

The map displays the Greater Yellowstone Ecosystem, spanning across Montana, Idaho, and Wyoming. A large, irregularly shaped area in the center, representing the grizzly bear habitat, is outlined in a thick black line. This area includes parts of Yellowstone National Park, Grand Teton National Park, and surrounding national forests like the Teton, Shoshone, and Snake River. Major cities such as Helena, Bozeman, Big Sky, and Jackson are labeled. The map also shows various rivers, including the Snake, Yellowstone, and Big Lost, and major highways like I-90, I-15, and I-84. The text 'Motorized Access Analysis for Monitoring Grizzly Bear Habitat in the Greater Yellowstone Ecosystem' is overlaid in the upper center. At the bottom, it says 'For use with ArcGIS 10.x' and 'Revised: Spring, 2014'.

Motorized Access Analysis for Monitoring Grizzly Bear Habitat in the Greater Yellowstone Ecosystem

For use with ArcGIS 10.x

Revised: Spring, 2014

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Introduction: Motorized Access Analysis

This document is designed to assist the end user in performing motorized access analysis when planning Federal projects at a local level in compliance with habitat standards identified in the [Conservation Strategy](#) and [Forest Plan Amendment](#) for grizzly bear management in the Greater Yellowstone Ecosystem (GYE). The Motorized Access Model (herein referred to as the Access model) is a set of geoprocessing tools used to quantify the potential impacts on grizzly bear secure habitat due to federal land-use projects within bear management subunits both inside and outside the Primary Conservation Area (PCA)¹. Motorized access analysis is required as an integral part of the planning stage whenever a proposed Federal project involves the construction, reconstruction, or change in motorized status of access routes (roads and trails) that could potentially result in a reduction of secure grizzly bear habitat inside the PCA. Examples of such project activities might include timber harvest, fuels reduction, or mining and drilling operations.

When used in the project planning stage, the model can help land managers anticipate habitat impacts for any number of alternative configurations in motorized access routes. The user can evaluate the impact of each proposed alternative compared with the current (no action) situation, and when comparing one alternative against another. Output from the model yields measurements for percent secure habitat, open motorized access route density (OMARD), and total motorized access route density (TMARD) for grizzly bear management units inside and outside the PCA. Model results enable managers to determine which alternative best satisfies a set of preferred management criteria and whether grizzly bear habitat standards identified in the Conservation Strategy and Forest Plan Amendment have been met (see appendix C).

The Access model is a complete software package that includes source GIS data layers bundled with geoprocessing tools designed to run in ArcGIS software versions 10.x. This document guides the end user through the installation and execution of the model as well as the interpretation of model results. For illustrative purposes, a fictitious project is presented as an example to lead the user through the various steps needed to compare impacts of a project alternative with the existing (no action) situation. It is assumed the user has minimal familiarity with ArcGIS software.



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¹ The Primary Conservation Area (PCA) depicts an area surrounding Yellowstone National Park where inter-agency grizzly bear recovery and management efforts are concentrated to ensure long-term viability of the Yellowstone population. The PCA is equivalent to the Grizzly Bear Recovery Zone (GBRZ), but the term GBRZ is used when the population is listed under the [Endangered Species Act](#), and PCA when de-listed.


I. Introduction to the Access Model Folder

This section lists the steps to retrieve the Access model and introduces the data content and structure of the Access model folder. The Access model folder contains the necessary scripts, tools, and spatial GIS layers required to conduct motorized access and secure analysis for grizzly bear habitat inside and outside the PCA. The user will need to provide a GIS layer representing changes in motorized routes for each alternative to be analyzed.

The Access model can be run either on your local machine or remotely in the Citrix environment, and is compatible with ArcGIS versions 10.0 or higher. The Access model folder nomenclature includes a suffix of 4 digits representing the year for which the data is current (for example, *AccessModel_2013*). A lag in time between the current year and model year exists since model data is only updated at the end of each year. At the close of every year, annual updates of motorized routes are submitted and then incorporated into the current grizzly bear Access model by early spring of the following year. The most current version of the model is posted on the T drive of the FS Enterprise File System. For illustrative purposes, we assume that the current year is 2014 and the motorized access data was last updated for 2013.

Retrieve Access Model

1. Access the T-Drive and navigate to
T:\FS\NFS\Collaboration\GrizzlyBearRecovery\GreaterYellowstone\GIS\Data\Current_GBAccess Model
2. Copy the compressed file **AccessModel2013_Arc10x.zip** to your preferred workspace, and use WinZip to un-compress the folder. When uncompressed you will see a folder **AccessModel_2013** (Note: This assumes it is 2014 and the most recent model is 2013. Download more current model if available).


Tip  Do not place the AccessModel folder under My Documents, and avoid any directory with a space in the path. ArcGIS does not handle paths with spaces!

3. Download the **PortalCreekExample.zip** file if you wish to follow the learning example illustrated in this document. Unzip the file and **store the PortalCreekExample folder directly under the AccessModel_2013 folder.**

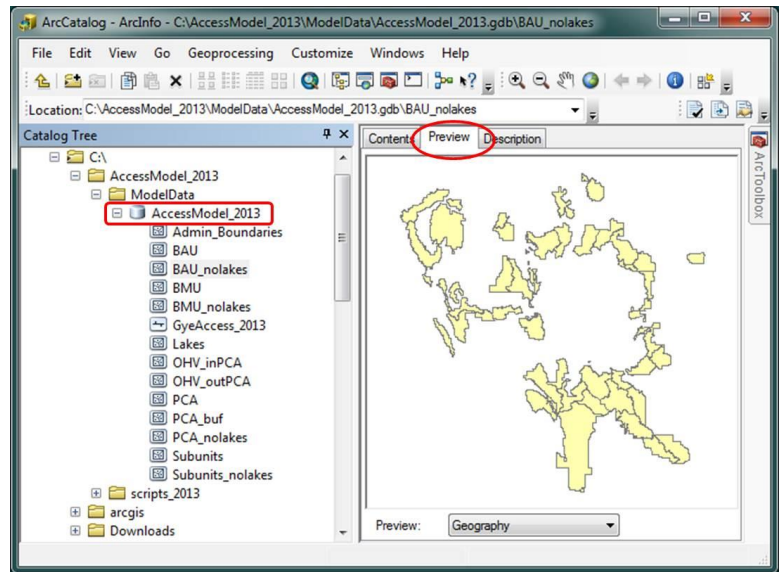
Examine Access Model

The Access model folder includes a geodatabase with source GIS data, a series of python scripts, and a set of customized geoprocessing tools which provides a user friendly interface to execute the scripts and perform the motorized access analysis. Examine the contents of the Access model folder.




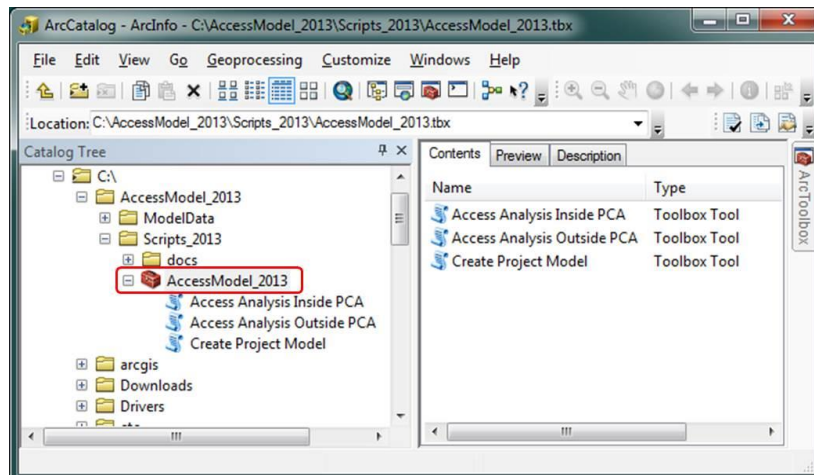
1. *Open ArcCatalog* : click on Start > All Programs > ArcGIS > ArcCatalog10
2. In the Catalog table of contents on the left, browse to the **AccessModel_2013** location and click the plus sign  to expand the folder contents. A folder called **ModelData** stores the input source layers to run the analysis and also serves as the location for all model output. The folder **Scripts_2013** contains embedded python scripts. Finally, the **PortalCreekExample** folder will be listed if you chose to follow step 3 above.

3. Under the **ModelData** folder, expand the contents of the **AccessModel_2013** geodatabase. You will see a series of Feature Classes listed, each representing a different data theme. Preview each feature class by selecting the feature class you wish to preview in the left pane with the Preview tab selected in the right pane.






Notice that a feature class called **GyeAccess_2013** is stored in the geodatabase. It contains linear features representing the most current motorized access routes for the six National Forests and two National Parks in the GYE. Other feature classes worth noting include the Primary Conservation Area (PCA), Bear Management Units (BMU) and subunits, Bear Analysis Units (BAU), and Off Highway Vehicle (OHV) areas inside and outside the PCA.

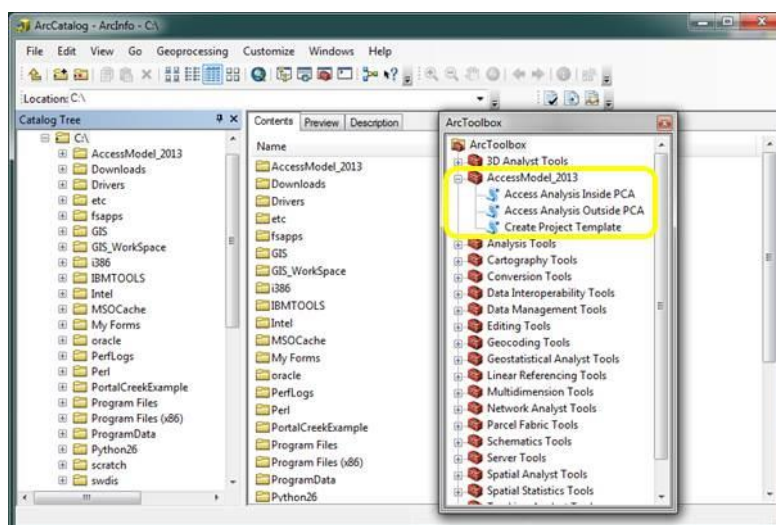
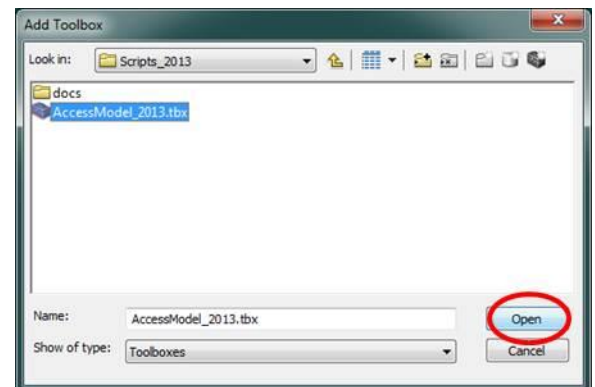
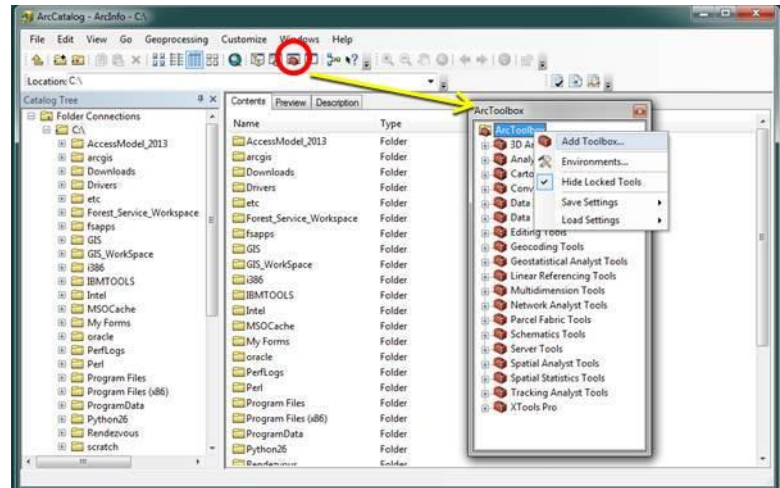
4. Finally, expand the **Scripts_2013** folder and the contents of the  **AccessModel_2013** toolbox. The toolbox contains three distinct analytic tools. In the following sections you will learn how and when to use each of these tools.



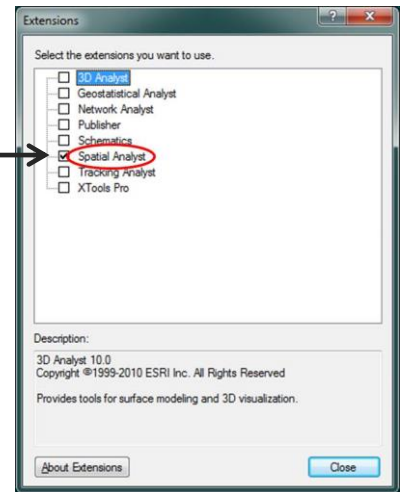
II. Install Access Model Toolbox

This section shows you how to install the AccessModel toolbox. Once installed (via ArcCatalog) it will be readily available whenever you open ArcCatalog or ArcMap.

1. **Open ArcCatalog** : click on Start > All Programs > ArcGIS > ArcCatalog
2. Inside ArcCatalog click on the Toolbox icon  in the upper toolbar to open the ArcToolbox table of Contents.
3. Right-click anywhere in the whitespace of the ArcToolbox table of contents, and select **Add Toolbox**.
4. In the Add Toolbox dialog window and navigate to the **Scripts_2013** folder and select the  **AccessModel_2013.tbx**. Click **Open** to install.
5. The  **AccessModel_2013** toolbox should now appear in the Arc Toolbox table of contents. Expand the contents of the AccessModel_2013 toolbox. All 3 tools in the toolbox are now installed and available for use.



Tip 🖱️ The **Spatial Analyst** extension must be loaded and turned on before you can run the AccessModel tools. In ArcCatalog, open the **Customize Menu** and select **Extensions**. In the Extensions window, make certain the Spatial Analyst box is checked. **Repeat this process inside ArcMap** (Start > All Programs > ArcGIS > ArcMap). Once enabled in both ArcCatalog and ArcMap, the Spatial Analyst extension will remain enabled for all future sessions in ArcCatalog and/or ArcMap. The Access Model tools can now be run from either ArcMap or ArcCatalog.



Congratulations! You have successfully installed the toolbox for the Access model and its associated geo-processing tools. The following sections will review how to run, and in which circumstances you might choose to run, each of these tools.





III. Create Project Template

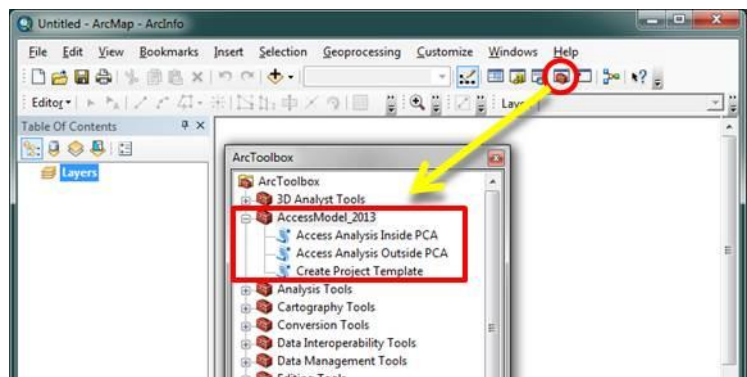
When planning a federal project it is often necessary to compare impacts of proposed actions on grizzly bear secure habitat to existing habitat conditions. The Access model provides a means to evaluate the impact of one or more project alternatives on existing values of percent secure habitat and motorized route density. The first step in this process is to run the **Create Project Template** tool which selects current motorized routes within a buffered area around the user-specified bear management unit where the project is to occur. The user is prompted to select a *Bear Management Unit* (BMU) if the project is inside the PCA or a *Bear Analysis Unit* (BAU) if outside the PCA, and provide a project name which will be used in the nomenclature of the model output.

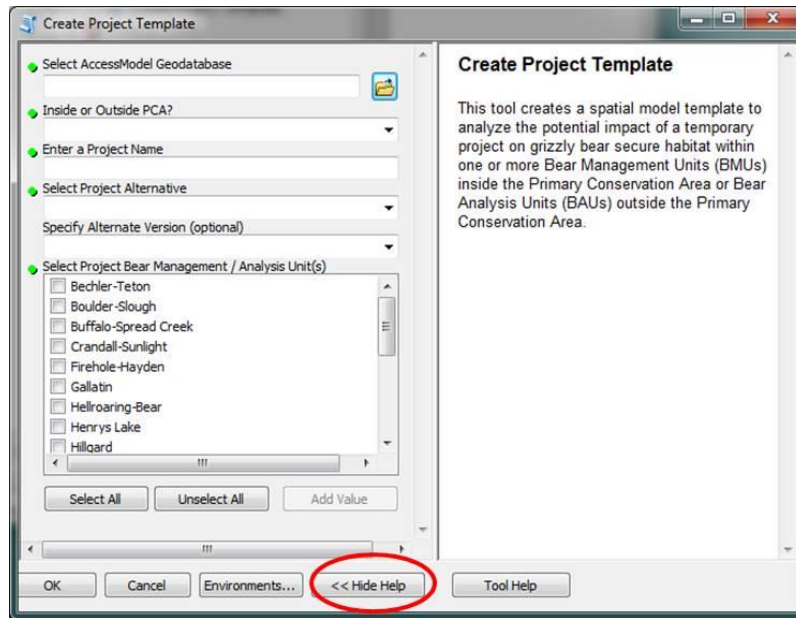
- Objective:**
- 1) Create an initial Project Feature Class of motorized routes for each alternative.
 - 2) Edit the Feature Class(es) to reflect proposed changes in access routes.

Note: For illustrative purposes, it is assumed the user wishes to analyze a proposed project in the Portal Creek area of the Gallatin BMU on the Gallatin National Forest. In this example the **Create Project Template** tool is run twice, once to generate a feature class reflecting existing motorized route conditions, and a second time to generate a feature class which will later be modified to reflect proposed changes due to an Alternative situation. Let's get started!

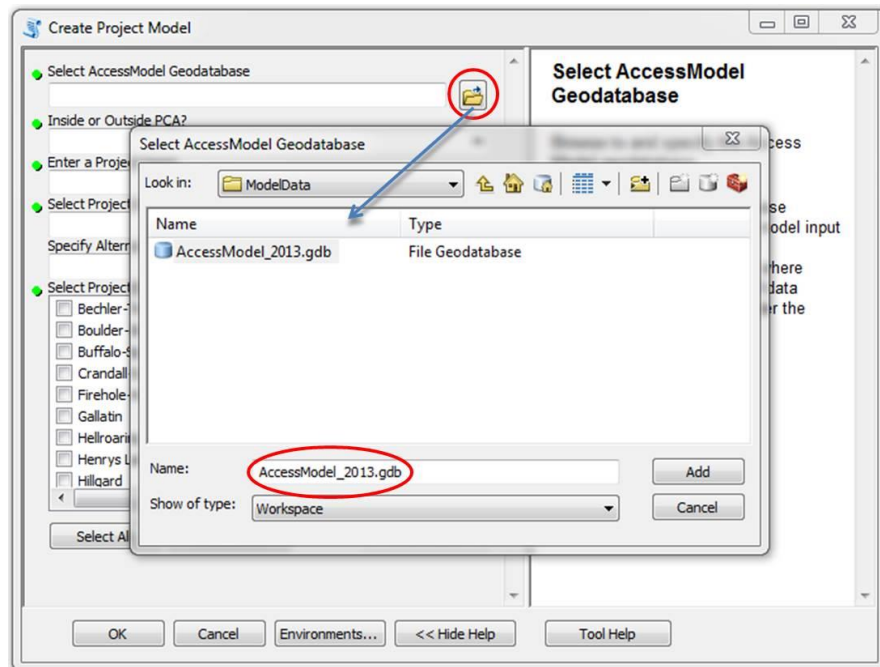
Run Create Project Template Tool

1. Open ArcMap: Start > All Programs > ArcGIS > ArcMap. Click cancel to open a new blank document.
2. Click on the ArcToolbox icon  in the top toolbar to open the ArcToolbox table of contents. Expand the contents of the **AccessModel_2013** toolbox and note the three geoprocessing script tools denoted with the  icon.
3. Double click the **Create Project Template** tool to open the dialog box which prompts the user for a series of input parameters. A green dot indicates a required parameter. If necessary, toggle the **Hide/Show Help** button to display a side window containing general instruction.



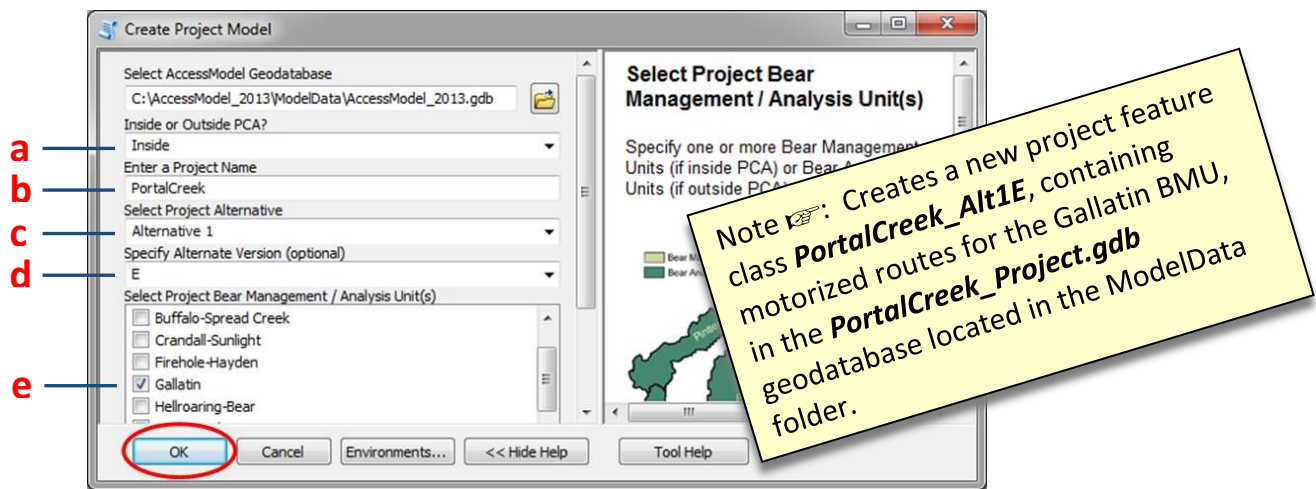


4. The first parameter prompts the user for the Access Model Geodatabase which contains input GIS layers needed to run the analysis. Use the browse folder icon to navigate to and highlight the **AccessModel_2013.gdb** geodatabase located under the Model Data folder. Click **Add** to select.



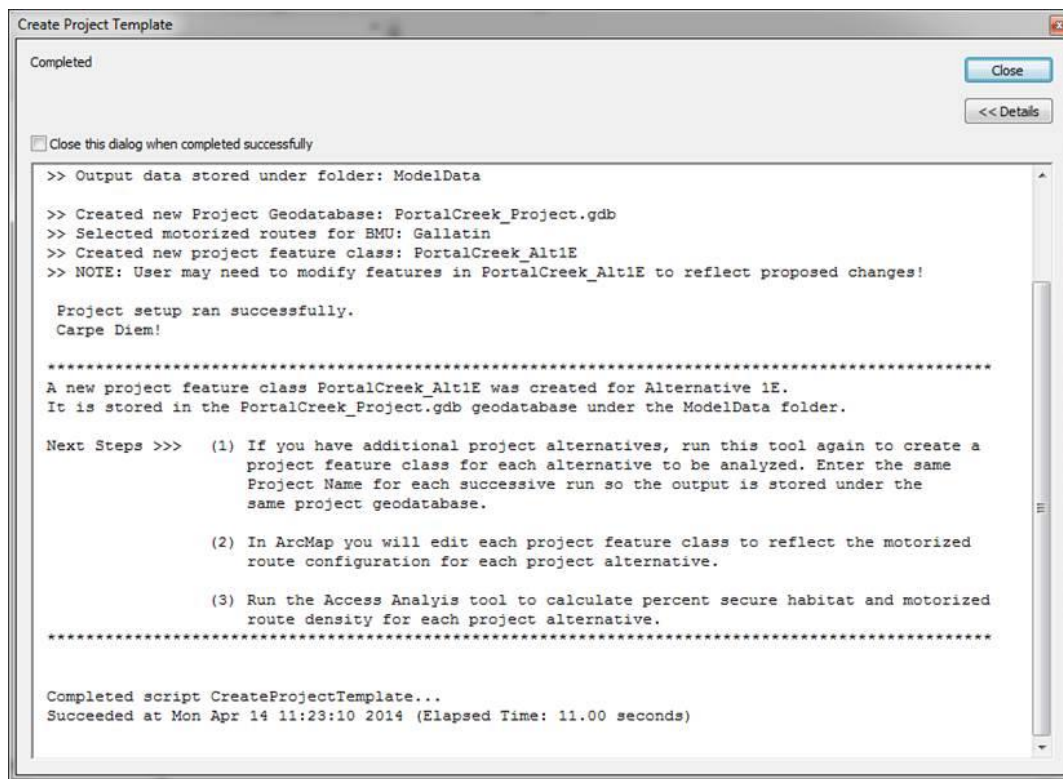
5. Specify the remaining parameters for your project. In this example we will create an access feature class reflecting existing motorized conditions which we will call **Alternative 1E**:
 - a. Select **Inside** to indicate that the project occurs inside the PCA.

- b. Enter a *Project Name* excluding blanks and special characters. In this example, enter **PortalCreek** as the *Project Name*. (No blanks or special characters).
- c. Under *Select Project Alternative* choose **Alternative 1**.
- d. Specify the *Optional Alternative Version* as **E** to denote that Alternative 1 will represent “Existing” motorized conditions.
- e. Finally, select a Bear Management Unit (BMU) if the project is inside the PCA or a Bear Analysis Unit (BAU) if outside the PCA. In the Portal Creek example we select the **Gallatin** BMU. (Note: More than one unit may be specified if the project area spills into an adjacent unit). Click **OK** to execute the tool.

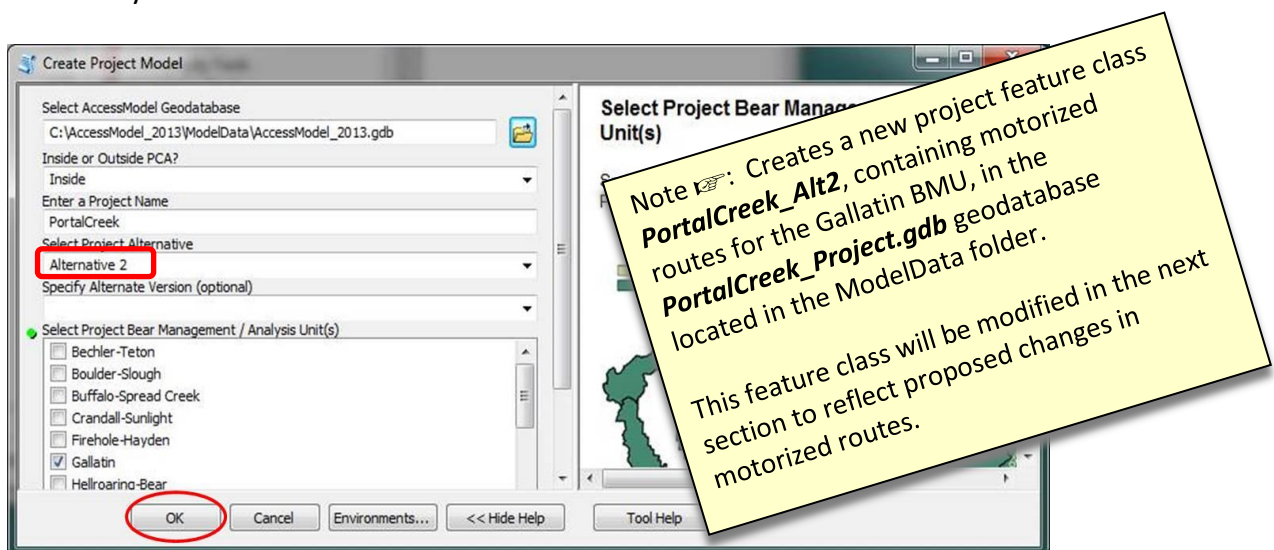


6. A console window will open showing progress of the model; listing various GIS layers created and where they are stored. The model typically takes 2 to 10 minutes on a local machine and longer if run in the Citrix environment. When the model is finished you can look over the list of additional steps that are listed and click on Close when done.

Tip If you wish, you can save the contents of the console window and store it as a log file. To do this, scroll to the top and select all of the text with your mouse and click Ctrl-C (press the C-key while holding down the Control key). Open a text editor such as WordPad and paste the contents. Name your log file accordingly and store it in the Model Data folder.



7. Close the console window.
8. Repeat the process (steps 2 to 7) to create a second project feature class, this time representing the Alternative scenario. Your input will be the same as before, except you wish to specify *Alternative 2* for the project alternative. You can leave the alternate version blank if you wish.



Project Template Output

The *Create Project Template* tool created a project geodatabase with feature classes representing access routes within the specified BMU for each alternative. In the above example, the tool was executed twice, each time providing *PortalCreek* as the project name. This resulted in a project geodatabase called **PortalCreek_Project.gdb** stored under the ModelData folder. The project geodatabase can be thought of as a folder or container for all GIS spatial layers associated with the project. In this example it contains two feature classes: **PortalCreek_Alt1E** and **PortalCreek_Alt2** which will store the configuration of motorized routes associated with existing conditions (Alt1E) and an alternative scenario (Alt2).

The **PortalCreek_Alt1E** feature class was generated to provide a baseline of existing grizzly bear habitat conditions (the “no change” scenario) for comparison with alternative conditions. At this point, the two feature classes have different names but are identical in content in that they both contain line features representing the existing (pre-project) configuration of motorized routes for the project area. Both feature classes will serve as input for the motorized access analysis which estimates percent secure habitat and percent route density (Section V). However, before the analysis can be performed, the **PortalCreek_Alt2** feature class will need to be modified so that its features represent the alternate configuration of motorized routes proposed in Alternative 2.

The next section gives instruction on how to edit route features in a project feature class. For illustrative purposes it continues with the example of the fictitious Portal Creek project.



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IV. Edit Project Alternative Routes

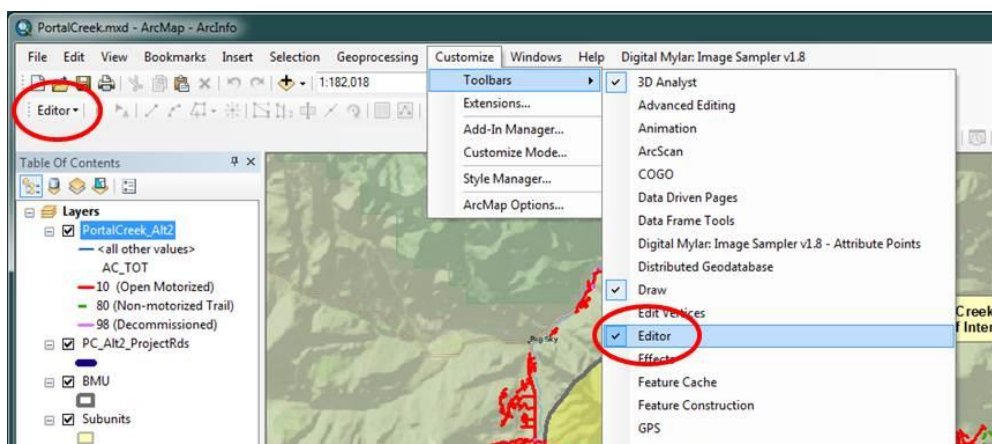
This section shows the user how to edit a project feature class so it reflects the changes in existing motorized routes proposed by a project alternative. It is assumed you have already run the *Create Project Template* tool and have created one or more new project feature classes for specific project alternatives. The example below continues with the fictitious Portal Creek example from the previous section and assumes you have created the **PortalCreek_Alt2** feature class. Supplant your own project data if you are not following the Portal Creek example.

Note 1: For illustrative purposes, assume Alternative 2 of the Portal Creek example calls for the construction of two new temporary motorized routes and the temporary “re-opening” of an existing decommissioned road in the Portal Creek drainage of subunit #3 in the Gallatin BMU inside the PCA. You wish to determine the potential impact on grizzly bear secure habitat and motorized route density due to these changes. First, you must edit the **PortalCreek_Alt2** project feature class to reflect these proposed changes in motorized routes.

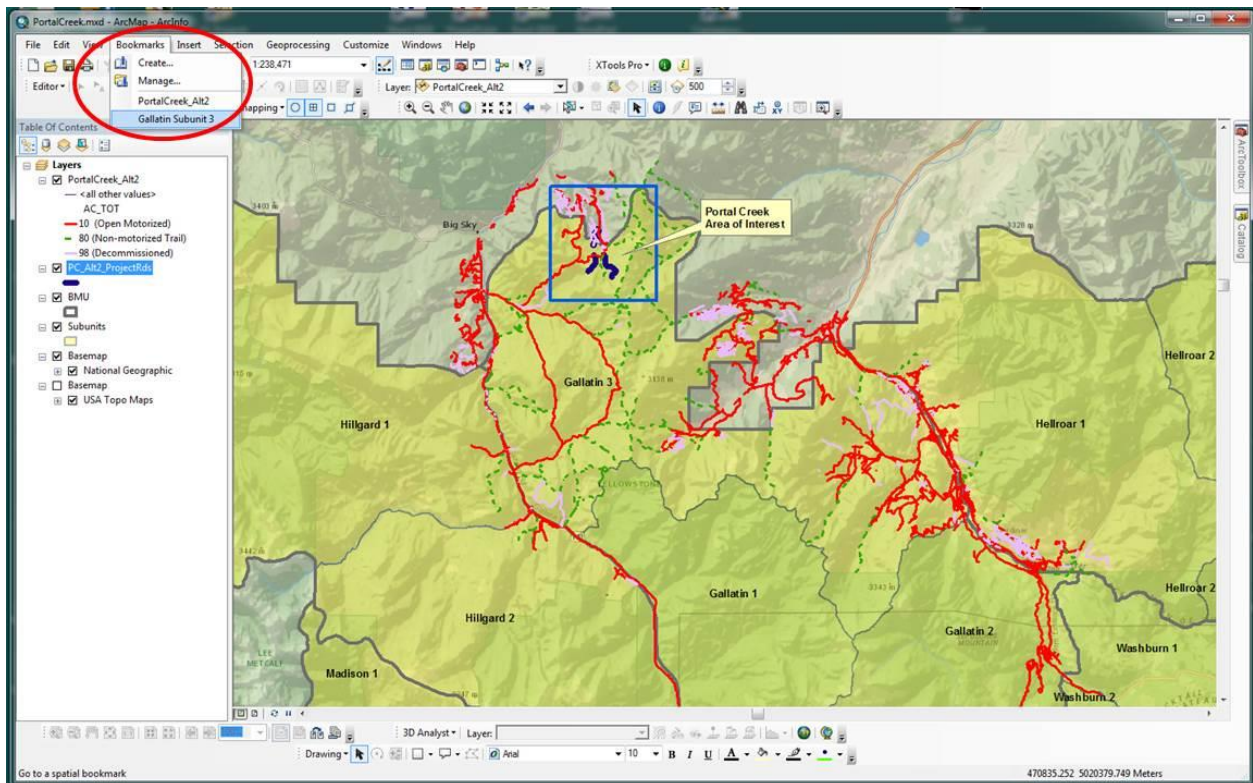
If you wish to execute the following steps with data from the Portal Creek example, you must have downloaded and unpacked the **PortalCreekExample.zip** sample data folder from the T-Drive. (Refer to step 3 on page 2 of this document). Otherwise, follow this example as a mere guideline, substituting PortalCreek with your own project name.

Objective: Edit a project feature class to reflect changes in motorized routes due to a proposed alternative.

1. Browse to and open the **PortalCreek.mxd** map project under the **PortalCreekExample** folder.
2. Make sure that the Editor Menu is available in the upper toolbar. If not, from the **Customize** menu click on **Toolbars** and check the box next to **Editor**.



3. Zoom to the area of interest by clicking on the *Gallatin Subunit 3* bookmark under the **Bookmarks** menu.

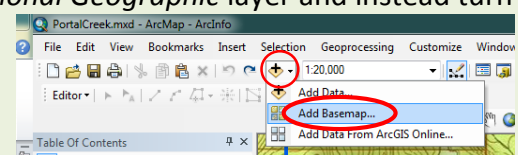


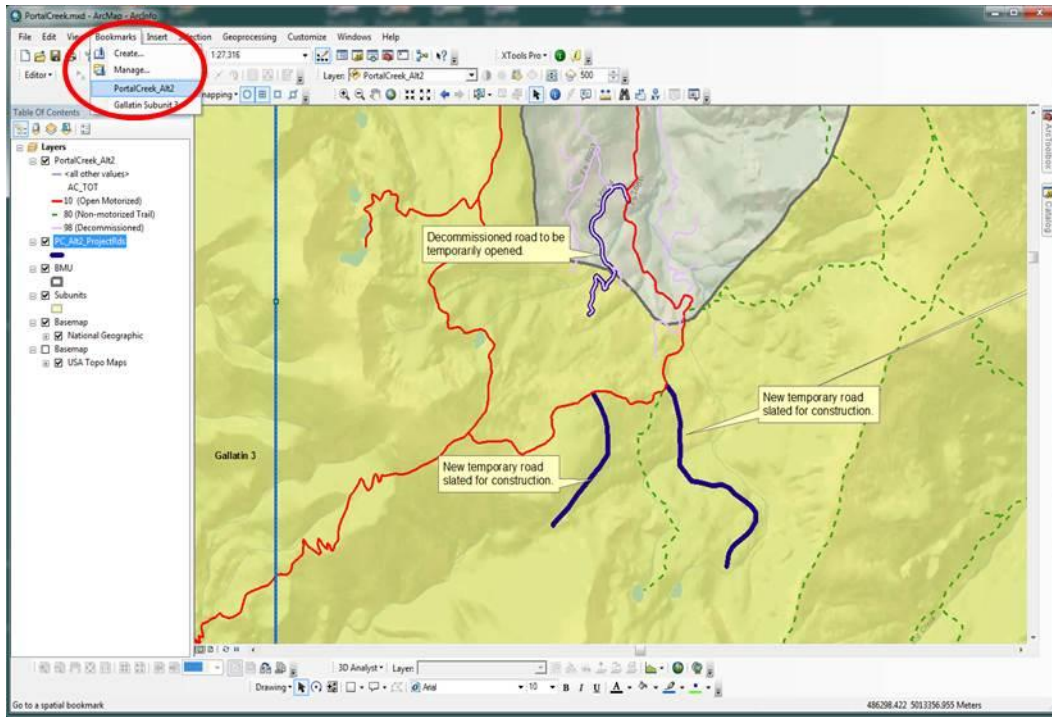
The map view displays the **PortalCreek_Alt2** feature class which represents all existing routes within a buffered area of the Gallatin BMU. You will edit the road features in the **PortalCreek_Alt2** layer to reflect changes in motorized routes associated with Alternative 2. The **PC_Alt2_ProjectRds** shapefile was provided by the Forest Roads Engineer and identifies the road changes proposed in Alternative 2.

2. Zoom to the area of interest by clicking on “**Portal Creek_Alt2**” view from the **Bookmarks** menu. Three road features displayed as thick dark blue lines were provided by the Roads Engineer to identify the two new routes proposed for construction and the existing decommissioned road to be temporarily re-activated. Overlain on these are the existing routes from the project feature class.


Tip If you like, you can display a more detailed basemap for location reference. In the ArcMap Table of Contents, turn off the *Basemap>National Geographic* layer and instead turn on the *Basemap>USA Topo Maps* layer.

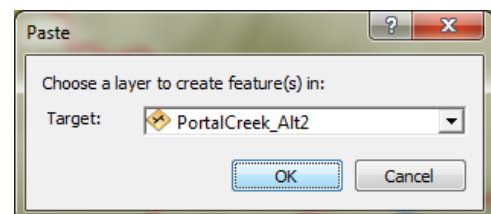
You can add other basemaps by clicking on the drop-down arrow next to the Add Data tool. These are web-served, so display time may be slow.




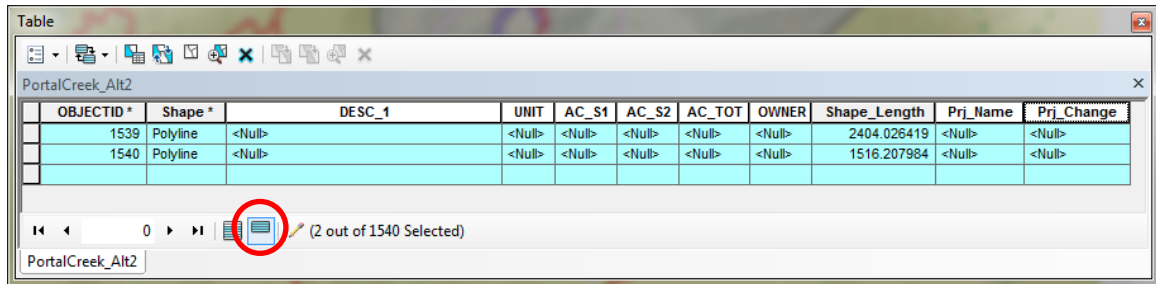


The 2 new roads proposed for construction will be copied from the Engineer's shapefile to the project feature class. The decommissioned route already exists in the project feature class, but must have the motorized status changed from "decommissioned" to "open".

3. Copy the two new road features from the engineer's **PC_alt2_ProjectRds.shp** shapefile to the project feature class **PortalCreek_Alt2**.
 - a. Start an edit session by right-clicking on the **PortalCreek_Alt2** feature class and select **Edit Features > Start Editing**.
 - b. Right-click the engineer's **PC_Alt2_ProjectRds** shapefile and select **Selection > Make this the Only Selectable Layer**.
 - c. Click on the **Select Features by Rectangle** icon  and select the two new routes slated for construction by clicking on each while holding the SHIFT key down, or by tracing a rectangle that intersects only the two features to be copied. Selected features will be highlighted in cyan.
 - d. Click **Edit > Copy**, and then **Edit > paste**. Click **OK** to acknowledge PortalCreek_Alt2 as the Target layer where the features will be copied.
 - e. With these two features still selected, right click on the **PortalCreek_Alt2** feature class in the table of contents and select **Open**



Attribute Table, and click the **Show selected records** icon  at the bottom of the table. Only 2 selected records should be displayed. For clarity, the figure below does not show all of the fields in the table.

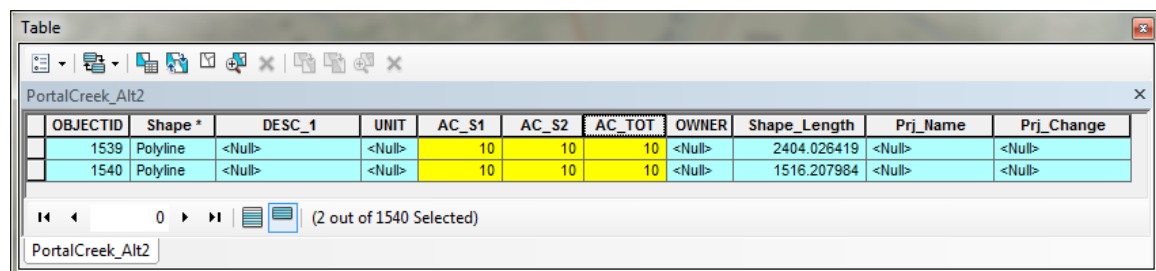


| OBJECTID * | Shape * | DESC_1 | UNIT | AC_S1 | AC_S2 | AC_TOT | OWNER | Shape_Length | Prj_Name | Prj_Change |
|------------|----------|--------|--------|--------|--------|--------|--------|--------------|----------|------------|
| 1539 | Polyline | <Null> | <Null> | <Null> | <Null> | <Null> | <Null> | 2404.026419 | <Null> | <Null> |
| 1540 | Polyline | <Null> | <Null> | <Null> | <Null> | <Null> | <Null> | 1516.207984 | <Null> | <Null> |

(2 out of 1540 Selected)

Notice that the fields **AC_S1**, **AC_S2**, and **AC_TOT** are blank (<Null>) and will need to be populated with an appropriate access code number to indicate the motorized status of the two new roads. These 3 fields are used by the Access model to calculate S1OMARD, S2OMARD and TMARD respectively.

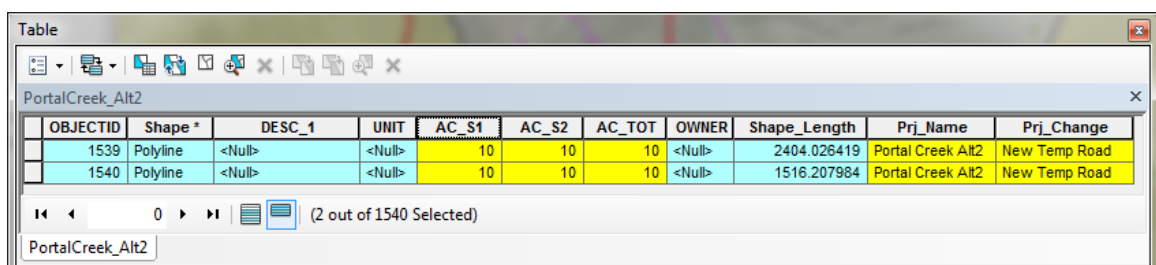
- f. Specify the motorized status codes of the 2 selected roads. Type the value **10** into the fields **AC_S1**, **AC_S2**, and **AC_TOT** for both records. The number 10 tells the model that the new roads will be open motorized during seasons 1 and 2. The number 10 for **AC_TOT** indicates that the road is open to motorized use during some or all of the year by the public and/or administrative personnel *Refer to Appendix B for more information on Access Status Codes.*



| OBJECTID | Shape * | DESC_1 | UNIT | AC_S1 | AC_S2 | AC_TOT | OWNER | Shape_Length | Prj_Name | Prj_Change |
|----------|----------|--------|--------|-------|-------|--------|--------|--------------|----------|------------|
| 1539 | Polyline | <Null> | <Null> | 10 | 10 | 10 | <Null> | 2404.026419 | <Null> | <Null> |
| 1540 | Polyline | <Null> | <Null> | 10 | 10 | 10 | <Null> | 1516.207984 | <Null> | <Null> |

(2 out of 1540 Selected)


- g. Two additional fields, **Prj_Name** and **Prj_Change** were created for documentation purposes. They flag any routes that represent a change in the configuration of motorized routes due to a project action, and document the corresponding change associated with a feature. Enter the values *Portal Creek Alt2* under the Project field to flag these as project routes associated with Alternative 2. Enter *New Temp Road* to indicate these are new temporary project roads slated for construction.

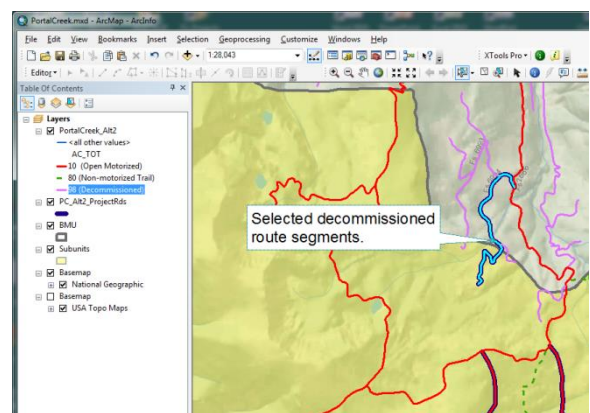


| OBJECTID | Shape * | DESC_1 | UNIT | AC_S1 | AC_S2 | AC_TOT | OWNER | Shape_Length | Prj_Name | Prj_Change |
|----------|----------|--------|--------|-------|-------|--------|--------|--------------|-------------------|---------------|
| 1539 | Polyline | <Null> | <Null> | 10 | 10 | 10 | <Null> | 2404.026419 | Portal Creek Alt2 | New Temp Road |
| 1540 | Polyline | <Null> | <Null> | 10 | 10 | 10 | <Null> | 1516.207984 | Portal Creek Alt2 | New Temp Road |

(2 out of 1540 Selected)

- h. Save your edits and close the editing session: Close the attribute table, and from the **Editor Menu** select **Stop Editing** and click **Yes** to save your changes.
4. Change motorized access status codes for the third and last project road. This is an existing road with decommissioned status (light purple overlaying the dark blue engineer roads) which will be changed to open motorized status for the duration of the project.
 - a. Right-click the **PortalCreek_Alt2** feature class and select **Selection > Make this the Only Selectable Layer**.

- b. Select the decommissioned route. Note that it is comprised of three segments. To select the entire route, click on the Select Features  icon and, with the Shift key held down, click on all three segments. Selected features are highlighted in bright cyan.



- c. Examine the attributes of the decommissioned route. With the route segments still selected right-click on the **PortalCreek_Alt2** feature class in the table of contents and select **Open Attribute table**. Click on the **Show Selected Records** button at the bottom of the table.

Table

PortalCreek_Alt2

| OBJECTID * | Shape * | DESC_1 | UNIT | AC_S1 | AC_S2 | AC_TOT | OWNER | Shape_Length | Prj_Name | Prj_Change |
|------------|----------|------------------------|------|-------|-------|--------|-------|--------------|----------|------------|
| 1200 | Polyline | LOWER PORTAL FORK ROA | GNF | 98 | 98 | 98 | FS | 822.718741 | <Null> | <Null> |
| 1202 | Polyline | LOWER PORTAL FORK ROA | GNF | 98 | 98 | 98 | FS | 949.848253 | <Null> | <Null> |
| 1294 | Polyline | UPPER PORTAL CREEK ROA | GNF | 98 | 98 | 98 | FS | 260.858783 | <Null> | <Null> |

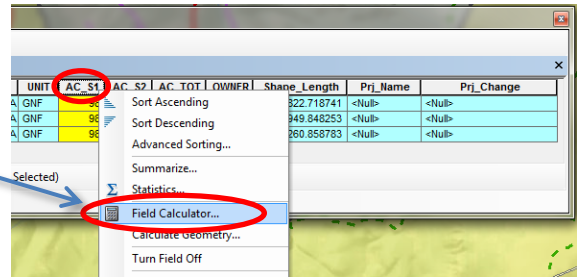
3 out of 1540 Selected)

Note that **AC_S1**, **AC_S2**, and **AC_TOT** attributes are set to 98 indicating that the current status of the route is decommissioned.

- d. Modify the status of the selected route segments to reflect the change in status from decommissioned to open motorized. Change the field values of **AC_S1**, **AC_S2**, and **AC_TOT** from 98 to 10. Since you are no longer in an Edit mode, you cannot enter values directly into the table. Instead right click on the field header and click


Field Calculator as shown:

Tip To edit the field for all selected records simultaneously, right-click on the attribute field header and select *Field Calculator*. Enter the value 10. Click OK. (Note: These fields are numerical. Text fields would require double quotes).



- e. It is good practice to document changes so that when you come back at a later date you can quickly query to examine the various changes associated with a project alternative. Use the tip above to calculate the **Prj_Name** field to "Portal Creek Alt2" and **Prj_Change** field to "Decommissioned to Open" (Note: double quotes are required since these are text fields).

| Table | | | | | | | | | | |
|------------------|----------|------------------|------|-------|-------|-------|-------|--------------|-------------------|------------------------|
| PortalCreek_Alt2 | | | | | | | | | | |
| OBJECTID | Shape * | DESC_1 | UNIT | AC_S1 | AC_S2 | AC_TO | OWNER | Shape_Length | Prj_Name | Prj_Change |
| 1200 | Polyline | LOWER PORTAL FO | GNF | 10 | 10 | 10 | FS | 822.718741 | Portal Creek Alt2 | Decommissioned to Open |
| 1202 | Polyline | LOWER PORTAL FO | GNF | 10 | 10 | 10 | FS | 949.848253 | Portal Creek Alt2 | Decommissioned to Open |
| 1294 | Polyline | UPPER PORTAL CRE | GNF | 10 | 10 | 10 | FS | 260.858783 | Portal Creek Alt2 | Decommissioned to Open |

- f. Close the attribute table when you are finished. Click on the save icon  to save your project map session. Click **yes** if you are prompted to save your edits. Close out of ArcMap.

You have successfully edited your project feature class for Alternative 2 so it now reflects the proposed changes in motorized routes. You are ready to run the motorized access analysis and evaluate secure habitat and route density for existing conditions (PortalCreek_Alt1E) and the subsequent impacts of proposed change reflected in Alternative 2 (PortalCreek_Alt2).



Donna Sullenger, Shoshone NF


V. Perform Access Analysis for Project Alternatives

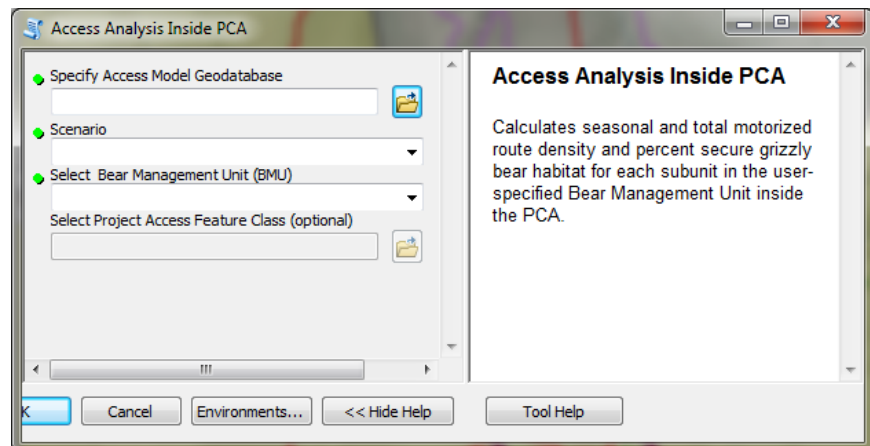
In this section the appropriate *Access Analysis tool* will be employed to evaluate percent secure habitat and motorized route density (seasonal OMARD and/or TMARD) for project alternatives. It is assumed that you have created a project alternative feature class from the *Create Project Template* tool and you have edited the alternative project feature class(es) to reflect any proposed changes in motorized access routes (Sections III and IV). For comparison purposes, you may also have a feature class for the existing scenario. You are now ready to calculate the impact of proposed changes on grizzly bear secure habitat and motorized route density.

The user will choose between two Access tools for analysis depending on whether the project is to occur inside or outside the PCA. Analyses for areas outside the PCA calculates percent secure habitat and total motorized access route density (TMARD), but does not generate seasonal open motorized access route density (OMARD). *For definitions of route density terms, please refer to Appendix B.*

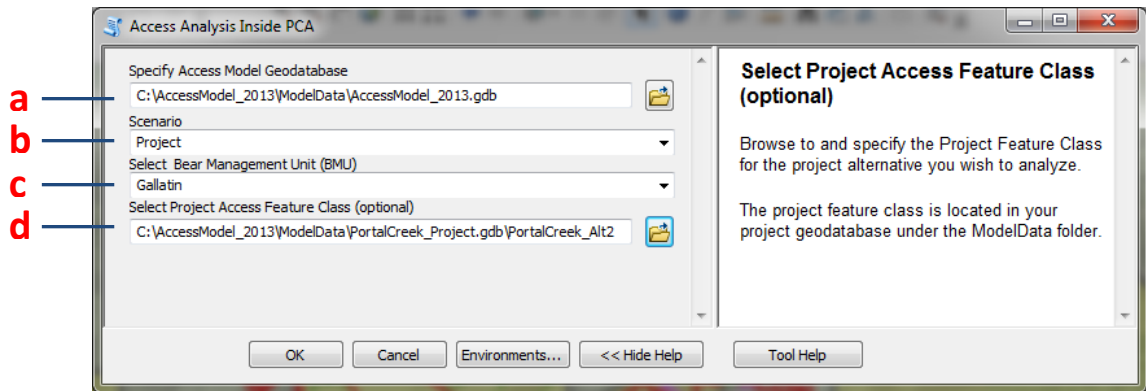
For illustrative purposes the following instructions continue with the fictitious Portal Creek example from the previous sections. Supplant with your own project data if desired.

Run Access Tool for Project Alternative

1. Open the PortalCreekExample\PortalCreek.mxd project.
2. Click to open the ArcToolbox icon  and from the **AccessModel_2013** toolbox double-click to open the appropriate tool for analysis *Inside or Outside the PCA*. In this example the “Access Analysis Inside the PCA” tool was selected for analysis of the Portal Creek Project in the Gallatin BMU.
3. Specify the required parameters.
 - a. Use the browse folder icon to specify the Access Model Geodatabase. Navigate to and select the **AccessModel_2013.gdb** geodatabase located under the Model Data folder. Click **Add** to select. (This geodatabase contains pertinent boundary layers for the analysis.)

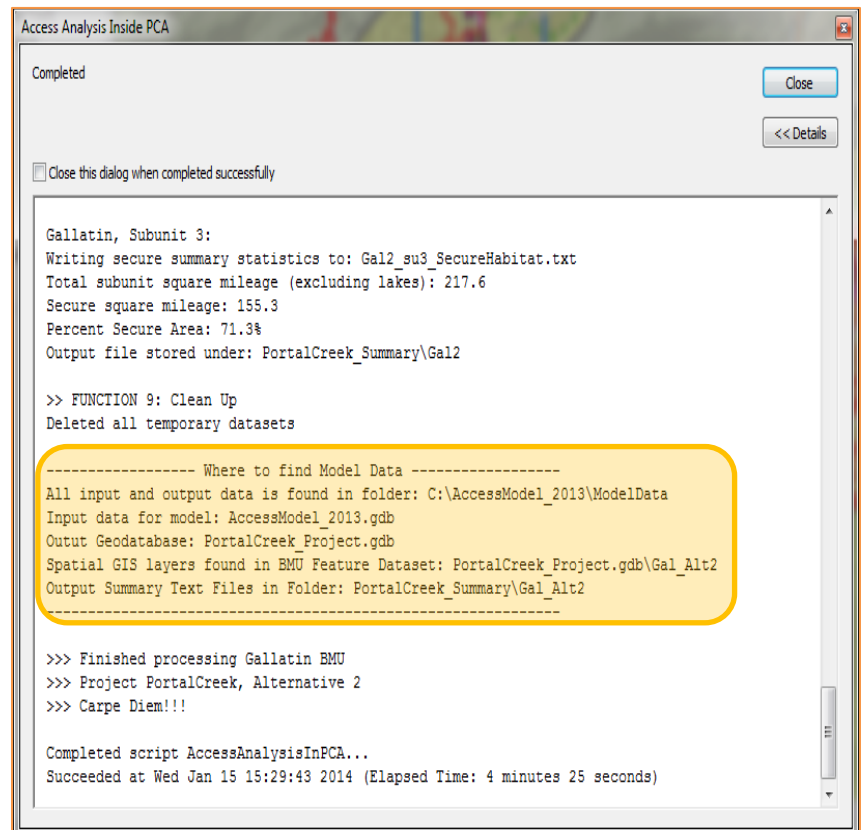


- b. Under Scenario, select **Project**. (Note that the fourth parameter now has a green dot indicating that the Project Feature Class is a required piece of information).
- c. Select the Bear Management Unit where your project is to occur. For the Portal Creek Example select the **Gallatin** BMU.
- d. Specify the Project Feature Class to be evaluated. For the Portal Creek Example browse to and select the **PortalCreek_Alt2** feature class located in the Portal Creek project geodatabase under the ModelData folder.



- e. Click **OK** to execute the model.

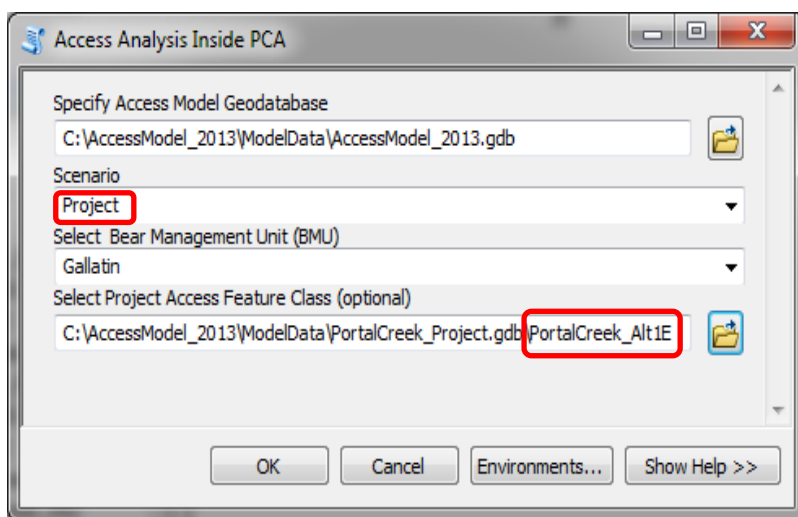
4. Status information is printed to a console window. It displays a log of the various GIS layers and summary files being generated and tells you where output data is stored. Save the contents if you wish (refer to the Tip in step 6 under section III) and close the console window.



Run Access Tool for Existing Scenario

When evaluating potential impacts on grizzly bear habitat due to a proposed project, it is convenient to have current habitat values that serve as a baseline for comparison. The term 'existing' refers to habitat ground conditions current as of the year specified in the Access model folder and toolbox name. Since we are working with the 2013 version of the AccessModel toolbox in this example, 'existing' refers to ground road conditions as of the close of 2013. Current results for existing percent secure habitat and route density for all Bear Management Units are also posted online in the current Yellowstone Grizzly Bear Investigations Annual Report at the [Interagency Grizzly Bear Study Team publications website](#). Although you can easily get values for existing conditions from the IGBST website, users may find it convenient to have the GIS spatial layers and summary tables for all alternatives, including existing conditions, stored along with the project you are evaluating. For this reason we will run the Access model a second time to generate existing habitat results.

1. Open the **PortalCreek.mxd** map project under the **PortalCreekExample** folder if necessary.
2. Repeat steps 2 to 4 from previous section. In the "Access Analysis Inside PCA" window specify the same input parameters exactly as before, but this time, for the Project Feature Class you will specify the **PortalCreek_Alt1E** feature class located in the **PortalCreek_Project.gdb** geodatabase. Note that the *Scenario* parameter will still be **Project** since you wish to store all analysis output (both existing and alternative scenarios) in the project geodatabase.



VI. Interpreting Model Results

Model results from the Access analysis come in two distinct flavors: 1) Summary statistic text files which summarize the calculated results for secure habitat and motorized route density, and 2) GIS spatial layers stored in the project geodatabase that visually examine the results. These results allow you to evaluate and visualize the potential impact imposed upon grizzly bear secure habitat and motorized route density due to changes in motorized configuration associated with a Federal project.

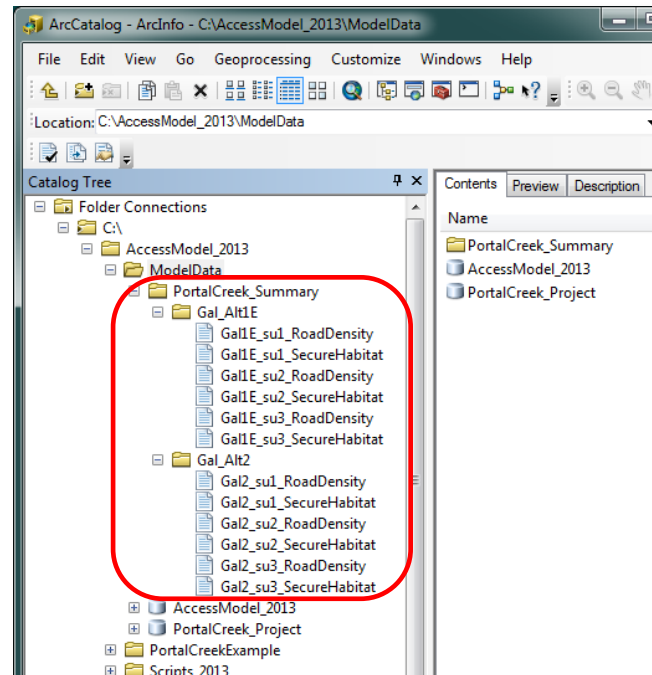
The following steps will help you locate and interpret the model results for the fictitious Portal Creek project presented in the previous sections. These results however are analogous to those associated with any typical Federal project that includes modifications in status and/or spatial configuration of motorized routes.

Summary Files

- Open ArcCatalog and browse to the **ModelData\PortalCreek_Summary** folder where the tabular summary results reside.

For each project alternative (Alt1E and Alt2), the model has generated a set of summary statistic files, one for each subunit, pertaining to: 1) secure habitat and 2) motorized route density.

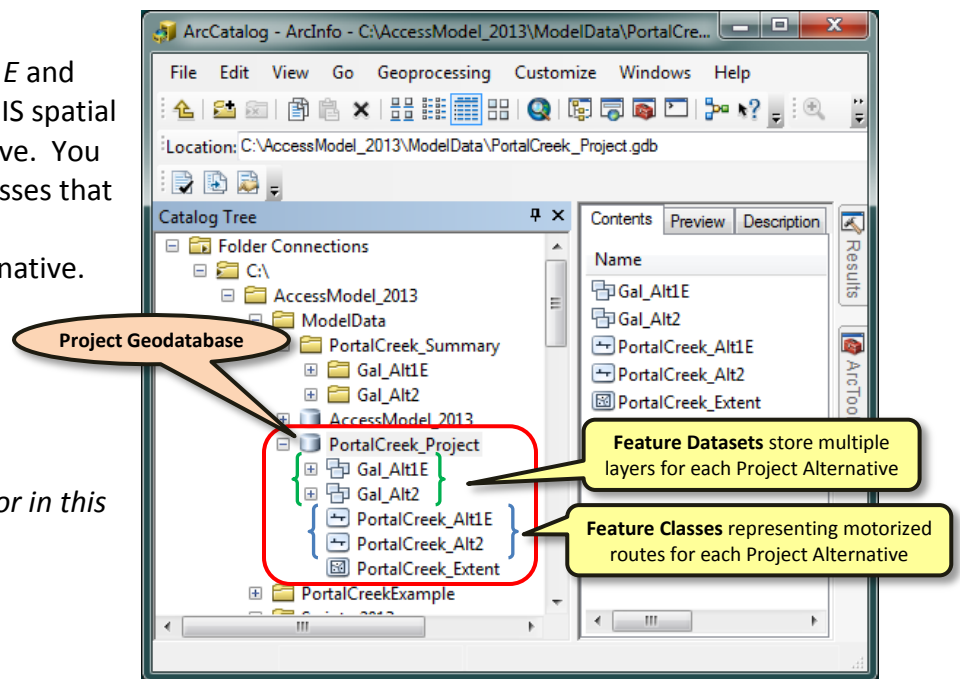
For example, the file *Galt1E_su1_RoadDensity* documents road density results for Gallatin subunit #1 pertaining to Existing Alternative 1E. For the two alternatives and 3 subunits associated with the Portal Creek Project, this yields a total of 12 summary files.




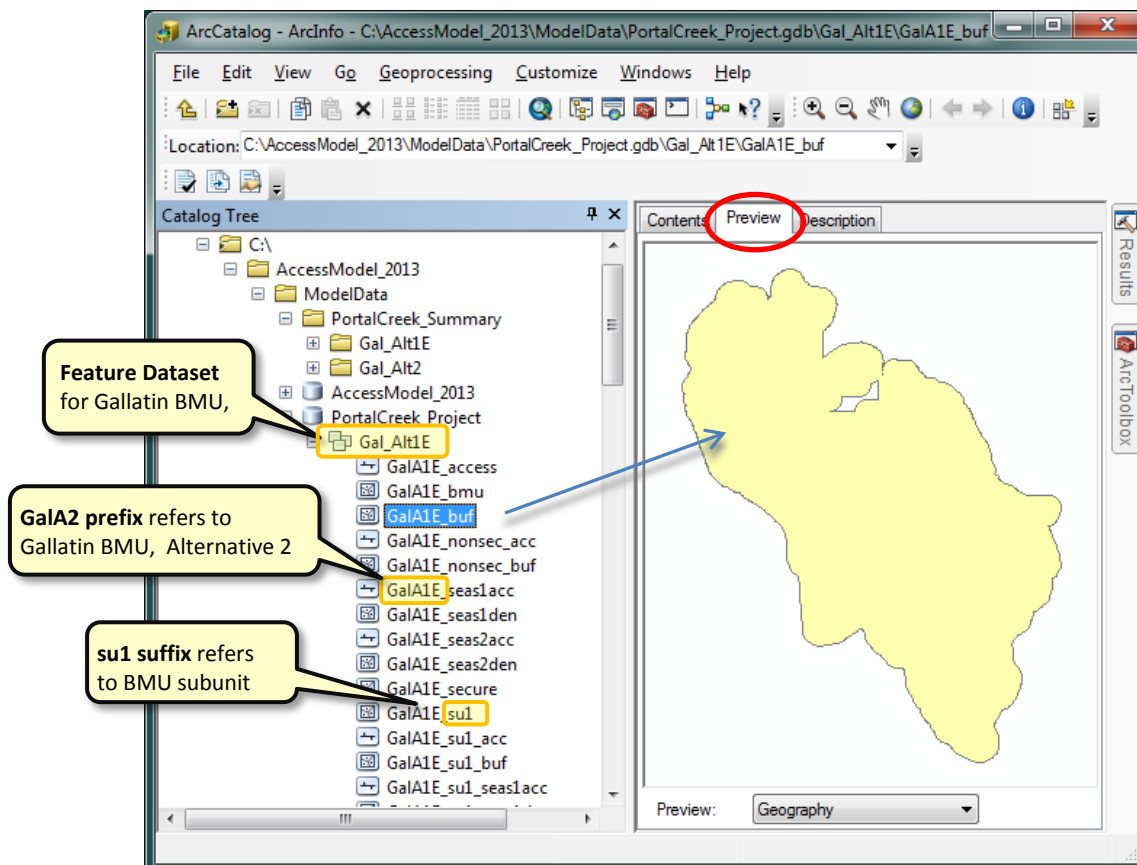
Spatial GIS layers

1. Expand the Contents of the **PortalCreek_Project** geodatabase under the ModelData folder to examine the GIS spatial content associated with each project alternative.

Two Feature Datasets (*Gal_Alt1E* and *Gal_Alt2*) contains associated GIS spatial layers for each project alternative. You also see the Project Feature Classes that represent the configuration of motorized routes for each alternative. (Note: *The term Feature Dataset can be thought of as a folder within the geodatabase that contains one or many spatial GIS layers relevant to a particular theme, or in this case, project alternative.*)



Expand the contents of each Feature Dataset by clicking on the  icon to the left. Visually examine a layer's geo-spatial contents by selecting a layer in the table of contents (left pane) and activating the Preview tab in the display window (right pane).



Interpret Tabular Results

Road modifications proposed in Alternative 2 of Portal Creek project occur exclusively in Gallatin subunit #3. Therefore it is this subunit which sustains the impact of the Portal Creek project and where we expect to find impacts on secure habitat and motorized route density.

Impacts on Motorized Route Density

Examine the results for seasonal and total motorized route density. Open the summary file **GaIA1E_su3_RoadDensity.txt** for subunit 3 under the **PortalCreek_Summary** folder. The summary file contains: 1) model parameter information, 2) road density class definitions, and 3) calculated values for seasonal and total motorized route density. (Note: for Analyses outside the PCA seasonal route density is not calculated.)

Model Information:

- BMU, subunit number
- Project Name & Alternative
- Project Feature Class
- Geodatabase (data resides here)
- Date & Time of Model Run

Definitions:

- 4 Road Density Classes
- OMARD
- TMARD

Resulting value for S1OMARD

```
Motorized Road Density Summary
Gallatin BMU, Subunit # 3
PortalCreek Project Analysis, Alt 1E
Access features used in analysis: PortalCreek_Alt1E
Geodatabase storing model output: PortalCreek_Project.gdb
Date/Time of Model Run: January 17 2014, 02:14 PM

Road Density Class Definitions:
Class 1: (0 mile/sqmi)
Class 2: (0 - 1 mile/sqmi)
Class 3: (1 - 2 mile/sqmi)
Class 4: (>= 2 mile/sqmi)

OMARD = Open Motorized Access Route Density (Season 1 or 2)
= Open for public access
-> Season1 (March 1 - July 15)
-> Season2 (July 16 - November 30)
-> OMARD >= 1 mile/sqmi (Class 3 + Class 4)

TMARD = Total Motorized Access Route Density (open or gated)
= Open for public and/or administrative access
-> TMARD >= 2 mile/sqmi (Class 4)

>>>> ROAD DENSITY RESULTS <<<<
----- Season 1 Open Motorized Road Density -----
Class 1:
square mileage: 154.526
percent of subunit area: 71.0026%
Class 2:
square mileage: 22.6884
percent of subunit area: 10.425%
Class 3:
square mileage: 16.4022
percent of subunit area: 7.5366%
Class 4:
square mileage: 24.0178
percent of subunit area: 11.0358%

>>>>>> S1OMARD = (Class 3 + Class 4) = 18.5724% <<<<<<<<
```

Scroll down to examine the results for S2OMARD and TMARD. Compare the results for the existing scenario with those in **GALA2_su3_RoadDensity.txt** to determine how road density would change if proposed changes were implemented.

Impacts on Secure Grizzly Bear Habitat

One of the questions a manager might need to know, for example, is whether a proposed project exceeds the *1 Percent Rule* regarding allowable temporary changes to secure habitat. Simply put, the *1 Percent Rule* states that the impacted acreage of secure habitat due to a Federal project must not exceed 1 percent of the acreage of the largest subunit within the BMU (refer to Appendix C). You will examine the secure habitat summary files to see if the proposed project Alternative 2 satisfies this requirement.

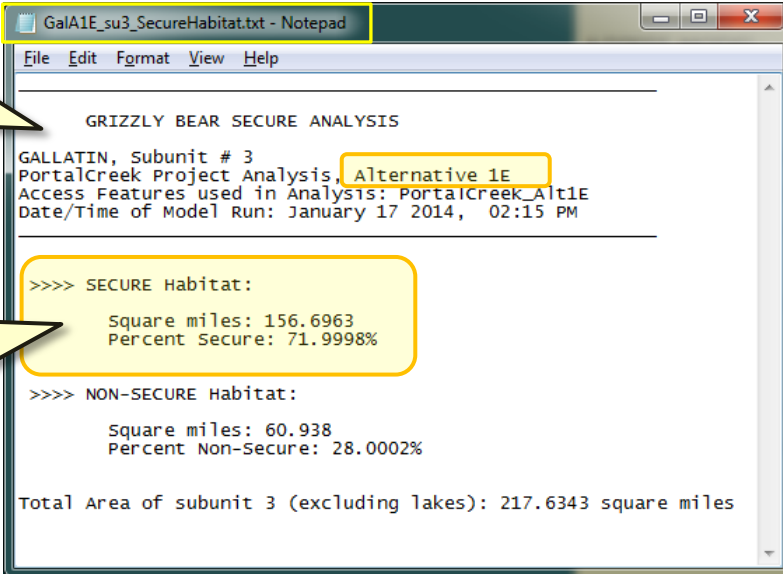
Open the **GalA1E_su3_RoadDensity.txt** for Gallatin subunit 3 under the **PortalCreek_Summary** folder. The summary file contains general header information and calculated values for the following: 1) square mileage and percent area of the subunit that is currently secure habitat, 2) same for non-secure habitat, and 3) the total square mileage (excluding lakes) of the subunit.

Model Information:

- BMU, subunit number
- Project Name & Alternative
- Project Feature Class
- Date & Time of Model Run

Secure Habitat Results:

- Square mileage within subunit that is secure.
- Percent area of subunit that is secure.



```
GRIZZLY BEAR SECURE ANALYSIS

GALLATIN, Subunit # 3
PortalCreek Project Analysis, Alternative 1E
Access Features used in Analysis: PortalCreek_Alt1E
Date/Time of Model Run: January 17 2014, 02:15 PM

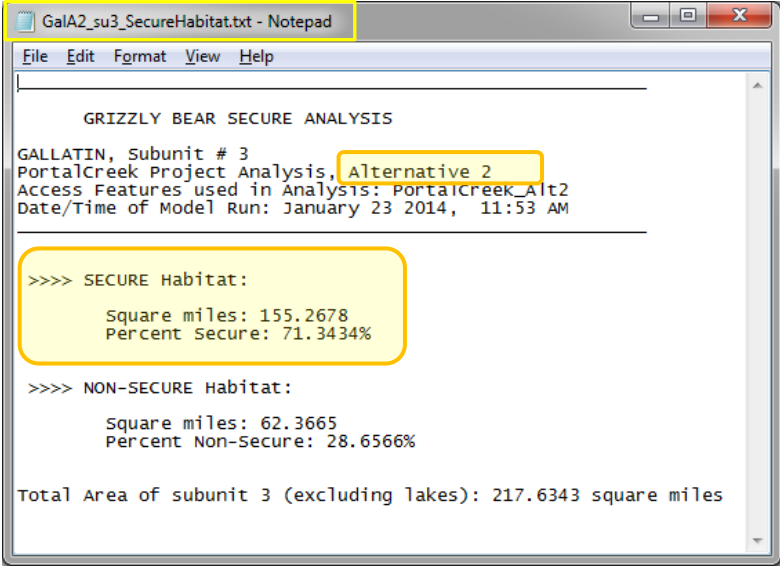
>>>> SECURE Habitat:
      Square miles: 156.6963
      Percent Secure: 71.9998%

>>>> NON-SECURE Habitat:
      Square miles: 60.938
      Percent Non-Secure: 28.0002%

Total Area of subunit 3 (excluding lakes): 217.6343 square miles
```

Now open the **GalA2_su3_RoadDensity.txt** summary file for Alternative 2 and compare the values for secure habitat with the existing levels from the file above.

The comparison indicates that a loss of 1.42 square miles would occur if Alternative 2 is implemented. From the summary tables for the three subunits one can determine that subunit #3 has the largest area with a total of 217.6 square miles, and that the temporary loss in secure habitat is well below 1% of this area. This result satisfies the requirements of the 1 Percent rule and would be permitted under the habitat standards of the



```
GRIZZLY BEAR SECURE ANALYSIS

GALLATIN, Subunit # 3
PortalCreek Project Analysis, Alternative 2
Access Features used in Analysis: PortalCreek_Alt2
Date/Time of Model Run: January 23 2014, 11:53 AM

>>>> SECURE Habitat:
      Square miles: 155.2678
      Percent Secure: 71.3434%

>>>> NON-SECURE Habitat:
      Square miles: 62.3665
      Percent Non-Secure: 28.6566%

Total Area of subunit 3 (excluding lakes): 217.6343 square miles
```



Conservation Strategy, assuming that other requirements of grizzly bear management are met.

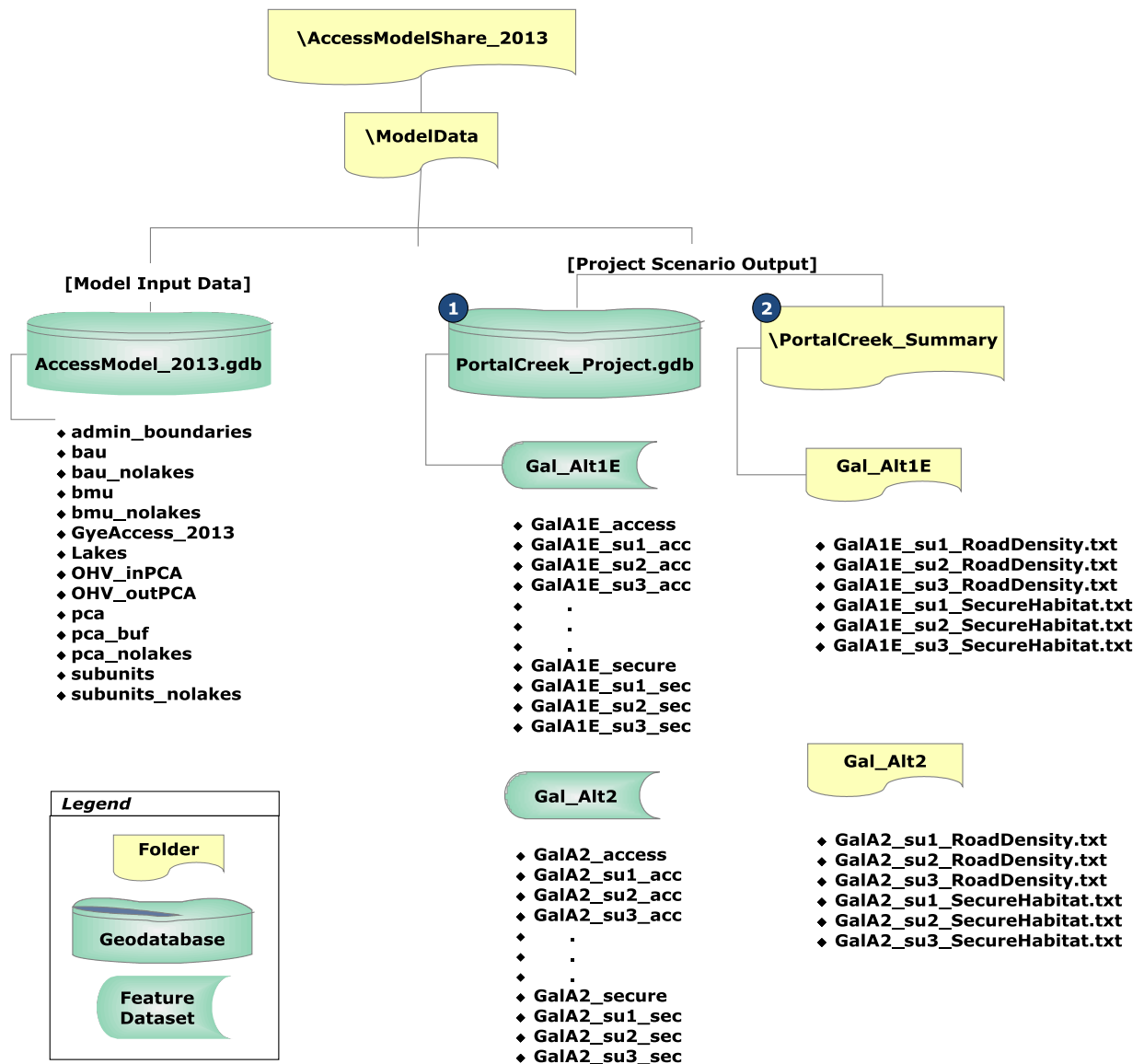
For more information on data structure and nomenclature associated with the Access model refer to Appendix A. Detailed definitions for motorized access route density and corresponding code values denoting motorized status can be found in Appendix B. Information on the definition, standards and application rules for grizzly bear habitat, as identified in the Conservation Strategy, are found in Appendix C. Finally, if you have any questions pertaining to interpretation and on implementation of the Access model please feel free to contact Lisa Landenburger, Grizzly Bear GIS Database Coordinator (lalandenburger@fs.fed.us, 406-994-7430).



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Appendix A - Access Model Output

The diagram below shows the typical file structure for the Access analysis data output associated with a given project. The output data is stored under the ModelData folder and includes two distinct data types: (1) project GIS spatial layers stored in the project geodatabase container and (2) project summary text files, containing information on route density and grizzly bear secure habitat, stored in the project summary folder. The project geodatabase contains a Feature Dataset for each project alternative in the analysis (see figure below).



1 The figure above shows the data output for a fictitious project called Portal Creek that occurs in the Gallatin BMU. GIS spatial data layers for the two project alternatives (Alternative

1E and Alternative 2) are stored in the project geodatabase. ² Summary files with statistics on percent secure habitat and motorized route density for each Gallatin subunit are stored for each project alternative under the project summary folder.

Below is an itemized description of the GIS feature classes stored in a feature dataset for a project alternative. The first three letters indicate the Bear Management Unit (or first five letters of a Bear Analysis Unit if the project is outside PCA). If the file name contains the string “_su”, it pertains to a specific subunit; otherwise, the feature class represents the entire BMU.

Feature Dataset Contents

Unit Boundaries

(polygon features)

- *GalA1E_bmu* – BMU boundary
- *GalA1E_buf* – 1 mile buffer of BMU boundary

- *GalA1E_su1* – subunit 1 boundary
- *GalA1E_su1_buf* – 1 mile buffer of subunit 1 boundary

Access Routes

(linear features)

- *GalA1E_access* – all access routes (motorized & non-motorized in BMU + 1 mile buffer
- *GalA1E_seas1acc*
- *GalA1E_seas2acc* } Season 1, Season 2, & Total motorized access routes in
- *GalA1E_totacc* } BMU + 1 mile buffer
- *GalA1E_nonsec_acc* – access routes that detract from secure habitat for BMU

- *GalA1E_su1_acc* – all access routes (motorized & non-motorized) in Subunit 1 + 1 mile buffer
- *GalA1E_su1_seas1acc*
- *GalA1E_su1_seas2acc* } Season 1, Season 2, & Total motorized access routes in
- *GalA1E_su1_totacc* } Subunit 1 + 1 mile buffer

Seasonal Route Density

(polygon features)

- *GalA1E_seas1den*
- *GalA1E_seas2den* } Season 1, Season 2, & Total motorized access route density for
- *GalA1E_totden* } BMU + 1 mile buffer

- *GalA1E_su1_seas1den*
- *GalA1E_su1_seas2den* } Season 1, Season 2, & Total motorized access route density for
- *GalA1E_su1_totden* } Subunit 1

Secure Habitat

(polygon features)

- *GalA1E_secure* – secure grizzly bear habitat within BMU
- *GalA1E_su1_sec* – secure grizzly bear habitat within Subunit 1

Summary Text Files

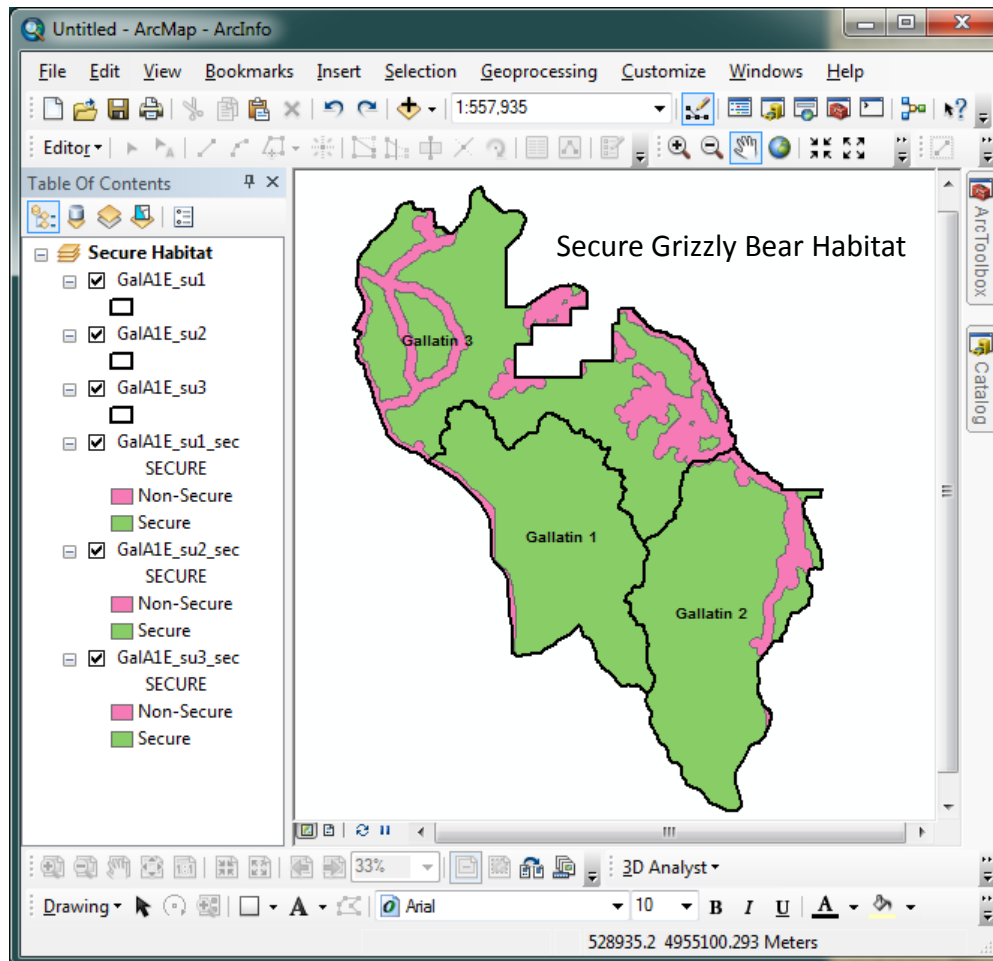
Route Density Statistics

- *GalA1E_su1_RoadDensity*
 - *GalA1E_su2_RoadDensity*
 - *GalA1E_su3_RoadDensity*
- } Percent S1OMARD, S2OMARD, & TMARD for each subunit

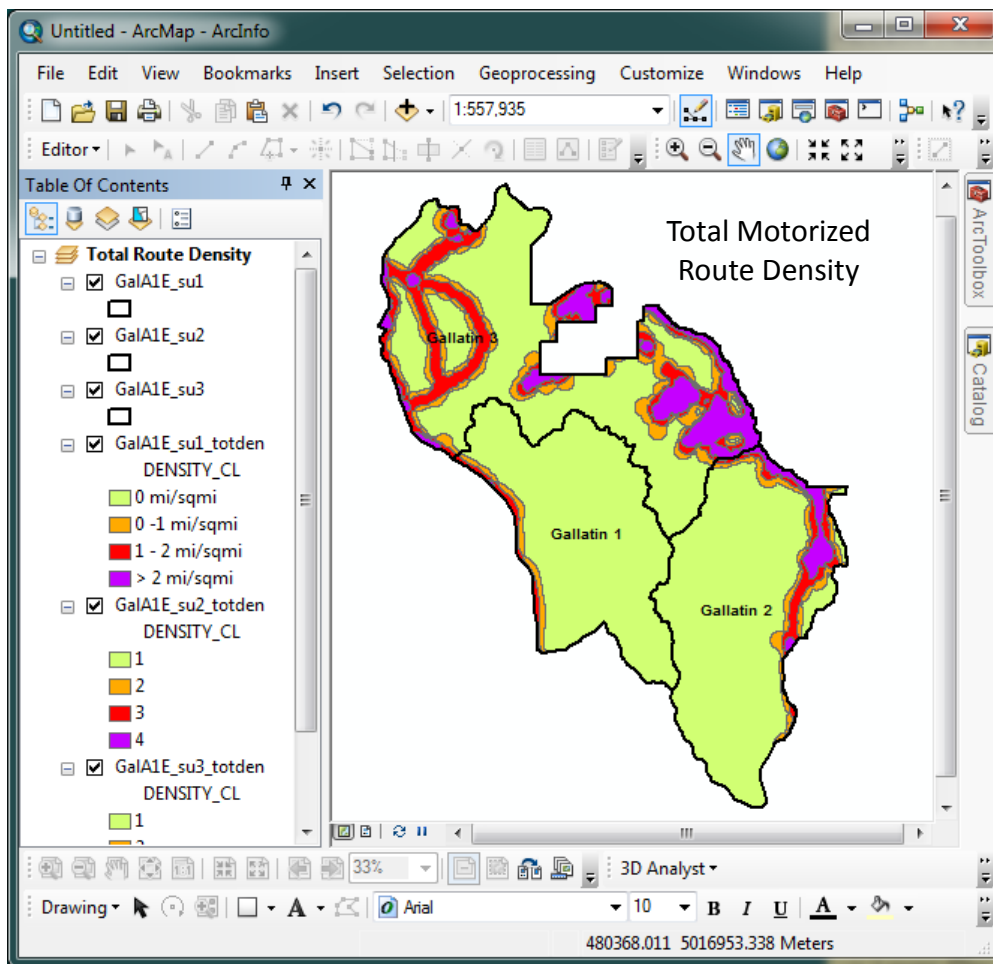
Secure Habitat Statistics

- *GalA1E_su1_SecureHabitat*
 - *GalA1E_su2_SecureHabitat*
 - *GalA1E_su3_SecureHabitat*
- } Percent secure grizzly bear habitat for each subunit

Sample Map Output



Secure Grizzly bear habitat for three subunits comprising the Gallatin BMU.



Total motorized route density for three subunits comprising the Gallatin BMU.

Appendix B – Route Density and Access Codes

The Grizzly Bear Conservation Strategy and Forest Plan Amendment require the annual monitoring of seasonal open motorized access route density (OMARD) and total motorized access route density (TMARD) inside the PCA². Route density serves as a surrogate measure of human presence on the landscape and is used as the major metric for quantifying secure grizzly bear habitat throughout the Greater Yellowstone Ecosystem. Routes that detract from secure habitat include all motorized system roads and trails (whether open or gated), as well as user-created (non-system) routes. Access codes are numerical values assigned to each route feature identifying the motorized status of the route. These codes are used in the Access model to filter out the appropriate access routes needed to calculate percent secure habitat and motorized route density. Non-motorized routes do not contribute to route density or detract from secure habitat.

Seasonal Open Motorized Access Route Density (OMARD)

OMARD is a measure of the density of routes open to public motorized use at least one or more days within a given grizzly bear season. OMARD is measured for two distinct grizzly bear seasons: Season 1 (March 1 – July 15) and Season 2 (July 1 to November 30). Routes that are gated to the public throughout the non-denning portion of the year (March 1 – November 30) do not contribute to OMARD. Values of OMARD > 1 mile per square mile are reported annually for each BMU subunit within the PCA.

For modeling purposes, two seasonal OMARD access codes, AC_S1 and AC_S2, were developed as attribute fields in the grizzly bear Motorized Access database to identify the motorized status for each of the 2 seasons pertinent to grizzly bear activity.

OMARD Access Codes

- *Open (10)* = open to public for motorized use for one or more days during the specified season.
- *Gated Restriction (30)* = gated to restrict public use during the specified season. Low levels of administrative use are acceptable.
- *Permanent Restriction (60)* = permanently restricted roads restricted to the public and administrative personnel yearlong by a permanent barrier. Barriers must function as effective closures or else be coded as open motorized.
- *Non-Motorized (80)* = non-motorized trails (i.e., open only for hiking, horseback riding and/or bicycles)
- *Decommissioned (98)* = decommissioned routes that are managed with the long term intent for non-motorized use and have been treated in such a manner so as to no longer function as a road. No motorized access by public or administrative personnel.

² The monitoring requirements for seasonal OMARD may be subject to change in future revisions.

Total Motorized Access Route Density (TMARD)

Total motorized access route density (TMARD) is a measure of the density of roads and trails that are open to the public and/or administrative personnel for motorized use on one or more days during the non-denning portion of the year when grizzly bears are considered active (March 1 – November 30). Routes that are gated yearlong to the public but open to administrative staff are included in TMARD calculations and detract from secure habitat. Values of TMARD > 2 miles per square mile are reported annually for each BMU subunit inside the PCA.

For modeling purposes the access code AC_TOT stores the overall motorized status for each route feature in the grizzly bear Motorized Access database and is used to calculate TMARD.

TMARD Access Codes

- *Open motorized (10)*
- *Gated Restriction (10)*
- *Permanent Restriction (10)*
- *Non-Motorized Trails (80)*
- *Decommissioned (98)*

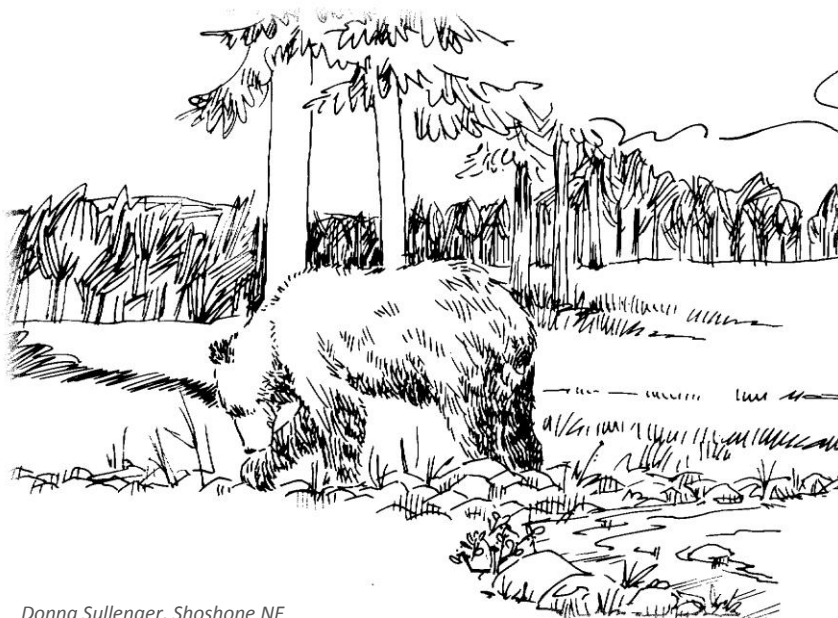
Access codes for TMARD may be assigned differently than seasonal OMARD for the same features. For example, a gated road that restricts public use during season 1 and season 2 are assigned a value of 30 for AC_S1 and AC_S2, but the same feature is assigned a 10 for AC_TOT indicating that the overall status is “motorized” since the road can be accessed by administrative personnel when necessary for maintenance. Snowmobile use is allowed (unless further research identifies a concern) before, during, and after denning season, and does not contribute to motorized density or detract from secure habitat.

Table 1. Valid combinations of OMARD and TMARD access codes.

| AC_S1 | AC_S2 | AC_TOT | Motorized Use |
|-------|-------|--------|--|
| 10 | 10 | 10 | open motorized yearlong |
| 30 | 10 | 10 | gated S1, open S2 |
| 10 | 30 | 10 | open S1, gated S2 |
| 30 | 30 | 10 | gated yearlong but open to admin |
| 60 | 60 | 10 | permanently restricted to public and admin |
| 80 | 80 | 80 | restricted to non-motorized use |
| 98 | 98 | 98 | decommissioned |

Table 2. Motorized status and contribution to route density and detract from secure habitat

| Motorized Status | Contribute to OMARD | Contribute to TMARD | Detract from Secure |
|------------------------------|---------------------|---------------------|---------------------|
| <i>Open</i> | Y | Y | Y |
| <i>Gated Restriction</i> | N | Y | Y |
| <i>Permanent Restriction</i> | N | Y | N |
| <i>Non-Motorized Trails</i> | N | N | N |
| <i>Decommissioned</i> | N | N | N |



Appendix C - Conservation Standard for Grizzly Bear Secure Habitat

Grizzly Bear Habitat Standards identified in the 2007 Grizzly Bear Conservation Strategy require that the percentage of secure habitat within each bear management subunit inside the PCA be maintained at or above levels existing in 1998. The 1998 baseline data establishes a set of information against which future improvements and / or impacts can be evaluated. Data comprising the baseline represent the best estimate of habitat conditions in 1998 and can be found in [Appendix F](#) (p. 135) of the Conservation Strategy. Habitat monitoring protocol requires annual reporting of current secure habitat levels compared against 1998 levels for all 40 BMU subunits. These numbers are reported annually in the Interagency Grizzly Bear Study Team (IGBST) annual report [Yellowstone Grizzly Bear Investigations](#).

Secure Habitat Standard

Inside the Primary Conservation Area, maintain the percentage of secure habitat in each Bear Management Subunit at or above 1998 levels.

Definition of Secure Habitat

Secure habitat is any contiguous area ≥ 10 acres in size and more than 500 meters from an open or gated motorized route or recurring helicopter flight line. Lakes larger than 1 square mile in spatial extent are excluded from secure habitat calculations.

Definition of Project

A project is defined as any authorized Federal activity requiring the construction, reconstruction, or re-opening of a permanently closed motorized road or trail, or requiring recurring low elevation helicopter flight lines.

Application Rules for Changes in Secure Habitat

Application rules identified in the Conservation Strategy and the Forest Plan Amendment serve as mandatory guidelines for implementing grizzly bear habitat standards inside the Primary Conservation Area. Projects that result in changes to secure habitat must comply with the following application rules.

Permanent Changes to Secure Habitat

- A project may permanently change secure habitat if and only if secure habitat of equivalent habitat quality and quantity is replaced (e.g., through road closures and decommissioning) in the same Bear Management Subunit. Habitat quality will be assessed based on our best collective scientific understanding of grizzly bear habitat.

- For those subunits identified as in need of improvement above 1998 levels (*Gallatin #3, Henry's Lake #2, and Madison #2*) maintain at levels of the fully implemented Gallatin National Forest Travel Management Plan)
- Replacement habitat must be in place before project implementation or concurrent with project development as an integral part of the project plan.
- For activities based in statutory rights; such as access to private lands under the Alaska National Interest Lands Conservation Act (ANILCA) or the 1872 General Mining law, where permanent reductions in secure habitat cannot be replaced within the affected subunit, then secure habitat will be compensated to levels at or above the 1998 baseline at a commensurate level in the nearest subunit. In these rare situations, subsequent changes in secure habitat become permanent changes to the baseline.
- Honor existing oil and gas or other mineral leases. Proposed applications for permit to drill and operation plans within those leases are required to meet the application rules. New leases, applications for permit to drill and operating plans must meet the secure habitat standard.

Temporary Changes to Secure Habitat

Temporary reductions in secure habitat to levels below the baseline can occur if all of the following conditions are met:

- Total acreage of active projects within a given BMU must not exceed 1% of the acreage in the largest subunit within that BMU. The acreage of a project that counts against the 1% rule is the acreage of the 500-meter buffer around any motorized access route that extends into existing secure habitat.
- Only one project can be active per grizzly subunit at any one time.
- Secure habitat must be restored within one year after completion of the project.
- To qualify as a temporary project, implementation would last no longer than three years.
- Project activities should be concentrated in time and space to the extent feasible.

