	image or heightmap		
.psv	separated value	heightmap		
.r8	raw binary 8-bit	heightmap	2	Yes
.r16	raw binary 16-bit	heightmap	4	Yes
.r32	raw binary 32-bit	heightmap	4	Yes
.r64	raw binary 64-bit	heightmap		Yes
.raw	raw binary	heightmap	21	Yes
.rsv	separated value	heightmap		
.sb	RAW Signed Byte	heightmap		
.ssv	separated value	heightmap		
.stl	Stereolitho	mesh	2	
.t3d	Epic 3D Text	heightmap	1	
.tab	tab separated value	heightmap	1	
.ter	Terragen Terrain	heightmap	1	
.tga	Truevision TARGA	image	5	
.tif	Tagged Image Format	image	4	Yes
.tsv	tab separated value	heightmap	1	
.txt	space separated value	heightmap	1	
.txt	Vista Pro 4 ASCII DEM	digital elevation model	1	
.usv	separated value	heightmap		
.xml	Extended Markup Language	heightmap		
.xyz	ASCII XYZ Text	heightmap		

.3ds – Autodesk 3DS Max mesh

Format

Total format types: 1

Autodesk 3D Studio and Max mesh format.
Only a single plane XY grid mesh is supported. Importing other mesh shapes will result in an unspecified heightmap shape.
Files that contain multiple objects will present an object list where one object may be chosen.

Import Options

na

Export Options

Vertex spacing
Z offset
Z scale
Reverse vertex order
Rotate mesh origin
Include smoothing group

Notes

The 3DS file format only supports objects with a maximum of 65536 faces (triangles), which limits the heightmap mesh to a maximum square resolution of 181x181. A future version will allow exporting the entire terrain as multiple triangle strip objects.

When importing mesh formats, the mesh object being imported must be a square or rectangular grid plane with constant and equidistant XY vertex spacing. The mesh grid plane will be converted into a 16-bit heightmap.

.ase – Autodesk ASCII Scene Export

Format

Total format types: 1

Autodesk mesh format.
Only a single plane XY grid mesh is supported. Importing other mesh shapes will result in an unspecified heightmap shape.
Files that contain multiple objects will present an object list where one object may be chosen.

Import Options

na

Export Options

Vertex spacing
Z offset
Z scale
Accuracy
Reverse vertex order
Rotate mesh origin
Include smoothing group

Notes

ASE is a text format file type. Text format files are typically much larger than binary format files.

When importing mesh formats, the mesh object being imported must be a square or rectangular grid plane with constant and equidistant XY vertex spacing. The mesh grid plane will be converted into a 16-bit heightmap.

.bil – Band Interleaved by Line DEM

Format

Total format types: 9

ArcView and United States Geological Survey (USGS) National Elevation Dataset (NED) Digital Elevation Model.
Only BIL Single-Band (one heightmap in file) binary format data files are supported.
The following data types are supported in either Motorola or Intel Byte Order: 8-bit Unsigned Byte, 16-bit Signed and Unsigned Short Integer, 32-bit Signed and Unsigned Floating Point.
The default format if no header file is included is: Intel 16-bit Signed Short Integer with Skip Bytes = 0.
A .hdr Header properties file should be included to specify the binary file properties.

Description

The USGS NED BIL files contain elevation data tiles of the earth at various resolutions. The tiles are available from a number of sources and usually include an .hdr Header properties file, and may also include a .prj Projection properties file.

These files are commonly available in 10 meter (⅓ arc-second), 30 meter (1 arc-second), 90 meter (3 arc-second), and 300 meter (10 arc-second) resolutions.

The tile data supports an elevation range from -32767 to +32767 meters. An elevation value of -32768 signifies a void (missing data sample). When imported into TerreSculptor, this range is converted to 0.0 to 100.0.

Header Properties File

Varying tile Width and Height values, and various bit-depth data types, are supported through an .hdr Header file that contains a set of property values for the BIL file. The Header file is a multi-line ASCII text file that contains the following supported properties. Additional properties supported by the BIL .hdr file format that are not shown in this list are ignored by TerreSculptor.
Each property is the upper-case name followed by white-space (one or more tabs, or one or more spaces) and the property value. TerreSculptor ignores the case and will properly load lower-case, upper-case or mixed-case.

BYTEORDER	see note below	Intel or Motorola byte order
LAYOUT	BIL	must be "BIL"
NCOLS	<tile width>	eg: 1200
NROWS	<tile height>	eg: 1200
NBANDS	1	must be "1", files whose value is greater than 1 are not supported
NBITS	8 or 16 or 32	number of bits per data sample: 8-bit byte, 16-bit short, or 32-bit float
PIXELTYPE	see note below	the data sample type, typically absent when NBITS = 8
SAMPLETYPE	see note below	the data sample type, our custom HMES property
SKIPBYTES	0 to n	the number of bytes to skip to get to the sample data, typically 0
XDIM	The x-dimension of a pixel in map units. <x arc-seconds>	eg: 3.000000000000, optional
YDIM	The y-dimension of a pixel in map units. <y arc-seconds>	eg: 3.000000000000, optional
ULXMAP	The x-axis map coordinate of the center of the upper left pixel.	
ULYMAP	The y-axis map coordinate of the center of the upper left pixel.	
XLLCENTER	x center.	
YLLCENTER	y center.	
CELLSIZE	The size in meters of a pixel, optional.	
NODATA	the altitude value for DEM voids, typically -32768.	

BYTEORDER may be one of the following: M or MOTOROLA or MSBFIRST, or, I or INTEL or LSBFIRST.
I, INTEL, LSBFIRST are for PC format files, and M, MOTOROLA, MSBFIRST are for Mac format files.
TerreSculptor supports both types. 8-bit byte data (NBITS = 8) will ignore the BYTEORDER property entry.

PIXELTYPE may be one of the following: SIGNEDINT, UNSIGNEDINT, FLOAT, or FLOATINGPOINT.
INT entries are for 16-bit Short Integer data type, and FLOAT entries are for 32-bit Floating Point data type.
8-bit byte data (NBITS = 8) will ignore the PIXELTYPE property entry.

The SAMPLETYPE entry is our own custom property that supersedes both of the ambiguous NBITS and PIXELTYPE entries. NBITS and PIXELTYPE are supported for compatibility with other software, however, HMES will give SAMPLETYPE higher precedence if it is present in the header. SAMPLETYPE must be one of the following:
UNSIGNEDBYTE, SIGNEDSHORT, UNSIGNEDSHORT, SIGNEDSINGLE, UNSIGNEDSINGLE.

Unsupported Header Entries

The following header entries are not supported and are ignored by TerreSculptor.

BANDROWBYTES	the number of columns times the number of bytes per pixel, when NBANDS > 1.
TOTALROWBYTES	the number of columns times the number of bytes per pixel, when NBANDS > 1.
BANDGAPBYTES	must be 0 for single band images.

Import Options

Width
Length
Data type
Byte order
File offset
Fill voids
Void fill type
Proxy filespec

Export Options

Data type
Byte order
File offset
File scale
Save header
Header type

Notes

The optional HDR and PRJ files are read and persisted for the current session, and then written back out with the next BIL file export. This maintains the geolocation data from a file import to export.

The ULXMAP is assigned to the GIS Properties Longitude.
The ULYMAP is assigned to the GIS Properties Latitude.
The XDIM is assigned to the GIS Properties X Resolution.
The YDIM is assigned to the GIS Properties Y Resolution.
The NODATA is assigned to the GIS Properties Void Value.

.bmp – Windows Bitmap

Format

Total format types: 4+1

The Windows Bitmap format is very popular for storing standard grayscale and color images.

The following BMP formats are supported for import and export:

8-bit Grayscale	with a 24-bit RGB palette
8-bit Paletted	with a 24-bit RGB palette
16-bit Grayscale	the Epic Unreal G16 heightmap format
24-bit RGB Color	
32-bit ARGB Color	

Import Options

Source: Grayscale, Red, Green, Blue, Alpha

Export Options

Format
Source: Grayscale, Red, Green, Blue, Alpha
Orientation

Supported Orientations

Left to right, Top to bottom
Left to right, Bottom to top

Notes

Only the uncompressed format is supported at this time.
The .bmp 16-bit Grayscale format is the Epic G16 format.
HMES can read and write to the 32-bit format Alpha Channel which is not supported on most other software.

.bt – Binary Terrain

Format

Total format types: 3

VTP Binary Terrain digital elevation model file format supported by numerous open-source and retail heightmap, terrain, and GIS applications for saving and transferring of digital elevation model data.

The following data types are supported: 16-bit Integer, 32-bit Integer, and 32-bit Floating-Point.

TerreSculptor supports importing and exporting all four BT file format versions from 1.0 (1997) through 1.3 (2007).

Import Options

Type conversion

Export Options

File version
Data type
Type conversion

Notes

The following BT properties are ignored by TerreSculptor:
- UTM Zone
- Datum
- Horizontal and Vertical Units (scale)
- Extents (Left, Right, Top, bottom)
- Internal Projection
- External Projection

.csv .tab .tsv .txt – Delimited ASCII Text and Vista Pro 4 ASCII DEM

Format

Total format types: 1+1+1+1+1

This is the standard ASCII delimited formats.
The supported delimiters include comma (.csv), tab (.tab and .tsv), and space (.txt).
Each heightmap row is written to an individual line as multiple fields separated by the delimiter.
Each numeric value is prefixed with the number of required 0's to be either three digits 000...255 for 8-bit range or five digits 00000...65535 for 16-bit range. This allows for easier reading in text editors that use a fixed font as all columns are aligned.
Each heightmap row line is terminated by a CRLF.

Import Options

Export Options

Encoding: ASCII (default) or Unicode or UTF-8
Integer range: 8-bit or 16-bit
Orientation
Write header

Supported Orientations

Left to right, Top to bottom
Left to right, Bottom to top

Notes

Only ASCII format is currently supported for importing.

Heightmaps saved for Vista Pro 4 ASCII DEM format must be saved in ASCII encoding, 16-bit range, LRBT orientation, no Header, to be compatible with Vista Pro 4.

It is not recommended to use Unicode encoding formats to save heightmap files since the file size can become extremely large. For example, an 8192x8192 16-bit heightmap saved as UTF-32 will result in a text file larger than 1.6GB.

Unicode files will have to be converted to ASCII prior to importing using Notepad or another compatible text editor. An attempt is made to recognize common Unicode format text files and provide a warning to convert the file to ASCII before importing. This is only possible if the text file contains the Unicode preamble or BOM (byte order marking) information at the start of the file.

.dem – GTOPO30 DEM

Format

Total format types: 9

Description

Header Properties File

BYTEORDER	Intel or Motorola byte order	
LAYOUT	BIL	must be "BIL"
NCOLS	<tile width>	eg: 1200
NROWS	<tile height>	eg: 1200
NBANDS	1	must be "1", files whose value is greater than 1 are not supported
NBITS	8 or 16 or 32	number of bits per data sample: 8-bit byte, 16-bit short, or 32-bit float
PIXELTYPE	see note below	the data sample type, typically absent when NBITS = 8
SAMPLETYPE	see note below	the data sample type, our custom HMES property
SKIPBYTES	0 to n	the number of bytes to skip to get to the sample data, typically 0
XDIM	The x-dimension of a pixel in map units. <x arc-seconds> eg: 3.000000000000, optional	
YDIM	The y-dimension of a pixel in map units. <y arc-seconds> eg: 3.000000000000, optional	
ULXMAP	The x-axis map coordinate of the center of the upper left pixel.	
ULYMAP	The y-axis map coordinate of the center of the upper left pixel.	
XLLCENTER	x center.	
YLLCENTER	y center.	
CELLSIZE	The size in meters of a pixel, optional.	
NODATA	the altitude value for DEM voids, typically -32768.	

Import Options

Width
Length
Data type
Byte order
File offset
Fill voids
Void fill type
Proxy filespec

Export Options

Data type
Byte order
File offset
File scale
Save header
Header type

Notes

The optional HDR and PRJ files are read and persisted for the current session, and then written back out with the next BIL file export. This maintains the geolocation data from a file import to export.

The ULXMAP is assigned to the GIS Properties Longitude.
The ULYMAP is assigned to the GIS Properties Latitude.
The XDIM is assigned to the GIS Properties X Resolution.
The YDIM is assigned to the GIS Properties Y Resolution.

The NODATA is assigned to the GIS Properties Void Value.

.dem – VistaPro 4 binary DEM

Format

Total format types: 2

VistaPro version 4 binary digital elevation model.

File import supports both compressed and uncompressed formats.
File export supports uncompressed format.

During file import, the DEM altitude data is automatically scaled and centered.

During file export, the following limitations are imposed:
- The DEM data is always 258x258 samples.
  Heightmap resolutions other than this will be resampled to 258x258.
- The DEM data altitude range is 0 to 16000.
  Heightmap ranges greater than 16000 will be scaled to 0 to 16000.

Import Options

None.

Export Options

Name
Comment

Notes

The Colormap data is ignored.
The DEM data is assumed by VistaPro 4 to be 30 meter sample spacing and 1 meter altitude spacing.

.fbx – Autodesk FBX Mesh

Format

Total format types: 1

Autodesk ASCII Mesh format.

Export Options

Format
Vertex Spacing
Z Scale
Save Textures
File format
Resolution

Notes

The FBX ASCII Export is currently the only supported format.

.flt – GridFloat DEM

Format

Total format types: 2

ArcGIS GridFloat binary digital elevation model.

Import Options

Width override
Length override
Byte order
Fill voids
Void fill type
Proxy filespec

Export Options

Byte order
File scale
Save .hdr header properties file

Notes

The optional HDR and PRJ files are read and persisted for the current session, and then written back out with the next BIL file export. This maintains the geolocation data from a file import to export.

The XLLCORNER or XLLCENTER is assigned to the GIS Properties Longitude.
The YLLCORNER or YLLCENTER is assigned to the GIS Properties Latitude.
The CELLSIZE is assigned to the GIS Properties X Resolution.
The CELLSIZE is assigned to the GIS Properties Y Resolution.
The NODATA is assigned to the GIS Properties Void Value.

.gif – Graphics Interchange Format

Format

Total format types: 2

The GIF format is one of the image standards for Internet and image transfer. GIF supports a paletted image of up to 256 gray-levels or 256 colors.

The following GIF formats are supported for import and export:

8-bit Grayscale	with a 24-bit grayscale palette
8-bit Paletted	with a 24-bit RGB palette

Import Options

Source: Grayscale, Red, Green, Blue

Export Options

Source: Grayscale, Red, Green, Blue

Notes

The heightmap data is saved as an 8-bit grayscale palette image.

.hgt – SRTM DEM Heightmap

Format

Total format types: 1

Shuttle Radar Topology Mission Digital Elevation Model.

Typically available in 30 meter (1 arc-second) and 90 meter (3 arc-second).
All SRTM formats are supported.
SRTM HGT files are normally 16-bit signed big-endian with a left-to-right top-to-bottom format.

Description

The Shuttle Radar Topology Mission HGT files contain elevation data tiles of the earth at various resolutions. The tiles are available from a number of sources and usually have the following file naming convention:

<latitude><longitude>.hgt

The file name is the latitude and longitude of the bottom-left corner sample point of the SRTM file. For example, a file named N36W005.hgt would be North 36:00:00 latitude and West 5:00:00 longitude.

The tile data supports an elevation range from -32767 to +32767 meters. An elevation value of -32768 signifies a void (missing data sample). When imported into HMES, this range is converted to 1 to 65535, with a value of 0 signifying a void flag value.

HGT files are a square aspect ratio whose dimensions vary depending on the source resolution. 90 meter files are commonly 1201x1201 with a file size of 2.75MB (2,884,802 bytes), while 30 meter files are commonly 3601x3601 with a file size of 24.7MB (25,934,402 bytes).
Non-square-aspect files cannot be imported unless a Header properties file is supplied along with the HGT file. The Header file is custom for HMES and normally unsupported by other SRTM software.

The Width and Height are pre-determined by the file size, or the optional Header properties, and cannot be modified.

Header Properties File

The optional Header properties file contains a set of property values for the HGT file. The Header file is a multi-line ASCII text file with the same file name as the HDR file with a file extension of .hgp, and contains the following supported properties. Each line is terminated with a CRLF. Any line cannot be longer than 80 characters not including the CRLF line terminator. There is a single space character between each property and value pair. Case is not strict and can be upper or lower or mixed. A Resolution value of 0 is "unknown".

<comment>	SRTM HGT N38W112	normally SRTM HGT followed by the HGT's file name
Width <value>	Width 3601	x sample points, supports 1 to 65536
Height <value>	Height 3601	y sample points, supports 1 to 65536
Resolution <value>	Resolution 30	spatial resolution in meters, supports 5, 10, 30, 60, 90, 300

Import Options

Fill voids
Void fill type
Proxy filespec

Export Options

File scale
Save header

Use Units for Resolution
Resolution

Notes

The optional HDR and PRJ files are read and persisted for the current session, and then written back out with the next BIL file export. This maintains the geolocation data from a file import to export.

The RESOLUTION is assigned to the GIS Properties X Resolution.
The RESOLUTION is assigned to the GIS Properties Y Resolution.
The NODATA is assigned to the GIS Properties Void Value.

.obj – Alias Object ASCII Mesh

Format

Total format types: 1

Only a single plane XY grid mesh is supported. Importing other mesh shapes will result in an unspecified heightmap shape.
Files that contain multiple objects will present an object list where one object may be chosen.

Import Options

Rotate mesh origin	Rotates the mesh to be bottom-left origin.
Swap Y and Z axis	Swap the Y and Z axis in the file data.

Export Options

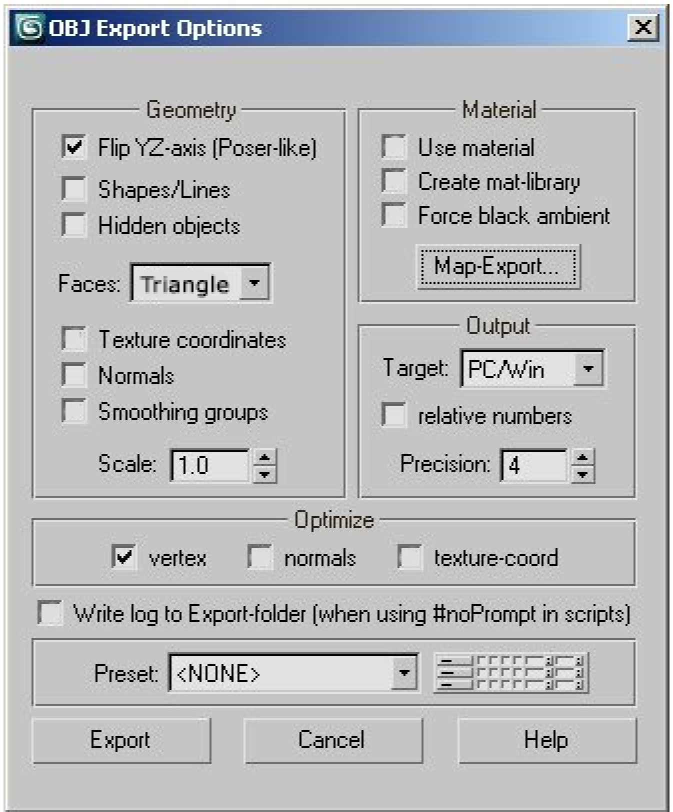
Scale by Terrain Properties	Scale the mesh to real world size using the Terrain Properties Spacing XYZ. This ignores Vertex Spacing and Z Scale.
Vertex spacing	Choose the spacing in world units between the vertices.
Center XY	Center the mesh on the XY axis.
X origin offset	Offset the mesh on the X axis by the specified amount.
Y origin offset	Offset the mesh on the Y axis by the specified amount.
Z offset	Offset the mesh on the Z axis.
Z scale	Scale the Z axis by the specified percent.
Accuracy	Specify the number of decimal places in the vertex data numbers.
Reverse vertex order	Reverse the vertex order which flips the triangle faces.
Rotate mesh origin	Rotates the mesh to be bottom-left origin.
Swap Y and Z axis	Swap the Y and Z axis in the file data.
Include object name	Include the object name.
Include texture coordinates	Include texture UV coordinates in the file.
Include smoothing group	Include the smoothing group in the file.
Include vertex colors	Include vertex colors in the file, this will be taken from the Material Colorset.
Create Material file	Create an .mtl Material file with material information.
File format	Specify the Material texture file format.
Resolution	Specify the Material texture resolution.

Notes

Autodesk 3DS Max requires that the vertex order be reversed to render the face normals in the upward direction.
Autodesk 3DS Max requires that the rotate mesh origin be used to change the origin to the bottom-left corner.

When importing mesh formats, the mesh object being imported must be a square or rectangular grid plane with constant and equidistant XY vertex spacing. The mesh grid plane will be converted into a 16-bit heightmap.

The typical Autodesk 3DS Max Export Settings dialog is as follows:



.pam – Portable AnyMap Binary Image or Heightmap

Format

Total format types: 3

PAM files are always unsigned big-endian format.

The following PAM formats are supported for import and export:

P7 - 8-bit Grayscale
P7 - 16-bit Grayscale
P7 - 24-bit RGB Color

Import Options

Source: Grayscale, Red, Green, Blue

Export Options

Format
Integer Range
Source: Grayscale, Red, Green, Blue

.pgm – Portable GrayMap ASCII and Binary Image or Heightmap

Format

Total format types: 4

PGM files are always unsigned big-endian format.

The following PGM formats are supported for import and export:

P2 - 8-bit ASCII Grayscale
P2 - 16-bit ASCII Grayscale
P5 - 8-bit Binary Grayscale
P5 - 16-bit Binary Grayscale

Import Options

Source: Grayscale, Red, Green, Blue

Export Options

Format
Integer Range
Source: Grayscale, Red, Green, Blue

.png – Portable Network Graphics

Format

Total format types: 7

The PNG format is one of the image standards for Internet and image transfer. PNG supports a wide range of image formats including grayscale, paletted and planar, and up to 64-bit color with alpha channel.

The following PNG formats are supported for import:

Black and White	[WIC]
2-bit Grayscale	[WIC]
4-bit Grayscale	[WIC]
1-bit Monochrome Indexed	[WIC]
2-bit 4-Color Indexed	[WIC]
4-bit 16-Color Indexed	[WIC]
8-bit 256-Color Indexed	[WIC][PNGCS]
8-bit Grayscale	[WIC][PNGCS]
16-bit Grayscale	[WIC][PNGCS]
24-bit RGB	[WIC][PNGCS]
32-bit RGB with alpha	[WIC][PNGCS]
48-bit RGB	[WIC][PNGCS]
64-bit RGB with alpha	[WIC][PNGCS]

The following PNG formats are supported for export:

8-bit Grayscale	[WIC][PNGCS]
8-bit 256-Color Indexed	[WIC]
16-bit Grayscale	[WIC][PNGCS]
24-bit RGB	[WIC][PNGCS]
32-bit RGB with alpha	[WIC][PNGCS]
48-bit RGB	[WIC][PNGCS]
64-bit RGB with alpha	[WIC][PNGCS]

Import Options

Source: Grayscale, Red, Green, Blue

Export Options

Source: Grayscale, Red, Green, Blue

Notes

The heightmap data is saved as an 8-bit grayscale palette image when 8-bit Paletted format is chosen.

The PNG Importer supports automatic tile stitching if the source file name is of the format that include X,Y tiles:
filename_x0_y0.png or filename_X0_Y0.png
Technically the number of tiles can be up to the full 1 million x 1 million pixels.
When automatically detecting an X,Y file name, the PNG Import dialog will display a “Load as Tile Set” checkbox, allowing selection of tiled import.

.r8, .r16, .r32, .r64, .raw – RAW Heightmap

Format

Total format types: 21

Essentially twenty-one different RAW formats are supported, including 8-bit byte, 16-bit short integer, 32-bit integer, 64-bit long integer, 32-bit single-precision floating point, and 64-bit double-precision floating point; in Intel and Motorola byte order where applicable, and in signed and unsigned where applicable.
The floating point formats also support real-number or scaled 0.0-to-1.0 ranges.

The raw data is assumed to be an X×Y grid of heightmap sample point altitudes.

The RAW Format property and file extension is used to determine the data contents of the file:

.r8	8-bit unsigned byte
.r16	16-bit short integer, signed or unsigned, Intel or Motorola byte order
.r32	32-bit single-precision float, signed or unsigned, real or scaled, Intel or Motorola byte order
.r64	64-bit single-precision double, signed or unsigned, real or scaled, Intel or Motorola byte order
.raw	can be any of the following: 8-bit unsigned byte, 16-bit short integer in signed or unsigned and Intel or Motorola, 32-bit integer in signed or unsigned and Intel or Motorola, 64-bit long integer in signed or unsigned and Intel or Motorola, 32-bit single-precision floating point in signed or unsigned and real or scaled and Intel or Motorola, 64-bit double-precision floating point in signed or unsigned and real or scaled and Intel or Motorola

RPL RAW Parameter List Properties File

RAW file properties are supported through a RAW Parameter List .rpl file that contains a set of property values that define the contents of the RAW binary data file.
The RPL file is a multi-line ASCII text file that contains the following supported properties. Additional properties supported by the RAW RPL file format are ignored by HMES.
Each property entry is the lower-case property name followed by white-space (one or more tabs, or one or more spaces) and the property value. Any line that begins with a semicolon (;) is regarded as a comment and is ignored. The line with "key" and "value" must be present in an RPL file but is ignored by HMES.

The “sample-type” entry is our custom property that is used to alleviate the ambiguous meanings and missing data types with the default RPL data-length and data-type entries. This entry is not supported by most other software.

;comment	comment	;HMES Heightmap Raw Parameter List	* optional
key	value	key value	* ignored
width	<raw width>	eg: 256	
height	<raw height>	eg: 256	
depth	<number of raw blocks>	must be 1 if present	* optional
offset	<file offset to data>	must be between 0 and the file length -1 if present	* optional
data-length	<bytes per raw sample>	must be 1 for 8-bit, 2 for 16-bit, 4 for 32-bit, 8 for 64-bit	
data-type	<raw data type>	must be "signed", "unsigned", or "float" 8-bit is always "unsigned"	
byte-order	<raw data byte order>	must be "big-endian", "little-endian", or "dont-care" big-endian = Motorola, little-endian = Intel 8-bit is always "dont-care"	
record-by	<raw, image or vector>	must be "dont-care" if present	* optional
sample-type	<data type>	must be one of the following: unsigned-byte, signed-short, unsigned-short, signed-integer, unsigned-integer, signed-long, unsigned-long, signed-single, unsigned-single, signed-double, unsigned-double	* optional

Epic Games JSON Properties File Support

TerreSculptor also supports saving the Epic Games JSON file for RAW properties.
This file contains properties for Width, Height and Bits Per Pixel.
Note that Epic has misspelled BPP in their file, so this format may change in the future.

```
json
{
“width”: 1024,
“height”: 1024,
“bbp”: 8
}
```

Import Options

Format (r8, r16, r32, r64, raw)
Width
Height
Data type
Type conversion
Byte order
File offset

Export Options

Format (r8, r16, r32, r64, raw)
Write header (write a RPL parameter file)
Data type
Type conversion
Byte order
File offset

Notes

The Format property values of r8, r16, r32 and r64 determine whether the RAW file written is fixed as an 8-bit unsigned byte, 16-bit short integer, 32-bit single-precision floating point, or 64-bit double-precision floating point data format.

The File Offset property allows for importing a chunk of binary data that is located at virtually any location within a file. This allows the use of the RAW importer to import additional unsupported file types through the proper use of the import properties, where the chunk dimensions are specified along with the number of file header bytes to skip over.

.stl – StereoLitho ASCII and Binary Mesh

Format

Total format types: 2

Both ASCII and Binary formats are supported.
Only a single plane XY grid mesh is supported. Importing other mesh shapes will result in an unspecified heightmap shape.
There is no support for multiple objects, all vertices are assumed to be a single plane mesh.

Import Options

na

Export Options

Format
Vertex spacing
Z offset
Z scale
Vertex Accuracy
Reverse vertex order
Rotate mesh origin

Notes

Autodesk 3DS Max requires that the vertex order be reversed to render the face normals in the upward direction.

When importing mesh formats, the mesh object being imported must be a square or rectangular grid plane with constant and equidistant XY vertex spacing. The mesh grid plane will be converted into a 16-bit heightmap.

.t3d – Epic 3D Text

Format

Total format types: 1

Unreal Engine 3 3D ASCII Text Terrain format.

Supports the Terrain Actor only.

Import Options

none

Export Options

none

.tab – TAB Delimited ASCII Text

See .csv .tab .tsv .txt - Delimited ASCII Text and Vista Pro 4 ASCII DEM

.ter – Terragen Terrain

Format

Total format types: 1

HMES supports the Terragen Classic (1.0) file format properties relevant to the heightmap data.
Heightmap sizes from 2x2 up to the HMES maximum heightmap dimensions are supported.
Both square and rectangular heightmaps are supported for both import and export.
HMES supports the Terragen file format properties (chunks) for SIZE, XPTS and YPTS, ALTW, and EOF.
HMES ignores the file format properties (chunks) for CRAD (curve radius), CRVM (curve mode), and SCAL (terrain scale in meters).
HMES always writes out the optional XPTS and YPTS chunks even if the heightmap is square.

"TERRAGEN"
"TERRAIN "
"SIZE" n-1 (if the heightmap is rectangular then SIZE is the shorter dimension -1)
"XPTS" width
"YPTS" length
"ALTW" HeightScale, BaseHeight, heightmap data width*length signed shorts
"EOF "

Import Options

none

Export Options

none

Notes

TerreSculptor imports and exports Terragen Terrain files flipped vertically (Left-Right Bottom-Top) so that the terrain orientation within TerreSculptor matches the Terragen Classic top-down preview.

Terragen Terrain format files created with World Machine have an n+1 resolution. In other words, a 1024×1024 World Machine heightmap is exported as a 1025×1025 Terragen file.

.tga – Truevision TARGA

Format

Total format types: 6

The following TGA formats are supported for import and export:

8-bit Grayscale	
8-bit Paletted	with a 24-bit RGB Palette
16-bit Grayscale	
24-bit RGB Color	
32-bit ARGB Color	
32-bit Floating Point	

Import Options

Source: Grayscale, Red, Green, Blue, Alpha

Export Options

Format
Source: Grayscale, Red, Green, Blue, Alpha
Orientation
Enhanced Format

Supported Orientations

Left to right, Top to bottom
Left to right, Bottom to top
Right to left, Top to bottom
Right to left, Bottom to top

Notes

Normal and Enhanced (Extended) TGA Format is supported.
Only the uncompressed format is supported.
Only the non-scanline-interleave format is supported.
Not all software supports the 16-bit Grayscale format.
Not all software supports Right-to-Left orientation.

.tif – Tagged Image Format and GeoTIF

Format

Total format types: 14

The following TIF formats are supported for import and export:

8-bit Grayscale
16-bit Grayscale Signed
16-bit Grayscale Unsigned
32-bit Grayscale Signed
32-bit Grayscale Unsigned
64-bit Grayscale Signed
64-bit Grayscale Unsigned
32-bit Floating-Point
64-bit Floating-Point
8-bit Paletted with a 24-bit RGB palette
24-bit RGB Color
32-bit ARGB Color
48-bit RGB Color
64-bit ARGB Color

Import Options

Format: Determined from the file header information
Source: Grayscale, Red, Green, Blue, Alpha
Void Value: The GeoTIF Void Value, GeoTIF formats only
Fill Voids: Whether to fill the voids.
Void Fill Type: The Void Fill Type.
Proxy Filespec: The Void Fill proxy filespec.

Export Options

Format: see above list.
Source: Grayscale, Red, Green, Blue, Alpha
Compression: Uncompressed, LZW
File Scale: Normal, Scaled (Scaled is used to maintain the numerical range of the imported fil)

Supported Orientations

Left to right, Top to bottom

GeoTIF Support

The common GeoTIFF Interchange Tags are fully supported when loading and saving TIF files.

33550 - GEOTIFF_MODELPIXELSCALETAG
33922 - GEOTIFF_MODELTIEPOINTTAG
34264 - GEOTIFF_MODELTRANSFORMATIONTAG
34735 - GEOTIFF_GEOKEYDIRECTORYTAG
34736 - GEOTIFF_GEODOUBLEPARAMSTAG
34737 - GEOTIFF_GEOASCIIPARAMSTAG
42113 - NODATA

Notes

The TIF Importer supports automatic tile stitching if the source file name is of the format that include X,Y tiles:
filename_x0_y0.tif or filename_X0_Y0.tif
Technically the number of tiles can be up to the full 1 million x 1 million pixels.
When automatically detecting an X,Y file name, the TIF Import dialog will display a “Load as Tile Set” checkbox, allowing selection of tiled import.

.tsv – TAB Delimited ASCII Text

See .csv .tab .tsv .txt - Delimited ASCII Text and Vista Pro 4 ASCII DEM

.txt – Space Delimited ASCII Text and Vista Pro 4 ASCII DEM

See .csv .tab .tsv .txt - Delimited ASCII Text and Vista Pro 4 ASCII DEM

Appendix G: Obtaining DEM Data

A DEM or Digital Elevation Model is a file that contains real altitude information gathered from areas of the earth or other planets in our solar system. The DEM data is typically collected by orbiting a satellite, the shuttle, or an airplane around the planet and performing altitude distance measurements using radar or other means. These stripes of altitude distance measurements are then converted and compiled into files based on planetary latitude and longitude values. The final DEM data is often available at no charge from a variety of websites, typically operated by organizations or governments.

For use as typical heightmaps in video games and 3D rendering, DEM data should be at least 10 meter or higher resolution, 16-bit or greater bit-depth, with an altitude range of more than 1000 samples.

DEM Sample Spacing

DEM data is normally measured in meters between sample points, but may be using one of the additional equivalent scales. The meters value is only approximate, the arc-seconds value is typically accurate.
Meters and arc-seconds for terrestrial DEM data are shown in the table below.

Meters	Arc Seconds
1 meter	1/27th (0.037) arc-second
3 meter	1/9th (0.111) arc-second
5 meter	1/6th (0.167) arc-second
10 meter	1/3rd (0.334) arc-second
30 meter	1 arc-second
60 meter	2 arc-seconds
90 meter (100 meter)	3 arc-seconds
300 meter	10 arc-seconds

DEM Spacing to Engine Units

DEM data is typically provided in meters, whereas TerreSculptor and many video game engines are scaled in centimeters, such as TerreSculptor's default 1 cm unit scaling and the Epic UDK's 1 unreal unit = 2 cm scaling.

To determine the proper terrain vertex spacing within TerreSculptor or a video game engine so that the DEM data is scaled correctly, simply convert the DEM sample spacing to the equivalent engine units.

TerreSculptor example:
A 5 meter DEM is 5 meter spacing between sample points. 5 meters is 500 centimeters.
The engine scale is 1 unit = 1 cm.
Therefore, a terrain units XZ spacing of 500 is 5 meters (500 cm / 1 cm = 500).

UDK example:
A 5 meter DEM is 5 meter spacing between sample points, 5 meters is 500 centimeters.
The engine scale is 1 unit = 2cm.
Therefore, a DrawScale3D.X/Y spacing of 250 is 5 meters (500 cm / 2 cm = 250).

DEM Properties Files

Some of the DEM file formats are headerless raw binary data files and therefore support an additional ASCII text file that contains the DEM properties.
These properties typically include the data samples width, data samples length, data bit-depth (bits per sample such as 16-bit), data endian (Intel/PC or Motorola/Mac), data integer sign (signed or unsigned), etc.

When working with DEMs, if the properties file is not included by the source supplier, it can be advantageous to create the properties file in order that TerreSculptor has the correct file information for importing.

DEM Dataset Links

For current up-to-date links and file format support information, visit the TerreSculptor Wiki web site.

Appendix H: Keyboard Shortcuts

Menu

File Menu	Alt+f
Edit Menu	Alt+e
Generate Menu	Alt+g
Noisemap Menu	Alt+n
Weightmap Menu	Alt+w
Adjust Menu	Alt+a
Filter Menu	Alt+i
Modify Menu	Alt+m
Transform Menu	Alt+t
Geology Menu	Alt+y
Erosion Menu	Alt+r
Create Menu	Alt+c
View Menu	Alt+v
Tools Menu	Alt+l
Help Menu	Alt+h

File

New File	Ctrl+n
Open File	Ctrl+o
Save File	Ctrl+s
Save File As	Ctrl+a
Close File	Ctrl+x
Exit	Alt+F4

Edit

Undo	Ctrl+z
Redo	Ctrl+y
Repeat	F4
Copy	Ctrl+c
Paste	Ctrl+v

View

Perspective View	p
Top View	t
Front View	f
Back View	b
Left View	l
Right View	r
LOD Type	F2
Wire/Facet/Smooth	F3
Backdrop toggle	Ctrl+b
Bounding Boxes toggle	Ctrl+B
Designer toggle	Ctrl+d
Home Grid toggle	g or Ctrl+g
Geometry toggle	Ctrl+G
Lighting toggle	Ctrl+l
Origin Axes toggle	Ctrl+O
Planner toggle	Ctrl+p
Terrain toggle	Ctrl+t
Terrain Extents toggle	Ctrl+T
Water toggle	Ctrl+w
World Extents toggle	Ctrl+W
Redraw Viewport	~ or ` or F8
Zoom Extents	z
Statistics toggle	7

Scene Statistics toggle	8
Animation toggle	/

Tools

Save Screenshot	F9
Save Custom Screenshot	Ctrl+F9

Widgets

Select Transform	Shift+T
Select Rotate	Shift+R
Select Scale	Shift+S

Help

Help	F1

Camera

Home	Ctrl+Home
Forward	Ctrl+UpArrow
Backward	Ctrl+DownArrow
Left	Ctrl+LeftArrow
Right	Ctrl+RightArrow
Up	Ctrl+PageUp
Down	Ctrl+PageDown

Orbit Camera

Orbit	left button + x axis
Pitch	left button + y axis
Dolly	wheel

Free Camera

Pan	left button + x axis
Dolly	left button + y axis or wheel
FreeLook	right button + xy axes
Truck	left+right button + x axis
Pedestal	left+right button + y axis

Ortho Camera

Truck	left button + x axis
Pedestal	left button + y axis
Dolly	wheel

Devices

Noise Generator Preview	F5

Terrain Stack

Selection Navigation	Up Arrow
Selection Navigation	Down Arrow
Selection Navigation	PgUp
Selection Navigation	PgDn
Selection Navigation	Home
Selection Navigation	End
Item Enabled toggle	Space
New Item	Ctrl+i

Move Item Up	Ctrl+u
Move Item Down	Ctrl+d
Edit Device	Ctrl+e
Edit Mask	Ctrl+m
Delete Item	Del
Duplicate Item	Ctrl+p
Load Stack	Ctrl+l
Build All	Ctrl+b or F5
Build To Item	F2
Build From Item	F3
Build Item	F6
Display Item Properties	Enter

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