# Deform ByProjecting Utility

3ds Max Utility
Version 1.0

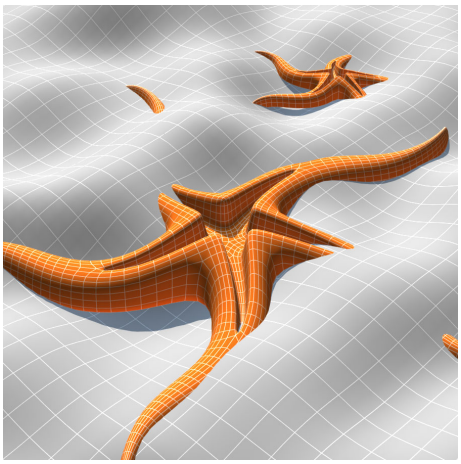
## User guide

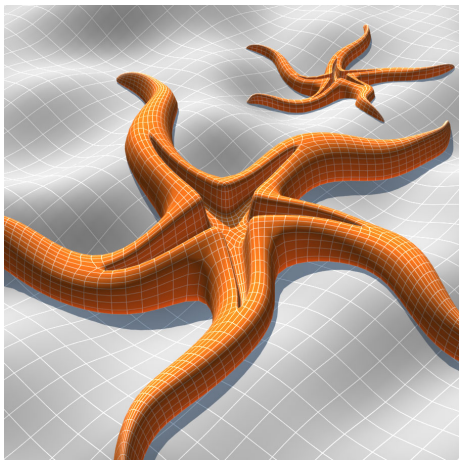
## What is DeformByProjecting Utility?

**DeformByProjecting** is a scripted utility for 3dsmax that allows deform one or more objects by projecting mesh verticies on the surface of another object (preform). The basic idea is similar to Conform (Compound Object), but functionality DeformByProjecting utility has differences and features:

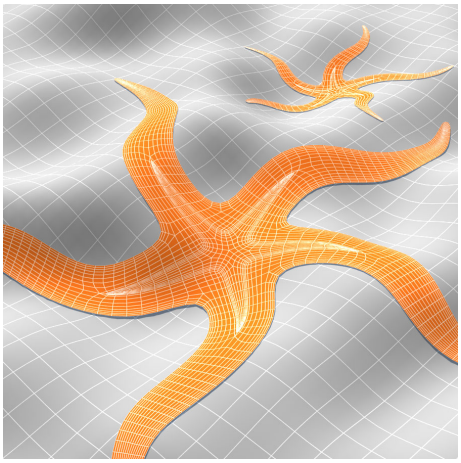
- Deformation is added to the object as a **EditPoly** modifier. This makes it easy to cancel changes and continue editing the poly mesh while keeping the previous changes in the modifier stack.
- The possibility to deform by projecting with the restoration thickness of the body (**Keep Thickness**) or to reconstruct the geometry via relative height of body (**Use Waterlevel**).
- The utility allows you to deform many number of objects at the same time. Deformation is added to each object separately from the other.
- You can choose different projecting directions at once individually for each object using the direction type **Local coordsys (Object)**.

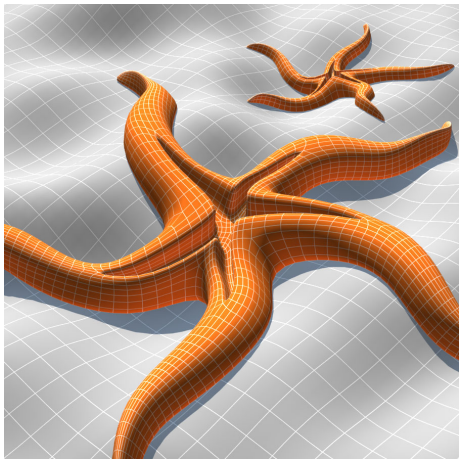
For example, look at the following two images. In the first picture starfish object is placed on the hilly bottom without change. As a result, the objects have multiple geometry intersections. In the second picture starfish object is deformed using DeformByProjecting utility with checked parameter **Keep Thickness**. As a result, geometry objects have no intersection, and starfish is wrapped to the bottom object.





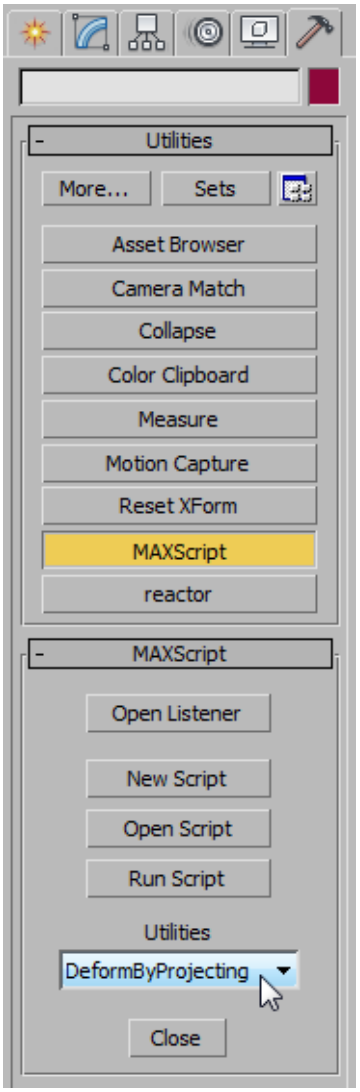
Next pictures show a deformation to thin projection without keeping volume, and a deformation with the geometry reconstruction by means of **Normal Correction** and **Keep Thickness.**





**DeformByProjecting** utility is made mainly for assistance in the modeling, therefore deformations are added as a modifier in the stack. This allows you to modify the model, to cancel the deformations and apply new. Particularity of the utility is that it is does not automatically recalculate deformation when change the position of objects or modify preform surface.

## Start working with DeformByProjecting Utility




View of Utilities panel

### Run scripted utility

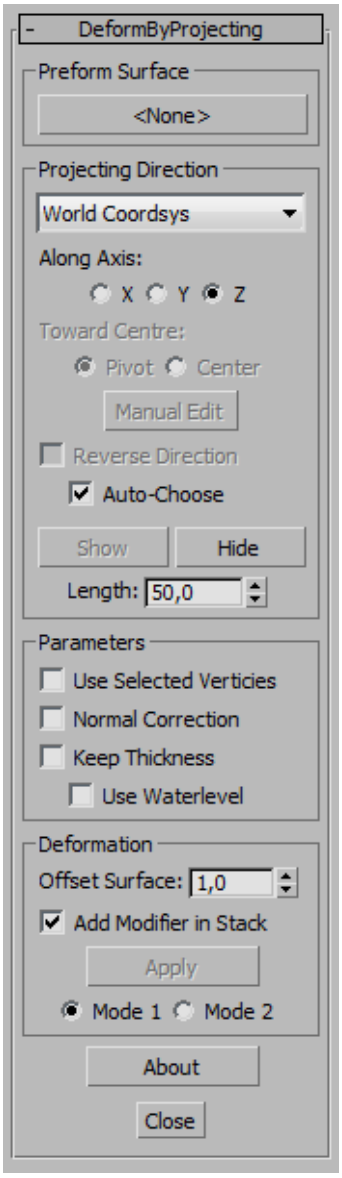
#### Compatibility and demo version

The utility work in 3ds Max version 2010 and higher. Possible to work in earlier versions of program. You can check the compatibility with your version of 3ds Max by executing the demo (free) version of utility.
Demo version of utility has limitations in functionality: at the same time the number of deforming objects does not exceed 1, the maximum number of transforming vertices of object is limited to 100, disabled parameter the Use Selected Verticies

#### Start utility

To start the utility, go to Utilities panel, select section Maxscript.
Click Run Script, in the opened window (Choose Editor File) find the file **DeformByProjectingUtility.mze** in the folder where you store utility and click Open. After that choose DeformByProjecting in drop-down list .
Rollout DeformByProjecting Utility will be opened below.

## Interface of DeformByProjecting Utility




Inteface of utility

### Group Preform Surface

**Pick button**

Pick button lets pick up geometry object as preform surface (surface template). Right mouse button click deselects the preform surface. Faces of the preform surface must be oriented towards the vector of projecting direction. Deformable objects should not intersect the preform surface on which they wil be projected.

> **Tip** If preform surface has too many faces, the utility work may be too slow. To speed up processing, you can temporarily remove a portion of the surface which is not needed for projection. For example, you can add EditPoly modifier and delete unnecessary faces. After finishing utility work, you can disable the modifier or remove it from the stack to return surface into the primary state.

### Group Projection Direction

**Drop-down List**

Lets you choose the type of projecting direction. Types can be divided into three main groups:

- **World coordsys, coordsys Local (Object / Preform), Screen coordsys**
  Allows you to select the projecting direction along one of the axes coordinate system (World, Local, Screen). For this types it is available select the axis (X, Y, Z) along which the projection made.

- **Radial (To Object / To Preform)**
  Allows to make the Radial projection. The projecting is provided along the ray outgoing from a vertexes positions to the center of a radial system. The centre is chosen for each object (To Object) or for Preform Surface (To Preform). Location set by option Toward Centre (Pivot, Center).

- **Manual**
  Allows you to specify an arbitrary projecting direction. After selecting this type Manual Edit button becomes available.

**Along Axis**

Available when you select projecting direction type of World coordsys, Local coordsys or Screen coordsys. Determines along which axis (X, Y, Z) the coordinate system will be projected vertices of mesh.

**Toward Centre**

Available when you select projecting direction type of Radial. Specifies the reference point of the Radial Projection system. You can choose Pivot point or mesh Center (Pivot, Center) of deformable objects (Object) or Preform Surface (Preform).

**Manual Edit button**

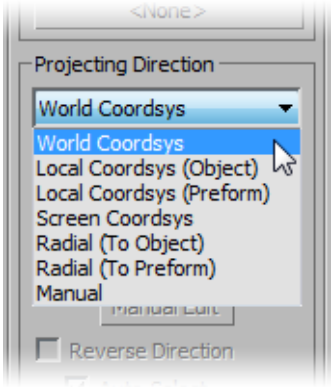
Available when you select the projecting direction type Manual. Pressing the button state on activates the edit mode. You can change the direction by moving points of ManualVector. After pressing the button off, changes are saved.

**Reverse Direction**

It allows you to manually reverse direction of projection vector. By default, the projection vector specified by the direction of the axis in the coordinate system (coordsys) and toward the centre in the radial system. Checking **Auto-Choose** makes unavailable to change this option.

**Auto-Choose**

Allows the utility to choose forward or reverse orientation of projecting direction automatically. This option gives the command to test the intersection of projecting ray and Preform Surface, and then to choose the direction. If the direction is chosen incorrectly, set forward or reverse direction manually after disabling this option.




Drop-down list of projecting direction types

### Show button

Shows the specified type of projecting direction for each selected objects as a helper vector. It allows you to visually assess the correct choice of projecting direction type and orientation (forward or reverse).

### Hide button

Hides all projection direction helper vector.

### Length

Sets the size of the displayed projecting direction helper vector.

## Group Parameters

### Use Selected Veticies

When turned on, only the selected vertex sub-objects will be transformed.

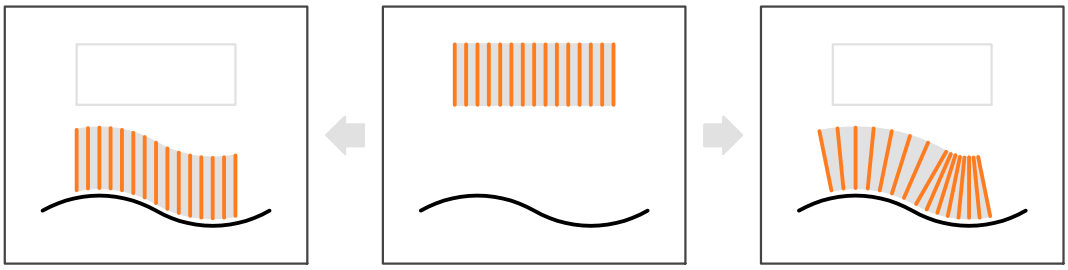
### Normal Correction

Performs correction of a verteces positions along normals of surface at the point of intersection with projection ray, when using a non-zero **Offset Surface** value or parameter **Keep Thickness**.

> **Tip** When using the **Normal Correction** it is recommended to apply to the preform surface smoothing modifier (for example TurboSmooth) to improve the accuracy of transforming and reduce possible distortions in the deformed mesh geometry.

### Keep Thickness

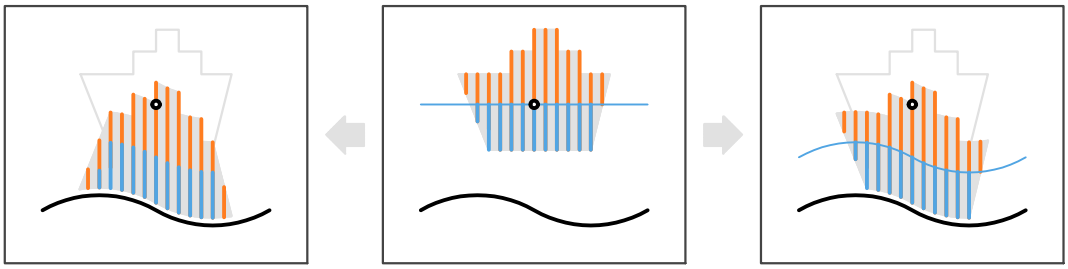
Restores thickness (volume) of the object after projection. When turned on, the utility calculates the local thickness of the body for each vertex and makes the reconstruction of a form based on these values.



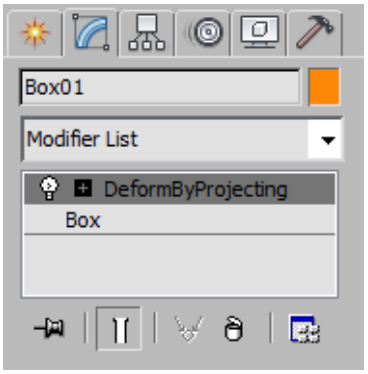
Deformed object (Normal Correction = Off, Keep Thickness = On) | Primary object | Deformed object (Normal Correction = On, Keep Thickness = On)

### Use Waterlevel

Used with checked parameter **Keep Thickness**. Reconstuct body of the object after projection, by calculating the vertices positions via relative height from conditional plane named waterlevel. This plane is defined by position of pivot point of the object.



Deformed object (Keep Thickness = On, Use Waterlevel = Off) | Primary object | Deformed object (Keep Thickness = On, Use Waterlevel = On)




Modifier stack of object after performed deformation

## Group Deformation

### Offset Surface

Allows you to set how far vertex should be standoff from the preform surface after the projection. When checked **Normal Correction** shifting occurs along the normal of surface at the point of intersection with the projection ray, otherwise the shifting occurs along the projection ray.

### Add Modifier in Stack

When turned on, adds a new **EditPoly** modifier to the modifiers stack, and stores therein the produced deformation. If turned off, adds changes to the upper modifier if it is the **EditPoly** and enabled, otherwise a new modifier still added to the stack.

### Apply

After pressing button the utility performs deformation object(s) in accordance with the specified parameters.

**Tip** Apply button remains disabled until the conditions of possibility to execute utility are fulfilled:

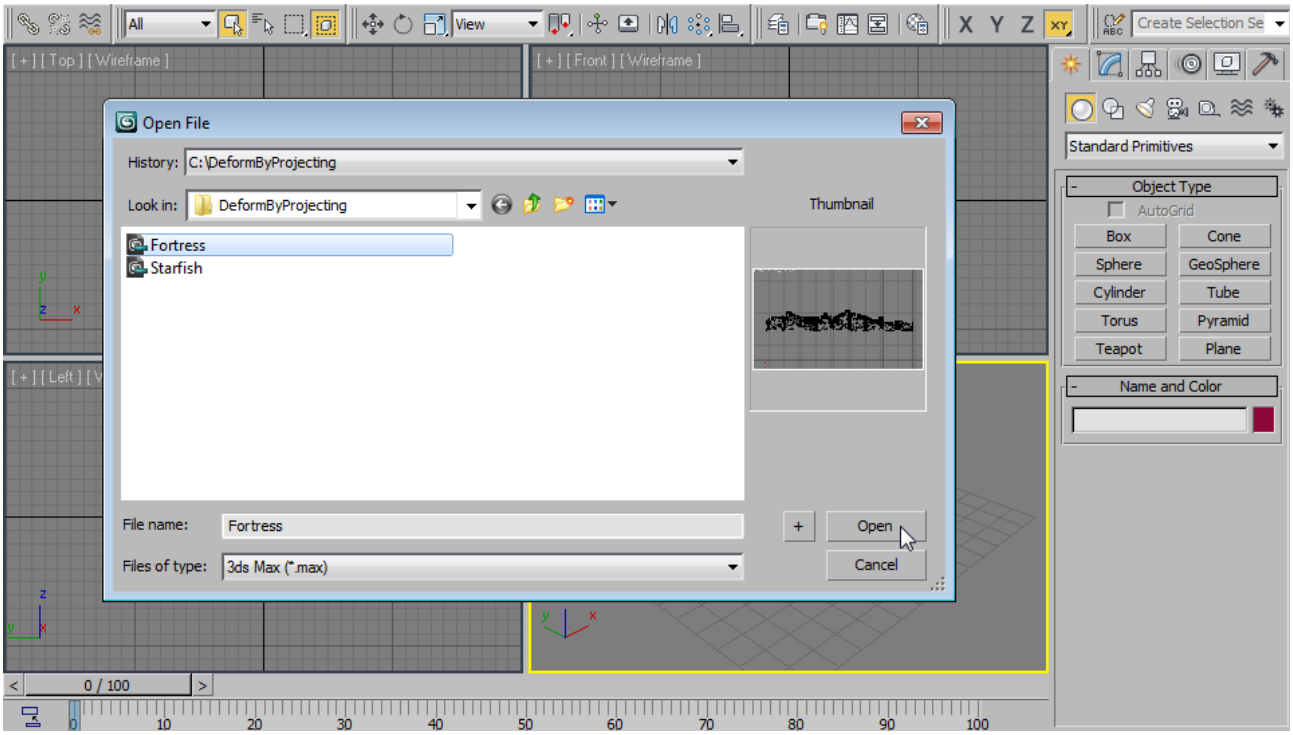
1) The preform surface is set
2) One or more objects to deform are selected

### Mode1 / Mode 2

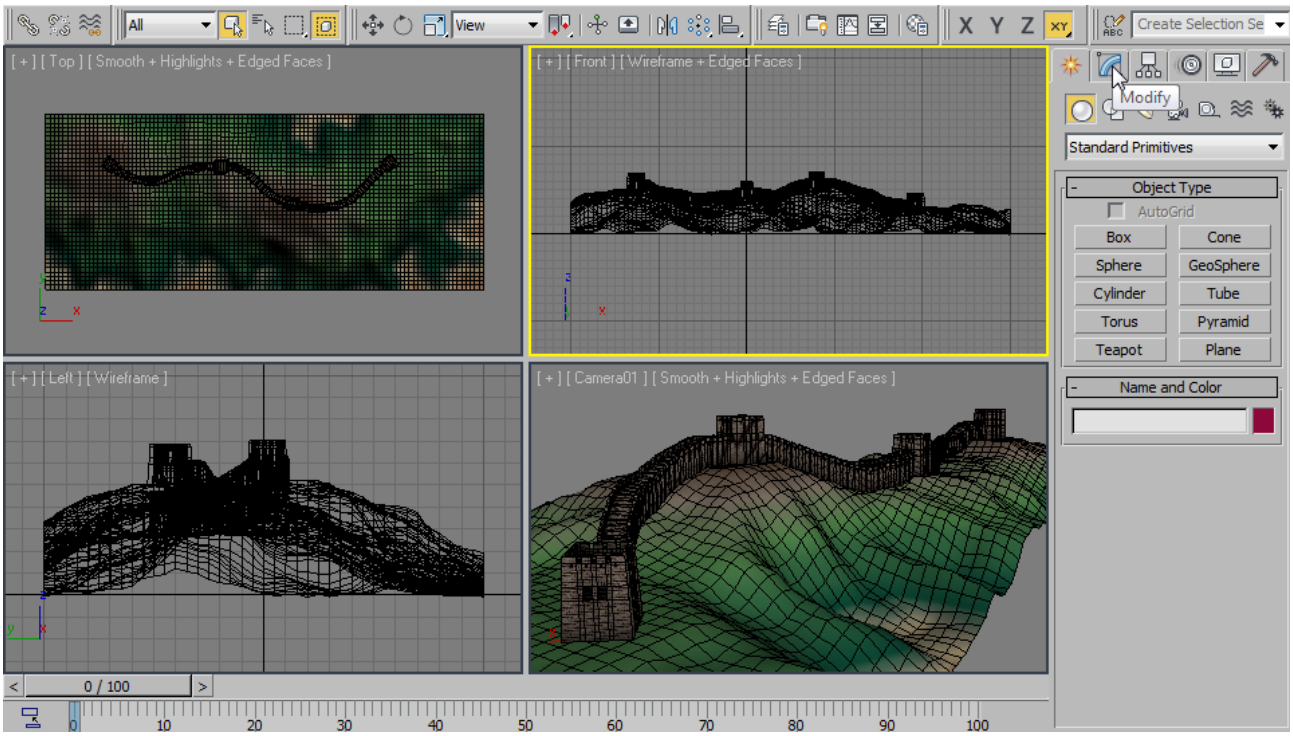
Let you choose the mode of applied deformations.The differences between modes are the different ways of storing information about the deformations in the EditPoly modifier. **Mode 1** performs the entire embed the deformed mesh in modifier. This mode provides high speed and average memory usage. **Mode 2** performs a deformation via the relative moving of vertices. It allows to interact with modifiers located below in the stack. This mode not recommended for applying to objects containing more than 5000 vertices, because uses a very large amount of memory to store the changes in the EditPoly modifier.

## Step-by-step utility usage

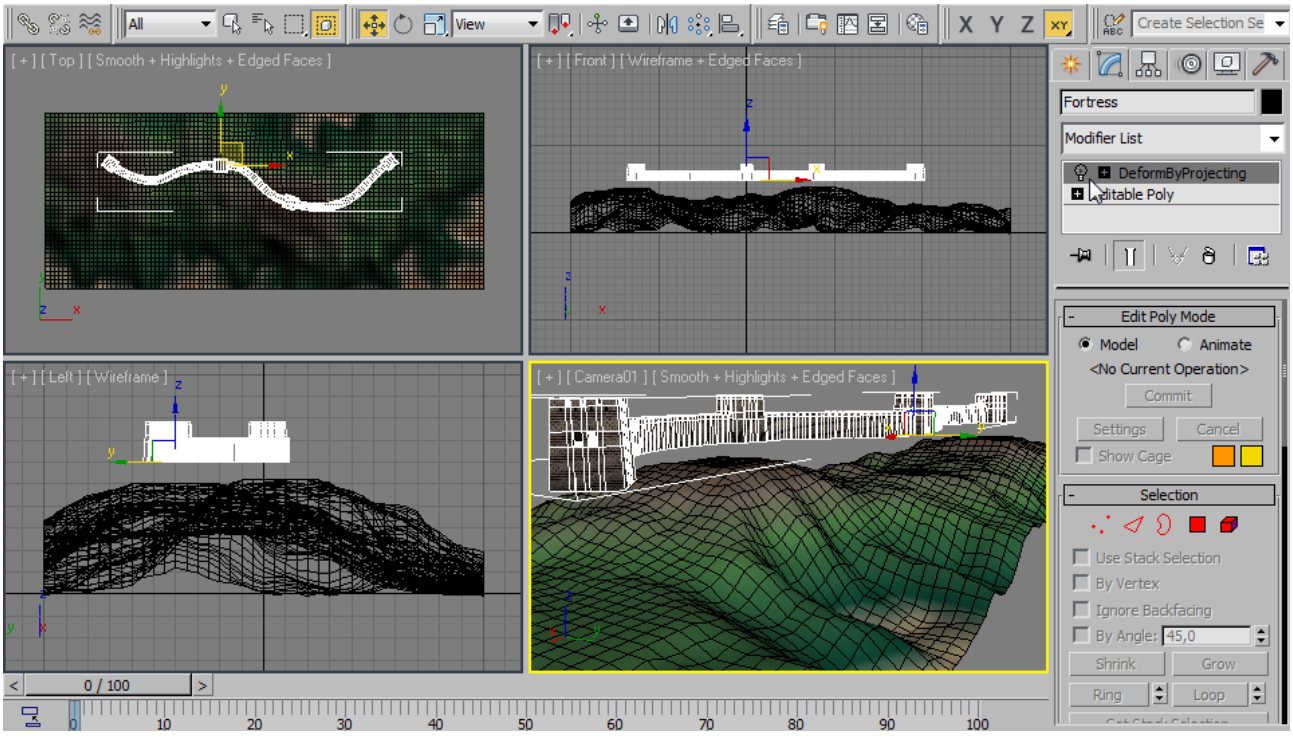
1) Open file Fortress.max



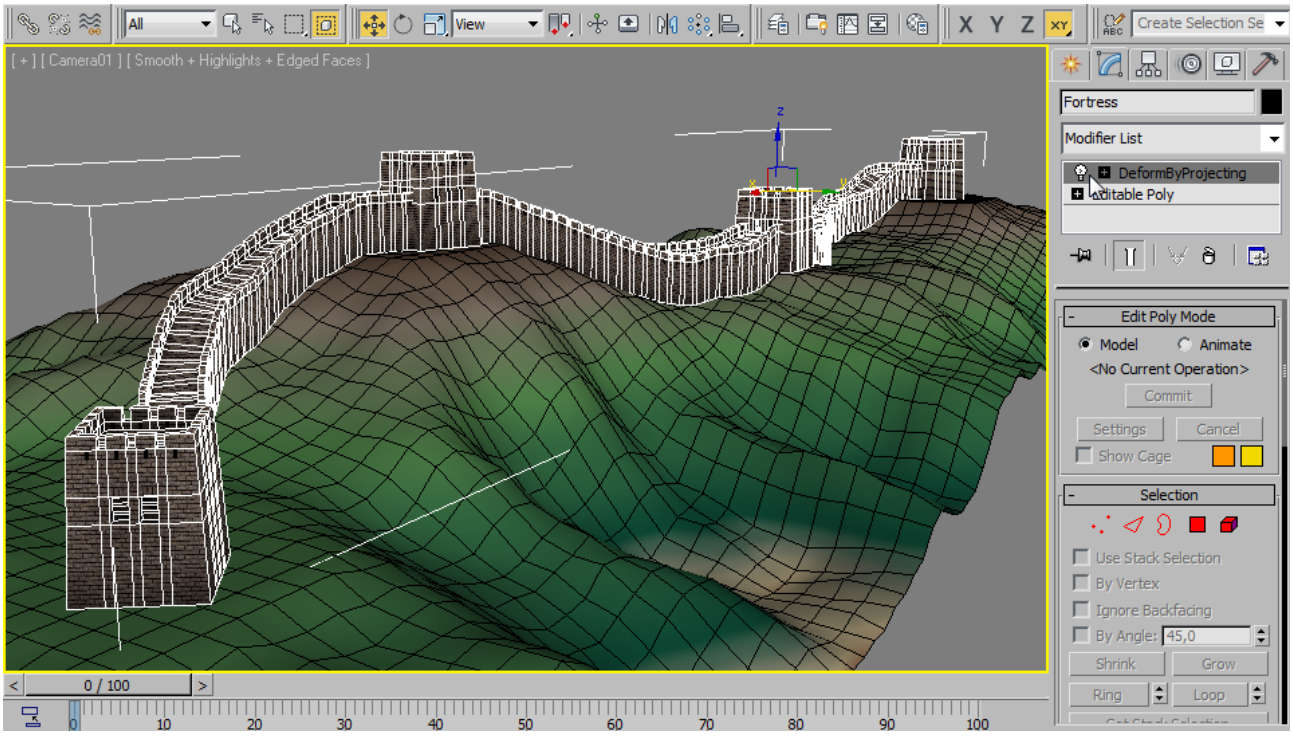

2) Go to Modify panel.



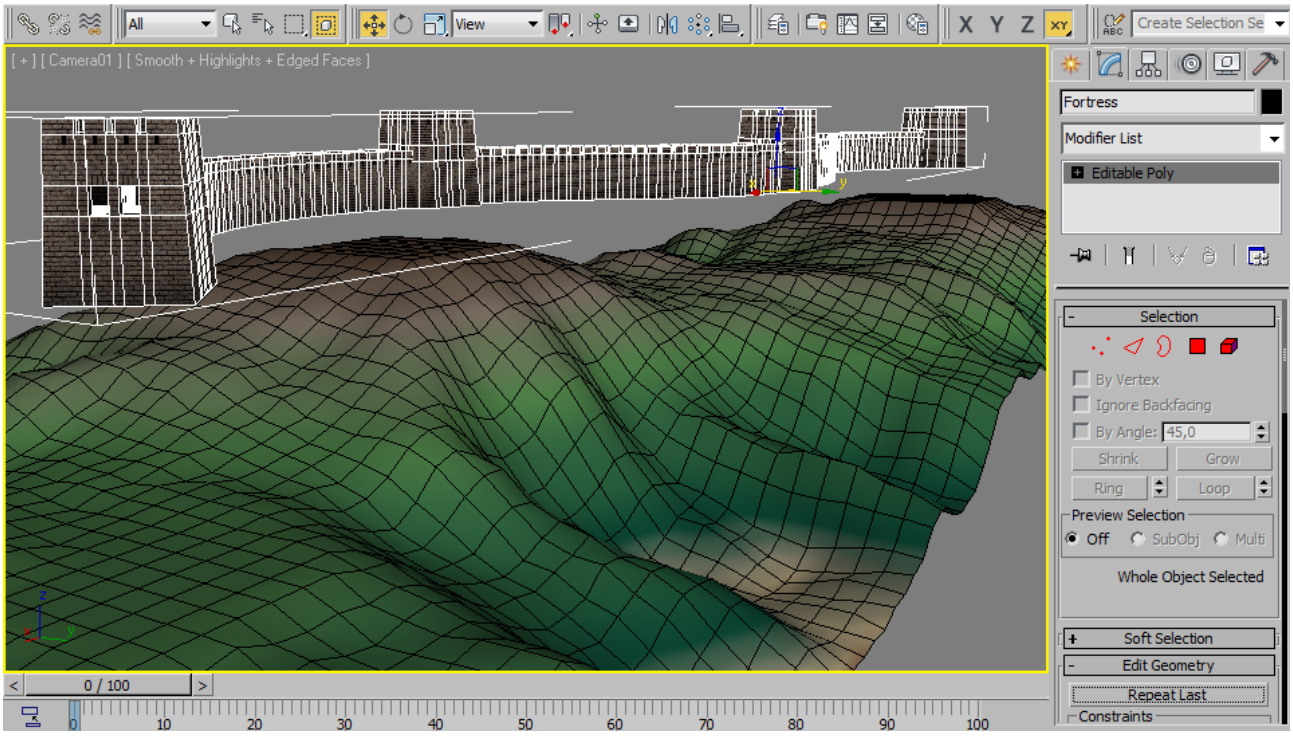
3) Select the object Fortress in the viewport. In the stack of modifiers, select modifier DeformByProjecting and turn off the , the modifier will be disabled and Fortress object change the form straightened in the horisontal plane.



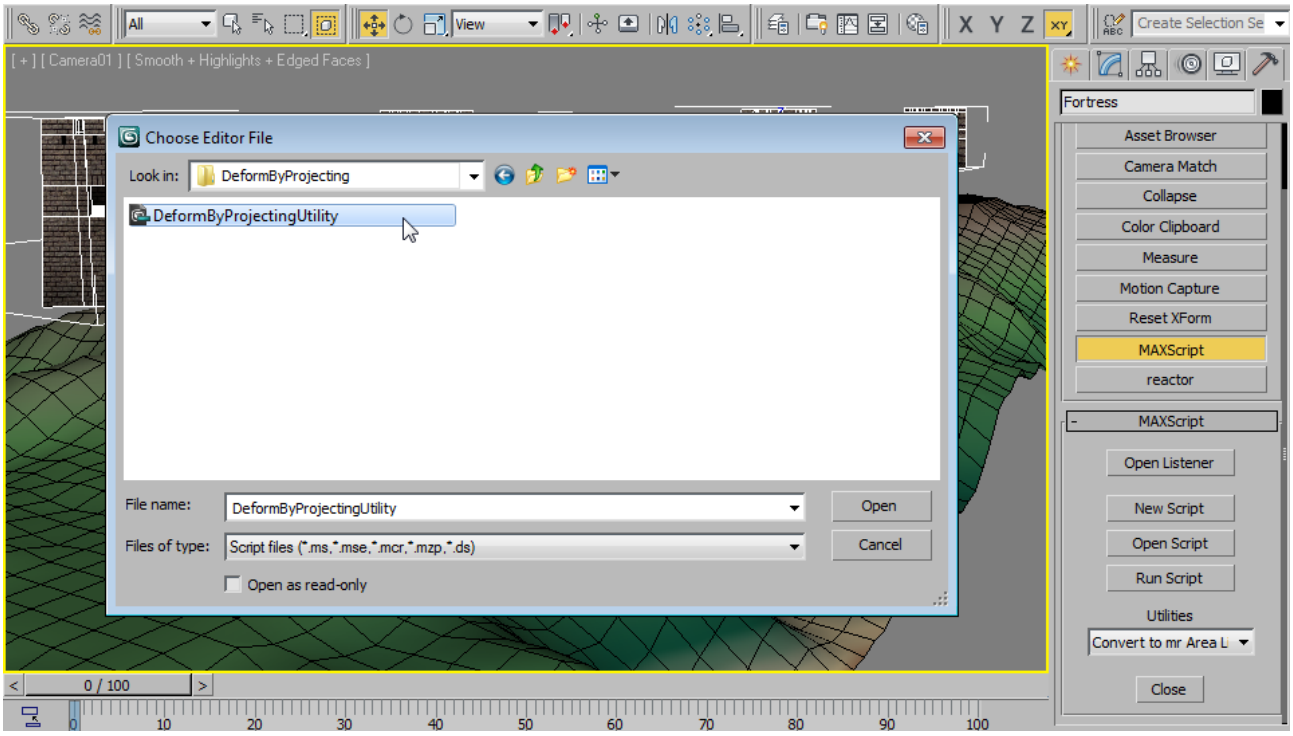

4) Turn on the , modifier DeformByProjecting will be enabled and the Fortress object will take the landform of the Terrain object again.



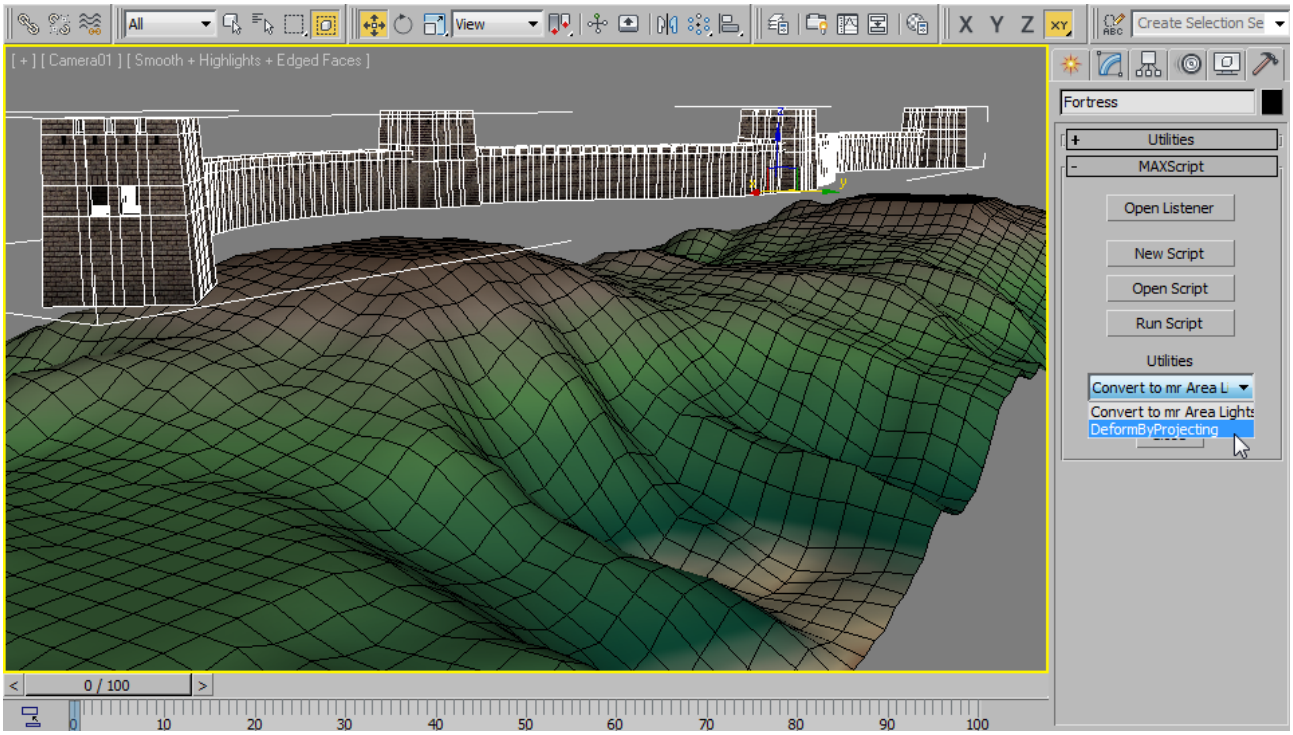
5) Now, we will remove modifier and apply anew deformation using utility. Click , DeformByProjecting modifier will disappear from the stack and object Fortress will be straightened.



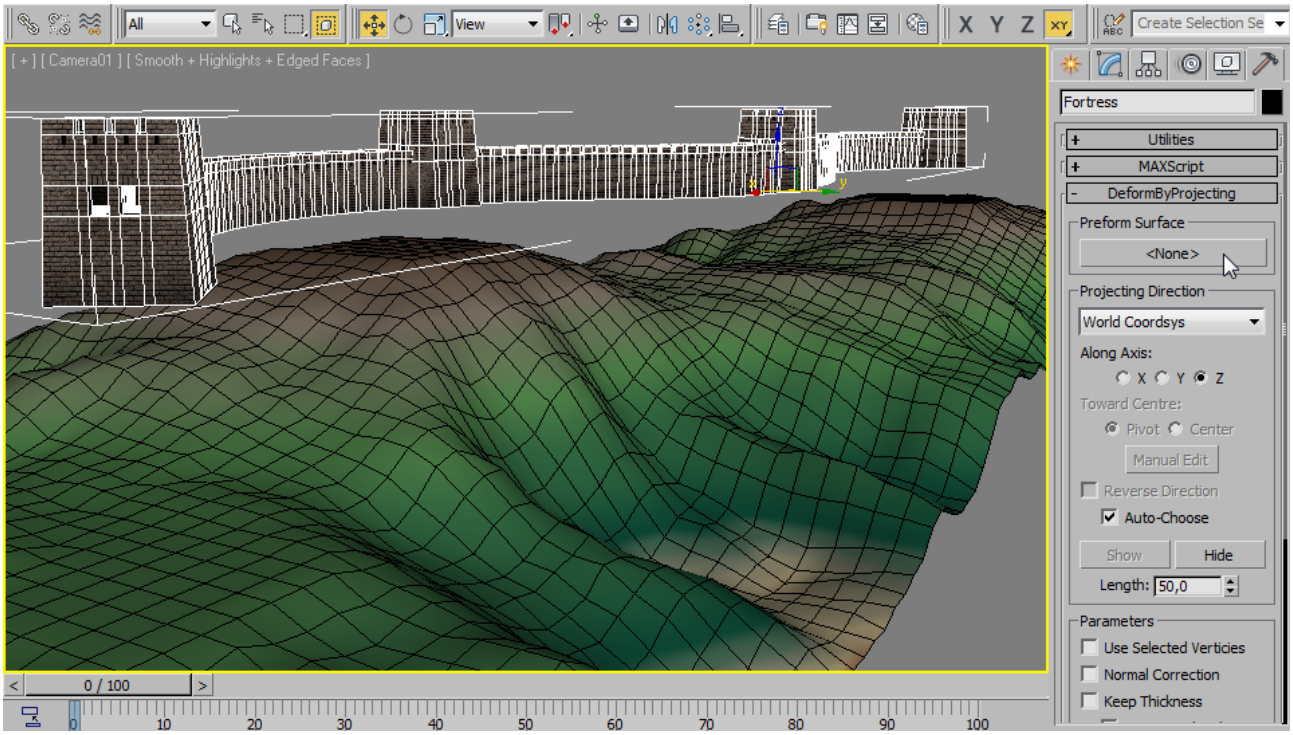

6) To start the utility do the following steps. Go to Utilities panel, select section Maxscript. Click Run Script, in the opened window (Choose Editor File) to find the file DeformByProjectingUtility.mze and click Open.



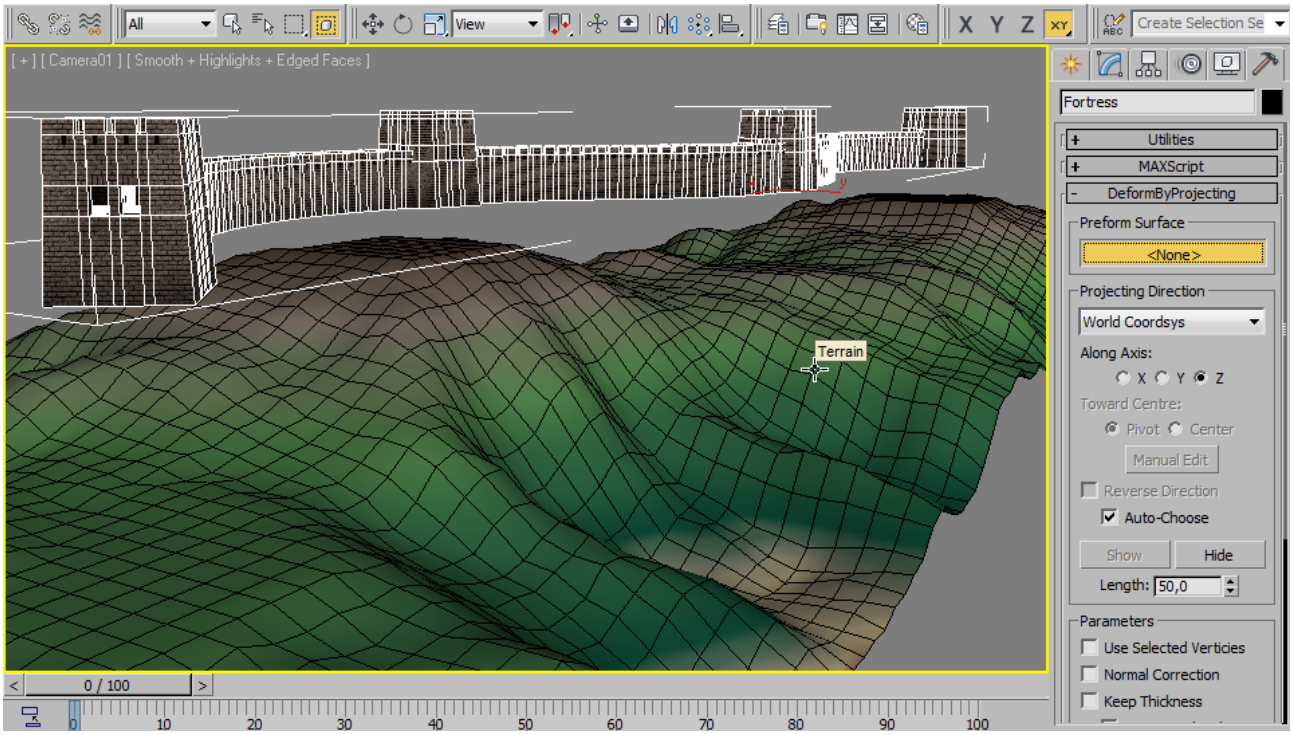
7) In the Utilities drop-down list choose DeformByProjecting.



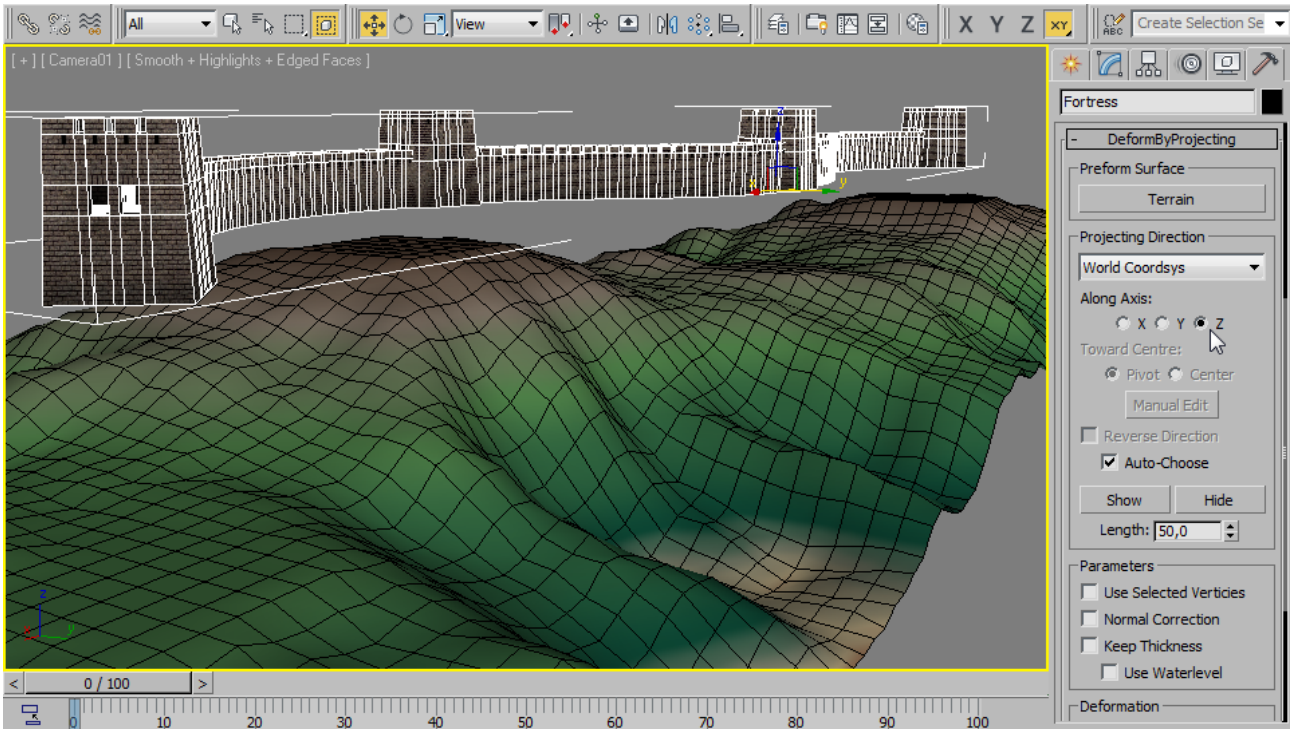

8) Now the utility is started, rollout DeformByProjecting is opened on the panel below. Go to the group **Preform Surface** and press the pick-up button.



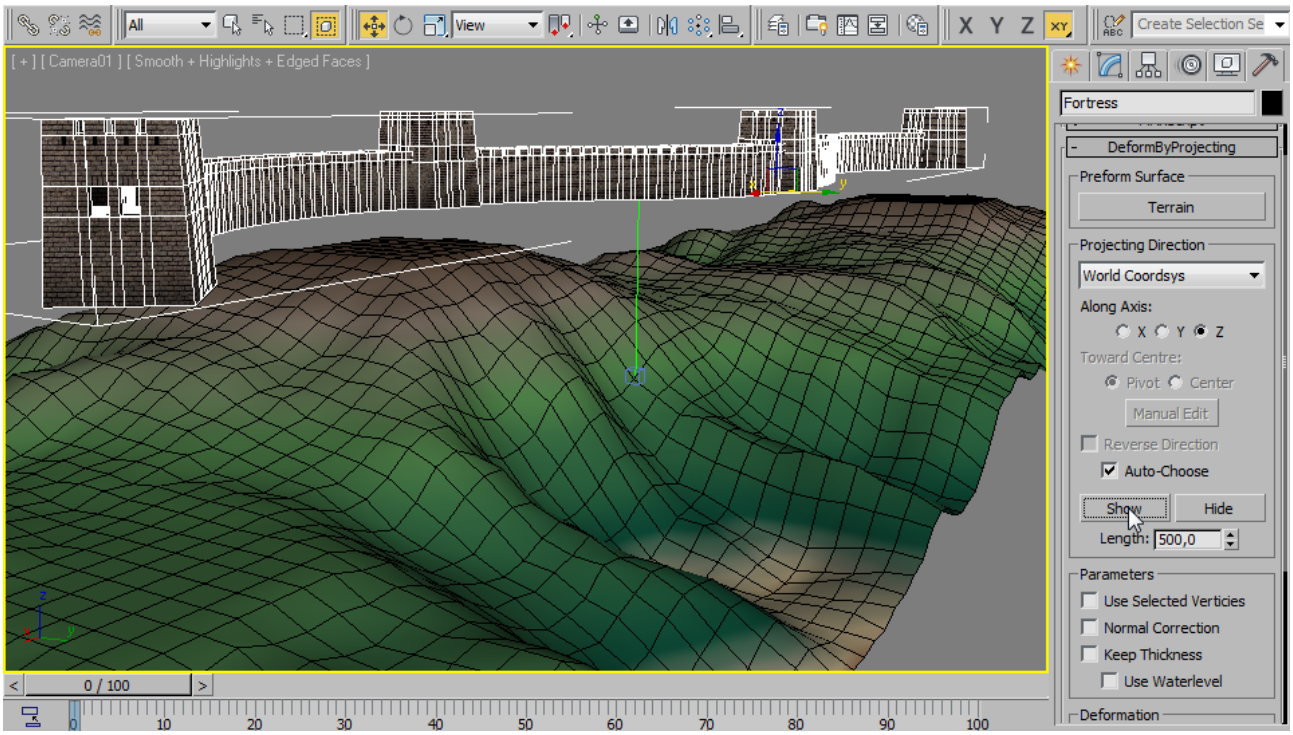
9) Select object named Terrain in viewport.



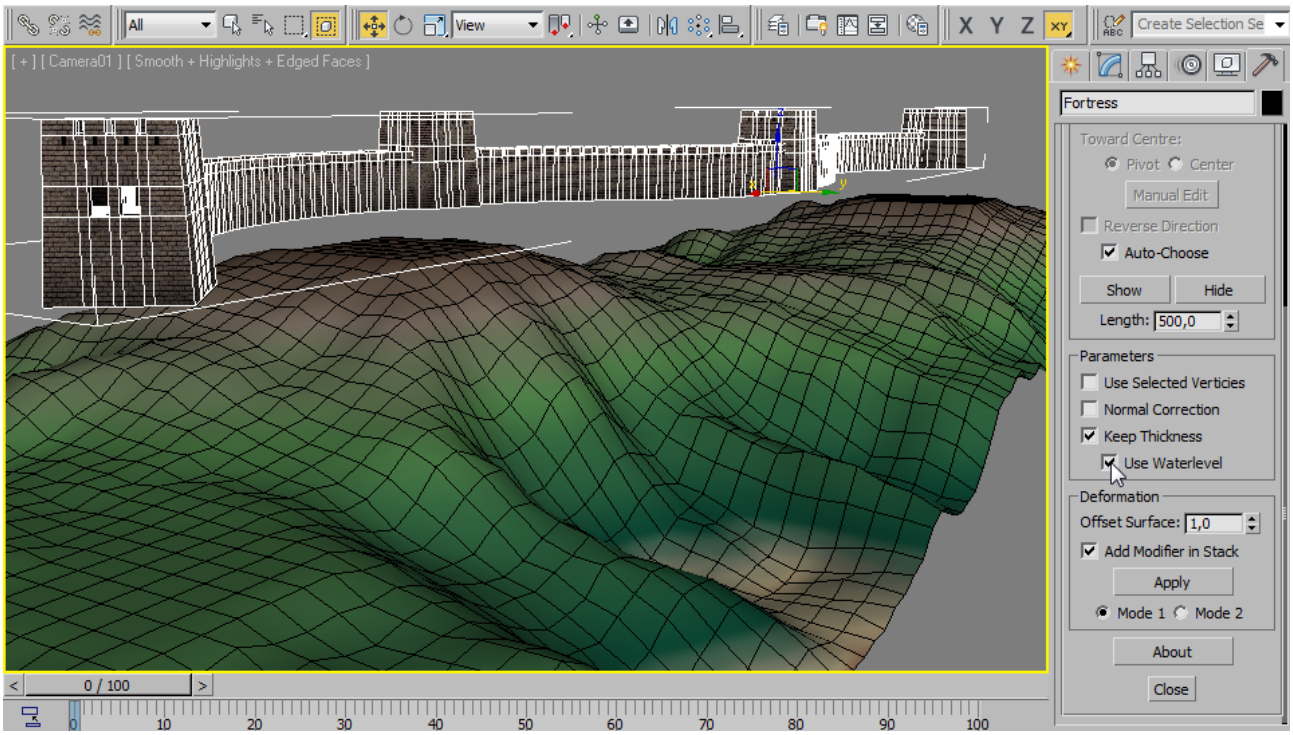

10) Now we can choose projecting direction. We need to projecting Fortress in a downward direction on the Terrain object. This direction corresponds to the Z axis in the world coordinate system. Verify, the type of projecting direction must be selected **World Coordsys**, parameter **Along Axis** must be checked to **Z**.



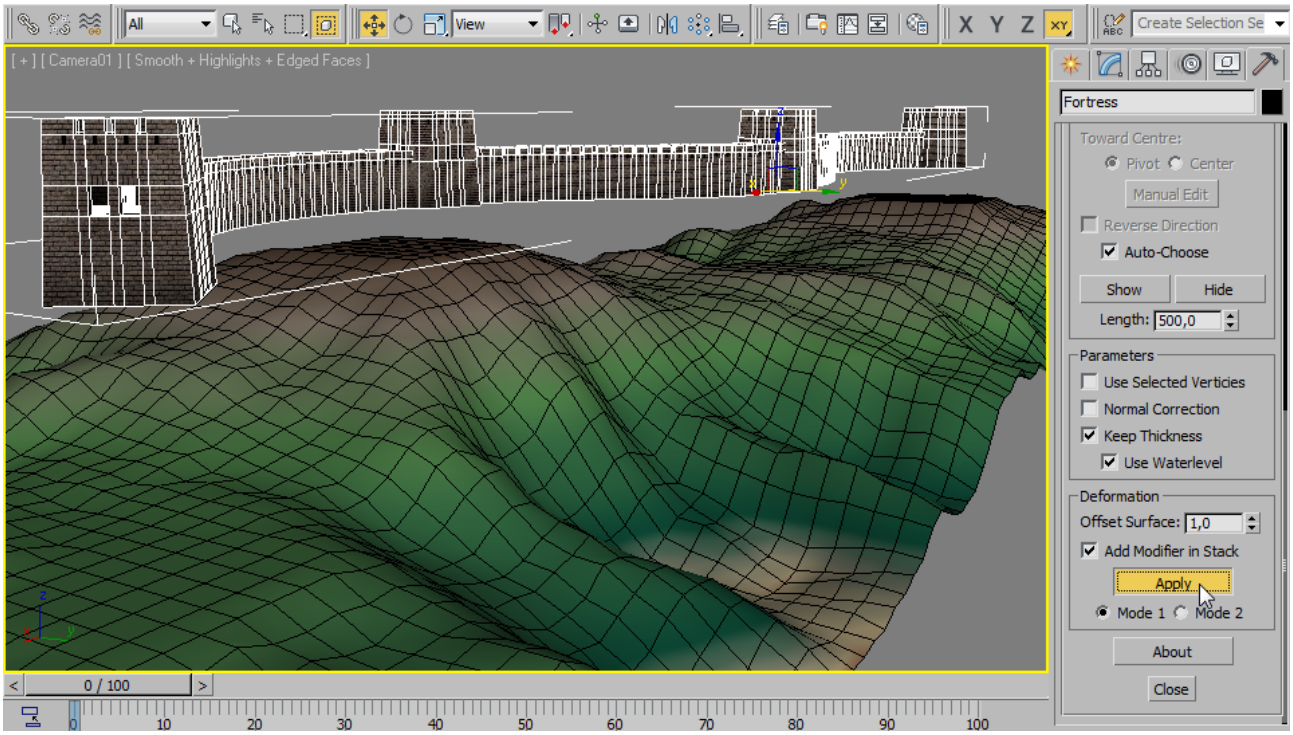
11) If the object Fortress is not selected - select it and Show button will be enabled. Now we can check correct choice of the projecting direction. Enter in the field **Length** - 500 (displayed size of vector) and click **Show** button. In the viewport we will see a green vector that show the current projection direction. We have seen that the direction is correct, you can now click **Hide** button to remove vector.



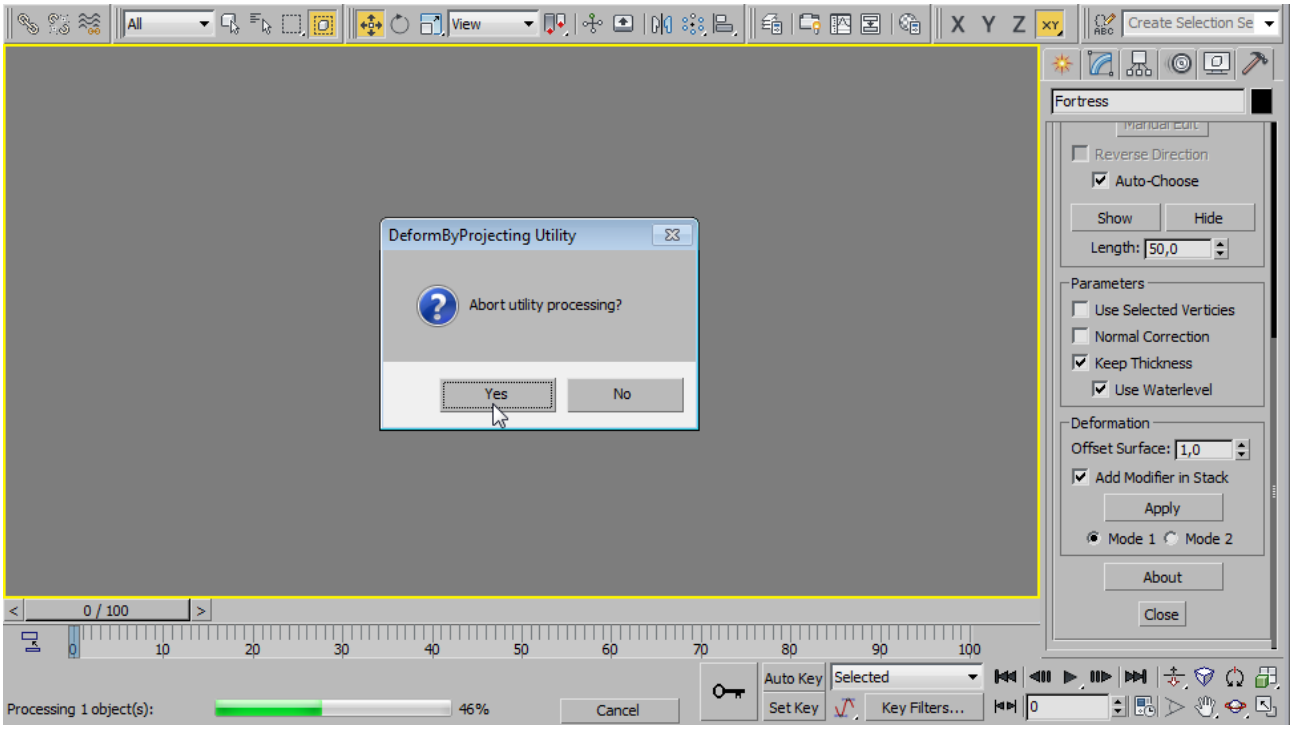

12) Go to the group **Parameters**. For your object Fortress we should keep the volume, turn on a checkbox **Use Waterlevel**. Keep Thickness option will turn on automatically.



13) All the settings are correct and we can proceed to the execution of the script. Click **Apply** button.




14) Execution of the script can be aborted. If you press the ESC key will appear the window with a confirmation (Yes / No) for processing abort. Click No to continue.



15) After completion of the deformation process, the object Fortress will become conform to the landform again.