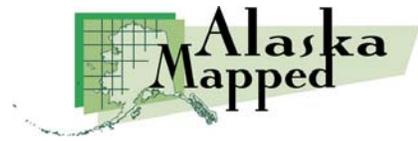


Using the AlaskaMapped Web Services in ESRI ArcGIS



Version 2.0, November 9, 2009

Produced by the Geographic Information Network of Alaska

<http://www.gina.alaska.edu>

AlaskaMapped is committed to making data freely and easily available through open standards. Unlike commercial services in which the data displayed on screen or in mapping tools is very restricted in use, the Alaska Mapped and GINA web maps and web services can be displayed in virtually any mapping application and can be printed and downloaded. Additionally, for all public domain licensed data, the full, raw data sets have been made available for download by anyone.

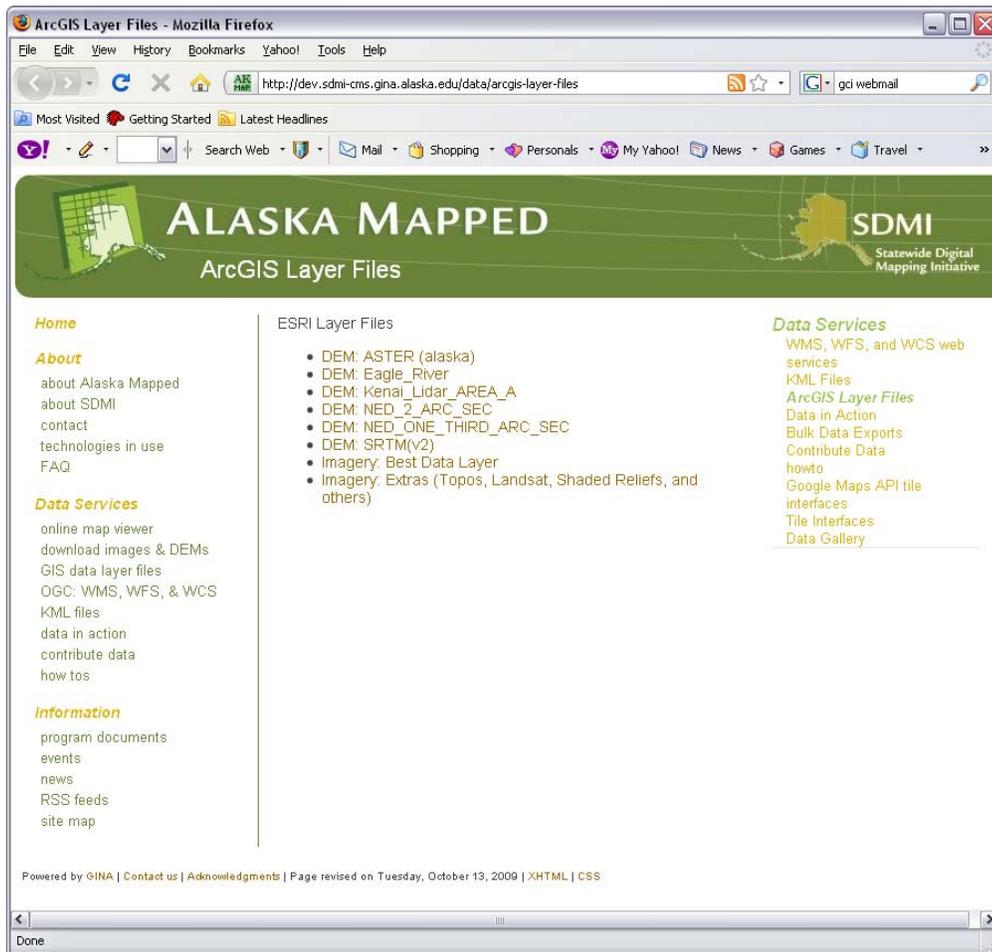
In keeping with open standards, GINA uses Open Geospatial Consortium (OGC) web service protocols to distribute these data. There are three basic OGC web service formats that are employed separated according to the data type being delivered by the service. The Web Map Service (WMS) format is used to deploy ortho-imagery, the Web Coverage Service (WCS) for distribution of digital elevation data, and the Web Feature Service (WFS) for related vector and attribute data (i.e. ortho-image or DEM tile footprints and metadata). More detailed background information on OGC can be found at <http://www.opengeospatial.org>.

There are several ways to bring a WebMapService (WMS) or WebCoverageService (WCS) into ArcGIS. Once a WMS or WCS has been added to ArcMap as a layer, a layer file can be saved containing the URL for the service which can be easily added to as many ArcMap map documents as the user chooses. Layer files for every WMS and WCS maintained by through SDMI are already available for download at <http://dev.sdmi-cms.gina.alaska.edu/data/arcgis-layer-files>. Once downloaded, all the user must do is to add the desired layer file (*.lyr) to the map document as is outlined in the steps below. This tutorial includes a demonstration of how to use the WCS in routine geoprocessing workflows. **Note that since the WCS is a raster data product, these examples require the Spatial Analyst extension to ArcGIS Desktop.** Lastly, it will cover incorporation of the inventory WebFeatureService (WFS) to retrieve metadata for the variety web services hosted under the SDMI.



Download SDMI Web Service ArcGIS Layer Files.

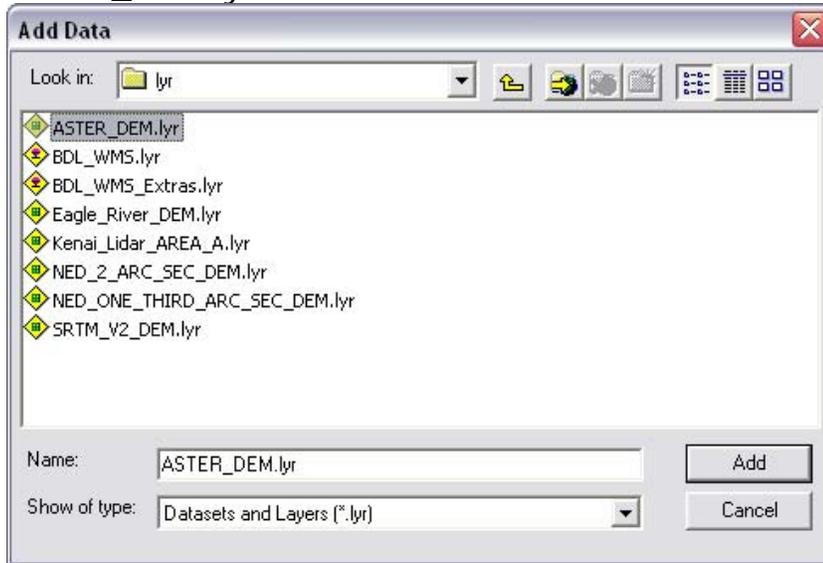
1. Navigate your web browser to <http://dev.sdmi-cms.gina.alaska.edu/data/arcgis-layer-files>



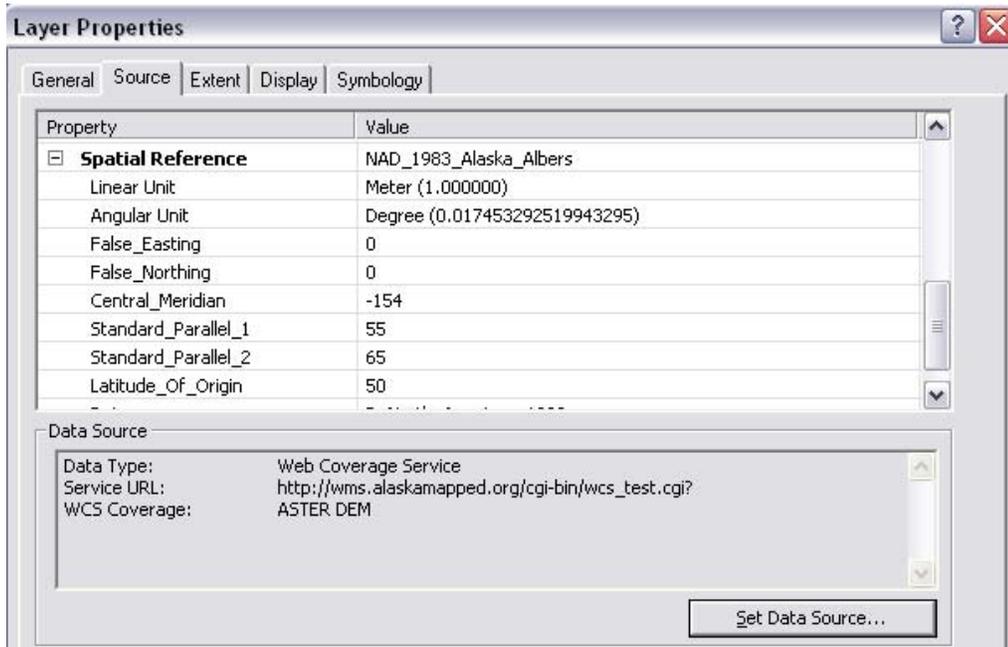
2. Feel free to download all of the layer files if you would like, but for the purpose of this exercise, ensure that you download both the DEM: ASTER (alaska) and the Imagery: Best Data Layer layer files. Remember that these layer files only contain the URL for the web service along with some simple ArcMap display properties so they are extremely small files, less than 20Kb or so each, so they will download very quickly.



3. Launch ArcMap and open a new empty map document. Click the Add Data button and browse to the directory where you downloaded the layer files in the previous step. Select the ASTER_DEM.lyr file then click the Add button.

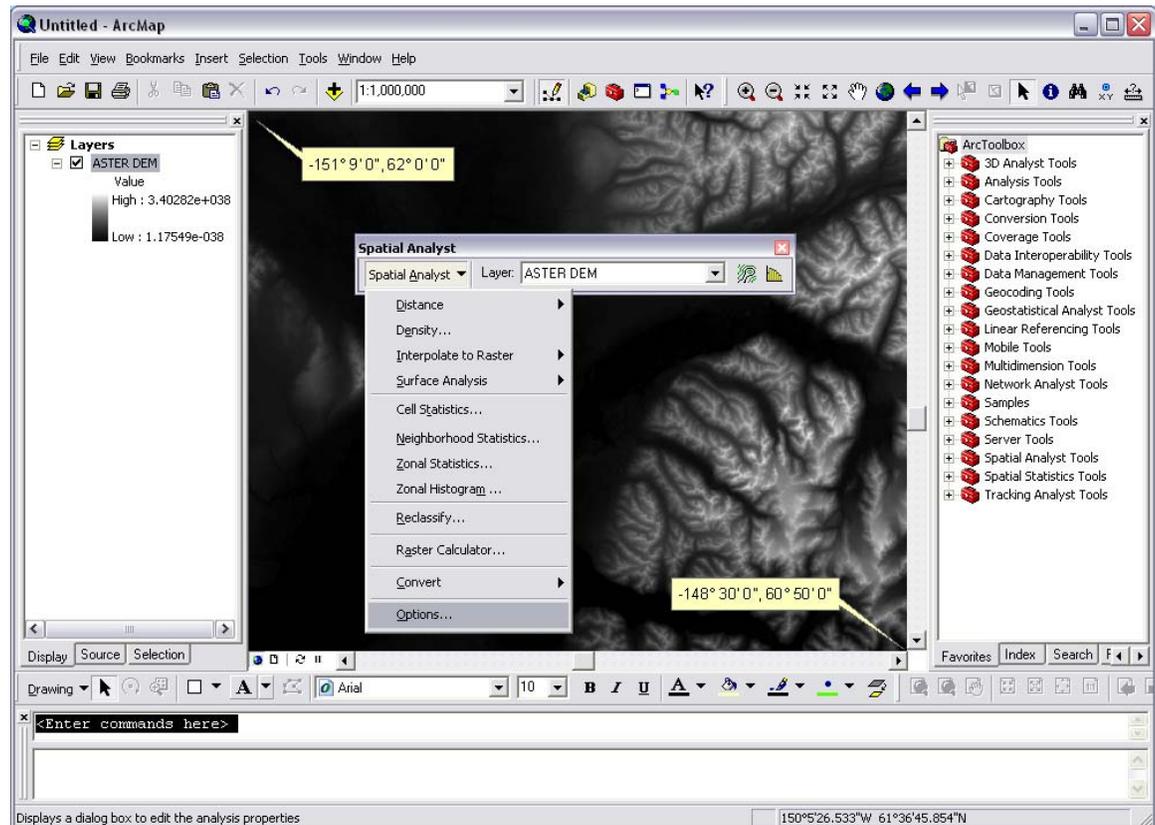


4. Right-click on the ASTER DEM layer in the TOC and choose the Properties command from the layer context menu. On the Source tab, scroll to and take note of the Spatial Reference, Cellsize and Uncompressed Size. Also note the Data Type and Service URL.



The WCS format actually streams data from the server to the client application as if it were a local resource. It is possible at this point, for example, to export these data from the server to your local hard drive, provided of course you have the free disk space to accommodate it (recall that the uncompressed file size is 87.92GB). The next few steps will outline one method for extracting a subset of the ASTER DEM layer and using it as an input dataset.

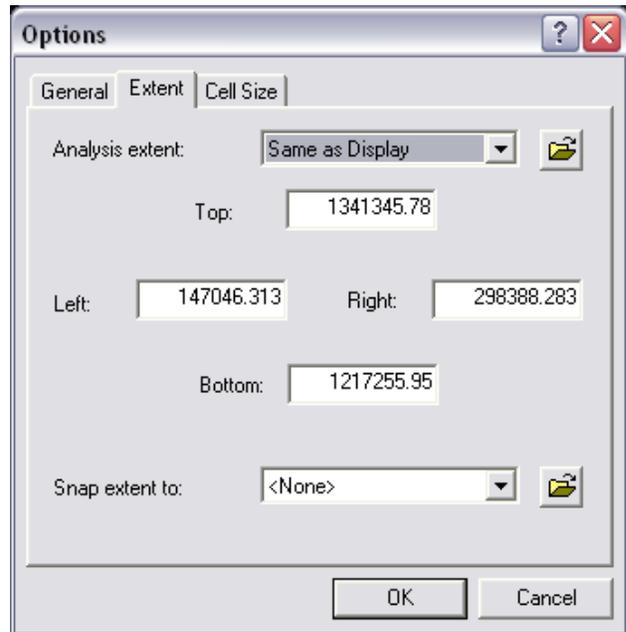
5. Zoom in on the Anchorage Bowl area (roughly the same extent as the example below). Ensure that either the Spatial Analyst or 3D Analyst extension is enabled and the toolbar launched, then go to the Options command under the far left pull-down menu on either toolbar (the example below depicts the Spatial Analyst toolbar).



ArcMap allows you to use the display extent as a parameter when setting the Spatial Analyst or 3D Analyst options. On the Extent tab of the Options dialog, set the pull-down to Same As Display, then click OK. At this point, it is quite possible jump

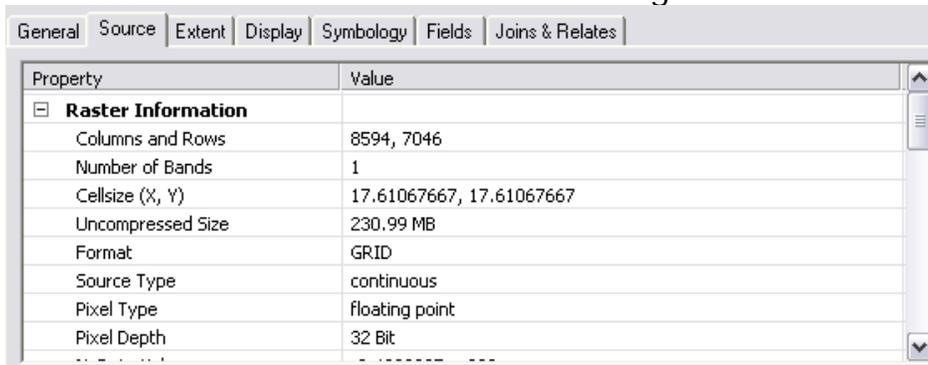
right into surface modeling using the WCS as source data without any further processing. For the purpose of this demonstration, however, we will first create a subset DEM of the same spatial reference and resolutions as the ASTER DEM WCS, but smaller in extent which will make it much easier to further manipulate and/or use as a component to more complex geogrocessing (i.e. using model builder, etc...).

Before closing the Options dialog, go back to the General tab and pay special attention path of the Working directory: . This is the current workspace for all commands and processes ran from the Spatial Analyst toolbar which will be important to remember in the following steps of this exercise.



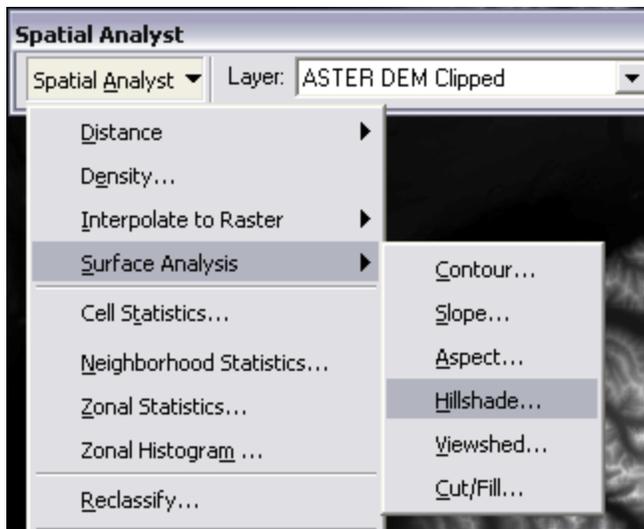
6. From the Spatial Analyst pull-down menu, launch the Raster Calculator. Double-click on the ASTER DEM in the Layers: list box to bring it down to the expression window on the bottom of the calculator (the expression window is where much more complicated map algebra expressions can be built, but to simply re-process any input raster (the ASTER DEM in this case) with only the modifications specified in the Spatial Analyst Options dialog (the display extent parameters in this case), the source data parameter is the only parameter needed in the expression window. Simply click the Execute button to run the process. A new
7. A new Calculation grid will be added to your map document TOC. Uncheck the visibility of the ASTER DEM layer then rename the newly added Calculation grid layer **ASTER DEM Clipped**. Ensure that new ASTER DEM Clipped layer visibility is checked on. If you prefer, it is easy to export the grid format out as another raster format (i.e Imagine .img). The grid format, however, is perfectly acceptable for this exercise.

Right-click on the new ASTER DEM Clipped layer in the TOC and select Properties from the context menu. Again as before, on the Source tab, scroll through and take note of the characteristics of this extracted Anchorage ASTER DEM.

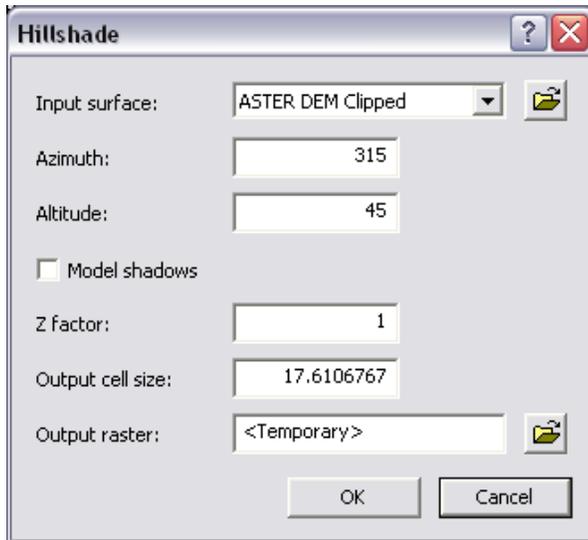


Pay special attention to the much smaller and more manageable Uncompressed Size as compared to the ASTER DEM WCS (your properties may vary from those in the example above). Even though it was not necessary to create this smaller clipped out DEM from the WCS, the more manageable size will make further processing much more efficient. The next step will guide you through using the new Anchorage ASTER DEM grid in a common geoprocessing workflow. Close the properties window.

- Change the target on the Spatial Analyst toolbar from the ASTER DEM to ASTER DEM Clipped. Next choose the Hillshade command from the Surface Analysis group under the Spatial Analyst pulldown menu.



Ensure the Input surface is ASTER DEM Clipped not ASTER DEM. Accept the default values for all other parameters (you can spend the time on your own later if you would like to research and modify the parameters according to your analytical or cartographic objectives), then click OK to run the geoprocess and generate a grayscale shaded relief surface model of the Anchorage Bowl based on the ASTER DEM.

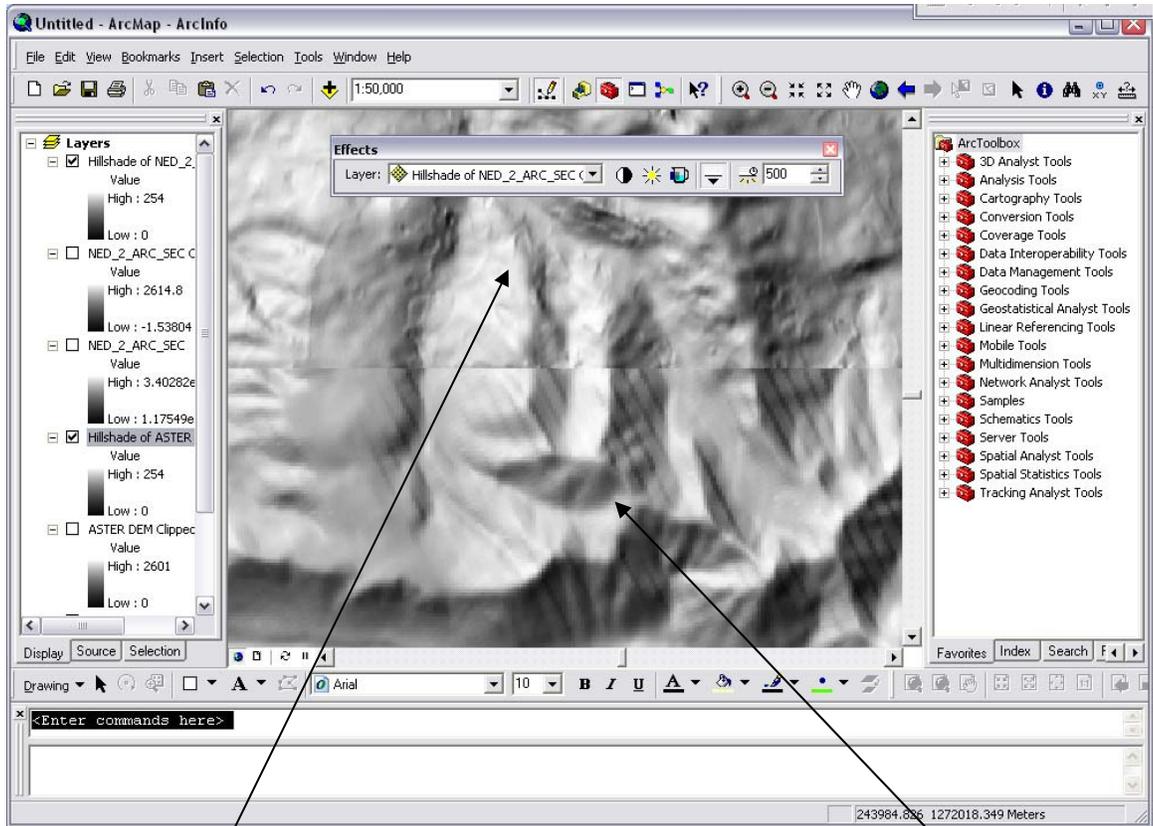


Turn off the visibility of the ASTER DEM Clipped layer and ensure the visibility of the new Hillshade of ASTER DEM Clipped layer is checked on. Examine and discuss these results and what it leads you to believe about the ASTER DEM source data.

Go back to the Alaska Mapped website at the following URL:

<http://dev.sdmi-cms.gina.alaska.edu/data/arcgis-layer-files>

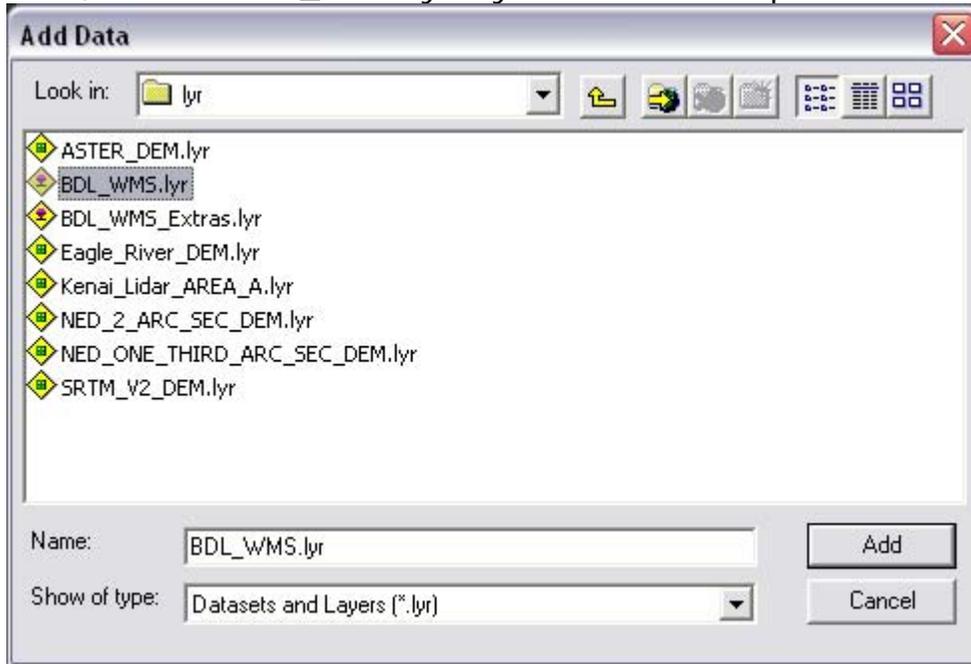
Download the DEM: NED_2_ARC_SEC layer file and repeat steps 3 through 8 (make sure not to change the Display extent to ensure the extents of the clipped DEMs are the same). Rename the new clipped Calculation DEM created from the NED_2_ARC_SEC DEM layer **NED_2_ARC_SEC Clipped**. Use the Zoom and Pan tools to navigate around the map; use the Swipe tool on the Effects toolbar to compare the Hillshade of ASTER DEM Clipped and the Hillshade of NEC_2_ARC_SEC Clipped shaded relief surface models. Does this comparison generate further discussion?



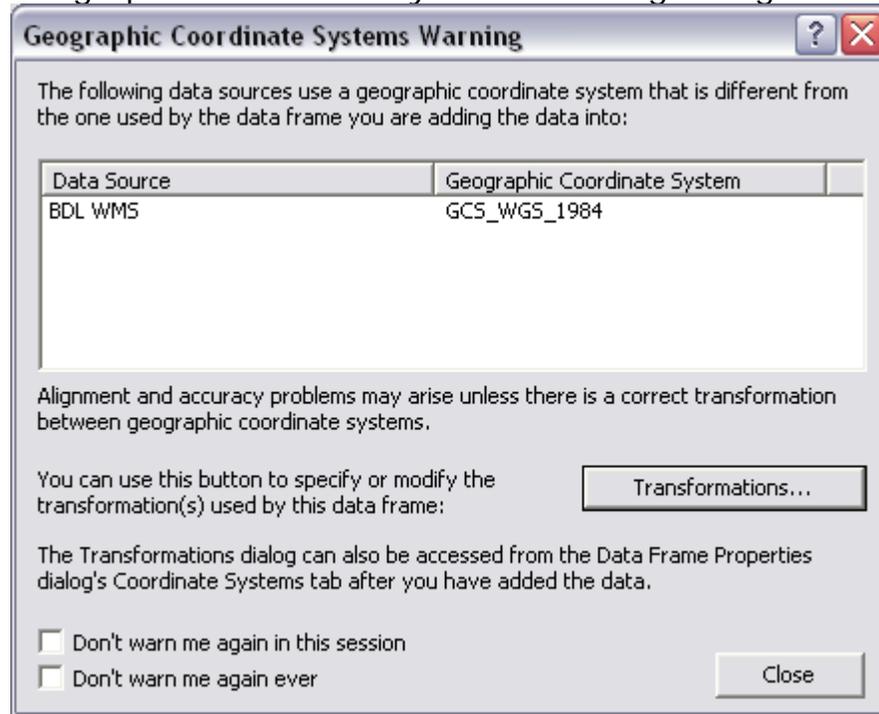
Hillshade of ASTER DEM

Hillshade of NED

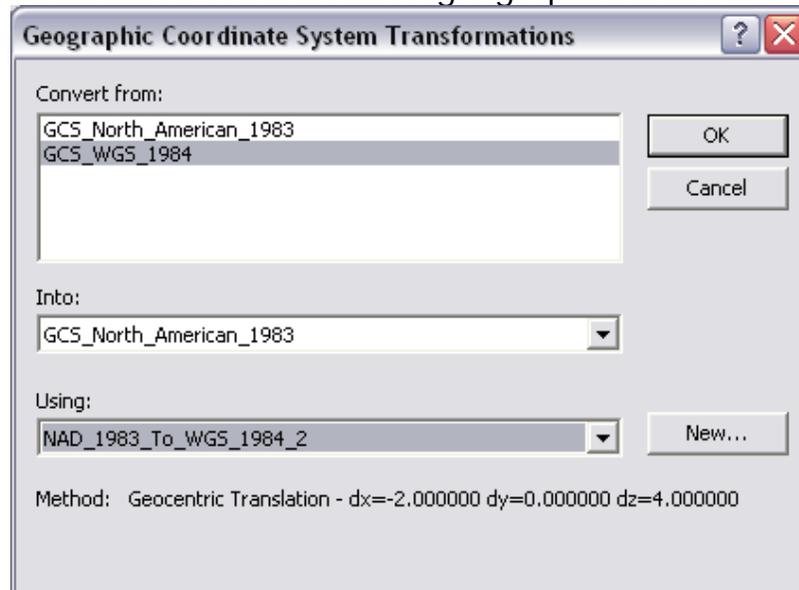
9. Next, add the BDL_WMS.lyr layer file to the map document.



Click the Transformations button when prompted by the Geographic Coordinate Systems Warning dialog.



On the Geographic Coordinate System Transformations dialog, ensure the Convert from list box is set to GCS_WGS_1984, the Into combo box is set to GCS_North_American_1983 and the Using combo box is set to NAD_1983_To_WGS_1984_2 then click OK to set the correct geographic transformation.

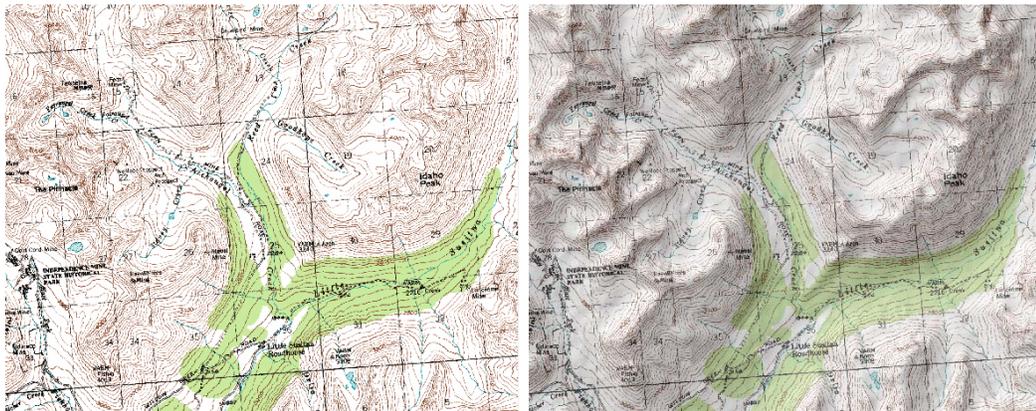


10. Uncheck the visibility for all layers except the BDL WMS. Within the extent of the clipped DEM layers, zoom and/or pan to an area of your interest, right-click on the BDL WMS layer in the TOC and choose the Properties command. On the Advanced tab of the Layer Properties dialog, set the transparency slider to 35%, then click OK to set the property for the BDL WMS layer.



Check back on the visibility of either or both the Hillshade of ASTER or Hillshade of NED layers. You have quickly created cartographic shaded relief effect of the orthophotography being streamed to your map document using the hillshade model based on the WCS.

If time permits, go back to the AlaskaMapped website, download the Imagery: Extras (Topos, ...) layer file and repeat steps 9 and 10 to quickly create a shaded relief version of the USGS topo map.



Some background about the BDL WMS:

The BDL (Best Data Layer) is the repository for the Alaska Statewide Digital Mapping Initiative (SDMI). More information about SDMI can be found at <http://www.alaskamapped.org>. The goal of BDL WMS is to provide open access to the most current, publicly available orthorectified imagery anywhere across the entire State of Alaska. The WMS format is an open source protocol defined by the Open Geospatial Consortium (OGC, <http://www.opengeospatial.org>) and can be implemented in a variety of mapping software platforms, not just ESRI ArcGIS.

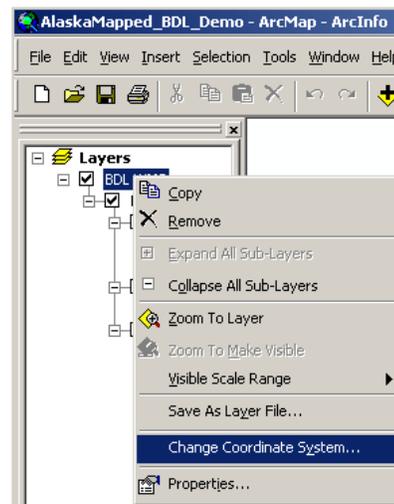
Currently, there are two additional WMS available through AlaskaMapped; one named **Extras** containing a variety of raster datasets that are in frequent demand among end-users of geospatial information (i.e. USGS Digital Raster Graphics, USGS National Elevation Dataset Shaded Relief, etc...), and another named **Charts** containing the full listing of NOAA Nautical Charts for the State of Alaska (not suitable for navigation). These are at the following URLs:

Extras: <http://wms.alaskamapped.org/extras>

Charts: <http://wms.alaskamapped.org/charts> and

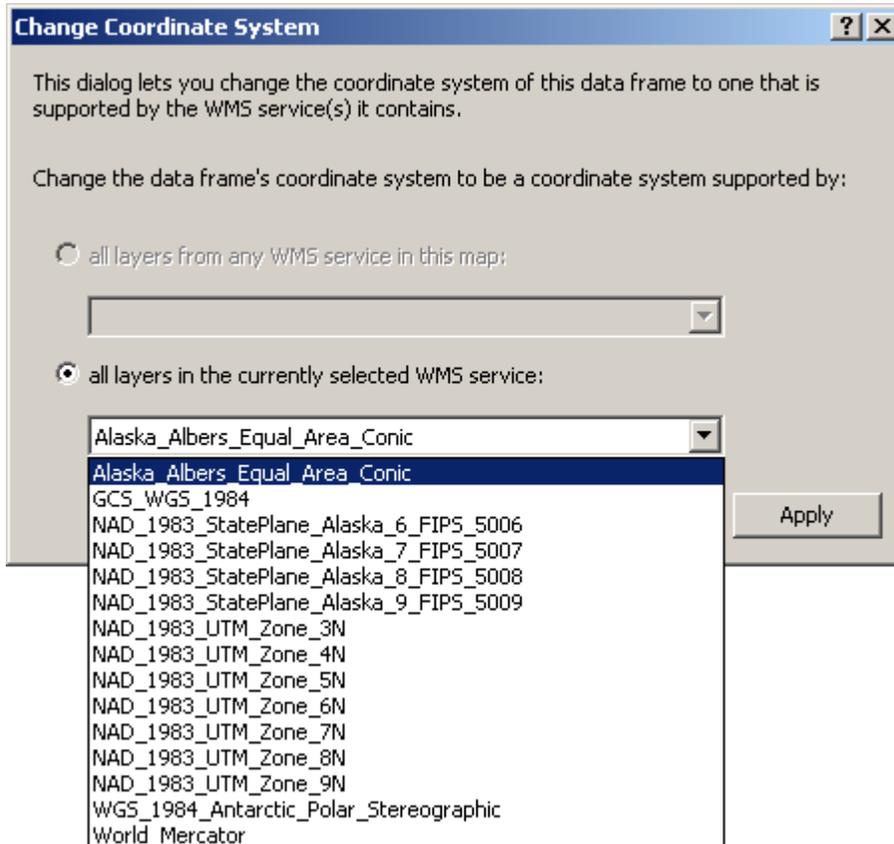
http://wms.alaskamapped.org/charts_nc (nc = no collar)

Note: If the BDL WMS is the first layer added to a map document, it will be added by ArcMap in the Geographic WGS84 spatial reference and the data frame coordinate system will be set accordingly. This can easily be changed using either the Coordinate System tab of the Data Frame Properties, or the Change Coordinate System command located on the BDL WMS layer context menu. The BDL WMS supports a wide range of coordinate systems commonly used in Alaska.



To use the layer context menu to set the spatial reference to any of the currently supported coordinate systems, right-click on the BDL WMS layer name in the Table of Contents and select the Change Coordinate System command to launch the Change Coordinate System

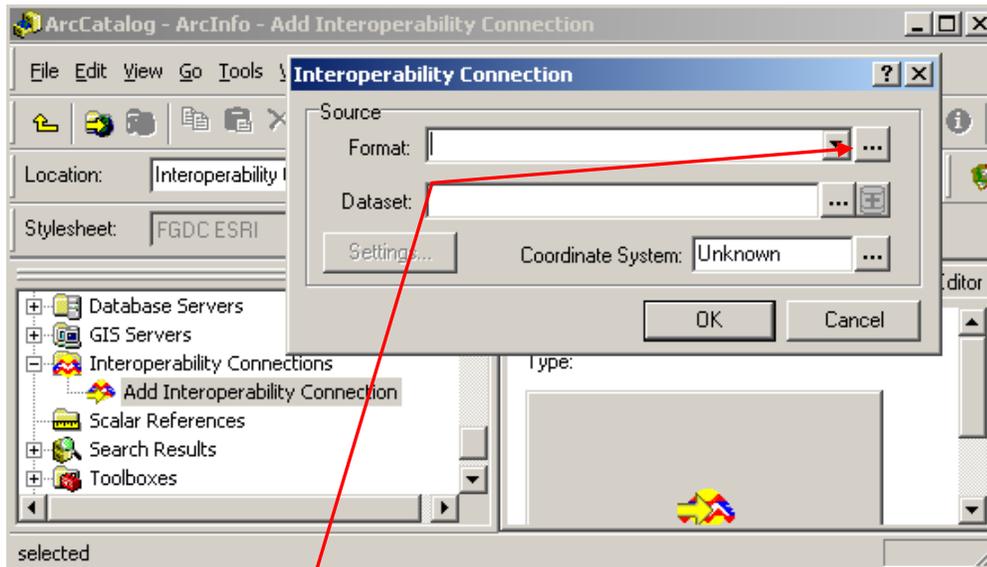
dialog. Next, click on the pull-down arrow under the “all layers in the currently selected WMS service: option to view the list of coordinate systems currently supported by the BDL WMS.



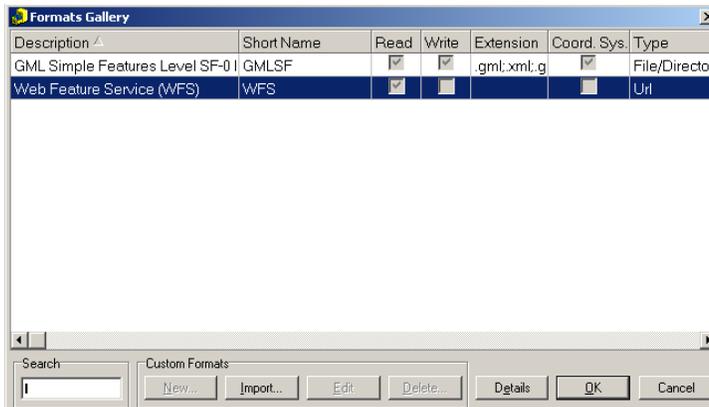
Select the desired coordinate system, then click OK. The next section of this exercise covers connecting to the AlaskaMapped Inventory Web Feature Service (WFS) to browse metadata for the BDL WMS interactively using image footprints as a guide.

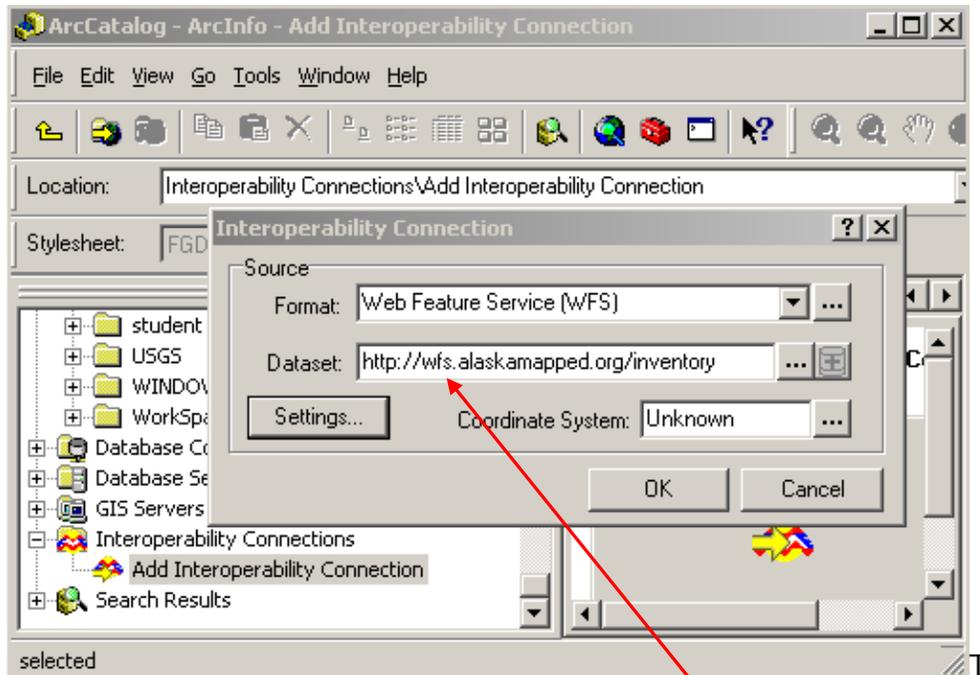
AlaskaMapped Web Feature Service(WFS) ArcGIS Tutorial

11. Launch ArcCatalog if you don't still have it running.
12. In ArcCatalog, scroll down to the Interoperability Connections entry towards the bottom of the catalog tree. Expand Interoperability Connections and double-click on Add Interoperability Connection to launch the Interoperability Connection dialog.



13. Click the ellipsis [...] next to the Format: window on the Interoperability Connection dialog to launch the Formats Gallery of the Data Interoperability extension. Select the Web Feature Service entry and click the OK button.





Type the URL for the AlaskaMapped WFS <http://wfs.alaskamapped.org/inventory> into the Dataset: window as is shown in the example above, then click the Settings button.

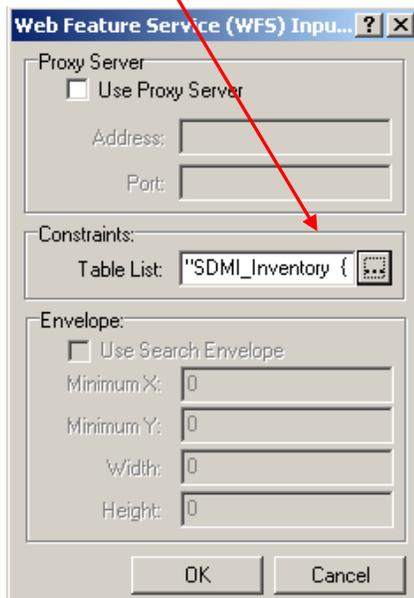


14. Click the ellipsis next to the Table List: window under the Constraints: section of the Web Feature Service (WFS) dialog. This may take some time, but the Web Feature Service (WFS) Table List will eventually load.

15. Check the Selected box to the left of the SDMI_Inventory item as in the example above, then click the OK button.



16. Ensure that the SDMI_Inventory is loaded into the Table List of the Settings dialog, then click OK.

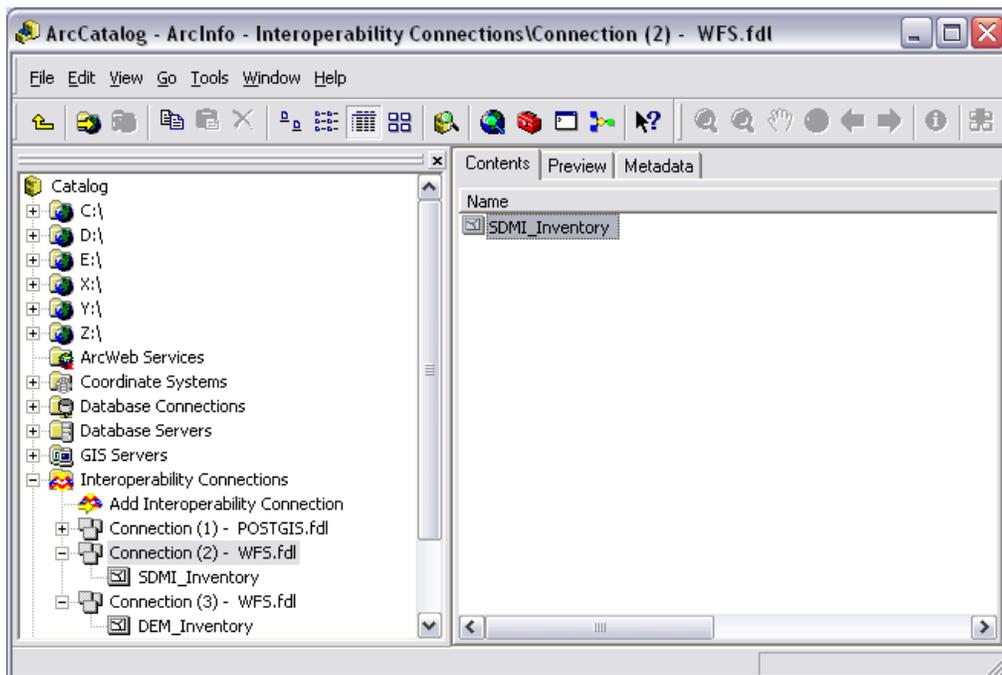


17. The coordinate system for the AlaskaMapped WFS is built into the service. It will NOT function correctly if you specify the coordinate system in the Interoperability Connection dialog. **Note:** Leave the Coordinate System: window of the Interoperability Connection dialog intentionally set to **Read from source**. Your dialog should look exactly like the example below.

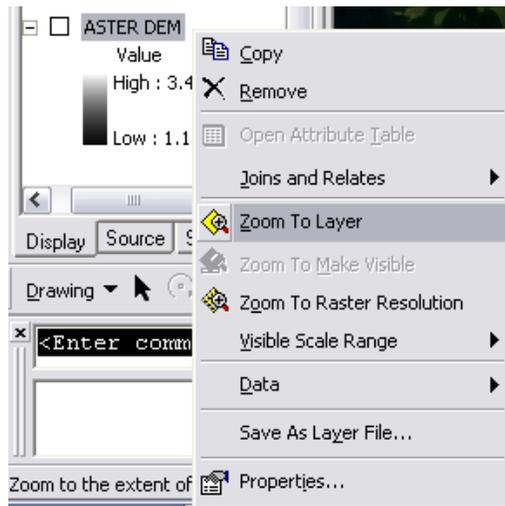


Click OK to complete the connection to the AlaskaMapped WFS Inventory. It will be added to the ArcCatalog tree under Interoperability Connections as Connection (?) – WFS.

18. Expand Connection (?) – WFS in the ArcCatalog tree to view its contents.

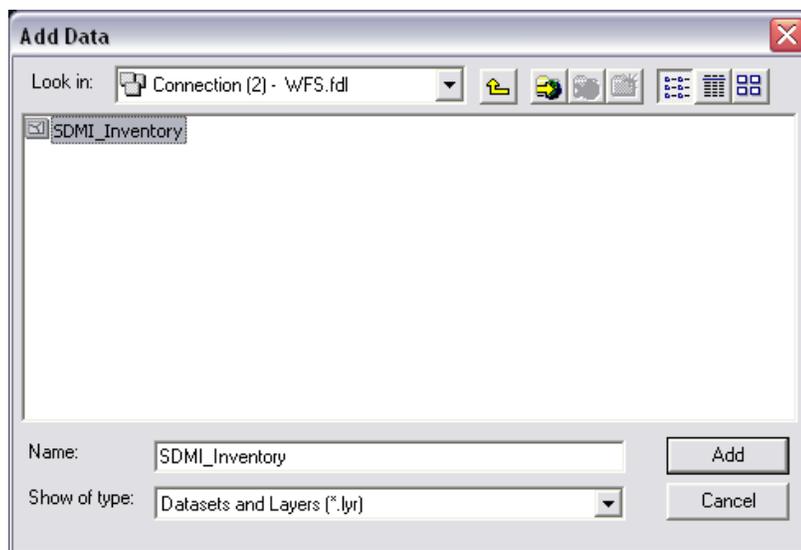


19. Bring ArcMap back to the front of your desktop. You may wish to uncheck the visibility for all layers except the BDL WMS. Zoom to the extent of the ASTER DEM layer by right-clicking on the ASTER DEM layer name in the TOC and choosing the Zoom to Layer command.



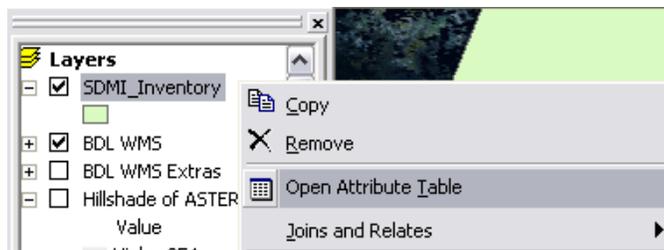
This will bring most of the state into the Display window.

20. Click the Add Data button and set the Look in: window to Interoperability Connections. Double-click the entry for Connection(?) – WFS.fdl, select the SDMI_Inventory Polygon layer and click the Add button.



The SDMI_Inventory Polygon layer is a vector data WFS that contains a footprint (boundary) polygon feature and record of attribute for all ortho image tiles ingested and maintained in the AlaskaMapped BDL WMS, as well as minimum metadata stored in the form of the attributes of each polygon which pertain to each ortho image tile being referenced by an Inventory polygon. These data are a live connection to the database server hosting the BDL WMS and are created on-the-fly from the bounding coordinates of every image tile that has been ingested into the service.

21. Click Close on the Geographic Coordinate System Warning if it is presented.
22. Right-click on the SDMI_Inventory layer in the TOC and choose the Open Attribute Table command to launch the attribute table for the layer. Close the table window.



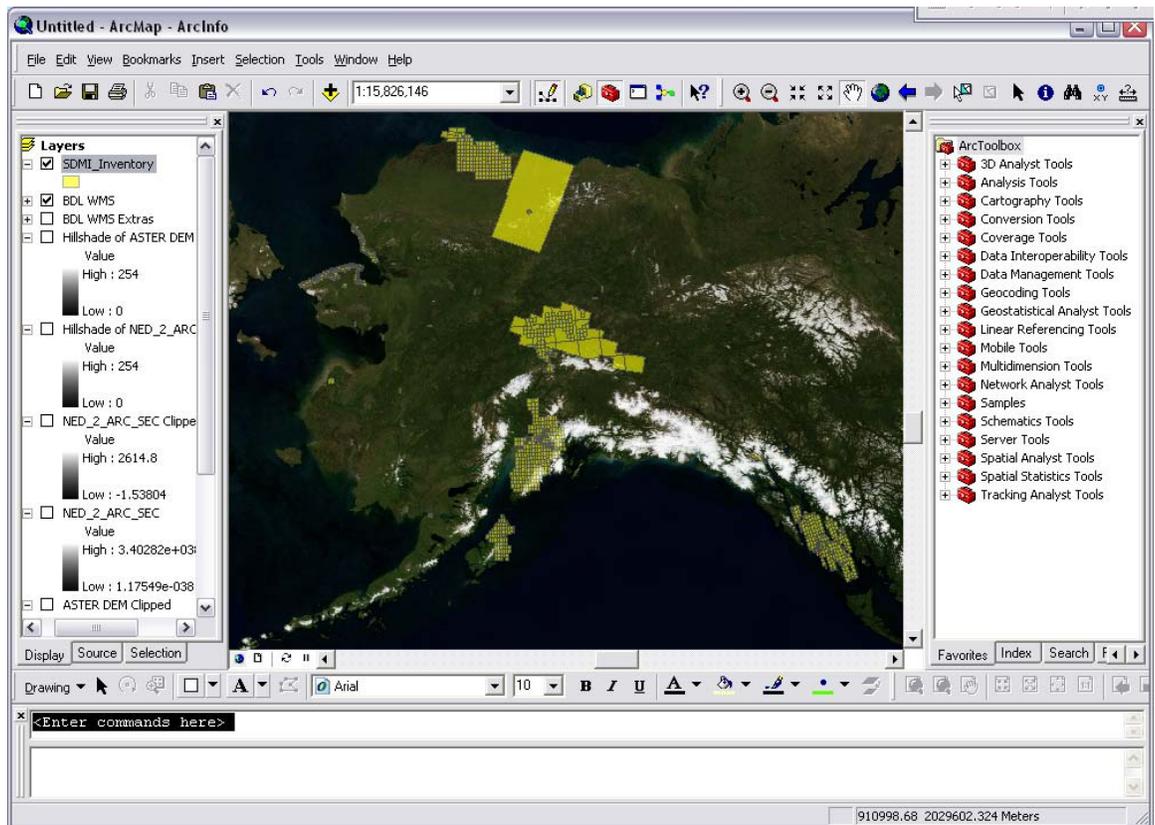
scene_id	downloadable	start_time	end_time	source_res	contact	license_type
USGS.URBAN_ANCHORAGE.06VUN375800	t	2002-09-10 00:00:00	2002-09-10 23:59:59	0.3	Carl Markon	Public Domain
USGS.URBAN_ANCHORAGE.06VUN375815	t	2002-09-10 00:00:00	2002-09-10 23:59:59	0.3	Carl Markon	Public Domain
USGS.URBAN_ANCHORAGE.06VUN375830	t	2002-09-10 00:00:00	2002-09-10 23:59:59	0.3	Carl Markon	Public Domain
USGS.URBAN_ANCHORAGE.06VUN375845	t	2002-09-10 00:00:00	2002-09-10 23:59:59	0.3	Carl Markon	Public Domain
USGS.URBAN_ANCHORAGE.06VUN375860	t	2002-09-10 00:00:00	2002-09-10 23:59:59	0.3	Carl Markon	Public Domain
USGS.URBAN_ANCHORAGE.06VUN375875	t	2002-09-10 00:00:00	2002-09-10 23:59:59	0.3	Carl Markon	Public Domain
USGS.URBAN_ANCHORAGE.06VUN375890	t	2002-09-10 00:00:00	2002-09-10 23:59:59	0.3	Carl Markon	Public Domain
USGS.URBAN_ANCHORAGE.06VUN390800	t	2002-09-10 00:00:00	2002-09-10 23:59:59	0.3	Carl Markon	Public Domain
USGS.URBAN_ANCHORAGE.06VUN390815	t	2002-09-10 00:00:00	2002-09-10 23:59:59	0.3	Carl Markon	Public Domain
USGS.URBAN_ANCHORAGE.06VUN390830	t	2002-09-10 00:00:00	2002-09-10 23:59:59	0.3	Carl Markon	Public Domain
USGS.URBAN_ANCHORAGE.06VUN390845	t	2002-09-10 00:00:00	2002-09-10 23:59:59	0.3	Carl Markon	Public Domain
USGS.URBAN_ANCHORAGE.06VUN390860	t	2002-09-10 00:00:00	2002-09-10 23:59:59	0.3	Carl Markon	Public Domain
USGS.URBAN_ANCHORAGE.06VUN390875	t	2002-09-10 00:00:00	2002-09-10 23:59:59	0.3	Carl Markon	Public Domain
USGS.URBAN_ANCHORAGE.06VUN390900	t	2002-09-10 00:00:00	2002-09-10 23:59:59	0.3	Carl Markon	Public Domain
USGS.URBAN_ANCHORAGE.06VUN405785	t	2002-09-10 00:00:00	2002-09-10 23:59:59	0.3	Carl Markon	Public Domain
USGS.URBAN_ANCHORAGE.06VUN405800	t	2002-09-10 00:00:00	2002-09-10 23:59:59	0.3	Carl Markon	Public Domain
USGS.URBAN_ANCHORAGE.06VUN405815	t	2002-09-10 00:00:00	2002-09-10 23:59:59	0.3	Carl Markon	Public Domain
AERIAL_UAF_MAY2007_UAF_AREA_2_14	t	2007-05-14 00:00:00	2007-05-14 23:59:59	0.25	Karen Amstrup	Public Domain
AERIAL_NPS.BELA.2003_C03	t	2003-07-19 00:00:00	2003-09-24 23:59:59	0.6	Scott Miller	Public Domain
AERIAL_UAF_MAY2007_UAF_AREA_2_15	t	2007-05-14 00:00:00	2007-05-14 23:59:59	0.25	Karen Amstrup	Public Domain
AERIAL_UAF_MAY2007_UAF_AREA_2_01	t	2007-05-14 00:00:00	2007-05-14 23:59:59	0.25	Karen Amstrup	Public Domain
AERIAL_UAF_MAY2007_UAF_AREA_2_02	t	2007-05-14 00:00:00	2007-05-14 23:59:59	0.25	Karen Amstrup	Public Domain
AERIAL_NPS.BELA.2003_C04	t	2003-07-19 00:00:00	2003-09-24 23:59:59	0.6	Scott Miller	Public Domain
AERIAL_NPS.CAKR.2003_R24	t	2003-07-19 00:00:00	2003-09-24 23:59:59	0.6	Scott Miller	Public Domain
AERIAL_NPS.CAKR.2003_O26	t	2003-07-19 00:00:00	2003-09-24 23:59:59	0.6	Scott Miller	Public Domain
AERIAL_NPS.BELA.2003_Q10	t	2003-07-19 00:00:00	2003-09-24 23:59:59	0.6	Scott Miller	Public Domain
AERIAL_NPS.BELA.2003_R06	t	2003-07-19 00:00:00	2003-09-24 23:59:59	0.6	Scott Miller	Public Domain
AERIAL_NPS.BELA.2003_L10	t	2003-07-19 00:00:00	2003-09-24 23:59:59	0.6	Scott Miller	Public Domain
AERIAL_UAF_MAY2007_UAF_AREA_2_04	t	2007-05-14 00:00:00	2007-05-14 23:59:59	0.25	Karen Amstrup	Public Domain
USGS.URBAN_ANCHORAGE.06VUN330815	t	2002-09-10 00:00:00	2002-09-10 23:59:59	0.3	Carl Markon	Public Domain
USGS.URBAN_ANCHORAGE.06VUN330830	t	2002-09-10 00:00:00	2002-09-10 23:59:59	0.3	Carl Markon	Public Domain
USGS.URBAN_ANCHORAGE.06VUN330845	t	2002-09-10 00:00:00	2002-09-10 23:59:59	0.3	Carl Markon	Public Domain
USGS.URBAN_ANCHORAGE.06VUN345815	t	2002-09-10 00:00:00	2002-09-10 23:59:59	0.3	Carl Markon	Public Domain
USGS.URBAN_ANCHORAGE.06VUN345830	t	2002-09-10 00:00:00	2002-09-10 23:59:59	0.3	Carl Markon	Public Domain
USGS.URBAN_ANCHORAGE.06VUN345845	t	2002-09-10 00:00:00	2002-09-10 23:59:59	0.3	Carl Markon	Public Domain
DOQQ_USDA_NRCS_FAIRBANKS_N_6514822_SW	t	2007-06-01 00:00:00	2007-06-01 23:59:59	0.6	Ted Cox	Public Domain



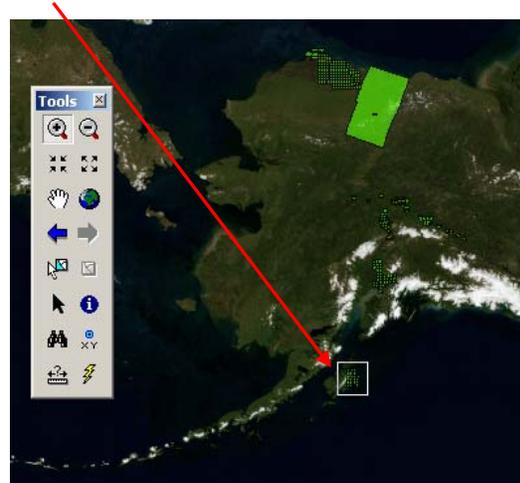
23. To make the inventory easier to understand, set a Definition Query to show only the image footprints that are under Public Domain and not BMNG. Double-click on the SDMI_Inventory layer to launch it's properties then activate the Definition Query tab. Click the Query Builder button and either type or build the following expression:

```
NOT (("scene_id" LIKE 'BMNG%') OR( "downloadable" = 'f'))
```

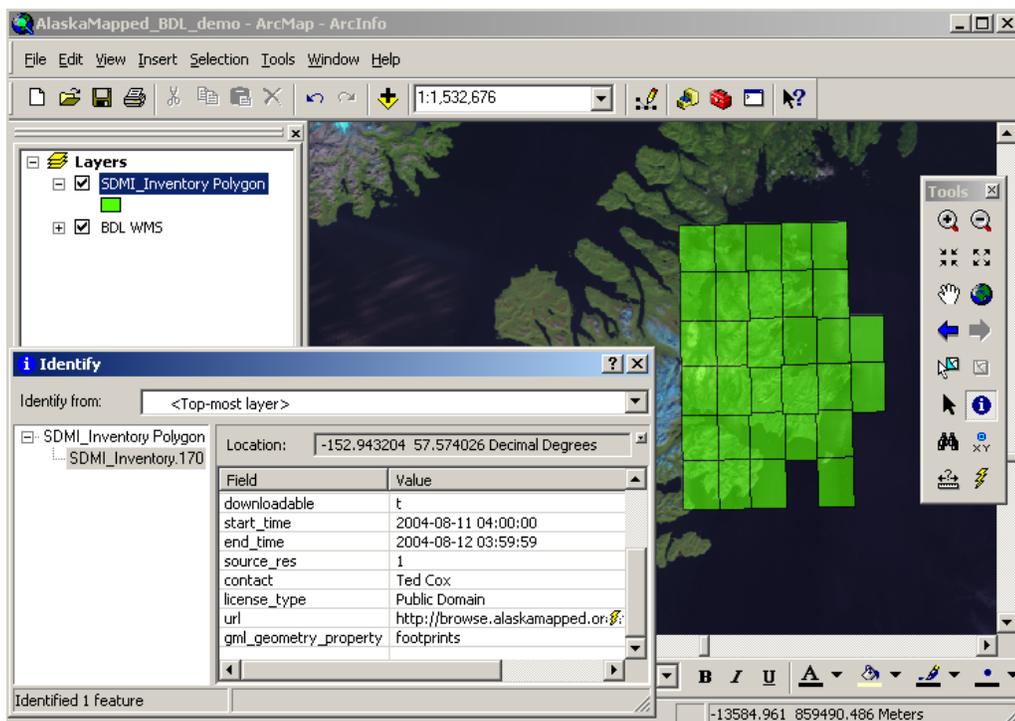
Before closing the Layer Properties dialog, go to the Display tab and set the Transparency parameter to 40%, then go to the Symbology tab and set the fill color to Solar Yellow, then click OK. Your display should look something like the example below.



24. Using the Zoom In tool, click and drag a box around the series of Inventory polygons on Kodiak Island (see the example on the right).



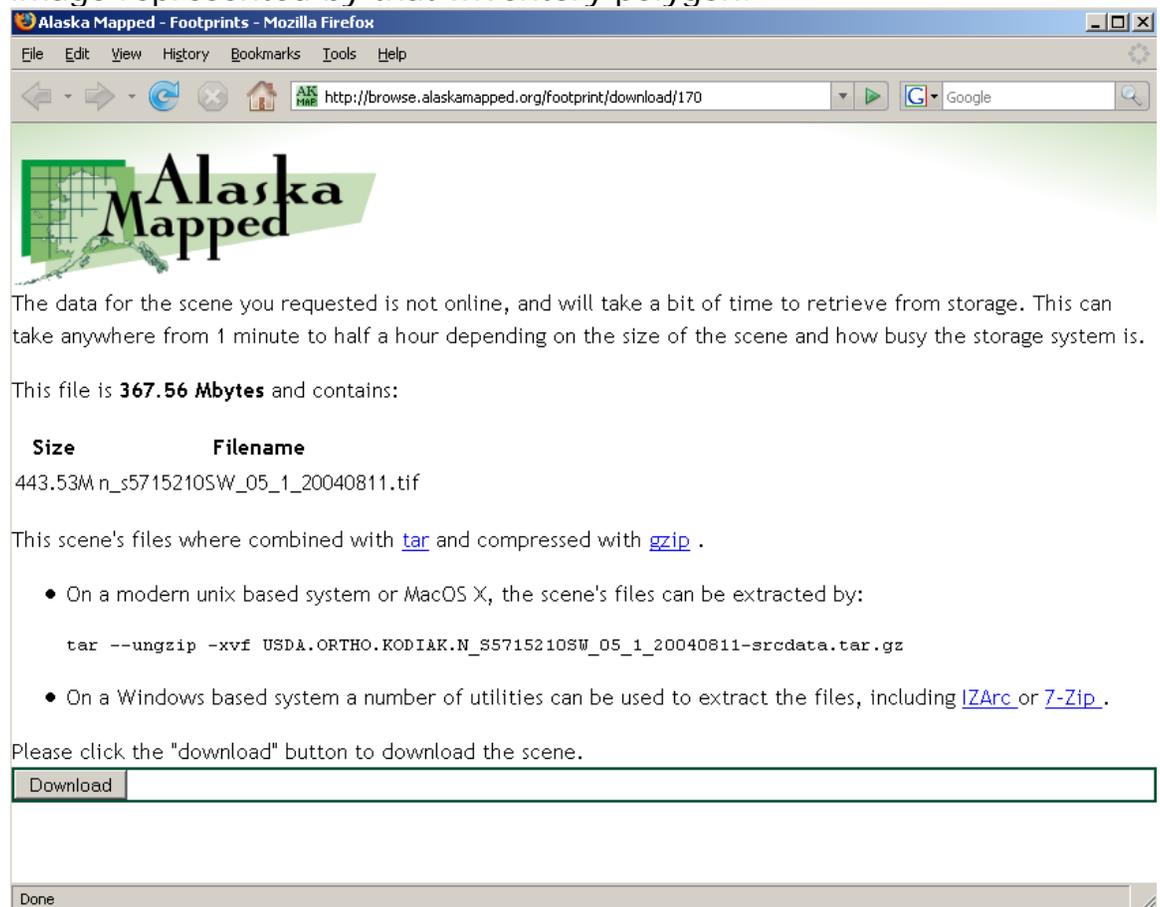
25. Using the Identify tool on the Tools toolbar, click on any of the Inventory polygons in the display area. In left hand side of the Identify window, all available image tiles beneath your mouse click are listed (only one in this example). If there had been more than one, selecting one of these records would flash the polygon related to the selected record on the map display.



Notice that a minimum set of metadata has been built into the Inventory WFS pertinent to the BDL WMS ortho image underlying the Inventory footprint polygon (i.e. contact, license_type, etc...). Pay special attention to the downloadable field. If the value for this field is the letter t, the original ortho imagery being referenced by that inventory polygon and displayed by the BDL WMS is freely downloadable from the browse.alaskamapped.org website.

If necessary, scroll down on the Identify window until the url field is visible. Notice the hyperlink lightning bolt icon to the right of the url value.

26. Click on the lightning bolt to launch the browse.alaskamapped.org download page specific to the ortho image represented by that Inventory polygon.



Alaska Mapped - Footprints - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://browse.alaskamapped.org/footprint/download/170

Alaska Mapped

The data for the scene you requested is not online, and will take a bit of time to retrieve from storage. This can take anywhere from 1 minute to half a hour depending on the size of the scene and how busy the storage system is.

This file is **367.56 Mbytes** and contains:

Size	Filename
443.53M	n_s5715210SW_05_1_20040811.tif

This scene's files were combined with [tar](#) and compressed with [gzip](#).

- On a modern unix based system or MacOS X, the scene's files can be extracted by:

```
tar --ungzip -xvf USD\ORTHO.KODIAK.N_S5715210SW_05_1_20040811-srcdata.tar.gz
```
- On a Windows based system a number of utilities can be used to extract the files, including [IZArc](#) or [7-Zip](#).

Please click the "download" button to download the scene.

Download

Done

Clicking on the Download button on this webpage will execute a download of the original ortho image in the original format in which it was received by GINA prior to ingestion into the AlaskaMapped BDL WMS. You do not have to actually download the imagery for this tutorial, just keep in mind that this is how you can do it if you ever have the need to.

This concludes the Using the SDMI AlaskaMapped OGC web services in ArcGIS Tutorial.

You should now have an understanding of how to connect to the AlaskaMapped WCS, WMS and WFS using either ArcCatalog or ArcMap, and how to use the Inventory WFS to view metadata for imagery held within the BDL WMS as well as use the WFS Inventory polygons to hyperlink to the download page for the image to which they refer.

Thank you...

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