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Final Technical Report

National Geological and Geophysical Data Preservation Program
(NGGDPP)

**Population of the National Geological and Geophysical Data Catalog
with New Mexico Data (Year 2)**

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Abstract

From September 1, 2009 through August 31, 2010 the New Mexico Bureau of Geology and Mineral Resources, a Division of the New Mexico Institute of Mining and Technology and the state geological survey of New Mexico, uploaded data/metadata from 14 of our high-priority collections into the National Geological and Geophysical Data Catalog (Table 1).

Table 1. The 14 high-priority geological collections for which metadata were generated and uploaded during 2009-2010.

1. P743 – Rock cores
2. P744 – Rock cuttings
3. P745 – Rock core chips
4. P746 – Uranium drill hole logs
5. P747 – Petroleum (oil & gas) well logs
6. P1100 – Sidewall cores
7. P751 – Core analyses
8. P752 – Drill-stem test records
9. P753 – Strip/sample logs
10. P754 – Coalbed methane desorption analyses
11. P755 Well history reports
12. P762 – Micropaleontologic reports
13. P1269 – Coal drill hole logs
14. P1270 – Petroleum source rock analyses

These 14 collections contain more than 93,000 data elements. Data/metadata have been uploaded into the National Catalog for more than 95% (89,499) of the data elements in these 14 collections.

Work during the project year included completing internal digital (Access format) catalogs for the first six collections in Table 1 and adding data/metadata required for the National Catalog which included calculating latitude and longitude coordinates for each data element. Work on these six collections started during the previous (FY2008-2009) NNGDPP project year. For collections 7 through 14 in the above list, we developed internal data catalogs from scratch during FY2009-2010 because internal catalogs did not exist prior to the start of this year's NNGDPP project. After these data/metadata were added to our internal catalogs, the data/metadata entries for each catalog were converted into the NNGDPP flat-file format required by the National Catalog. Once in the flat-file format, the data/metadata were uploaded into the National Catalog. After uploading, data were checked for errors and omissions as they reside on the NNGDPP website.

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Introduction

The project “Population of the National Geological and Geophysical Data Catalog with New Mexico Data – Year 2” began on September 1, 2009 and ended on August 31, 2010. The work on this project was undertaken under the auspices of the U.S. Department of the Interior, U.S. Geological Survey Assistance Award Number G09AP00137 to the New Mexico Bureau of Geology and Mineral Resources, a Division of the New Mexico Institute of Mining and Technology. The New Mexico Bureau of Geology and Mineral Resources is the state geological survey of New Mexico. Total obligated funds under this award were \$44,440.26, of which \$22,220.13 is the federal share and \$22,220.13 is the non-federal matching share provided by the New Mexico Bureau of Geology and Mineral Resources.

The goal of the work performed under this contract was to upload into the National Geological and Geophysical Data Catalog data/metadata for geological and geophysical collections at the New Mexico Bureau of Geology and Mineral Resources. The 46 major collections at the New Mexico Bureau of Geology and Mineral Resources were specified in the 2007 NNGDPP Inventory of Geological and Geophysical Data Collections. We anticipate that constructing data/metadata catalogs for all of our collections and uploading them into the National Catalog will be a multiyear project.

For 2009-2010, our second NNGDPP project year for catalog development and data uploading, we chose eight new high-priority collections with more than 8,600 data elements for inclusion into the National Data Catalog. For these eight collections, no internal data catalogs in either digital or hardcopy format had previously been developed so a significant amount of our effort for the project year was concentrated on developing internal data/metadata catalogs in Access and Excel format that could be converted into NNGDPP flat-file format for upload into the National Catalog. These new internal data catalogs were populated with metadata as required by the National Catalog. In addition, we added additional data elements and associated metadata for the six collections that we had uploaded into the National Catalog during the previous (2008-2009) project year. These represent new data added into our collections during the project year. We generated necessary metadata for these new data elements during the current (2009-2010) project year. During the 2009-2010 project year, we worked on completing the internal catalogs for these high priority collections, adding data/metadata required by the National Catalog (for example, latitude and longitude coordinates), converting our internal digital catalogs into the NNGDPP flat file format, uploading the collection data/metadata into

the National Catalog, and checking our uploaded data for errors and omissions. Data/metadata for 100% (8,684) of the data elements in the additional eight high-priority collections were uploaded during the 2009-2010 project year and data/metadata for 2308 data elements in the first six high-priority collections (Table 1) were generated and uploaded.

Methodology

Catalogs of geological and geophysical data collections at the New Mexico Bureau of Geology and Mineral Resources were uploaded into the National Catalog using the NGGDPP flat file template made available on the NGGDPP website at <http://datapreservation.usgs.gov/catalog.shtml>. Preparation of the flat files and uploading into the National Catalog utilized the following procedure, which was modified and streamlined from previous years during 2009-2010.:

1. Our internal databases are in Access format. A query was made in our Access databases to supply the information required by the NGGDPP flat file template. Metadata fields that are considered optional in the NGGDPP flat file template/National Catalog were also supplied in the query where the optional metadata were available.
2. Results of the Access query were exported into Excel.
3. The resulting Excel files were proofed and appropriately modified.
4. The Excel files were re-imported into Access.
5. The new Access files were exported as delimited .txt files.
6. The .txt files were saved as .csv files in DOS in the NGGDPP template.
7. If the above examination revealed that the flat file did not upload correctly into the National Catalog, the Excel .csv file was re-imported into Access, saved as a separate table in Access, and then exported out as a text file using either commas or pipe characters as the field separators, depending on which was appropriate for the way the file was constructed.
8. The newly uploaded file was re-examined on the NGGDPP website for errors and problems which were then rectified, if present.

The NGGDPP requirements for collections include the following required and optional data fields:

1. **Collection ID**: This is the collection ID number as assigned by the USGS to each of our collections after they were entered into the 2007 NGGDPP Inventory of Geological and Geophysical Data Collections.
2. **Title**: This is our internal title for each data element in each of our data collections. As an example, **Core_1** indicates that the data element is the first data element from our rock core collection.
3. **Alternate title**: During the year, we tried a new system for the alternate title to make the titles more meaningful to those searching the National Catalog. For oil and gas wells (drill holes), this is the API number. For collection P746 (Uranium well logs), this is our internal database well ID number for that drill hole. For collection P755 (Well history reports) this is township-range-section location followed by the API number. For collection P1269 (Coal drill hole logs) this is the township-range-section followed by the drill hole name.

For collection P1270 (Petroleum source rock analyses) this is the township-range section followed by either the API number (for drill holes) or the outcrop/section name (for outcrop samples). For other data types (e.g. water wells) there is no API number or other Alternate internal identifier and this field is left blank.

4. **Abstract:** This readable text contains the operator or company name for drill holes, the well name and number, the type of well (e.g. petroleum, mineral water, etc.), oil-gas pool name or mining district, number of related items, and the source of the latitude/longitude coordinates. See Table 1 below for a description of sources and calculation methods for latitude/longitude coordinates.
5. **Data type:** This is the USGS data type as specified for the NGGDPP.
6. **Supplemental information:** Primary and secondary contact information for the data element and accompanying collection were entered in this field.
7. **Coordinates:** This is the geographic location of the sampled site in decimal degrees latitude and longitude. For almost all of the samples in our collections, latitude and longitude coordinates are derived (calculated) from the alternate geometry (described below) and are not coordinates measured in the field with a GPS, although GPS-rendered coordinates are increasingly more available for new and recently acquired samples. The method of calculation or other source of latitude/longitude is described in the Abstract. In most cases, latitude and longitude are calculated from the Federal Public Land Survey System (PLSS) section-township-range coordinates using the Geographix Exploration System and digital land grid. However, relatively large areas of New Mexico have not been surveyed with the PLSS, for example the Spanish Land Grants and many of the Native American Reservations; digital land grids are not available for these unsurveyed areas. Other methodologies were developed or used to calculate latitude/longitude for these unsurveyed areas and are summarized in Table 2. A substantial portion of our work during the 2009-2010 project year included calculation of latitude and longitude coordinates for data items uploaded into the National Catalog.
8. **Alternate geometry:** This is the PLSS township-range-section and location within the section given as either surveyed footage from the section lines or in the quarter/quarter/quarter section system. For Spanish Land Grants or Native American Reservations with no PLSS Survey, petroleum and mineral exploration drill holes are formally (officially) located within the non-PLSS area by either a recognized non-governmental survey (for example the Martin and Border Survey for certain areas in northern New Mexico) or by projecting the PLSS survey grid into the unsurveyed area from adjacent surveyed areas. Many large-scale (1:250,000) U.S. Geological Survey and U.S. Bureau of Land Management digital and paper maps indicate projected township and range boundaries (but not section boundaries) in unsurveyed areas.
9. **Online resources:** URL pointers are presently available only for our Petroleum Source Rock Data (collection P1270). For this collection, the URL pointers will allow for online access and download of data.

10. **Browse graphics:** No URL pointers are presently available for our collections. Entries are listed as “none”.
11. **Dataset reference date:** Metadata is in the format “20100609”. This is the data (year – month – day) that the query was run to generate the data for upload. This data field will be used to limit any new entries from our internal catalogs into the National Catalog in the future, thereby eliminating duplicate entries for the same data element.
12. **Date:** Format is “19541231”. This date refers to the test date, completion date of a drill hole, or the date the well log was run.
13. **Vertical extent:** (ft, max, min). The gross interval for samples within a drill hole or on a measured outcrop section. Well logs are assumed to be from total depth to surface.

Table 2. Methodologies used to calculate or derive latitude and longitude for New Mexico collection elements.

Calculation method for latitude and longitude (abbreviation used in our entries in the National Catalog)	Brief description of calculation methods or source of latitude/longitude values
GES	The Geographix Exploration System Landgrid and Wellbase modules used to calculate lat/long values based on a digital Landgrid referenced to the 1927 North American datum.
GESest	Same as GES above, but if sample/well locations were not exact the lat/long values were extended to only 3 decimal places.
GESqtr	Same as GES above but the latitude/longitude values mark the center of the quarter section the well sample is in. This method was used if sample/well locations are only specified to a quarter section and if surveyed footages from section boundaries are not available, or if multiple surveyed footages exist in our records that all indicate location within a quarter section but otherwise differed.
GESCntr	Same as GESQtr, but the lat/long location is in the center of a section. This method was used if sample/well location does not specify a location more exact than a section in a specified township and a specified range.
PRRC	The latitude/longitude coordinates for oil and gas wells as made available on the website of the New Mexico Petroleum Recovery Research Center (PRRC) at New Mexico Institute of Mining and Technology. In general, these values agree with ones calculated by our GES system (described above) to four decimal places.
PRRCestQtr	Same as PRRC above, but latitude/longitude accuracy is only to quarter of a section. This method was used if some aspect

	of the well location (e.g. surveyed footage from section boundaries) by PRRC differed from that in our records, but placed the well in the same quarter section as our records.
PRRCest	As above, but only locations of center of section were used if PRRC data and our data placed the well in different quarter sections.
BLMest	The U.S. Bureau of Land Management's online website (http://www.geocommunicator.gov/GeoComm/index.shtm) was used to estimate the latitude and longitude of a sample or drill hole. The accuracy of this method is the center of a quarter-quarter section.
BLMQtr	Same as BLMest except that the latitude/longitude coordinates were estimated only to the center of a quarter section. This method was used most often in unsurveyed areas of the state using the BLM-projected township-range boundaries.
BLMsec	Same as BLMest except that the latitude/longitude coordinates were estimated only to the center of a section. This method was used most often in unsurveyed areas of the state using the BLM-projected township-range boundaries and where data did not warrant using the more exact BLMQtr method.
Scoutcard	Latitude/longitude coordinate data was obtained from an oil and gas well scout card. Data source is unknown but is most likely a GPS-based survey obtained when the well location was staked.
Hoffman	Latitude/longitude coordinates calculated by New Mexico Bureau of Geology Senior Coal Geologist Gretchen Hoffman for her project work.
Hoffmanest	Latitude/longitude coordinates calculated by New Mexico Bureau of Geology Senior Coal Geologist Gretchen Hoffman for her project work in unsurveyed areas using well spots referenced to USGS topographic maps.
Broadhead	Latitude/longitude coordinates calculated by New Mexico Bureau of Geology Senior Petroleum Geologist Ron Broadhead in unsurveyed areas using well spots referenced to USGS topographic maps.
Calc	Latitude/longitude coordinates calculated for miscellaneous projects at New Mexico Bureau of Geology and Mineral Resources.
NMBGMR	Latitude/longitude coordinates obtained from data files at New Mexico Bureau of Geology and Mineral Resources. Calculation or measurement method unknown.
Other	Unknown latitude/longitude coordinates associated with data files at New Mexico Bureau of Geology and Mineral Resources.

Progress and Measures of Success

The data collections that had data/metadata uploaded into the National Catalog during the 2009-2010 project year are listed in Table 3 along with the number of data elements uploaded during the project year, the total number of data elements that have been uploaded and the percentage of data elements in each collection with data/metadata that have been uploaded. Detailed information regarding data/metadata fields are described below.

Table 3. Collections with data/metadata uploaded into National Catalog during 2009-2010 project year, number of entries (items) with uploaded data/metadata, and percent of items in collection with entries uploaded into National Catalog. Data/metadata uploading for collections shaded in blue was initiated in the previous project year (2008-2009) and work during FY2009-2010 involved completion of internal metadata catalogs and uploading into the National Catalog. For collections shaded in yellow, work during FY2009-2010 involved development of internal data catalogs from scratch and uploading of metadata into the National Catalog. Figures 1 through 9 show the geographic distribution of data elements of selected collections.

Data Collection ID	Brief description of collection	Number of entries uploaded during project year 2009-2010	Total number of entries uploaded, including previous project years	Percent of collection items with entries uploaded into National Catalog
P743	Rock cores	67 drill holes	1644 (see Fig. 1)	100%
P744	Rock cuttings	1056 drill holes	15305 (see Fig. 2)	90%
P745	Rock core chips	16 drill holes	556	92%
P746	Uranium well logs	615 drill holes	18354 (see Fig. 3)	100% (except for 433 drill holes with undetermined locations)
P747	Petroleum (oil & gas) well logs	548 drill holes	44737 (see Fig. 3)	100% (not including pending near-term donations)
P1100	Sidewall cores	6 drill holes	169	90+%

P751	Core analyses	496 drill holes	496 (see Fig. 4)	100%
P752	Drill-stem test reports	247 drill holes	247 (see Fig. 5)	100%
P753	Strip/sample logs (of cuttings)	2626 drill holes	2626 (see Fig. 6)	50%
P754	Coalbed methane desorption data	21 drill holes	21	100%
P755	Well history reports	233 drill holes	233	100%
P762	Micropaleontologic reports	247 drill holes	247 (see Fig. 7)	100%
P1269	Coal drill hole logs	4569 drill holes	4569 (see Fig. 8)	100% (of publicly available information)
P1270	Petroleum source rock data	216 drill holes + 29 outcrop sections/locations	245 (see Fig. 9)	100%

During 2009-2010 we completed uploading of metadata for more than 95% of the data elements in our highest priority collections (Table 2). Work during the year included:

1. entry of data/metadata into our internal catalogs (where not already done);
2. development of internal data catalogs with metadata for the last eight collections in Table 3 (shaded yellow);
3. calculation and derivation of latitude and longitude geographic coordinates for each data element that was uploaded (required for entry into the National Catalog);
4. verification of data entry and latitude/longitude calculations;
5. translation of our internal catalogs into the NGGDPP flat file format using the method described above;
6. upload of prepared flat files into the National Catalog;
7. verification of correct uploads into the National Catalog.

Given that we have generated and uploaded data/metadata for more than 95% of our highest priority collections, we believe that we have successfully concluded the 2009-2010 project year.

Some data elements in some of the high priority collections were not included in the uploads because not all the metadata required by the National Catalog were available. In almost all cases, the required data are the latitude/longitude coordinates. For some of the cores and cuttings in our collections, usually those related to water wells or mineral exploration drill holes, we have acquired the cuttings or cores without any exact location

information and we are in the continually ongoing process of obtaining exact locations. In the other cases, the drill holes are located in areas without a digital land grid (non-PLSS areas – Spanish Land Grants or Native American Reservations) and latitude/longitude must be calculated manually from hand-spotted well locations on paper maps or by manually locating the wells on digital maps provided on the US BLM website. Both are extremely time-consuming processes; again we are in the continually ongoing process of calculating exact locations as time permits and will upload data/metadata into the National Catalog in upcoming years upon completion of latitude/longitude calculations for samples/drill holes in each reservation or land grant.

For collection P753 (strip/sample logs) only about 50% of items in the collection had metadata generated and were uploaded into the National Catalog. Metadata physically written or printed on a large percentage of the logs does either not contain adequate location data to generate latitude-longitude or to positively identify and link the logs to data elements in our other collections so that individual hardcopy records have to be compared to hardcopy records in other collections to get accurate location and other data. This forensic analysis proved executable but time-consuming.

Personnel employed on the New Mexico NCGDPP project during 200-2010

The following personnel were employed on the NCGDPP New Mexico project during the 2009-2010 project year:

1. Ron Broadhead, Principal Petroleum Geologist at New Mexico Bureau of Geology and Mineral Resources and Project PI.
2. Amy Trivitt-Kracke, Petroleum Computer Specialist at New Mexico Bureau of Geology and Mineral Resources
3. Annabelle Lopez, Petroleum Information Coordinator at New Mexico Bureau of Geology and Mineral Resources
4. Adela Magallanes, part-time student employee and undergraduate biology major at New Mexico Institute of Mining and Technology

Illustrations referenced in this report

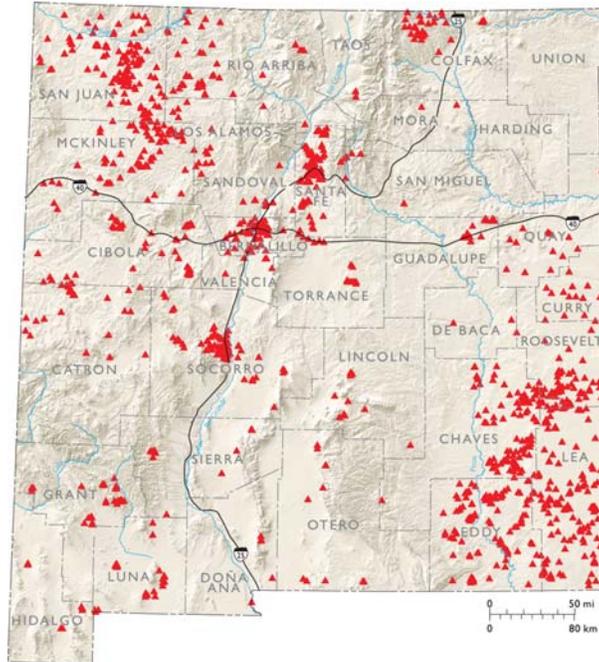


Figure 1. Locations of drill holes with rock cores at the New Mexico Bureau of Geology and Mineral Resources (collection P743) entered into the National Catalog.

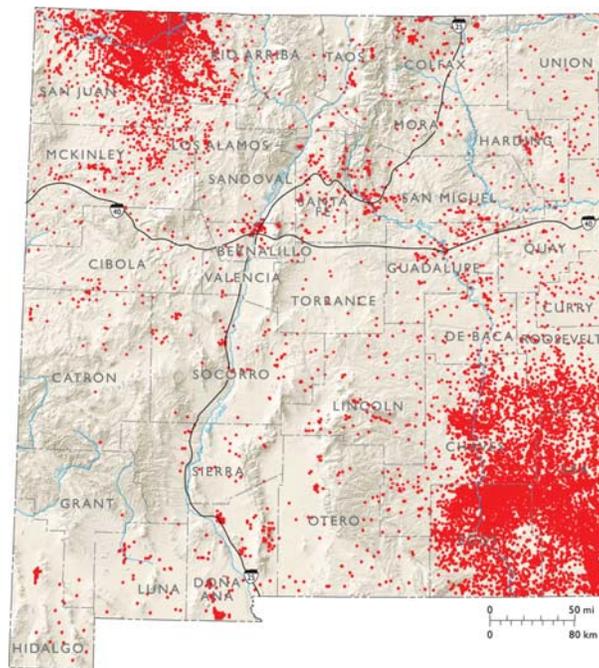


Figure 2. Locations of drill holes with rock cuttings at the New Mexico Bureau of Geology and Mineral Resources (collection P744) entered into the National Catalog.

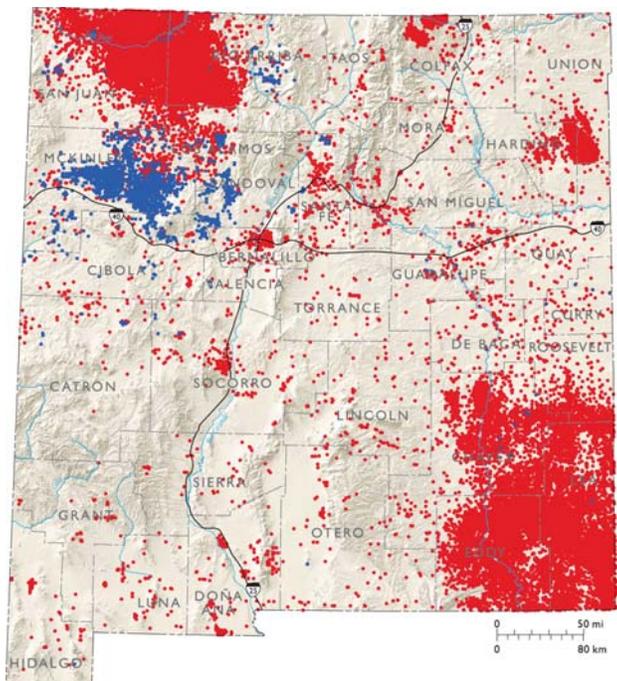


Figure 3. Locations of well logs at the New Mexico Bureau of Geology and Mineral Resources entered into the National Catalog. The red dots are the locations of logs for oil and gas wells (collection P747). The blue dots are the locations of logs for uranium drill holes (collection P746).

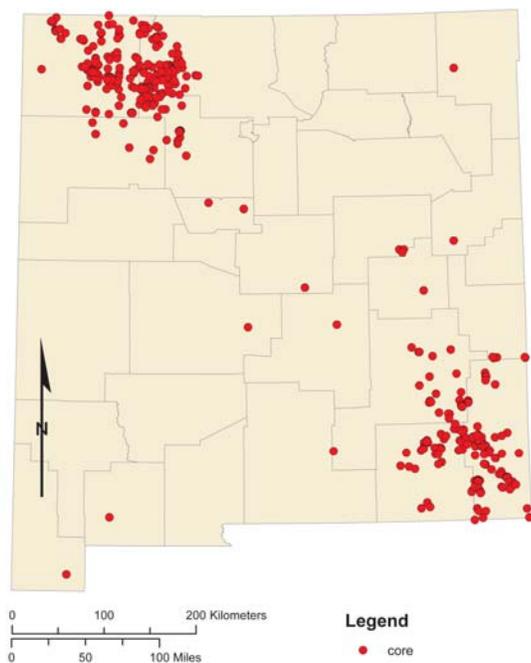


Figure 4. Locations of drill holes with core analyses at the New Mexico Bureau of Geology and Mineral Resources (collection P751) entered into the National Catalog.

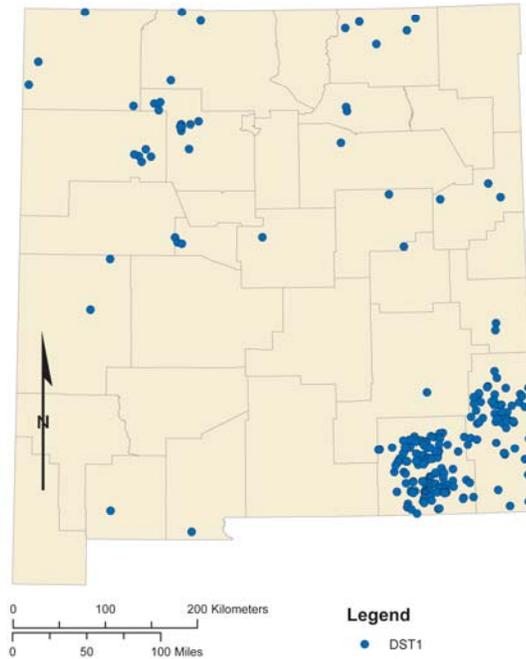


Figure 5. Locations of drill holes with DST (drill-stem test) reports at the New Mexico Bureau of Geology and Mineral Resources (collection P752) entered into the National Catalog.

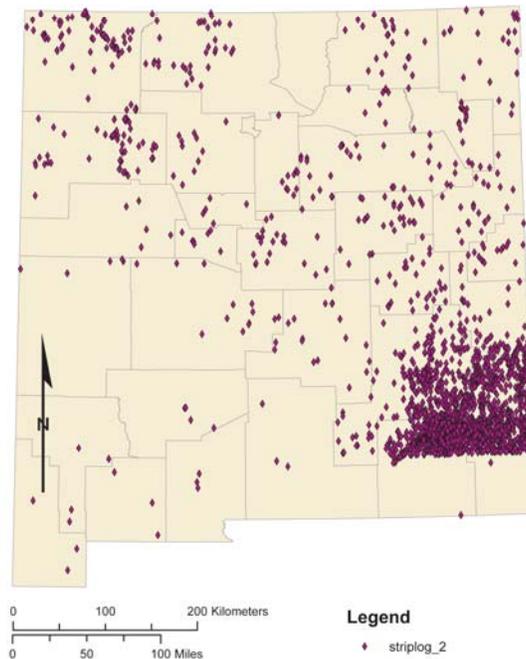


Figure 6. Locations of drill holes with strip/sample logs of cuttings descriptions at the New Mexico Bureau of Geology and Mineral Resources (collection P753) entered into the National Catalog.

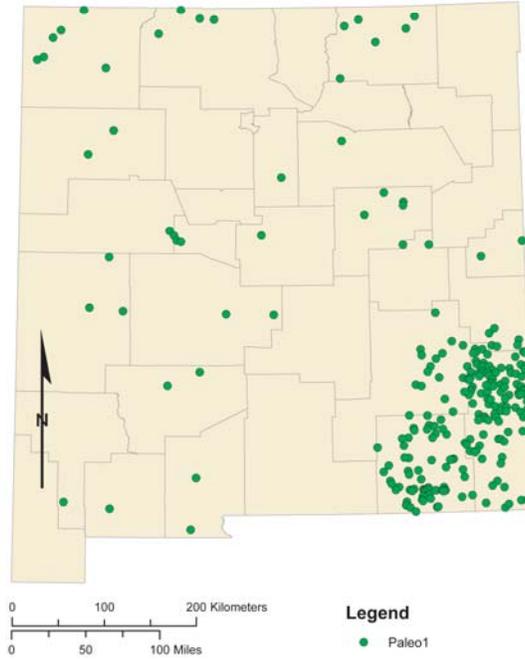


Figure 7. Locations of drill holes and outcrop locations with micropaleontologic determinations and descriptions at the New Mexico Bureau of Geology and Mineral Resources (collection P762) entered into the National Catalog.

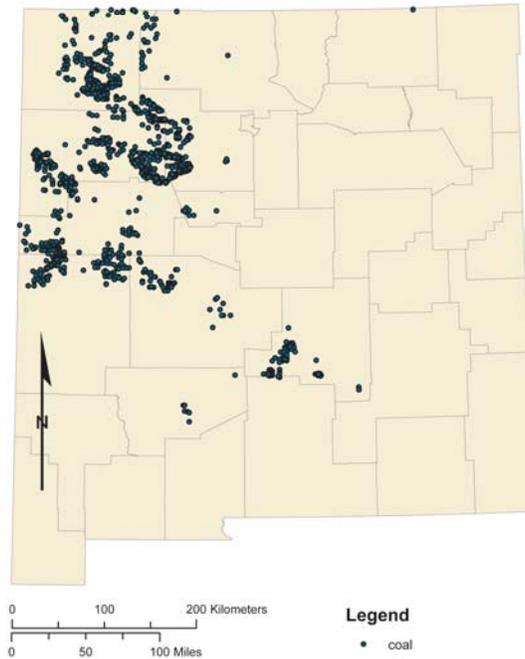


Figure 8. Locations of coal drill holes with well logs at the New Mexico Bureau of Geology and Mineral Resources (collection P1269) entered into the National Catalog.

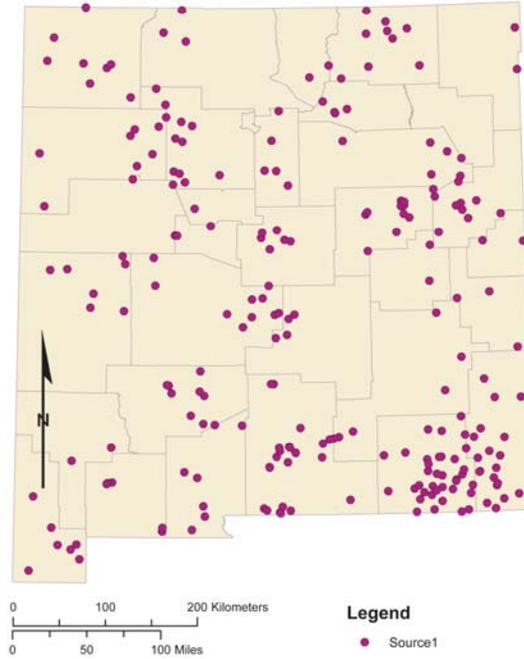


Figure 9. Locations of drill holes and outcrop locations with petroleum source rock analyses at the New Mexico Bureau of Geology and Mineral Resources (collection P1270) entered into the National Catalog.