Introduction

Editing TINs can be a challenging task as it's difficult to identify errors. **TIN repairs must be made carefully, so as to remove bad data without creating new or artificial data that was not collected in the field, and avoid creating an artificial stream that is not representative of the surveyed channel**. Remember that we don't want to over edit a survey so that the channel looks artificial.

Most errors are not recognizable unless the surrounding area is taken into consideration and even then it is difficult to determine whether the error is significant and worth repairing. In many cases, the natural "uncertainty" of the survey data will account for small errors, but larger survey "blunders" must be repaired.

Finally, it can be difficult to determine when a TIN repair session is complete. A balance must be struck with finding and repairing all of the major errors in the TIN while being efficient. The exercises in this document provide a chance to practice the skills learned in the TIN editing tutorial and improve your ability to accurately and efficiently edit a topographic TIN.

Objectives of this Tutorial:
Apply the lessons from the TIN Editing Tutorial on additional practice TINs and be able to:
- o Identify TIN errors in a survey
- o Repair TIN errors in a survey

Required Datasets
Three datasets will be used in these exercises--please open each one as instructed in the exercises.

Survey Geodatabases (3)
- Site 1: SurveyGeoDatabase_Transformation.gdb (CBW05583-248063)
- Site 2: Wenmaster-000195_2013.gdb (WENMASTER-000195)
- Site 3: SurveyGeoDatabase.gdb (CBW05583-001487)

TINs (3)
TIN_original (3)

Site Metadata

Site Name 1:   CBW05583-010495
Projection: UTM 11N
Watershed: Tucannon
Visit Year: 2014
Visit ID: 2262

Site Name 2:   CBW05583-0020943
Projection: UTM 11N
Watershed: Lemhi
Visit Year: 2014
Visit ID: 2612

Site Name 3:   JDW00001-Lower Owens 2
Projection: UTM 10N
Watershed: John Day
Visit Year: 2014
Visit ID: 2770

Instructions

Getting Started

1. **OPEN** the "Advanced_TIN" folder using Windows Explorer.
2. **OPEN** the first exercise map document in ArcGIS.
   a.   **Advanced_Tin_1.mxd (in the Advanced_Tin_1 folder)**
3. When you are finished, move on to the second exercise map document, then the third.
   a. **Advanced_Tin_2.mxd (in the Advanced_Tin_2 folder)**
   b. **Advanced_Tin_3.mxd (in the Advanced_Tin_3 folder)**

TIN Review and Editing

In each exercise, you will review various parts of the survey, list errors in the worksheet provided, and repair each error. It is okay to repair each error as you find it, but just make sure you list each one as well. There is <u>A KEY</u> to the errors in the surveys and you can make sure you found them all.

HELPFUL TIP
When you are processing your own surveys, it is helpful to have your field notes handy in case you need to reference notes during the repair process.

1. **REVIEW** the Survey Extent and TIN extents:
   a. ***Are there artificial dams at the top and bottom of the site?***

b. *Are there areas where the TIN was interpolated inaccurately due to low density of points?*
Inside meanders and areas lacking survey points are particularly prone to invalid interpolation due to the geometry of sites and should be checked carefully.

c. *Does the remainder of the TIN follow the outer extents of the topo points appropriately (note that control points may be outside of the TIN as these are not used for TIN generation)?*

2. **LOOK** for "Elevation Errors" both within and outside of the stream channel.
3. **REMEMBER** to list the "Errors" in the worksheet and **REPAIR** the errors.
   a. Bust and Sink Points.
   b. Artificial ridges and troughs.
   c. Artificial cross channel dams.
   d. Artificial dams at ends of survey.

4. **CHECK** the Banks and islands for:
   a. Notches and prisms along stream edges.

5. **CHECK** for other errors:
   a. Crossed Hard Breaklines
   b. Any additional areas that look 'abnormal'

6. **CHECK** areas that may be particularly prone to errors:
   a. Side channels, backwaters, and other areas that may have low point densities.
   b. Steep banks.
   c. Complex topography (e.g. braided channels).

7. **CHECK** areas of notable features to make sure they were surveyed accurately.
   a. Big boulders, log jams, or other large features that may have been delineated with breaklines.
   b. Side channel confluences, large meanders, steep stream sections, or other features that may stand out in the TIN or from the site.

IMPORTANT

Any edits you make to the TIN can only be undone to the last time the TIN was saved. It is recommended that you save your TIN often, but thoughtfully, since saving makes the edits permanent. If you do make or save an un-repairable edit, you can always recreate a new TIN from your original data.

FINAL REVIEW OF TIN

1. Once you've completed your initial repairs, **SCAN** the "TIN" for errors you may have missed or that have become noticeable due to the repairs you've already made.
2. **REMEMBER**, when you make a change to one part of the TIN, the surrounding area will change too.
3. **SAVE** the "TIN Edits" to your TIN.

ADDITIONAL TIN EXPLORATION

1. Since you're currently working in a training environment, it's a good opportunity to play with the TIN editing tools and see how they affect the TIN.
2. For example:
   a. Try **DELETING** a 'good' breakline or node and see how the TIN changes.
   b. **USE** the "Undo since Last Save" command under the TIN EDITING menu to restore your TIN.
   c. Try **ADJUSTING** the location of hard breaklines and seeing what happens when they approach adjacent points.
3. **COMPARE** your edited TIN to a clean version of the TIN using the EFFECTS toolbar.
   a. **ADD** "TIN_original" from the "Advanced_Tin_1, 2 or 3" folder (depending on which survey you are working with) to the map.
   b. **USE** the EFFECTS toolbar "Swipe" tool to compare the two TINs.
      i. Remember that the Layer in the Dropdown box is the one you will SWIPE, so make sure it is the top most layer.

Finish and Close
1. On the TIN EDITING toolbar, **SELECT** "Save and Exit TIN".
2. **SAVE** the ".mxd document" with a new name.
3. Once the first TIN exercise is complete, **REPEAT** this process with the "Advanced_Tin_2 and Advanced_Tin_3.mxds".
4. **CLOSE** ArcMap.

Resources
ArcGIS 10.1 Help
   http://resources.arcgis.com/en/help/main/10.1

TIN Editing Toolbar
   http://resources.arcgis.com/en/help/main/10.1/index.html#//006000000006000000

TIN 1 Error Worksheet:

Location:	Problem:

TIN 2 Error Worksheet:

Location:	Problem:

TIN 3 Error Worksheet:

Location:	Problem: