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Digital Soils Survey Map of the Patagonia Mountains, Arizona

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U. S. DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY

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Introduction

The Patagonia – southern Santa Rita Mountains area, located in Southeastern Arizona (fig. 1), is approximately 60 miles SE of Tucson and at its northern edge, 10 miles North of the US Mexico border. The area was mined intermittently from the 1600's to the mid-1960's primarily for silver, lead, copper, and zinc.

The U. S. Geological Survey in cooperation with the U. S. Department of Agriculture Forest Service is conducting a combined Preliminary Assessment (PA)/Site Inspection (SI) of small watersheds that have been potentially impaired by historical mining activities in southern Arizona. Mineral deposit geology, climate, weathering processes, faults, and fractures are factors affecting environmental conditions existing in the area (Gray and others, 2000). The project integrates new and existing geologic, geophysical, and geochemical data and imagery to provide visualizations of the Sonoita Creek basin and adjacent Patagonia Mountains. Emphasis is placed upon development of baseline information, a better knowledge of these aquifer systems, and the understanding of the distribution of metals related to mineralization and their fate in the surface and subsurface environments. The objective is to provide information useful for defining areas of significant environmental impact from erosion processes and to provide some insight on the most practical remediation strategies to be employed. The data provided in the digital soils map presented within this paper, is one of several essential components supporting the overall environmental assessment of the area. Digital data models, like the ones presented in Brady (2000), Gray and others (2000), and Brady and others (2001) require accurate representation of soil material in the area as input.   The Universal Soil Loss Equation (USLE) (Wischmeier 1976, Wischmeier and Smith, 1978) and the Spatially Explicit Delivery MODel (SEDMOD) (Fraser, 1999) were chosen to assist in characterization of potential point and nonpoint source material yield within selected drainage systems.

An integrated analysis using a Geographic Information Systems (GIS)-based platform was implemented to examine three-dimensional visualizations of transport mechanisms within the headwaters of the Patagonia watersheds that ultimately drain to the Sonoita Creek. Sediment transport characteristics were modeled with emphasis on development of background information in this historically mined area, as well as the distribution of metals in the sediment and their destiny in the defined watersheds.

Objective

Historical analog soils data were automated to create a high resolution digital soils survey map of the Patagonia Mountains, Arizona. Preexisting, high-resolution soils data could not be found in digital form. The most accurate soil information for the study area was in hard copy.   This was available as 1:20,000 scale maps in the "Soil Survey of Santa Cruz and Parts of Cochise and Pima Counties, Arizona" (USDA, SCS & FS, 1979), a product of the U.S. Department of Agriculture's Soil Conservation Service and Forest Service in cooperation with the Arizona Agricultural Experiment Station. These maps were created according to the site conditions in 1971. Aerial photography was used to accurately map polygonal soil types according to field tests.   The 1979 soil maps were automated for incorporation into the hydrologic modeling within a GIS.

The resulting digital database can be queried in many ways to produce a variety of soils maps, utilizing attributed polygons. Digital base map data files (topography, roads, towns, rivers and lakes, etc.) are not included. They may be obtained from a variety of commercial and government sources. The soil coverage is not meant to be used or displayed at any scale larger than 1:20,000 (e.g., 1:10,000).

The mapped area is located in Southeast Arizona (fig. 1). This open-file report describes the soil map units, the methods used to convert the soils map data into a digital format, the ArcInfo GIS file structures, and methods for downloading the digital files from the U.S. Geological Survey public access World Wide Web site on the Internet. Karen Bolm reviewed manuscript and digital files.
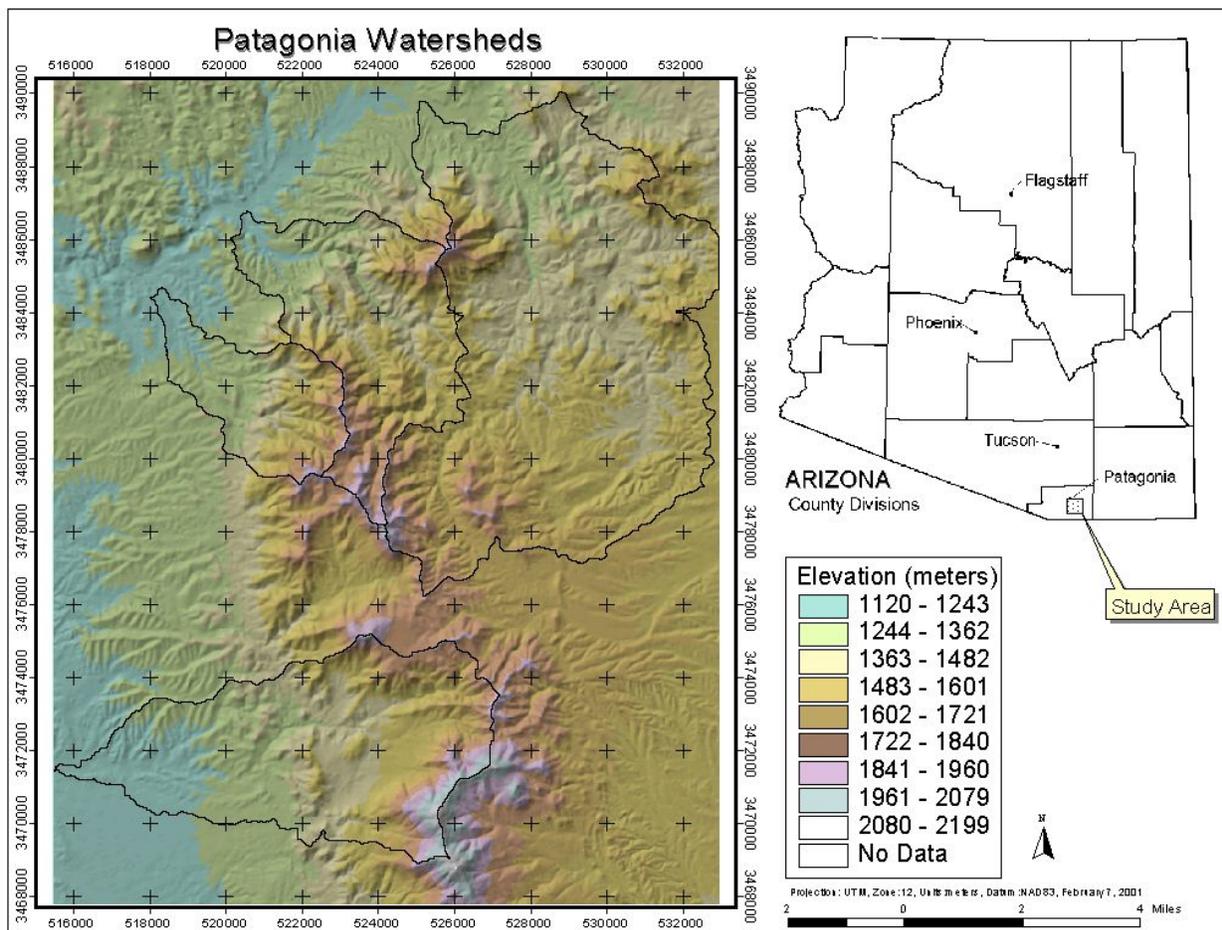
Figure 1: Index map showing the geographic extent of the Patagonia Mountains study area, with watersheds enclosed by black lines.

Description of Map Units

The soil units' descriptions are modified from information published by the U.S. Department of Agriculture: Soil Conservation Service and Forest Service in cooperation with Arizona Agricultural Experiment Station (USDA, SCS & FS, 1979).

Table 1: Symbols, Soils' association and USDA surface textures in the Patagonia soils map (U.S. Department of Agriculture: Soil Conservation Service and Forest Service in cooperation with Arizona Agricultural Experiment Station, 1979).

Ba **Barkerville-Gaddes Complex --** Gravelly sandy loam and sandy clay loam

Bg **Barkerville-Gaddes Association --** Gravelly sandy loam and sandy clay loam

Bh **Bernadino-Hathaway Association --** Gravelly clay loam and cobbly sandy loam

Ca **Calciorthids-Haplargids Association --** Properties too variable to be estimated

Cb **Canelo Gravelly Sandy Loam --** Gravelly, very gravelly, or cobbly sandy loam

Cg **Caralampi Gravelly Sandy Loam --** Gravelly sandy loam and very gravelly sandy clay loam

Cm **Casto Very Gravelly Sandy Loam --** Gravelly and very gravelly sandy clay loam

Co **Chiricahua Cobbly Sandy Loam --** Cobbly or gravelly heavy clay loam or clay

Cr **Chiricahua- Lampshire Association --** Cobbly or gravelly heavy clay loam or clay

Cs **Comoro Sandy Loam --** Sandy loam and gravelly sandy loam

Ct **Comoro Soils --** Sandy loam and gravelly sandy loam

Fr **Faraway- Rock Outcrop Complex --** Very cobbly fine sandy loam

Ga **Gaddes Very Gravelly Sandy Loam --** Gravelly sandy loam, sandy loam, sandy clay loam, gravelly clay, and cobbly sandy clay loam

Gb **Grabe- Comoro Complex --** Loam and sandy loam

Ge **Grabe Soils --** Loam and sandy loam

Gh **Graham Soils --** Very cobbly clay loam and clay

Gu **Guest Soils --** Clay, gravelly clay and gravelly clay loam

HO **Water Bodies**

Ha **Hathaway Gravelly Sandy Loam --** Gravelly sandy clay loam, gravelly and very gravelly sandy loam, and sandy loam

Lc **Lampshire-Chiricahua Association --** Very cobbly loam

Lg **Lampshire- Graham- Rock Outcrop Association --** Very cobbly loam

Lu **Luzena Gravelly Loam, Deep Variant --** Gravelly clay loam and gravelly clay

Mg **Martinez Gravelly Loam --** Loam or clay loam and clay

NA **Not Available** – Undefined soil type

Pm **Pima Soils --** Clay loam

Rn **Rock Outcrop- Lithic Haplustolls Association** – Properties too variable to be estimated

So **Sonoita Gravelly Sandy Loam --** Gravelly sandy loam

Th **Torrifluvents and Haplustoils --** Properties too variable to be estimated

Tr **Tortugas- Rock Outcrop Complex --** Very cobbly loam

Wg **White House Gravelly Loam --** Gravelly loam, clay loam, and clay

Wh **White House Cobbly Sandy Loam --** Gravelly loam, clay loam, and clay

Wn **White House- Bonita Complex --** Gravelly loam, clay loam, and clay

Wo **White House- Caralampi Complex --** Gravelly loam, clay loam, and clay

Wt **White House- Hathaway Association --** Gravelly loam, clay loam, and clay

The data are also attributed by slope; the capital letters B, C, D, E, or F define the slope; if a soil type has no slope defined, it can be assumed to have nearly level slope or a considerable range of slope (U.S. Department of Agriculture: Soil Conservation Service and Forest Service in cooperation with Arizona Agricultural Experiment Station, 1979), as seen in table 2.

Table 2: Slope attributes (U.S. Department of Agriculture: Soil Conservation Service and Forest Service in cooperation with Arizona Agricultural Experiment Station, 1979).

Slope	Percent represented
B	0-5 percent slopes
C	1-10 percent slopes
D	0-20 percent slopes
E	20-40 percent slopes
F	1 -- 60 percent slopes

A final user defined attribute within the data is the eroded factor. If the attribute has the number 2, it was considered to be eroded at the time of the survey.

Data Sources, Processing, and Accuracy

The maps from which this dataset was made had not been rectified for distortion or registered to a coordinate system. A total of 15 maps (17" X 11") cover the study area. Each of these maps was scanned into tagged image file format (TIFF) using an 8-bit black and white drum scanner at 100 dpi (fig. 2).
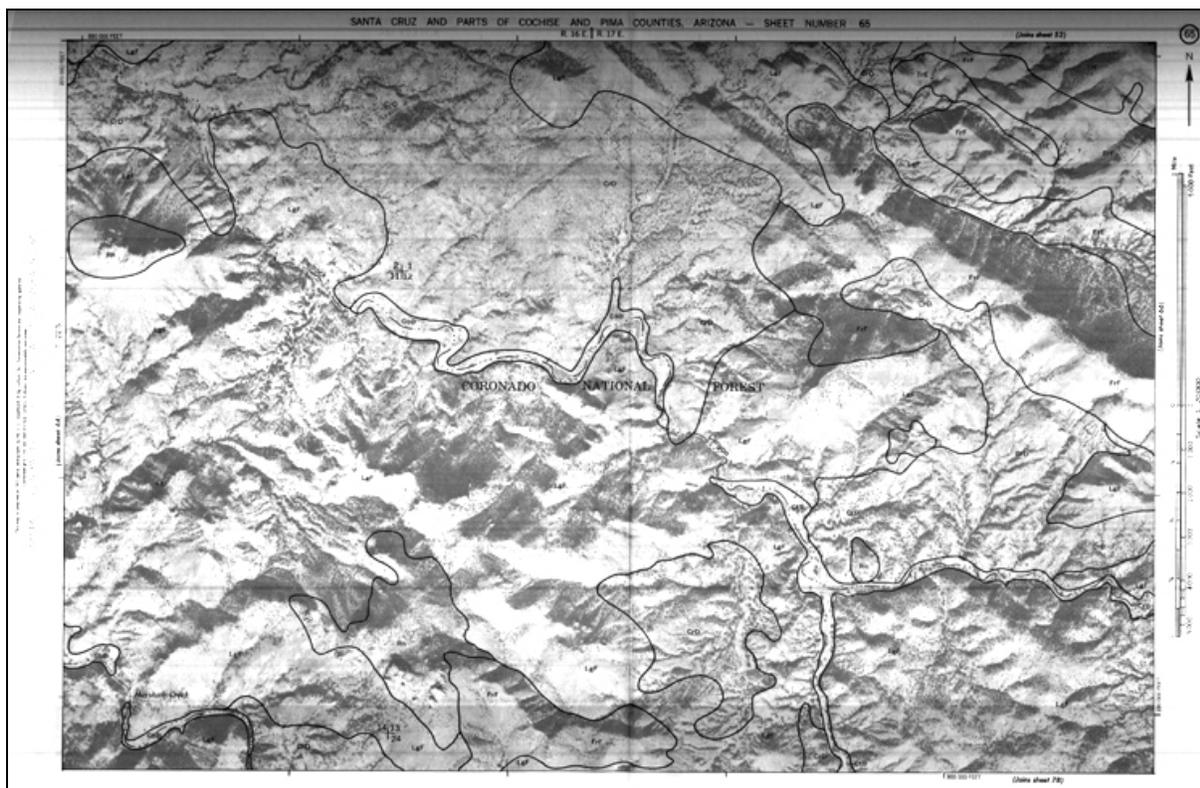
Figure 2: Soils Map: Santa Cruz and Parts of Cochise and Pima Counties, Arizona-Sheet Number 65.

ERDAS IMAGINE was used to import the images and the white borders were removed through subset decollaring processes. Five CD-ROM's containing Digital Orthophoto Quarter Quads (DOQQ's) from the USGS were used to register and rectify the scanned soils maps. Polygons were then attributed according to the soil units on the map. Ground Control Points (GCP's) were established by matching known locations on the soil maps to the same location identified on a DOQQ, see figure 3. The aerial photos were taken some 30 years prior to processing into DOQQ's and buildings, trees, and waterways had changed considerably. Therefore, the easiest and most accurate objects to identify were roads and intersections of roads with other features. These appeared to have the same shape throughout time, although some forest roads were out of use or had been paved or widened.
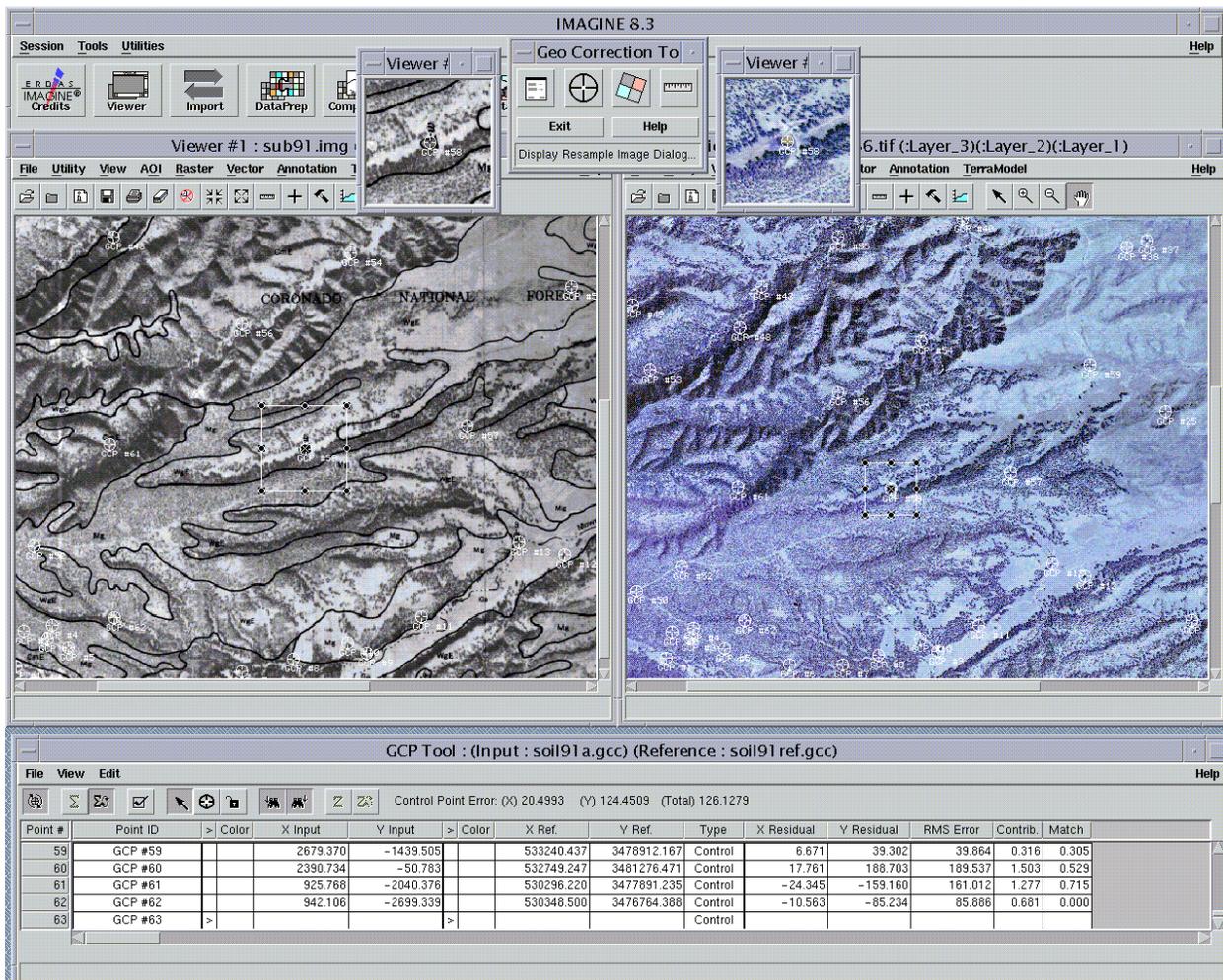
Figure 3: Picture of ERDAS IMAGINE georectification process.

A third-order polynomial transformation requires a minimum of 10 GCP's to be identified. However, the level of accuracy increases as more points are entered and widely distributed. The GCP prediction tool within ERDAS IMAGINE 8.4 uses the current transformation parameters to predict where the user will locate GCP's from the work in progress to source data. This enables the user to determine when enough points have been entered to ensure that the transformation is accurate (ERDAS, 1997). An average of 80 GCP's were identified on each aerial photo and cross-referenced with the source data for this study.

The digital transformation was performed with the cubic convolution method of resampling to effectively associate the aerial photo with pinpoints to known coordinates and to adjust the map to accurate proportions. This sampling method is suggested for aerial photos in which the cell size is dramatically changed (ERDAS, 1997).

This method transformed scanned soils maps into registered images. The cubic convolution method resamples using an algorithm that recognizes the data files of 16 pixels in a 4 by 4 window, and this creates the most accurate output when rectifying aerial photos (ERDAS, 1997). Error still exists despite the high number of GCP's used to control the transformation. The difficulty in accurately fitting images over mountainous terrain from aerial photos accounts for some of the error in rectification (Carson, 1993). Error exists in the DOQQ's due to possible error in input for the rectification that created them (digital elevation model (DEM), aerotriangulation control and methods, the photo source camera calibration, scanner calibration, and aerial photographs) and new error was introduced in the resampling process. However, the photos edge-matched positively and roads, rivers, trees and soil polygons merged together seamlessly when mosaiced to create a cohesive map. The raster geometric correction was successful for use in this project. The final .IMG file was converted and compressed within ARC/INFO to TIFF format and laid out onscreen with known vector coverages of digitized roads and rivers overlaid to check for accuracy and error. The rectified aerial photo is displayed in figure 4, with a digital line coverage composed in TIGER, a GIS software, of Santa Cruz County. Error was determined to be within +/- 40 meters. These data are not meant to be used or displayed at any scale larger than 1:20,000.
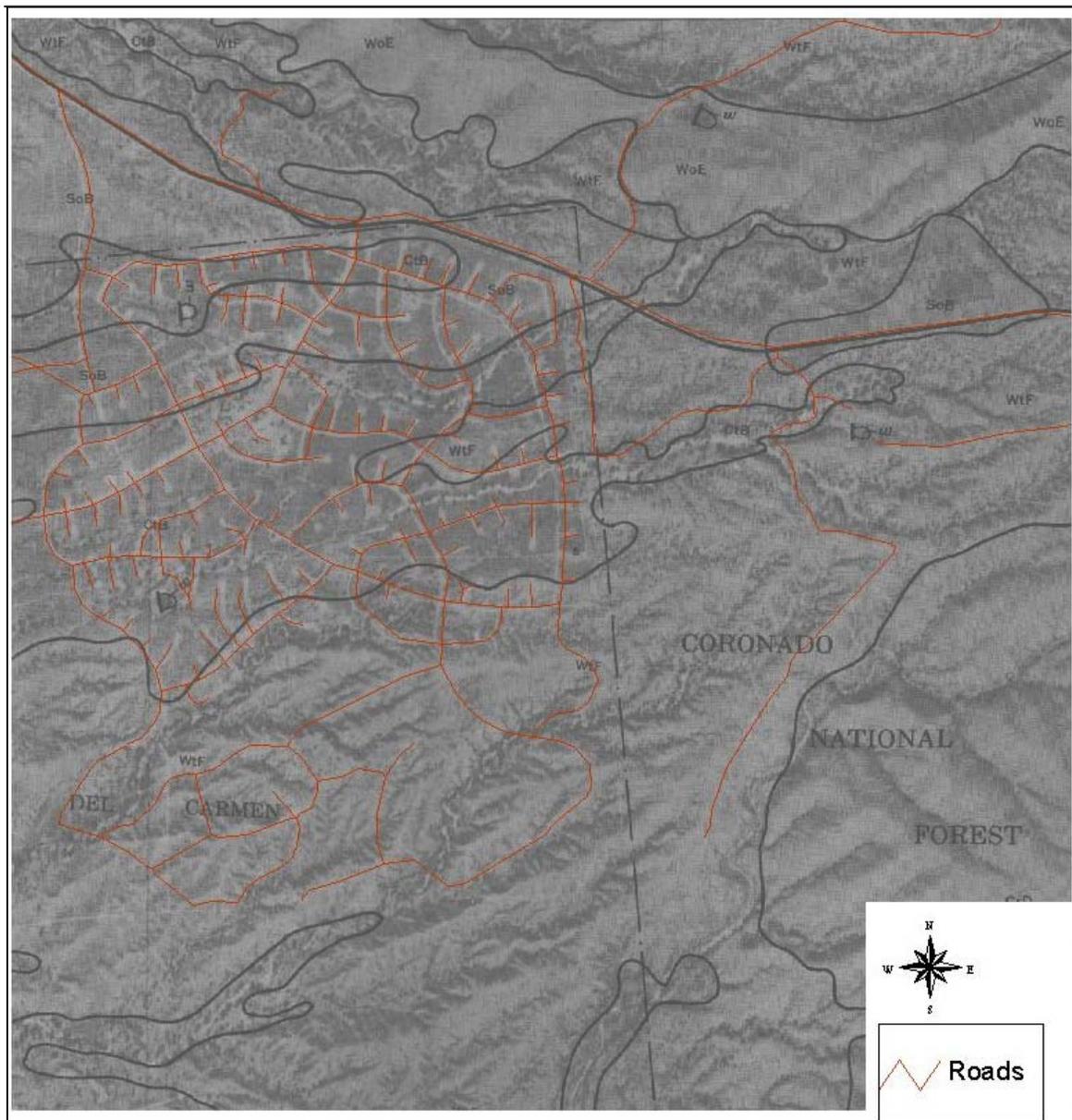
Figure 4: Campground area of aerial photo depicting error from overlain vector coverage of roads.

The soils data that had been inscribed on the aerial photos were then automated through the process of on-screen digitizing in ARCEDIT. The distance command identified acceptable tolerances, node snap to closest 100 meters and weed and grain tolerances to 15 meters. The user-friendly graphical user interface (GUI) called ARCTOOLS was employed for the initial digitizing. Topological errors were corrected manually using command line editing, and topology was built.

        User defined items were added to the newly digitized soil coverage feature attribute table to define the map unit descriptions: soil series, slope angle and previous erosion. Labels were created and attribution of the new soils coverage was completed using a form-based interface provided by ESRI within ARCEDIT.   Four hundred and forty three polygons were attributed against the labeled polygons of the final aerial TIFF. A subset of the digitized polygons was made to correspond to the study area, which left 360 polygons. That set is displayed as a soil series map (fig. 5).

        Thirty-two different soil types are represented in this area. The application of this type of digital map, with its newly formed relational database as stored in a GIS, creates a straightforward link amongst the soil polygon attributes (Maidment, 1993). The projection was defined according to the DOQQ that fostered it.
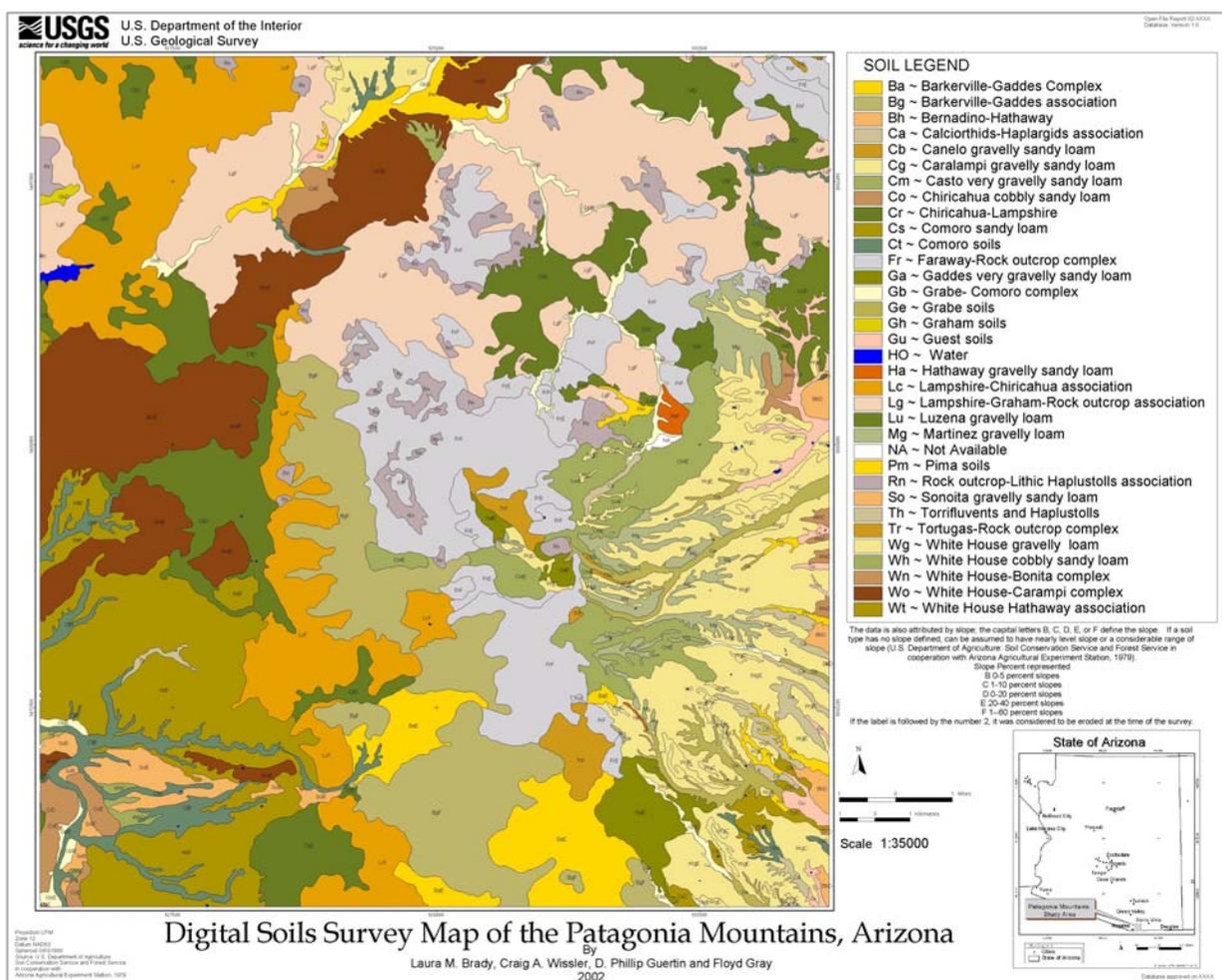
Figure 5: This digital soils survey map of the Patagonia Mountains, Arizona is available at a 40 X33 inch map size JPEG in this digital release.

GIS Documentation

The digital soils data set of the Patagonia study area includes a polygon attribute table, SCS_Soil.PAT that contains relevant information. This table is described below.

Polygonal Features

The data coverage contains 361 polygon features, 1,015 arc features and 720 node features.

Table 3: Descriptions and data type of the user defined items identifying polygon features (symbol, slope and erodibility).

scs_soil.pat			
ITEM NAME	ITEM TYPE	ITEM LENGTH	ATTRIBUTE DESCRIPTION
SOIL_SERIES	Character	2	Symbol used to identify the soil series as defined above, (table 1).
SLOPE	Character	2	Code given to show the slope (B, C, D, E, or F), (table 2).
IFERODED	Integer	2	Boolean code used to identify if the area was eroded at the time of survey.

Obtaining Digital Data

The complete digital data set is available in ArcInfo interchange file format with associated data files. These data and map images are maintained in a Universal Transverse Mercator (UTM) map projection:

Projection: UTM

Zone: 12

Datum: NAD83

Units: meters

To obtain copies of the digital data, do one of the following:

1. Download the digital files from the USGS public access World Wide Web site on the Internet: **URL = http://geopubs.wr.usgs.gov/open-file/ofr02-324/**

or

2. Anonymous FTP from **geopubs.wr.usgs.gov,** in the directory

      pub/open-file/ofr02-324

The Internet sites contain this report in PDF format, the digital soils map of the Patagonia study area in an ArcInfo exchange-format file (scs_soil.e00) and a JPEG file (scs_soil.jpg) of the automated map.

      To manipulate these data in a geographic information system (GIS), you must have a GIS that is capable of importing ArcInfo interchange-format files.

Obtaining Paper Maps

      Paper copies of the digital geologic map are not available from the USGS. However, with access to the Internet and access to a large-format color plotter that can interpret either image file (JPEG), or PDF (portable document format) files, a 1:35,000-scale paper copy of the map can be made, as follows:

1. Download the digital version of the map, **scs_soil.jpg** or **scs_soil.pdf,** from the USGS public access World Wide Web site on the Internet using the

URL = http://geopubs.wr.usgs.gov/open-file/ofr02-324/

or

2. Anonymous FTP the plot file, **scs_soil.jpg** or **scs_soil.pdf,** from: **geopubs.wr.usgs.gov,** in the directory:

      pub/open-file/ofr02-324

3. This file can be plotted by any large-format color plotter that can interpret JPEG or PDF files. The finished plot is about 30 inches by 42 inches.

      Paper copies of the map can also be created by obtaining the digital file as described above and then plotting with GIS software.

References Cited

Brady, L.M., 2000, GIS analysis of spatial variability of contaminated watershed components in a historically mined region, basin and range province, Southeast Arizona: Tucson, University of Arizona, Master thesis, 127 p.

Brady, L.M., Gray, F., Wissler, C.A., and Guertin, D.P., 2001, Spatial variability of sediment erosion processes using GIS analysis within watersheds in a historically mined region, Patagonia Mountains, Arizona: U.S. Geological Survey Open-File Report 01- 267.

Carson, Ward W., 1993. 'Monodigitizing', Make the Photograph match the Map": GIS World, v. 6, no. 10, p. 46-47.

ERDAS, Inc., 1997, ERDAS field guide (4th ed.): Atlanta, Georgia, p. 307- 342.

Fraser, R.H., 1999, SEDMOD: a GIS-based delivery model for diffuse source pollutants: New Haven, Conn., Yale University, Ph.D. dissertation, 99 p.

Gray, Floyd, Wirt, Laurie, Caruthers, Kerry, Gu, Ailiang, Velez, Carlos, Hirschberg, Douglas M., and Bolm, Karen, 2000, Transport and Fate of Zn and Cu rich, Low pH Water from Porphyry Copper and Related Deposits, Basin and Range Province, Southeastern Arizona; in Proceedings of the Fifth International Conference on Acid Rock Drainage, May 21-24, 2000, Denver, CO: (1), p. 411-430.

Maidment, David R., 1993. GIS and Hydrologic Modeling *in* Goodchild, Michael F., Parks, Bradley O. , Steyaert, Louis T., ed., 'Environmental Modeling with GIS.' Oxford University Press, NY, Oxford, p.147- 167.

U.S. Department of Agriculture: Soil Conservation Service and Forest Service in cooperation with Arizona Agricultural Experiment Station, 1979, Soil survey of Santa Cruz and parts of Cochise and Pima counties, Arizona: April 1979, 100 p.

Wischmeier, W.H., 1976, Use and misuse of the Universal Soil Loss Equation: Journal of Soil and Water Conservation, v. 31, no.1, p. 5-9.

Wischmeier, W.H., and Smith, D.D., 1978, Predicting rainfall erosion: a guide to conservation planning: U.S. Department of Agriculture Agronomy Handbook No. 537.

Appendix A ~ Metadata

Identification_Information:

 Citation:
  Citation_Information:
    Originator: Laura Margaret Brady
    Publication_Date: unpublished
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      COVERAGE SCS_SOIL -- Digital Soils Survey Map of the
      Patagonia Mountains, Arizona

    Edition: Version 1.5, March 12, 2002
    Geospatial_Data_Presentation_Form: map
    Series_Information:
      Series_Name: U.S. Geological Survey Open File Report
      Issue_Identification: USGS OFR 02-324
    Publication_Information:
      Publication_Place: Menlo Park, California

      Publisher: U.S. Geological Survey
    Online_Linkage: URL = http://geopubs.wr.usgs.gov/open-file/of02-324/

 Description:

  Abstract:
    The ,"Soil Survey of Santa Cruz and Parts of Cochise
    and Pima Counties, Arizona", a product of the USDA's
    Soil Conservation Service and the Forest Service in
    cooperation with the Arizona Agricultural Experiment
    Station, released in 1979, was created according to
    the site conditions in 1971, when soil scientists
    identified soils types on aerial photographs. The
    scale at which these maps were published is 1:20,000.

    These soil maps were automated for incorporation into
    the hydrologic modeling within a GIS. The aerial photos
    onto which the soils units were drawn had not been
    orthoganalized, and contained distortion. A total of 15
    maps composed the study area. These maps were scanned
    into TIFF format using an 8-bit black and white drum
    scanner at 100 dpi. The images were imported into ERDAS
    IMAGINE and the white borders were removed through
    subset decollaring processes. Five CD-ROM's containing
    Digital Orthophoto Quarter Quads (DOQQ's) were used to
    register and rectify the scanned soils maps. Polygonal
    data was then attributed according to the datasets.

  Purpose:
    Beginning in March of 1997, the Preliminary Assessment

of the Patagonia Mountains study area was undertaken.
An integrated watershed analysis using Geographic
Information Systems (GIS) based platform was undertaken
to examine transport characteristics. The Universal
Soil Loss Equation (USLE) and the Spatially Explicit
Delivery MODel (SEDMOD) were chosen to assist in
characterization of potential point and nonpoint source
material yield within selected drainage systems.
This was done to provide information
useful for defining areas of significant environmental
impact and to shed some light on the most practical
remediation strategies to be employed. Many studies
have been conducted to determine different parameters,
effects and contributions of human activity in the
Patagonia and southern Santa Rita Mountains study area.
Incorporation to a digital data model required acquisition
of accurate geo-spatial digital soils data. This digital
geospatial database is one of many being created by the
U.S. Geological Survey as an ongoing effort to provide
geologic information in a geographic information system
(GIS) for use in spatial analysis.

Time_Period_of_Content:
 Time_Period_Information:
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 Currentness_Reference: required

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 Progress: In work
 Maintenance_and_Update_Frequency: None Planned

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  Theme_Keyword: Soils
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  Place_Keyword: Patagonia, Arizona
  Place_Keyword: USA
  Place_Keyword: Arizona

Access_Constraints: none
Use_Constraints:
  Anyone who uses these data must cite USGS. These data
  are not to be used at scales greater than 1:20,000.

Point_of_Contact:
  Contact_Information:
   Contact_Person_Primary:
     Contact_Person: Laura Margaret Brady

     Contact_Organization: US Geological Survey, GD
   Contact_Position: Geographer, GIS Specialist
   Contact_Address:
     Address_Type: mailing and physical address
     Address: 520 N. Park Avenue, Suite 355
     City: Tucson
     State_or_Province: Arizona
     Postal_Code: 85719
     Country: USA
   Contact_Voice_Telephone: (520) 670-5510
   Contact_Facsimile_Telephone: (fax) (520) 670-5571
   Contact_Electronic_Mail_Address: lmbrady@usgs.gov

Data_Set_Credit:
  Coauthors helped to generate the final product map and
  ARCIFO coverage. Craig Wissler, professor at the
  University of Arizona, oversaw the automation and
  attribution of the actual data, while D.P. Guertin,
  also a professor at the University of Arizona, helped in
  assessing the final product and its further applications.
  Floyd Gray, geologist at the USGS, hired the work to be
  done as part of a 5-year project investigation of the fate
  and transport of minerals in the Patagonia Mountains in
  association with abandoned mine locations.
  Karen Bolm, also of the USGS, helped tremendously in the
  review of digital and manuscript data.

Native_Data_Set_Environment:
  SunOS, 5.6, sun4u UNIX
  ARCINFO version 7.2.1

Data_Quality_Information:
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  Attribute_Accuracy_Report:
    The final file was converted and compressed within
    ARCINFO to TIFF format and laid out onscreen with known
    vector coverages of digitized roads and rivers overlaid
    to check for accuracy and error. The most useful was the
    road coverage downloaded the AZGENREF library, which

identified error to be within +/- 40 meters. This digital
database is not meant to be used or displayed at any
scale larger than 1:20,000.
Logical_Consistency_Report:
 Polygon topology present.
 All polygons are closed.
Completeness_Report:
 Only the maps that covered the study area of interest
 were digitized.

Positional_Accuracy:
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     U.S. Department of Agriculture: Soil Conservation Service
     and Forest Service in cooperation with Arizona
     Agricultural Experiment Station, 1979, Soil survey of
     Santa Cruz and parts of Cochise and Pima counties,
     Arizona: April 1979, 100 p.
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    Title:
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     Publisher: U.S. Government Printing Office
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      Beginning_Date 1967
      Ending_Date 1970

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   Known points were identified on the aerial photo and

matched to points on the DOQQ's, these were referred to
as Ground Control Points (GCP's). This was the most time
consuming portion of this project as the aerial photos
were taken some 30 years prior to the DOQQ's and buildings,
trees, and waterways had changed considerably. The
easiest and most accurate objects to identify were roads
and intersections of roads with other features. These
appeared to have the same shape throughout time, although
some forest roads are out of use, or have been paved
or widened. A 3rd order polynomial transformation requires
a minimum of 10 GCP's to be identified. However, the level
of accuracy increases as more points are entered and
widely distributed. The GCP prediction tool within ERDAS
IMAGINE uses the current transformation parameters to
guess where the user will locate GCP's from the work in
progress to source data, this enables the user to determine
when enough points have been entered to ensure that the
transformation is accurate. An average of 80 GCP's were
identified on each aerial photo and cross-referenced with
the source data for this study. The cubic convolution
method of resampling was performed to effectively pierce
the aerial photo with pinpoints to known real time
coordinates and stretch or fold the picture to accurate
proportions. This sampling method is suggested for aerial
photos in which the cell size is dramatically changed.
This transformed the image of an abstract piece of paper
into an accurate representation of real time and space with
registered known coordinates. The cubic convolution
method resamples using an algorithm which recognizes the
data files of 16 pixels in a 4 by 4 window, and this
creates the most accurate output when ortho-rectifying
aerial photos. Error still exists despite the high number
of GCP'sused to control the transformation. It is
difficult to accurately fit images over mountainous
terrain from aerial photos. Error existed in the DOQQ,'
and new error was introduced in the resampling process.
However, the photos edge-matched positively and roads,
rivers, trees and soil polygons merged together seamlessly
when mosaiced to create the big picture. The raster
geometric correction was successful for use in this
project.
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Process_Step:
 Process_Description:
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     Transverse_Mercator:
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      Longitude_of_Central_Meridian: implied
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      False_Easting: implied
      False_Northing: implied
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    Coordinate_Representation:
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   found in OFR text:

   SCS_SOIL83.PAT:

COLUMN	ITEM NAME	WIDTH	OUTPUT	TYPE	N.DEC	ALT. NAME
1	AREA	8	18	F	5	
9	PERIMETER	8	18	F	5	
17	SCS_SOIL83#	4	5	B	-	
21	SCS_SOIL83-ID	4	5	B	-	
25	SOIL_SERIES	2	2	C	-	

```
27   SLOPE          2   2   C   -
29   IFERODED       2   2   I   -
```

SCS_SOIL83.AAT:

COLUMN	ITEM NAME	WIDTH	OUTPUT	TYPE	N.DEC	ALT. NAME
1	FNODE#	4	5	B	-	
5	TNODE#	4	5	B	-	
9	LPOLY#	4	5	B	-	
13	RPOLY#	4	5	B	-	
17	LENGTH	8	18	F	5	
25	SCS_SOIL83#	4	5	B	-	
29	SCS_SOIL83-ID	4	5	B	-	

Entity_and_Attribute_Detail_Citation: none

Distribution_Information:
 Distribution_Liability:
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Metadata_Reference_Information:
 Metadata_Date: 20020312
 Metadata_Contact:
  Contact_Information:
   Contact_Organization_Primary:
    Contact_Organization: USGS
    Contact_Person: Laura Margaret Brady
   Contact_Position: Geographer/ GIS Specialist
   Contact_Address:

Address_Type: mailing and physical address
Address: 520 N. Park Ave., Suite #355
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State_or_Province: AZ
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Contact_Electronic_Mail_Address: lmbrady@usgs.gov
Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata
Metadata_Standard_Version: Version of June 8, 1994
Metadata_Access_Constraints: none
Metadata_Use_Constraints: none