



## **Appendix: Map Data and References**

## Appendix References and Metadata for Maps

The following section describes in greater detail the extent and limitations of map data, summarized from the original metadata. Metadata are listed in the order they appear in the Atlas with the layer title and author in italics.

### General Data

#### *Watershed Boundary: Environmental Protection Agency*

This dataset links HUC8 names and ID numbers with their associated HUC6 names and ID numbers. Shapefile boundaries are for HUC8 watersheds. Data downloaded from the Watershed Boundary Dataset (<http://water.epa.gov/scitech/datait/tools/waters/data/wbd.cfm>) on 1/17/2013

#### *Roads: US Census Bureau*

The TIGER/Line Files are shapefiles and related database files (.dbf) that are an extract of selected geographic and cartographic information from the U.S. Census Bureau's Master Address File / Topologically Integrated Geographic Encoding and Referencing (MAF/TIGER) Database (MTDB). The MTDB represents a seamless national file with no overlaps or gaps between parts, however, each TIGER/Line File is designed to stand alone as an independent data set, or they can be combined to cover the entire nation. Primary roads are generally divided, limited-access highways within the interstate highway system or under State management, and are distinguished by the presence of interchanges. These highways are accessible by ramps and may include some toll highways. The MAF/TIGER Feature Classification Code (MTFCC) is S1100 for primary roads. Secondary roads are main arteries, usually in the U.S. Highway, State Highway, and/or County Highway system. These roads have one or more lanes of traffic in each direction, may or may not be divided, and usually have at-grade intersections with many other roads and driveways. They usually have both a local name and a route number. The MAF/TIGER Feature Classification Code (MTFCC) is S1200 for secondary roads.

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The horizontal spatial accuracy information present in these files is provided for the purposes of statistical analysis and census operations only. No warranty, expressed or implied is made with regard to the accuracy of the spatial accuracy, and no liability is assumed by the U.S. Government in general or the U.S. Census Bureau, specifically as to the spatial or attribute accuracy of the data. The TIGER/Line Shapefiles may not be suitable for high-precision measurement applications such as engineering problems, property transfers, or other uses that might require highly accurate measurements of the earth's surface. Coordinates in the TIGER/Line shapefiles have six implied decimal places, but the positional accuracy of these coordinates is not as great as the six decimal places suggest.

#### *Towns: US Geological Survey*

The Geographic Names Information System contains information about physical and cultural geographic features of all types in the United States, associated areas, and Antarctica, current and historical, but not including roads and highways. The database holds the Federally recognized name of each feature and defines the feature location by state, county, USGS topographic map, and geographic coordinates. Other attributes include names or spellings

other than the official name, feature designations, feature classification, historical and descriptive information, and for some categories the geometric boundaries. The database assigns a unique, permanent feature identifier, the Feature ID, as a standard Federal key for accessing, integrating, or reconciling feature data from multiple data sets. The GNIS collects data from a broad program of partnerships with Federal, State, and local government agencies and other authorized contributors. The GNIS provides data to all levels of government and to the public, as well as to numerous applications through a web query site, web map and feature services, file download services, and customized files upon request.

The Geographic Names Information System (GNIS) is the Federal standard for geographic nomenclature. The U.S. Geological Survey developed the GNIS for the U.S. Board on Geographic Names, a Federal inter-agency body chartered by public law to maintain uniform feature name usage throughout the Government and to promulgate standard names to the public. The GNIS is the official repository of domestic geographic names data; the official vehicle for geographic names use by all departments of the Federal Government; and the source for applying geographic names to Federal electronic and printed products of all types. See <http://geonames.usgs.gov> for additional information.

#### *Digital Elevation Model: US Geological Survey*

Data are 1/3 arc-second (10m) resolution, downloaded from The National Elevation Dataset (NED) (<http://ned.usgs.gov>), the primary elevation data product of the USGS. The NED is a seamless dataset with the best available raster elevation data of the conterminous United States, Alaska, Hawaii, and territorial islands. The NED is updated on a nominal two month cycle to integrate newly available, improved elevation source data. All NED data are public domain. The NED is derived from diverse source data that are processed to a common coordinate system and unit of vertical measure. NED data are distributed in geographic coordinates in units of decimal degrees, and in conformance with the North American Datum of 1983 (NAD 83). All elevation values are in meters and, over the conterminous United States, are referenced to the North American Vertical Datum of 1988 (NAVD 88). The vertical reference will vary in other areas. NED data are available nationally (except for Alaska) at resolutions of 1 arc-second (about 30 meters) and 1/3 arc-second (about 10 meters), and in limited areas at 1/9 arc-second (about 3 meters).

#### *Major Streams: Arizona Land Resources Information System (ALRIS)*

The original ALRIS streams layer was queried for just the largest streams in the watershed, indicated as 1,2, or 3 order streams in this dataset. The original dataset was converted in the fall of 1988 from USGS 1:100,000 scale DLG data to ARC format. Since then, multiple and extensive corrections have taken place. Early on, several Arizona agencies were part of rectification including: attributes, features, edgematching and the re-tiling of the data into the USGS Hydrologic Unit Code (HUC) library tiling format. The Environmental Protection Agency (EPA) has since added critical attributes to the Arizona database, including: A nationally recognized management link code (the Reach Id), names, and hydrologic information. Arizona has enhanced the theme further by adding Descriptive Attribute Codes, Cartographic Order, more Names, and intense Quality Assurance Controls.

## Physical Geography

### *Biotic Communities*

David Brown and Charles Lowe (1979); The Nature Conservancy in Arizona (2004); Arizona Land Resource Information System (1993); Instituto del Medio Ambiente y el Desarrollo Sustentable del Esatado de Sonora (1998); New Mexico Cooperative Fish and Wildlife Research Unit (1996)

This map is intended for broad, regional, landscape-scale analysis. The source scale of these data is 1:1,000,000.

At the time of printing data were available at: [www.azconservation.org](http://www.azconservation.org)

### *Instream Flow Status: Arizona Department of Water Resources*

Original data by ADWR of applications, permits and certificates for instream flow. Up to date as of June 2012.

### *Critical Habitat: US Fish and Wildlife Service*

Critical habitats are areas considered essential for the conservation of a listed species. These areas provide notice to the public and land managers the importance of these areas to the conservation of this species. Special protections and/or restrictions are possible in areas where federal funding, permits, licenses, authorizations, or actions occur or are required.

To provide the user with a general idea of areas where proposed critical habitat for various threatened and endangered species occur. The geographic extent has been clipped to include only the state of Arizona. Data for each species were downloaded from <http://criticalhabitat.fws.gov/crithab/> on January 25, 2013 and aggregated together to form this single coverage. For data that were only available as line files, a 30ft buffer polygon was created in lieu of the line feature.

The GIS files and their associated coordinates are not the legal source for determining the critical habitat boundaries of species described within this dataset. Inherent in any data set used to develop graphical representations, are limitations of accuracy as determined by, among others, the source, scale and resolution of the data. While the Service makes every effort to represent the critical habitat shown with this data as completely and accurately as possible (given existing time and resource constraints), the USFWS gives no warranty, expressed or implied, as to the accuracy, reliability, or completeness of these data. In addition, the USFWS shall not be held liable for improper or incorrect use of the data described and/or contained herein. Graphical representations provided by the use of this data do not represent a legal description of the critical habitat boundary. The user is referred to the critical habitat textual description in the appropriate final rule for this species as published in the Federal Register. These data are to be used only in the context of the definition and purpose of critical habitat. This primarily relates to Section 7 consultation under the Endangered Species Act. These data may be used for planning and land management purposes. They are not to be used for legal survey use.

*Geology: Arizona Geological Survey, US Geological Survey*

These digital maps are a reformulation of previously published maps, primarily maps of states. The reformulation gives all the maps the same structure and format, allowing them to be combined into regional maps. The associated data tables have information about age and lithology of the map units, also in a standard format. Data downloaded from <http://mrddata.usgs.gov/geology/state/state.php?state=AZ>

This database is not meant to be used at scales appreciably larger or smaller than the original scale. Any printed material utilizing these databases shall clearly indicate their source. If modifications to the data are made, this should be clearly indicated and described in print. Users specifically agree not to misrepresent these data, nor to imply that any changes they have made were approved by the U.S. Geological Survey. This database has been approved for release and publication by the Director of the U.S. Geological Survey. Although the database has been subjected to review and is substantially complete, the U.S. Geological Survey reserves the right to revise the data pursuant to further analysis and review. The database is released on the condition that neither the U.S. Geological Survey or the United States Government may be held liable for any damages resulting from its authorized or unauthorized use. Original source of this data was the Arizona Geological Survey.

*Soil Kw (Erodibility): National Resources Conservation Service*

Indicate the susceptibility of a soil to erosion via water. These values (Kw) indicate the erodibility of the whole soil.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity (Ksat). Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water. Data are derived from SSURGO and were mapped using the Soil Data Viewer <http://soils.usda.gov/sdv/>. Soil polygons are further divided by subwatershed.

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Soil Survey Geographic (SSURGO) Database for Arizona. Available online at <http://soildatamart.nrcs.usda.gov>. Accessed 12/13/2012.

*Soil Texture: National Resources Conservation Service*

Soil texture data for the Upper Gila Watershed. Based on STATSGO data. Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly."

*National Hazard Support System stations: US Geological Survey*

These data present the locations of stream gages and weather stations located in the United States, as well as the locations of Federal Lands. This map was developed as part of the United States Geological Survey's (USGS) Natural Hazards Support System (NHSS) which is available at <http://nhss.cr.usgs.gov>. But although this application was developed by the USGS, it contains data and information from a variety of public data sources, including non-USGS data. Therefore detailed information about each of these data providers, including specific data source, data currency and disclaimers, is provided at <http://nhss.cr.usgs.gov/data.shtml>.

*Met Stations: Western Regional Climate Center*

The weather stations presented are part of a cooperative network maintained by the National Oceanic and Atmospheric Administration (NOAA) and the National Weather Service (NWS). Data from these stations has been compiled by the WRCC and posted on its website. Station locations were pulled from <http://www.wrcc.dri.edu/inventory/sodaz.html> and were last updated in August 2010. The station attribute data was appended with HUC8 subwatershed name

*Precipitation Average: Oregon State University*

Monthly 30-year "normal" dataset covering the conterminous U.S., averaged over the climatological period 1981-2010. Contains spatially gridded average annual precipitation at 800m grid cell resolution. Distribution of the point measurements to the spatial grid was accomplished using the PRISM model, developed and applied by Dr. Christopher Daly of the PRISM Climate Group at Oregon State University. This dataset was heavily peer reviewed, and is available free-of-charge on the PRISM website. <http://www.prism.oregonstate.edu/>

*Groundwater Level Change: Arizona Department of Water Resources*

Original groundwater level change data were created for the Arizona Water Atlas project of the Arizona Department of Water Resources. These data were updated by the Department in 2011 for the Water Resources Development Commission. It is that data that are shown here.

*Arizona Well Data: Arizona Department of Water Resources*

The Wells 55 Registry database contains different well types - Notices of Intent to Drill (NOI) (55-500000 and 55-200000, series), Electronic NOI (eNOI) (55-900000 series), registrations of existing wells (55-600000 and 55-800000 series), discovered unregistered wells (55-700000 series), and existing wells that are registered to be abandoned (55-400000 series). In other words, the database contains NOIs to drill, modify, abandon, or deepen, registrations, driller reports, completion reports, change of well information, change of ownership, notice of well capping, and abandonment completion reports.

This feature class is provided to the general public as a single DVD obtained from the Arizona Department of Water Resources (ADWR) Bookstore. Background: ADWR has three groundwater well data sets for the state of Arizona. The first is the entire database, the 'Wells 55 Registry', which contains all wells registered in the state. The database was created in 1980 to store registration information submitted by well owners and drillers. It contains 193599 well records. The second data set is the Groundwater

Well Site Inventory (GWSI), which is a statewide database that contains well locations, construction, and water level measurements for wells that have actually been located and sampled in the field originally by the USGS and since 1990 by ADWR. The GWSI database contains 44035 well records. Of those, 22950 have a 'Wells 55 Registry ID'. The third data set is the 'Wells 35 Registry', which has not been maintained since 1980, when the Wells 55 Registry was created. The data on this DVD is only of the Wells 55 Registry Database, up to November 5, 2010. The data for GWSI and Wells 35 are available on other CD/DVD datasets from the ADWR Bookstore.

#### *New Mexico Well Data: Office of the State Engineer*

The exported ESRI point shapefile 'allwells' was made using Arc Map 8.2 on a Win2000 pc. The points were created from a download of the informix data base in June, 2002. Source of the location of the points varies. All State Plane Coordinates were entered by the applicant as the location of his well, usually from looking at a 1:24k USGS topographical map. A UTM coordinate is calculated to the center of the third quarter, or the smallest quarter of a section of land within the Public Land Survey System (PLSS). These quarters were also identified by the applicant as the location of the well. If no quarter was given, the UTM coordinate is calculated to the center of the section. The Bureau of Land Management's GCDB \*.lx files were used to plot the wells in the database that are entered by section, quarter, quarter, quarter description. Points that were originally located in the State Plane Coordinate system were projected using ArcInfo to UTM Zone 13, NAD83. The final data set is projected in UTM Zone 13, NAD83. Attributes found with this coverage are downloaded from the OSE WATERS database with the exception of X-coord, y-coord which were calculated.

Data were downloaded for the Upper Gila Watershed Atlas on November 4, 2013 from the New Mexico Resource Geographic Information System Program (<http://rgis.unm.edu/> )

#### *Aquifers: US Geological Survey*

These data are intended for use in publications, at a scale of 1:2,500,000 or smaller. Due to the small scale, the primary intended use is for regional and national data display and analysis, rather than specific local data analysis.

This map layer contains the shallowest principal aquifers of the conterminous United States, Hawaii, Puerto Rico, and the U.S. Virgin Islands, portrayed as polygons. The map layer was developed as part of the effort to produce the maps published at 1:2,500,000 in the printed series "Ground Water Atlas of the United States". The published maps contain base and cultural features not included in these data. This is a replacement for the July 1998 map layer called Principal Aquifers of the 48 Conterminous United States.

The Ground Water Atlas of the United States (GWA) chapters include additional information that may be relevant to the use of this map layer, such as maps of alluvial and glacial aquifers that overlie the aquifers in this map layer, as well as other information described below.

The areal extent of the aquifers, as shown in this map layer, represents the area in which a named aquifer is the shallowest of the principal aquifers. These aquifer areas are not necessarily the only areas in which ground water can be withdrawn, for two reasons: 1) The aquifers shown may have a larger areal extent than is represented here. The boundaries in this map layer generally represent an interpretation of the surface location (outcrop), or near-surface location (shallow subcrop) of the uppermost principal aquifer for the area. An aquifer may extend beyond the area shown, but be overlain by one or more other aquifers,

and (or) low-permeability material. 2) There may be areas of water-bearing surficial material not shown in this map layer. Major alluvial aquifers that occur along main watercourses are not shown. Significant unconsolidated sand and gravel aquifers, that are not indicated in this map layer but are important sources of water, may occur locally in glaciated regions. The user of this map layer is advised that to get complete information regarding areas that serve as sources of water, more information about surficial aquifers needs to be obtained, particularly in glaciated areas.

This map layer was constructed by combining data created for or from the regional GWA chapters. Minor aquifers that are important local sources of water were mapped in some regions, so the regional maps in the GWA may show more detail than this map layer. The data were reviewed, adjusted, and published based on new information provided by national, State, and local scientists. The juxtaposition of regionally mapped aquifers has led to some instances where an aquifer outcrop or shallow subcrop is bounded by a State line. This is a result of the regional mapping and national categorization methods used and is not meant to imply a hydrogeologic change coincident with a State boundary. The aquifer outcrop and shallow subcrop boundaries represent broad, regional categories and should not be interpreted as site-specific. Comments regarding the names of aquifers or the hydrogeologic interpretation of the aquifers can be directed to the U.S. Geological Survey, Water Resources Division, Office of Ground Water, [ogw\\_webmaster@usgs.gov](mailto:ogw_webmaster@usgs.gov).

#### *Riparian Areas: Arizona Game and Fish Department*

Riparian areas shown are based both on recent modeled data. Data for the modeling effort was derived from the Southwest Regional Gap Analysis Project in 2007. Lowry, J.H., Jr., Ramsey, R.D., Thomas, K.A., Schrupp, D., Kepner, W., Sajwaj, T., Thompson, B. (2007) "Land cover classification and mapping." In J.S. Prior-Magee, et al., (Eds.) Southwest Regional Gap Analysis Final Report (Chapter 2). Moscow, ID: U.S. Geological Survey, Gap Analysis Program.

#### *Springs: Arizona Department of Water Resources*

The original database was created for the Arizona Water Atlas project. Spring data to create the Department database were obtained from a variety of sources, most notably the USGS (2006a), which maintains a database of spring discharge records. Reports compiled from universities and public land agencies such as the U.S. Forest Service, National Park Service, and BLM were also useful (ADWR, 2008b). Many of the springs with discharge data were listed in more than one data source. To avoid over-counting, the Department compared spring names, locations, discharge rates, and dates of measurement and removed obvious duplicates. Topographic maps were also checked to verify that the springs had been mapped. Those springs not verified on topographic maps were included in the Atlas but noted accordingly.

#### *Perennial Streams: The Nature Conservancy (TNC)*

Data on perennial streams is taken from TNC's 2010 Freshwater Assessment ([http://azconservation.org/downloads/arizona\\_statewide\\_freshwater\\_assessment\\_gis\\_data\\_package](http://azconservation.org/downloads/arizona_statewide_freshwater_assessment_gis_data_package)) Streams displayed here are those designated by TNC as either perennial or regulated.

#### *Intermittent Streams: Arizona Game and Fish Department*

Information taken from 1997 AZGF reported prepared during the last phase of the Statewide

Riparian Inventory and Mapping Project. For this project intermittent stream reaches were identified on topographic maps by staff of AZGF, BLM, NPS and USFS. Original report citation is: AZGF, 1997, Remote sensing mapping of Arizona intermittent stream riparian areas: GIS cover and Technical Report 112 by Wahl and others.

#### *Ephemeral Streams: Arizona Land Resources Information System with WRRC analysis*

Layer of likely ephemeral streams based on mapping of intermittent and perennial streams. This layer originated as the ALRIS streams layer by the Arizona State Land Department. It was queried for all but the smallest (1-4 CO, the ALRIS method of describing stream size where 1 = largest rivers) streams. It was also queried for only those waterways indicated as a stream or wash. Finally it was joined with the TNC Flow Needs Assessment layer of perennial, regulated or effluent dominated reaches (2010) and the Az Game and Fish Intermittent Streams layer (1997). Any stream reaches that were included in either of these datasets were removed from the layer.

#### *Runoff Contours: US Geological Survey*

Average annual or 'unit' runoff contours are plotted and show the magnitude and spatial variation in runoff, in inches per year, based on streamflow data collected by the USGS during 1951 through 1980. The data reflects the runoff in tributary streams, rather than in major rivers, as an indication of how runoff varies regionally with precipitation and other geographic features. The streamflow data were compiled by the USGS in 1985 and, in 1987, a 1:2,000,000-scale unit-runoff contour map of the conterminous United States was published. The map has since been digitized and posted on the USGS website.

#### *Flood ALERT Gages: Arizona Department of Water Resources*

This information was originally collected for the Arizona Water Atlas and was obtained from the Department's Surface Water Division, which maintains a database of flood warning equipment across Arizona. The Department's database was queried in fall 2005 and the information presented in the Atlas was accurate at that time. According to staff in the Surface Water Division, new flood warning gages are routinely added to the ALERT (Automated Local Evaluation in Real Time) network so the current number of stations may be greater than presented.

#### *Stream Flow Gages: US Geological Survey*

Stream flow gages as of 2010, note some gages may have been discontinued and no longer recording data.

#### *Reservoirs: ADWR*

Data from ADWR Arizona Water Atlas, up to date as of 2010. Large reservoirs are defined as water bodies with a maximum storage capacity of 500 acre-feet or greater, or where capacity information was not available a surface area of 50 acres or greater. ADWR used 5 primary data sources to build their reservoirs layer:

- National Inventory of Dams maintained by the U.S. Army Corps of Engineers;
- ADWR's database of jurisdictional and non-jurisdictional dams in Arizona;
- Arizona Game & Fish Department's waterways file and lake classification study;
- Digital versions of 1:100,000 scale USGS topographic maps; and
- ADWR's registry of surface water right filings (see further discussion in this section under 'Stockponds') and adjudication reports.

## Political Geography

### *Schools: Arizona Department of Education*

Displays all public and charter schools in Arizona. Data are from the Arizona Department of Education (<http://www.azed.gov/>) and are accurate as of March 28, 2013.

### *Bridges: Federal Highway Administration*

One of the layers requested from the meetings was something that shows bridge locations. The source for Bridges is the National Bridge Inventory conducted by the Federal Highway Administration. You can go to <http://www.fhwa.dot.gov/bridge/nbi/ascii.cfm> to choose which year of data you want. On the next page, scroll down to the delimited files section and choose state of interest. Data will be downloaded in a comma-separated text file. In the text file, there are 116 different columns. Go here <http://www.fhwa.dot.gov/bridge/mtguide.pdf> for official descriptions.

One challenge with this data is the Lat/long data (columns 16 and 17) are in the format DDMMSS.SS, which can be difficult to separate out into a useable decimal degree format. Do the following in Excel:

*Adequate Water Supply Determinations: Arizona Department of Water Resources*  
Designations of Adequate Water Supply and Water Reports determining adequate or inadequate subdivision water supply in areas located outside of active management areas in the state, pursuant to A.R.S. § 45-108.

Adequacy is driven by the definition of a subdivision from the Arizona Department of Real Estate (ADRE) as six or more parcels with at least one parcel having an area less than 36 acres. This includes residential or commercial subdivisions, stock cooperatives, condominiums, and all lands subdivided as part of a common promotional plan (including golf courses, parks, schools, and other amenities). Short-term leases (12 months or less) and subdivisions where all parcels are greater than 36 acres in size do not fall under this definition. If the proposed development does not meet the definition of a subdivision, then the program does not apply.

The Adequate Water Supply program, first created in 1973, operates outside of the Active Management Areas as a consumer protection program. Developers are required to obtain a determination from the Department concerning the quantity and quality of water available before the ADRE will allow any lot sales. If the application for a Water Adequacy Report successfully demonstrates that water of sufficient quality will be physically, legally, and continuously available for the next 100 years, then the Department will determine the water supply to be adequate. If the water supply is determined to be inadequate, the developer may still sell lots, but the inadequate determination must be disclosed to potential buyers in the public report approved by ADRE and in all promotional materials. If a provider with a Designation of Adequate Water Supply will serve the proposed subdivision, then the developer only has to provide a written commitment of service from the designated provider.

This data set contains statewide data for the Water Atlas. Sources for this information come from the Arizona Department of Water Resources (ADWR) and include electronic databases maintained by the Office of Assured and Adequate Water Supply and paper files stored in the Hydrology Division.

Database queries were reviewed and some information was excluded from the Atlas based on subdivision location, duplicate applications, etc. Paper files were also reviewed to complete information that had not been entered into the databases such as number of lots and reasons for inadequate determinations.

Sources for adequate water supply determinations come from the Department and include electronic databases maintained by the Office of Assured and Adequate Water Supply and paper files stored in the Hydrology Division. Each determination of the adequacy of water supplies available to a subdivision is based on the information available to the Department and the standards of review and policies in effect at the time the determination is made.

#### *Surface Water Rights Points of Diverion: Arizona Department of Water Resources*

This SWR feature class was created at the request of the Water Atlas group in order to make the final maps of Points of Diversions (PODs) for the Water Atlas publication. Data downloaded from <http://www.azwater.gov/azdwr/gis/> on April 23, 2013. Data only current up to 2/05/09

#### *Water Quality: Arizona Department of Environmental Quality/Arizona Department of Water Resources*

Dataset originally from ADEQ, version here was edited by/used for the Arizona Water Atlas by ADWR. The maps show the location of wells, springs, and mines that have equaled or exceeded drinking water quality standards and lakes and streams that are impaired for designated uses. Tables for the wells, springs, and mines list the type of sampling site, its location (township, range and section), and relevant water quality parameters.

Water quality data for the wells, springs, and mines were obtained from the following primary sources:

- ADWR's Groundwater Site Inventory (GWSI) database;
- USGS's National Water Inventory System (NWIS) database;
- ADEQ's Safe Drinking Water (SDW), Rural Watershed Study, and Arsenic databases; and
- Various technical reports prepared by the Department, ADEQ and USGS.

Data on impaired lakes and streams comes from ADEQ's 2005 report The Status of Water Quality in Arizona – 2004, Arizona's Integrated 305(b) Assessment and 303(d) Listing Report.

Several of the well, spring, and mine sites have been sampled more than once and/or results from the same sampling date are listed in more than one data source. An effort was made to remove duplicate data using available information on site location. The water quality data presented in the ADWR's Atlas indicate areas where water quality exceedences have previously occurred. Additional areas of concern may currently exist where water quality samples have not been collected or sample results were not reviewed by the Department. For example, as part of ADEQ's Underground Storage Tank (UST) and Aquifer Protection Permit (APP) programs, thousands of water quality samples have been collected and analyzed. Results from these analyses were not included in the Atlas. What is included for these and other environmental programs is a 2006 map from ADEQ that shows the location of contaminated sites across the state (See Contamination Sites).

Finally, note that the water quality data presented in the Atlas may not reflect the quality of water being supplied by public water systems. The latter are required by federal and state law to supply water that meets drinking water standards. ADWR's Atlas data indicates areas where private well owners and surface water users may want to test the quality of their water or restrict its use. The distribution of common ground water quality exceedences in Arizona ground waters (arsenic, fluoride, nitrate and total dissolved solids) is shown in Figure 1-26 of this volume.

#### *Outstanding Arizona Waters: Arizona Department of Environmental Quality*

This data set is a general reference for the Outstanding Arizona Waters (formerly unique waters). The term "outstanding Arizona water" (OAW), replaces the term "unique waters". The terms "outstanding water" or "outstanding Arizona water" and "unique water" are to be considered synonymous. Last updated with the 2010 assessments.  
<http://www.azdeq.gov/environ/water/assessment/assess.html>

#### *Land Ownership: Bureau of Land Management*

These data was collected by the U.S. Bureau of Land Management (BLM) in New Mexico at both the New Mexico State Office and at the various field offices. This dataset is meant to depict the surface owner or manager of the land parcels. In the vast majority of land parcels, they will be one and the same. However, there are instances where the owner and manager of the land surface are not the same. When this occurs, the manager of the land is usually indicated. BLM's Master Title Plats are the official land records of the federal government and serve as the primary data source for depiction of all federal lands. Information from State of New Mexico is the primary source for the depiction of all state lands. Auxilliary source are referenced, as well, for the depiction of all lands. Collection of this dataset began in the 1980's using the BLM's ADS software to digitize information at the 1:24,000 scale. In the mid to late 1990's the data was converted from ADS to ArcInfo software and merged into tiles of one degree of longitude by one half degree of latitude. These tiles were regularly updated. The tiles were merged into a statewide coverage. The source geodatabase for this shapefile was created by loading the merged ArcInfo coverage into a personal geodatabase. The geodatabase data were snapped to a more accurate GCDB derived land network, where available. In areas where GCDB was not available the data were snapped to digitized PLSS. In 2006, the personal geodatabase was loaded into an enterprise geodatabase (SDE). This shapefile has been created by exporting the feature class from SDE.

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data, or for purposes not intended by BLM. Spatial information may not meet National Map Accuracy Standards.

### **Changes to the Landscape**

#### *Fire Perimeters: US Forest Service*

Large fires in Arizona and New Mexico, within Region 3 of the USFS. Data are preliminary burn severity data from the Burned Area Emergency Response (BAER) Imagery (<http://www.fs.fed.us/eng/rsac/baer/>) downloaded on April 16, 2013. Fire boundaries are clipped to fire perimeter data (<http://www.fs.usda.gov/detail/r3/landmanagement/gis/?cid=stelprdb5201889>) and only includes fires in the Upper Gila Watershed

#### *Fire Regime: US Forest Service, US Geological Survey*

Broad-scale alterations of historical fire regimes and vegetation dynamics have occurred in many landscapes in the U.S. through the combined influence of land management practices, fire exclusion, ungulate herbivory, insect and disease outbreaks, climate change, and invasion of non-native plant species. The LANDFIRE Project produces maps of historical fire regimes and vegetation conditions using the disturbance dynamics model VDDT. The LANDFIRE Project also produces maps of current vegetation and measurements of current vegetation departure from simulated historical reference conditions. These maps support fire and landscape management planning outlined in the goals of the National Fire Plan, Federal Wildland Fire Management Policy, and the Healthy Forests Restoration Act. Data Summary: The Fire Regime Groups layer characterizes the presumed historical fire regimes within landscapes based on interactions between vegetation dynamics, fire spread, fire effects, and spatial context (Hann and others 2004). Fire regime group definitions have been altered from previous applications (Hann & Bunnell 2001; Schmidt and others 2002; Wildland Fire Communicator's Guide) to best approximate the definitions outlined in the Interagency FRCC Guidebook (Hann and others 2004). These definitions were refined to create discrete, mutually exclusive criteria. This layer is created by linking the BpS Group attribute in the BpS layer with the Refresh Model Tracker (RMT) data and assigning the Fire Regime Group attribute. This geospatial product should display a reasonable approximation of Fire Regime Group, as documented in the Refresh Model Tracker. The Historical Fire Regime Groups data layer categorizes simulated mean fire return intervals and fire severities into five fire regimes defined in the Interagency Fire Regime Condition Class Guidebook (Hann et al. 2004). The classes are defined as follows: Fire Regime I: 0 to 35 year frequency, low to mixed severity Fire Regime II: 0 to 35 year frequency, replacement severity Fire Regime III: 35 to 200 year frequency, low to mixed severity Fire Regime IV: 35 to 200 year frequency, replacement severity Fire Regime V: 200+ year frequency, any severity Additional data layer values were included to represent Water (111), Snow / Ice (112), Barren (131), and Sparsely Vegetated (132). Vegetated areas that never burned during the simulations were included in the category "Indeterminate Fire Regime Characteristics" (133); these vegetation types either had no defined fire behavior or had extremely low probabilities of fire ignition.

Data Sources

Hann, W., A. Shlisky, D. Havlina, K. Schon, S. Barrett, T. DeMeo, K. Pohl, J. Menakis, D. Hamilton, J. Jones, and M. Levesque. 2004. Interagency Fire Regime Condition Class Guidebook. Interagency and The Nature Conservancy fire regime condition class website. USDA Forest Service, US Department of the Interior, The Nature Conservancy, and Systems for Environmental Management. [www.frcc.gov](http://www.frcc.gov).

Data have been collected and analyzed by teams at both USGS EROS, Sioux Falls, SD and at the USFS, Rocky Mountain Research Station, Missoula, MT. Depending on the data set described primary responsibility may reside with USGS EROS or with USFS. Contact information will be listed in the Contact Section and in the Metadata Reference section with regards to the primary responsibility.

#### *Fire Burn Severity: US Forest Service*

These data were created by the USDA Forest Service Remote Sensing Applications Center to support Burned Area Emergency Response (BAER) teams. FTP data sets are available to any user with access to the USFS FSWEB. There are no restrictions on use, except for reasonable and proper acknowledgment of information sources.

These data products are derived from Landsat Thematic Mapper data. The pre-fire and

post-fire subsets included were used to create a differenced Normalized Burn Ratio (dNBR) image. The dNBR image attempts to portray the variation of burn severity within a fire. The severity ratings are influenced by the effects to the canopy. The severity rating is based upon a composite of the severity to the understory (grass, shrub layers), midstory trees and overstory trees. Because there is often a strong correlation between canopy consumption and soil effects, this algorithm works in many cases for BAER teams whose objective is a soil burn severity assessment. It is not, however, appropriate in all ecosystems or fires. These data products are derived from Landsat Thematic Mapper data. Pre-fire and post-fire scenes are analyzed to create a differenced Normalized Burn Ratio (dNBR) image. The dNBR image portrays the variation of burn severity within the fire. The pre- and post-fire Landsat images are terrain corrected and further processed to convert bands 1-5 and 7 to at-sensor-reflectance. The Normalized Burn Ratio (NBR) is computed for each date of imagery using the following formula:

$$(\text{Band 4} - \text{Band 7}) / (\text{Band 4} + \text{Band 7}) = \text{NBR}$$

The Differenced NBR is computed to determine severity by subtracting the post-fire NBR from the pre-fire NBR:

$$(\text{PreNBR} - \text{PostNBR}) = \text{dNBR}$$

The BARC products are a generalization of the raw dNBR dataset. Both BARC products have been resampled to unsigned 8-bit images and are easily viewed and edited within ArcGIS.

The classes represented on the BARC products are created with thresholds chosen by an analyst at RSAC. These thresholds can be roughly related back to original dNBR values by multiplying by 5 and then subtracting 275 (for example, a BARC256 value of 100 would relate to a dNBR value of 225). The BARC thresholds used on this particular fire are:

- Unchanged: All values less than 65.
- Low: All values greater than 65 and less than 99.
- Moderate: All values greater than 99 and less than 177.
- High: All values greater than 177.

General descriptions of the severity classes are as follows:

Unchanged: This means the area after the fire was indistinguishable from pre-fire conditions. This does not always indicate the area did not burn.

Low: This severity class represents areas of surface fire with little change in cover and little mortality of the dominant vegetation.

Moderate: This severity class is between low and high and means there is a mixture of effects on the dominant vegetation.

High: This severity class represents areas where the canopy has high to complete consumption.

#### *Land Cover Change: WRRRC*

For this Atlas the WRRRC performed a simplified land cover change analysis using

information from the National Land Cover Database (NLCD). The NLCD was developed by the Multi-Resolution Land Characteristics Consortium (MRLC), a group of ten federal agencies. Datasets were developed for 1992, 2001, and 2006 using satellite imagery (Landsat TM/ETM+) with a spatial resolution of 30 meters. Though all three datasets were produced as part of the same program, changes in methodologies and input between the 1992 NLCD and the 2001 and 2006 NLCD makes it so that these datasets cannot all be directly compared to one another, though products developed by the MRLC for 1992/2001 and 2001/2006 allow for limited comparisons. Overall accuracy of the 1992 NLCD varied by region, but was 70% for the Southwest (Wickham et al. 2004). Overall accuracies for the entire 2001 and 2006 NLCD were 79% and 78%, respectively (Wickham et al. 2013).

*Water Supply Gap: Water Resources Development Commission (WRDC)*

Data for the water supply gap map come from the analysis by the WRDC of existing water supplies and projected (high and low) water demands. For more information on the data and methods for this analysis see the WRDC Final Report and Appendices available at: [http://www.azwater.gov/AzDWR/WaterManagement/WRDC\\_HB2661/Meetings\\_Schedule.htm](http://www.azwater.gov/AzDWR/WaterManagement/WRDC_HB2661/Meetings_Schedule.htm)