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Idaho and Montana Non-Fuel Exploration Database 1980-1997

By David A. Buckingham, Carl A. DiFrancesco, Kenneth E. Porter, Donald I. Bleiwas, J. Douglas Causey, and William B. Ferguson

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Abstract

This report describes a relational database containing information about mineral exploration projects in the States of Idaho and Montana for the years 1980 through 1997 and a spatial (geographic) database constructed using data from the relational database. The focus of this project was to collect information on exploration for mineral commodities with the exception of sand, gravel, coal, geothermal, oil, and gas. The associate databases supplied with this report are prototypes that can be used or modified as needed. The following sources were used to create the databases—serial mining periodicals; annual mineral publications; mining company reports; U.S. Bureau of Mines (USBM) and U.S. Geological Survey (USGS) publications; an Idaho mineral property data base developed by Dave Boleneus, USGS, Spokane, Washington; Montana state publications; and discussions with representatives of Montana, principally the Montana Bureau of Mines and Geology and the Department of Environmental Quality.

Fifty commodity groups were reported between the 596 exploration projects identified in this study. Precious metals (gold, silver, or platinum group elements) were the primary targets for about 67 percent of the exploration projects. Information on 17 of the projects did not include commodities. No location could be determined for 51 projects, all in Idaho. During the time period evaluated, some mineral properties were developed into large mining operations (for example Beal Mountain Mine, Stillwater Mine, Troy Mine, Montana Tunnels Mine) and six properties were reclaimed. Environmental Impact Statements were done on four properties. Some operating mines either closed or went through one or more shutdowns and re-openings. Other properties, where significant resources were delineated by recent exploration during this time frame, await the outcome of important factors for development such as defining additional reserves, higher metal prices, and the permitting process. Many of these projects examined relatively minor mineral occurrences.

Approximately half of the exploration projects are located on Federal lands and about 40 percent were on lands managed by the U.S. Forest Service. More than 75 percent of the exploration occurred in areas with significant previous mineral activity.

Introduction

The mineral industry has been a strong component of the economies of Idaho and Montana. These states have been major contributors in supplying part of the Nation's raw material needs. In recent years, Idaho has been among the principal producing states for silver, lead, zinc, molybdenum concentrates, phosphate, and garnet (U.S. Geological Survey and Idaho Geological Survey, 2003). Montana has been among the principal producing states for gold, platinum-palladium, zinc, lead, talc, and bentonite (U.S. Geological Survey and Montana Bureau of Mines and Geology, 2003).

However, before these states became major mineral producers it took exploration to find the economic mineral deposits. Exploration, begun more than 140 years ago, both by individuals and companies, has continued to the present day without any systematic documentation of what happened and where.

In this study, a relational database was developed to collect information on exploration activities for mineral raw materials in Idaho and Montana. The database does not include exploration activity related to sand, gravel, coal, geothermal, oil, and gas. Data from 1980 to 1997 was used to populate the database.

The relational database is designed to allow continued development and use. Users with a copy of Microsoft® Access version 2000 or later can add data to this database as well as modify or create their own tables, queries, forms, and reports. A basic set of forms were created for users to enter information in the data tables. Any of the tables can be modified by increasing field sizes, add new fields, or creating additional tables. Redesign of the forms will be necessary if new fields are added or additional tables created.

Exploration information for this study came mainly from serial periodicals; annual directories related to the minerals industries; company annual reports, Securities and Exchange Commission filings, and press releases; reports from the States of Idaho and Montana; USBM; and USGS data. Information was also acquired through discussions with representatives of the State of Montana (mainly Montana Bureau of Mines and Geology and the Department of Environmental Quality), the U.S. Forest Service and U.S. Bureau of Land Management.

The USGS has not evaluated the accuracy of the information contained in the database and by its inclusion in the database does not endorse any properties. From these sources, 596 individual exploration projects were identified. The locations of 545 sites with a known latitude/longitude are shown on figure 1.

For this study, an exploration project includes work, usually described in a publication, designed to find new mineral reserves within a small geographic region. The activity can vary from reconnaissance to pre-development drilling. Some of the exploration was to extend reserves at operating mines, but the majority of the projects were attempts to find new deposits.

Information provided in the database can be used alone or with other data for a variety of analyses, including identification of emerging social, economic, and environmental issues pertaining to potential mineral development; studying the affects of proposed legislation on exploration; studying the affects of changes in commodity prices, and advances in geologic knowledge and technology on exploration activity; adding recent discoveries to estimates of the reserve/resource base in the United States; identifying areas of permissive geology as determined by exploration activities; and assessing trends from exploration through permitting and development of mining properties.

The USGS's enterprise mineral deposit database—Mineral Resources Data System (MRDS)—was being redesigned at the same time this project was being done. The new version, also called MRDS, uses a new numbering system. The original MRDS database and (or) the USBM's Mineral Availability System/Mineral Industry Location System (MAS/MILS) database record identification numbers were added to the project database if an exploration project area coincided with a property in one of those databases. Although the "new" MRDS database has a new primary key (unique number) field, the key field values from the "old" MRDS and MAS/MILS databases are used in this report. Throughout this report, reference to MRDS refers to the new combined database unless otherwise noted. A portion of the "new" MRDS database was published by McFaul and others (2000).

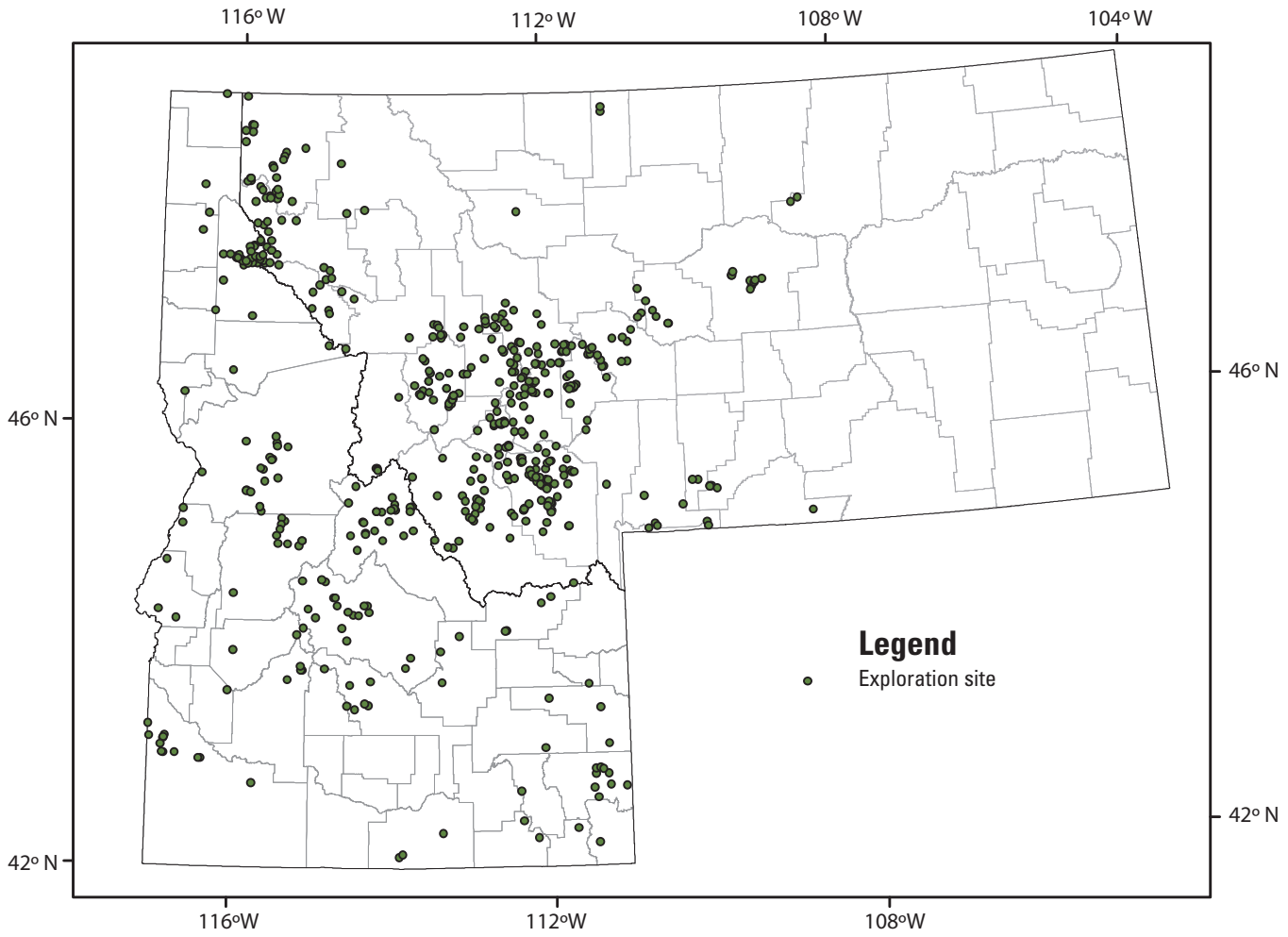

Figure 1. Location of mineral exploration sites in Idaho and Montana between 1980 and 1997.

Acknowledgments

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Bob Eppinger, Karen Bolm, Mary Carlson, William Dillingham, and John DeYoung, Jr. provided technical review of the report.

Conventions, Terminology, and Units of Measure

Throughout the text of this report, conventions are used to distinguish several digital objects. Table names are in small caps (for example, NAMES table). Field or item names are in italics (for example, *Current Owner* field). File names are italicized bold face type and capitalized (for example, ***EXP.MDB*** file). Database forms are underlined (for example, geology info).

Related tables in the Access database contain a field that is common to two or more tables so that they can be connected. The spatial (geographic) database contains only one table. In the software used for this project, the two databases can be linked together using the *PROPID* field in order to perform queries. Most of these connections are "many-to-one" with the "many" symbolized in this report by the infinity sign (∞).

The database programs described in this report are not endorsed by the USGS and are not provided with the data.

Units of measure abbreviations used in the RESOURCE DATA table of the Access database are % (percent), %+ (more than the percent), g (grams), g/mt (grams per metric ton), g/t (grams per short ton), lbs (avoirdupois pounds), lbs/t (pounds per short ton), lbs/yd3 (pounds per cubic yard), mt (metric tons), oz (troy ounces), oz/mt (troy ounces per metric ton), oz/t (troy ounces per short ton), oz/yd3 (troy ounces per cubic yard), st (short ton), and yd3 (cubic yards). A short ton is 2,000 pounds; a metric ton (tonne) is 1,000 kilograms.

Database Development and Description

This report describes two types of database that were created. A relational database used to manage data was implemented in Microsoft® Access 2000. A spatial (geographic) database was built using ESRI® ArcGIS® version 9.0 software.

Relational Database

The relational database was designed for mineral exploration activities as opposed to the MRDS database, which is a database for mineral deposit and mine-specific information and does not contain tables and fields for all the categories of information that needed to be captured in order to describe exploration activities. Another reason for designing this new database is ease of use and availability. MRDS is maintained in an enterprise database system that is not commonly used by the public. Therefore, a new database was designed that could be used on a personal computer in a commonly available software program.

The basic design of this database was modeled after the MAS/MILS database developed by the USBM. The public part of the MAS/MILS database is described in Causey (1998), available on the web (http://pubs.usgs.gov/of/1998/of98-512/masnpdictionary.pdf). Some of the fields and tables in this database are the same as those the MAS/MILS database. Additional fields were added and tables redesigned to contain information specific to mineral exploration. The design also allows a user to add information that was not generally available when we populated the database. For example, one table can hold geologic information about the exploration sites. This table presently contains limited information because the source materials used in this study usually did not contain geologic descriptions.

Another consideration in the design was to simplify data entry. For this purpose, forms were created whereby descriptive titles could be used rather than field names, associated tables could be easily populated, and pick lists could be used for data input. The software also allows development of simple and complex queries of the data as well as creation of reports.

Figure 2 shows the data tables, lookup tables, fields in the tables, and the table relationships. Lookup tables contain data that are used to populate specific fields in other tables. It is a good practice to add new terms to lookup tables and to have a data entry person select from that list, rather than to allow typing new terms in a field as this presents opportunities for typographical mistakes.

Each box in figure 2 is a table in the database. The name in the dark gray bar at the top of the box is the table name. Field names are listed in the box below the table name. The lines between the tables show how the tables are related; they connect the key fields that relate one table to another. This database has both one-to-one and one-to-many relationships. The numeral one on each end of a line connecting tables indicates a one-to-one relationship. One-to-many relationships are symbolized with a "1" and an "∞". The field in the table symbolized with a "1" can refer to zero or more records in the table symbolized with an "∞".

A summary of the tables follows. Documentation of the tables and fields is found in Appendix A. The full database documentation (322 pages) can be obtained by running the Documenter feature in Access (Tools/Analyze/Documenter from the menu bar).

_Main table

The _MAIN[1] table contains the project identification and geographic location information; it is linked to most of the other tables through the *PROPID* field. Each exploration project has a unique Project Identification Number, which is entered automatically by the database program in the *PROPID* fields of the tables when the data entry forms are used to input new records.

Project identification information includes the current name of the project (*Name* field) and the name of the owner or operator (*Current Owner*) as of the date of the information. Other general project description data, such as status of exploration/mining (*Current Status*), actual or proposed type of mining operation (*Type of Operation*), year discovered (*Year of Discovery*), year production started (*Production Start*), mining method being used (*Mining Method*), types of mining waste (*Mining Waste*), processing method (*Milling Method*), and types of processed waste (*Milling Waste*) can be recorded. The USBM sequence number (*SEQ*) and the original MRDS record number (*Record number*) were also entered, when identified, for cross reference to the MAS/MILS and MRDS databases (*MAS No* and *MRDS No* fields, respectively). These numbers are now referred to as *MAS_ID* and *MRDS_ID*, respectively, in the new MRDS database.

Other fields relating to the project's exploration and development potential (*Exploration Potential*, *Development Potential*), environmental sensitivity (*Environmental Sensitivity*), and a determination of previous mining activity (*Nature of Site*) were populated by the project team based on available information. Some of this information requires subjective judgment and the fields may be blank if information necessary to make a determination was insufficient or unavailable.

Geographic information is stored in the fields *State, County, Mining District, Latitude, Longitude* and the Public Land Survey (PLS) fields. The PLS data includes meridian (*PLS Mer*), township (*PLS Twn*), range (*PLS Rng*), section (*PLS Sec*), and fraction of a section (*PLS Frac*) descriptions.

Activity Info table

The ACTIVITY INFO table is used to document each instance of exploration activity at a site. Its fields include information on: the starting and ending years for each activity (*Begin Year*, *Ending Year*), the type of the activity (*Activity*), the total area disturbed (*Area Disturbed*), and a comments field (*Comments*) where unstructured descriptive information related to the exploration activities can be entered. A primary key field (*Activity recno*) is included.

[1]The name of the _MAIN table begins with an underscore so it will sort to the beginning of the list in the database.

Commodities table

The COMMODITIES table lists the commodities (*Commodity*) being sought at the project site or commodities that have been identified at the site. The mining economic significance (*Significance Ranking*) of each commodity is represented by a number (for example, 1 = primary commodity, 2 = coproduct), which is defined in the SIGNIFICANCE table. The commodity significance is subjective, and relates to the revenues potentially generated by the commodity(ies). A comments field (*Comments*) is provided to accommodate additional remarks. A primary key field (*Commodity recno*) is included.

Domain Data table

The DOMAIN DATA table fields are used to describes the type of ownership (for example, private, Federal, state) in *Domain*, and land holdings (mineral and access rights) of the project, as well as the beginning and ending years (*Begin Year, Ending Year*). Three "holding type" fields (*Type Holding 1, Type Holding 2, Type Holding 3*) are included because a project may involve more than one type of land position (for example, located claim, patented claim, lease arrangement). Another field is used to record the total area (*Total Area*) encompassed by the project. A comments field (*Comments*) is provided to accommodate additional remarks.

Geology Data table

The GEOLOGY DATA table has fields for the USGS deposit model number(s) (*Deposit Model No*) selected from the list in Stoeser and Heran (2000), type of ore body (*Type Ore Body*), rock type that hosts mineralization (*Host Rock*), ore and gangue minerals (*Ore Minerals, Gangue Minerals*), and mineralizing process (*Type Mineralization*). Descriptive information about geology and mineral deposits can be entered in the *Comments* field. This includes data that can't be completely described in the other fields in this table.

Names table

The NAMES table contains the name or names the project was referred to in the source information in the *Name* field. If an exploration project includes a site with past production or exploration history, the site's previous name(s) may be listed as "Alternate" in the *Type* field, whereas the most recent exploration project name would be listed as "Current." There is also a field for comments (*Comments*) and a primary key field (*Names recno*).

Ownership Data table

The OWNERSHIP DATA table provides ownership/operator information. The table lists the owner, operator, and (or) leaseholder (*Company Name*) and shows the changes in ownership

over time and in some cases the complexity of ownership arrangements. Additional data provided by this table are the beginning and ending years of the company's involvement (*Begin Year, Ending Year*), percent and type of participation/ownership (*Pct Ownership, Type Ownership*), and a *Comments* field to describe any unusual details of the ownership.

Since the company name entered in the database is the one reported in the literature, there may be several variations of the same company. Analysis was not done to determine if the variations were due to real differences in corporate organizations or inconsistencies in reporting.

Reference Data and Master Reference Data tables

The REFERENCE DATA table contains information to allow the user to identify specifically within each publication where

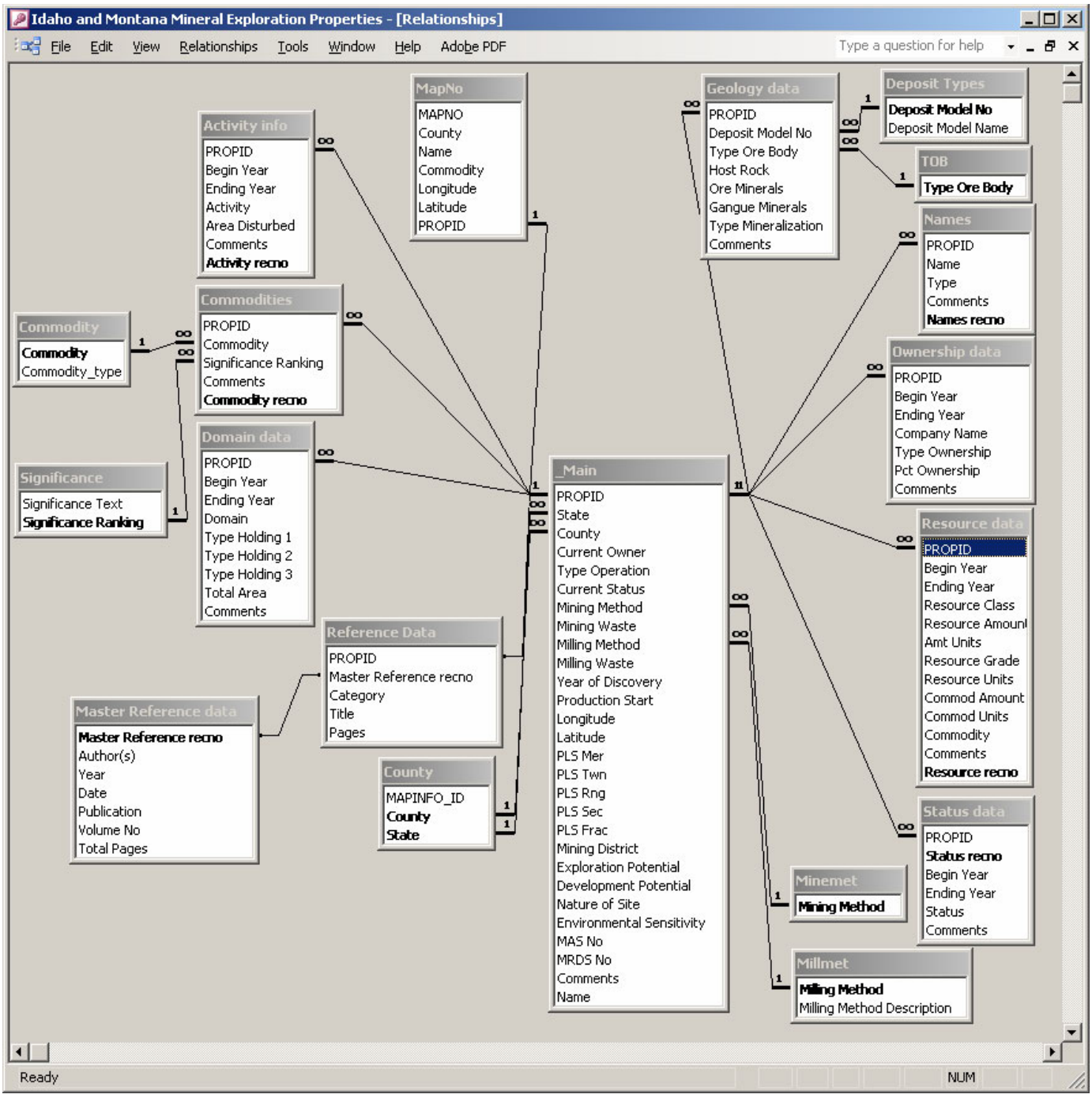

Figure 2. Exploration database table relationships. (See text for explanation of diagram.)

the data came from. This table is joined to data in the MASTER REFERENCE DATA table on the *Master Reference recno* field. These tables are designed to work together and should only be accessed through the references form to maintain integrity of the data.

The REFERENCE DATA table provides the title of the article or a starting phrase of the section or paragraph within an article containing the pertinent information (*Title*) and specific page number(s) in the publication (*Pages*) from which the data used for a record was obtained, as well as the identity of the table or tables or other information to which it applies (*Category*). Many of the magazines, newspaper articles, and company reports from which information was obtained do not have author by-lines. Some articles contain information pertinent to several exploration activities. This table directs the user to the specific piece of information that was incorporated into the database, and therefore it will not always be possible to extract a reference in USGS reference format.

The MASTER REFERENCE DATA table contains a master list of source publications and documents, a majority of which are mining journals, magazines, and newspapers, as well as company reports or documents. It provides the name of author(s) (*Author(s)*); year published (*Year*); specific month, and (or) day of publication (*Date*); publication name (*Publication*); volume number (*Volume No*); and total number of pages (*Total Pages*) in the publication.

Resource Data table

The RESOURCE DATA table is used to store information about the probability (for example, proven, measured, estimated) associated with any estimate of resources in the *Resource Class* field. Terms used are those found in the source material. The table also includes fields for amount of ore (*Resource Amount*), unit of measurement for the *Resource Amount* (*Amt Units*), grade of the resource/reserve (*Resource Grade*) and unit of measurement for *Resource Grade (Resource Units)*, estimate of contained metal or other commodity (*Commod Amount*), unit of measurement for the *Commod Amount* (*Commod Units*), and the *Commodity* that is estimated in *Commod Amount*. Additionally, the table includes beginning and ending year(s) (*Begin Year, Ending Year*) for each resource entry. There is also a field for comments (*Comments*) and a primary key field (*Resource recno*).

Status Data table

The STATUS DATA table includes a field to contain information on the stage in the exploration/development process (*Status*). The table can also reveal the time sequencing and length of time to complete various stages of the exploration process (for example, initial discovery, initial exploration, permitting) using the beginning and ending years (*Begin Year, Ending Year*). There is also a field for comments (*Comments*) and a primary key field (*Status recno*).

Other tables

There are eight lookup tables (COMMODITY, COUNTY, DEPOSIT TYPES, MILLMET, MINEMET, REFERENCE_CATEGORY_LU, SIGNIFICANCE, and TOB). These tables provide lists of acceptable choices to fill in data in related fields of the data tables. Drop-down lists are used in the appropriate form for data entry personnel to select the correct information.

A map number table (MAPNO) is used to assign numbers for plotting points on a map. The numbering is sequential for each state and ordered by county. A listing of the map numbers for each exploration project is given in appendix B, tables B-1 and B-2.

Forms

Forms are designed to provide the user with a set of easy to use data entry screens. There are seven main forms for data entry (table 1 and appendix C). Some forms have subforms. For some of the fields, entry is restricted to approved terms and spelling through the use of lookup tables. Table 1 shows the relationship of data entry forms to the tables. A database dictionary and figures showing the data entry forms is provided in appendix C. Subforms cannot be deleted without affecting the forms to which they are attached.

Spatial (geographic) Database

Latitude/longitude coordinates were determined for a majority of the properties in Idaho and all of the properties in Montana. Information was extracted from the Access database to create a spatial database (***EXP*** [2]) containing the 545 sites that have a latitude/longitude location. This spatial database, in shapefile format, is on the CD-ROM along with this documentation.

Data from the *Longitude, Latitude*, and *PROPID* fields of the _MAIN table was used to generate a point location spatial database. All fields, except the *Comments* field from the _MAIN table (see fig. 2), were exported to a shapefile using ArcMap. Names of the fields were modified to conform to DBASE III format. The fields are shown in table 2. The value in *PROPID* can be used to join the databases. Metadata for the spatial database fields is provided in ***EXP.TXT*** and in the shapefile (***EXP.SHP.XML***) located on the CD-ROM.

In order to use this database, software capable of using shapefile format is required. To fully explore all the data, it is necessary to have software that can connect the spatial database to the Access database, ***EXP.MDB.*** The *PROPID* field in the Access tables can be used to join or relate (link) those tables to the *PROPID* field in the spatial database in spatial

[2]The spatial database is in shapefile format that consists of seven files beginning with the prefix ***EXP*** and having the extensions .dbf, .prj, .sbn, .sbx, .shp.xml, and .shx.

Table 1. Forms in the Access database with tables, fields, and subforms shown on the associated form (refer to the figures, tables, and field descriptions in appendices A and C).

Form	Table	Fields names or subforms (form name in parentheses)
Mainfrm		
(Figure C-1)	_Main	
	(Table A-1)	*PROPID*
		State
		County
		MAS No.
		MRDS No.
		Name
		Latitude
		Longitude
		PLS Mer (Meridian)
		PLS Twn (Twn)
		PLS Rng (Rng)
		PLS Sec (Sec)
		PLS Frac (Frac)
		Current Owner
		Type Operation
		Current Status
		Year of Discovery
		Production Start
		Mining Method
		Mining Waste
		Milling Method
		Milling Waste
		Exploration Potential
		Development Potential
		Environmental Sensitivity
		Nature of Site
		Comments
		Names subform (list)
		Commodities subform (list)
Activity, Status, Domain Info		
(Figure C-2)	Activity Info	
	(Table A-3)	*Begin Year*
		Ending Year
		Activity
		Area Disturbed
		Comments
	Status data	
	(Table A-34)	*Begin Year*
		Ending Year
		Status
		Comments

Table 1. Forms in the Access database with tables, fields, and subforms shown on the associated form (refer to the figures, tables, and field descriptions in appendices A and C).—Continued

Form	Table	Fields names or subforms (form name in parentheses)
	DOMAIN DATA	
	(TABLE A-13)	*Begin Year*
		Ending Year
		Domain
		Type Holding 1
		Type Holding 2
		Type Holding 3
		Total Area
		Comments
		Names subform (list)
Commodity, Resource Info		
(Figure C-3)	COMMODITIES	
	(TABLE A-5)	*Commodity*
		Significance Ranking
		Comments
	RESOURCE DATA	
	(TABLE A-30)	*Begin Year (Start Year)*
		Ending Year (End Year)
		Resource Class
		Resource Amount (Resource)
		Amt Units (Res. Unit)
		Resource Grade (Grade)
		Resource Units (Grade Unit)
		Commodity
		Comments
		Names subform (list)
Geology Info		
(Figure C-4)	GEOLOGY DATA	
	(TABLE A-15)	*Deposit Model No.*
		Type Ore Body
		Host Rock
		Ore Minerals
		Gangue Minerals
		Type Mineralization
		Comments
		Names subform (list)

Table 1. Forms in the Access database with tables, fields, and subforms shown on the associated form (refer to the figures, tables, and field descriptions in appendices A and C).—Continued

Form	Table	Fields names or subforms (form name in parentheses)
Name and Ownership Data		
(Figure C-5)	NAMES	
	(TABLE A-24)	*Name*
		Type
		Comments
	OWNERSHIP DATA	
	(TABLE A-26)	*Begin Year*
		Ending Year
		Company Name
		Type Ownership
		Pct Owner
		Comments
		Names subform (list)
References		
(Figure C-6)	REFERENCE DATA	
	(TABLE A-28)	*Master Reference recno* (Form box called Master Reference shows *Author(s)* field information from MASTER REFERENCE table)
		Category
		Title
		Pages
		Names subform (list)
Master Reference Data		
(Figure C-7)	MASTER REFERENCE	
	(Table A-18)	*Master Reference recno*
		Authors(s)
		Year
		Date
		Publication
		Volume No
		Total Pages

Table 2. Equivalent field names in the spatial and relational databases.

Spatial Database (EXP) point attribute item name	Access (EXP.mdb) field name (table name)
PROPID	*PROPID* (_main)
State	*State* (_main)
County	*County* (_main)
Current_Ow	*Current owner* (_main)
Type_Opera	*Type Operation* (_main)
Current_st	*Current Status* (_main)
Year_of_Di	*Year of Discovery* (_main)
Production	*Production Start* (_main)
Mining_Met	*Mining Method* (_main)
Mining_Was	*Mining Waste* (_main)
Milling_Me	*Milling Method* (_main)
Milling_Wa	*Milling Waste* (_main)
MAS_No	*MAS No* (_main)
MRDS_No	*MRDS no* (_main)
Latitude	*Latitude* (_main)
Longitude	*Longitude* (_main)
PLS_Mer	*PLS Mer* (_main)
PLS_Twn	*PLS Twn* (_main)
PLS_Rng	*PLS Rng* (_main)
PLS_Sec	*PLS Sec* (_main)
PLS_Frac	*PLS Frac* (_main)
Mining_Dis	*Mining District* (_main)
Exploratio	*Exploration Potential* (_main)
Developmen	*Development Potential* (_main)
Environmen	*Environmental Sensitivity* (_main)
Nature_of	*Nature of Site* (_main)
Name	*Name* (_main) - "Current" name

display software. Figure 2 table relationships are valid for joining the Access tables to the spatial database point attribute table.

Description of Data

The database includes information on 227 mineral exploration projects in Idaho and 369 in Montana that were active between 1980 and1997. Tables of the exploration sites in each state, sorted by county, are shown in appendix B, tables B-1 and B-2. The tables include: current name, primary commodity, actual or potential type of mining operation, and status of the property. The 545 project sites whose locations are known have been added to the spatial database (***EXP***).

Exploration Projects

Exploration and mining have occurred in Idaho since at least 1861 with the discovery of gold at Oro Fino (Raymond, 1872, p. 255) and in Montana since at least 1862 with the discovery of gold on Gold Creek (Raymond, 1870, p. 253). However, this report focuses on mineral exploration during the period 1980-97. While this is a short time in the long history of exploration, it captures information about the recent history, which may be more relevant to predicting activity in the near future than an older time period. Exploration, in this case, refers not only to searching for new deposits, but also to exploration for extensions of a defined ore body at operating mines.

The field "*nature of site*" distinguishes exploration in new areas from exploration in proven mineralized areas. Two terms are used in this classification—brownfield and greenfield. The term brownfield was assigned to prospect areas that have experienced preproduction development activities[3]. Greenfield refers to sites where previous exploration did not advance to the preproduction stage. In most cases, exploration efforts in these areas were testing for mineralization based on new geologic concepts or were focused areas identified by regional exploration outcomes. The field was left blank when insufficient information was available to make a determination.

The nature of the site is characterized for 506 of the project areas. Of these, 421 are considered to have had significant activity in the past (brownfield) and 85 are in new prospect areas (greenfield). One criterion used to classify a project as occurring in a brownfield area is the current development status. All of the projects that had a *current status* value of producer (64), past producer (206), reclaimed (34), or intermittent producer[4] (17) were categorized as occurring in a brownfield, since these terms denote a previous history of production.

Because both Idaho and Montana have a relatively long history of exploration and mining, it is not surprising that most of the projects were classified as occurring in brownfield areas. Most of these sites have been revisited many times over the years because exploration, development, and production activities are affected by numerous factors that are subject to change, including commodity prices; availability of infrastructure; technological advances in exploration, mining, and mineral extraction methods; new deposit models; and local, State, and Federal legislation. Technological advances include: the capability of mining lower grade ores, better grade control, and extraction of metals from the ores using more effective beneficiation and (or) leaching methods. Bulk mining methods and new extraction techniques that allow mining lower grade ores have been especially important for the exploration and

[3]Preproduction development activities occur when a decision to mine has been made, permits are approved, and capital obtained to begin operations. The activities can include such things as construction of facilities, stripping of overburden, building leach pads, and driving access adits; but not the extraction of ore.

[4]An intermittent producer is defined as a site where mining occurs only part of the year. Production is interrupted due to seasonal, stockpiling, or other physical restrictions on a regular basis.

development of many gold and copper deposits. Better grade control and bulk mining methods have been important for the exploration and development of phosphate deposits in Idaho. More effective beneficiation has helped silver, lead, and zinc mines from the Coeur d'Alene area since operations are highly dependent on commodity price and improved extraction produces a higher value per unit of mined rock.

The date of discovery of mineralized rock at the sites in this database ranged from 1863 to 1992. If exploration occurred on a property that was being or had been mined, an initial production date was noted. That date ranged from the 1865 to 1995. These dates show that production doesn't occur when mineralized rock is discovered. However, because the focus of this database is on exploration, what is not shown is that mining is often followed by periods of inactivity. It is common for mineral deposits discovered before 1980 to have experienced periods of mining inactivity. For example, the Thompson Creek Molybdenum mine, and the mines in the Coeur d'Alene District have been closed at various times, often because the market price for the primary commodity dropped below the cost of production and refining. The property now called the Zortman mine, discovered in 1864, had several inactive periods during the time of underground mining. Large-scale surface heap leaching started in 1980. Another property, where the Diamond Hill mine was developed, was discovered in 1988 (really an extension of an ore body discovered in the 1860's). Production on this part of the ore body started in 1996.

Mineral Commodities

Review of the exploration projects found 50 mineral commodity groups[5] listed in 596 projects. The 50 commodities being sought or discovered as the result of exploration projects are shown in a generalized hierarchy in table 3 based on the group in which industry normally lumps the commodity. Twenty-two commodities are in the industrial minerals group, 12 in other metals/metalloids, 9 in ferrous metals, 3 each in base and precious metals categories, and one energy commodity. The commodities are also categorized as to whether they are the primary commodity, a coproduct, or minor (byproduct, recoverable) in the exploration project area. Insufficient data were available to enable identification of a primary commodity for 17 exploration projects.

Location and Land Status

The locations of the exploration sites were determined in several ways. When the publication listed the geographic coordinates for a site, it was entered into the database. If the location was described using the Public Land Survey system, the site was plotted on a 7.5-minute topographic map and the latitude and longitude were determined by digitization of the center of the section. If no location was given and a record in the MAS/MILS or original MRDS databases was determined to be the same site, the location in the database was used. If the property was in both databases and the coordinates differed, the MAS/MILS location was used. State geological/mining organizations and private companies were also contacted for a location if one of the other methods didn't work. Latitude/longitude information was obtained for all properties in Montana, but was not determined for 51 projects in Idaho. A county was not determined for eight exploration projects in Idaho.

The information collected provided sufficient data to locate 545 (91percent) exploration projects out of a total of 596 projects to the nearest section. The 369 projects in Montana were in 28 of Montana's 57 counties (fig. 1). In Idaho, the exploration projects were located in 31 of the 44 counties.

Ownership of the land where exploration activity occurred was determined by intersecting the exploration site points with polygons in ownership spatial databases for Idaho[6] and Montana[7]. About half of the exploration sites were located on Federal lands. The other projects were on Tribal, private, and State lands. About 40 percent of the exploration activities were on lands managed by the U.S. Forest Service. Nearly 90 percent were on or within one kilometer of Federal land.

Twenty of the 27 Montana counties in which mineral exploration projects occur are located in the western third of the state (west of the 111th West Longitude, fig. 1). The highest concentration of exploration projects was in five counties in the southwestern part of the State: Madison, with 63 projects, almost twice as many as any other Montana county; Lewis and Clark (34 projects); Beaverhead (32 projects); Granite (31 projects); Jefferson (27 projects); and Silver Bow (22 projects). These counties contain historic mining districts that continue to attract mineral exploration. Based on the information collected, covering the period 1980-97, 11 counties in southwest Montana accounted for 70 percent of the mineral exploration projects.

Idaho exploration projects were generally scattered throughout the State, but about half the projects in Idaho were located in four counties—Shoshone (38 projects), Lemhi (25 projects), Idaho (24 projects), and Custer (22 projects). The primary factor for the clustering of exploration projects is probably the presence of heavily mineralized regions. These areas also contain historic mining districts such as the Coeur d'Alene District, in Shoshone County. Historically, it is one of the world's largest and richest silver, lead and zinc mining regions. Only two of the 38 exploration projects located in Shoshone County are outside of the greater Coeur d'Alene District.

[5]Some similar commodities have been grouped. These include 2 silicon, 2 talc, 6 gemstone, and 9 building stone subcategories.

[6]A statewide Idaho land ownership shapefile found at http://www.idwr.state.id.us/gisdata/new%20pages/new%20data%20download/admin_boundaries.htm on 7/22/05.

[7]A statewide Montana land ownership shapefile and coverage GIS found at http://nris.state.mt.us/gis/gisdatalib/showDownloads.aspx?covdesc=Land%20Ownership%20/%20Stewardship%20%28Ownership%2C%20Easements%2C%20and%20Leases%29&covid=90 on 7/22/2005.

Table 3. Number of exploration projects associated with each commodity classified by commodity importance (primary, coproduct, or minor) for the project.

Industry Group	Commodity	Primary	Coproduct	Minor	Total
Base Metals	Copper	40	51	38	129
	Lead	9	60	48	117
	Zinc	8	54	28	90
Energy	Uranium	0	1	2	3
Ferrous Metal Group	Chromium	3		1	4
	Cobalt	1	8	3	12
	Iron	1	2	2	5
	Manganese	3	3	2	8
	Molybdenum	4	7	7	18
	Nickel	0	1	2	3
	Silicon	1	2	0	3
	Tungsten	2	5	9	16
	Vanadium	0	5	1	6
Industrial Mineral Group	Abrasive (Garnet)	1	1	0	2
	Barite	1	4	1	6
	Building Stone	1	0	0	1
	Clay (Bentonite)	2	0	0	2
	Diatomite	2	0	0	2
	Fluorine (Fluorite, Fluorspar)	1	1	2	4
	Fluorspar	1	1	0	2
	Garnet	3	0	0	3
	Gemstones	12	2	1	15
	Graphite	1	0	0	1
	Gypsum	2	0	0	2
	Kyanite Group	1	0	0	1
	Limestone	8	0	0	8
	Perlite	1	0	0	1
	Phosphate	12	0	0	12
	Pumice	7	0	0	7
	Quartz Crystal	2	0	0	2
	Stone (Building)	24	4	0	28
	Sulfur	0	0	1	1
	Talc and Chlorite	10	0	0	10
	Vermiculite	3	0	0	3
	Zeolites	2	0	0	2
Other Metal/Metalloids	Antimony	4	4	9	17
	Arsenic	0	0	3	3
	Beryllium	0	0	1	1
	Bismuth	0	0	2	2
	Cadmium	0	0	1	1
	Mercury	0	1	2	3
	Rare Earth	1	2	4	7
	Selenium	0	0	1	1
	Tellurium	0	0	2	2
	Thorium	3	0	0	3
	Titanium	1	0	1	2
	Zirconium	0	1	0	1
Precious Metals	Gold	345	43	17	405
	Platinum Group Elements	3	2	5	10
	Silver	54	141	28	223

Table 4 categorizes exploration projects by county and main industry commodity group target. Twenty-two properties are not listed because the data sources did not provide the necessary information to identify the county and primary target commodity. Table 5 lists the counties that had gold exploration distinguished by number of placer and lode gold (primary or coproduct) exploration projects. The county of one Idaho gold project is not known.

Resources and Production

Exploration data from the 1980s and 1990s determined that several past producing mines and some sites that have no record of production are thought to possess future economic potential. Large amounts of gold and silver resources are reported in the literature and have been entered into this database[8]. Some of the still undeveloped prospects with the most resources explored during this period are the Rock Creek and Montanore copper-silver properties; the Big Blackfoot, McDonald-Seven-Up-Pete, and New World gold properties; and the Sheep Creek copper-cobalt prospect. Although all of

[8]The database contains information that was published or reported to the authors. The U.S. Geological Survey has no knowledge of the accuracy of the data and does not endorse any claims made with respect to the economic viability of any of the properties in this database.

Table 4. Number of exploration projects in Idaho and Montana by county and primary target commodity group.

State	County	Precious Metals	Base Metals	Ferrous Metals	Other Metals	Industrial Minerals	Total
Idaho	Ada	1				1	2
Idaho	Adams		2				2
Idaho	Bear Lake					2	2
Idaho	Benewah					1	1
Idaho	Bingham					1	1
Idaho	Blaine	6					6
Idaho	Boise	4				1	5
Idaho	Bonner	1		1			2
Idaho	Bonneville	1				4	5
Idaho	Boundary				1		1
Idaho	Butte	2				1	3
Idaho	Camas		2			1	3
Idaho	Caribou					11	11
Idaho	Cassia	1				2	3
Idaho	Clark	1				3	4
Idaho	Clearwater	1	1			1	3
Idaho	Custer	13	3	2		2	20
Idaho	Elmore	5					5
Idaho	Fremont					2	2
Idaho	Idaho	19	2			1	22
Idaho	Kootenai	1					1
Idaho	Latah		2				2
Idaho	Lemhi	15	8	1	1		25
Idaho	Lewis					1	1
Idaho	Madison					1	1
Idaho	Oneida					2	2
Idaho	Owyhee	7				6	13
Idaho	Shoshone	34	3			1	38
Idaho	Valley	8			2	2	12
Idaho	Washington	6				1	7
Montana	Beaverhead	22	1	3	1	5	32
Montana	Broadwater	16				2	18
Montana	Carbon					1	1
Montana	Cascade	1	1				2
Montana	Deer Lodge	4		1			6
Montana	Fergus	11					11
Montana	Flathead	1	1				2
Montana	Gallatin	1				1	2
Montana	Granite	29				1	32
Montana	Jefferson	20	2			5	27
Montana	Judith Basin	3				1	6
Montana	Lake		1				1
Montana	Lewis and Clark	29	2			1	34
Montana	Liberty	2					2
Montana	Lincoln	15	5			2	22
Montana	Madison	50	1			12	63
Montana	Meagher	10	2	1			13
Montana	Mineral	5	1			1	7
Montana	Missoula	4	1			3	8
Montana	Park	6				1	7
Montana	Phillips	2					2
Montana	Powell	15				1	16
Montana	Ravalli	4				1	5
Montana	Sanders	7	9		3	2	21
Montana	Silver Bow	15	4	3			22
Montana	Stillwater	1		3			4
Montana	Sweet Grass	2					2
Montana	Teton				1		1
	Total	401	56	15	9	93	574

Table 5. Number of placer and lode gold exploration projects in Idaho and Montana, by county.

State	County	Placer	Lode	Total
Idaho	Ada	0	1	1
Idaho	Adams	0	2	2
Idaho	Blaine	0	5	5
Idaho	Boise	0	4	4
Idaho	Bonner	0	1	1
Idaho	Bonneville	0	1	1
Idaho	Butte	0	1	1
Idaho	Cassia	0	1	1
Idaho	Clark	0	1	1
Idaho	Clearwater	0	2	2
Idaho	Custer	1	11	12
Idaho	Elmore	0	5	5
Idaho	Idaho	0	20	20
Idaho	Kootenai	0	1	1
Idaho	Lemhi	2	17	19
Idaho	Owyhee	0	6	6
Idaho	Shoshone	1	23	24
Idaho	Valley	0	8	8
Idaho	Washington	0	6	6
Montana	Beaverhead	7	12	19
Montana	Broadwater	6	10	16
Montana	Cascade	0	1	1
Montana	Deer Lodge	2	2	4
Montana	Fergus	1	10	11
Montana	Flathead	0	2	2
Montana	Gallatin	0	1	1
Montana	Granite	9	19	28
Montana	Jefferson	1	20	21
Montana	Judith Basin	1	1	2
Montana	Lewis and Clark	12	19	31
Montana	Liberty	0	2	2
Montana	Lincoln	4	10	14
Montana	Madison	9	43	52
Montana	Meagher	2	7	9
Montana	Mineral	2	1	3
Montana	Missoula	0	4	4
Montana	Park	1	5	6
Montana	Phillips	0	2	2
Montana	Powell	3	12	15
Montana	Ravalli	2	2	4
Montana	Sanders	1	5	6
Montana	Silver Bow	1	13	14
	TOTAL	68	319	387

these properties are reported to possess economic potential, some possibly will not be developed because of conflicting land use, and none of these properties are anticipated to begin production before 2006. Other factors that could delay or prevent development of these properties include a combination of low metal prices and high development costs, environmental concerns, or insufficient reserves.

Out of the 596 project areas in the database, production values, mostly gold and silver (and usually only for a particular year), were only reported for 27 sites (ACTIVITY INFO table). However, 43 properties that listed gold as the primary commodity also reported active mining.

Significant properties that began production between 1980 and 1997 include four phosphate mines (Smoky Canyon, Dry Valley, Enoch Valley, and Rasmussen Ridge), five gold mines (Beartrack, Beal Mountain, Golden Sunlight, Montana Tunnels, and Zortman-Landusky,) the Stillwater platinum group metal mines, the Troy copper-silver mine, the Continental East copper mine, and two talc mines (Beaverhead Mine and Yellowstone Mine). An Environmental Impact Statement (EIS) was probably required for all these operations, but during this study the literature research found mention of EIS's at only 11 properties, two of which had not begun mining as of June 2001 (Hamilton vermiculite and New World). Since completion of data entry, the unpatented mining claims at the New World deposit were purchased by the Federal Government and removed from mineral development. Some mines that produced after 1980 have since closed or been placed in a standby status.

Analysis of Data

Exploration is an expenditure of effort (including money) in the hope of finding an economic deposit of mineral materials. Favorable geologic conditions and price of commodities are significant factors in a decision to explore. In general, it could be postulated that as the market price of a commodity increases, areas with favorable geologic conditions are more likely to become exploration targets. It is also true that operating mines will try to find additional ore in proximity to the mine to extend mine life in preference to finding a new deposit because of the costs associated with starting a new mine in a new area.

In order to evaluate the relationship of one factor, commodity price, on exploration, it is necessary to examine commodity price fluctuations. Average precious and base-metal prices for the years 1980 to 1997 are shown in figures 3 and 4, respectively (U.S. Geological Survey, 1999). The group of precious metals (gold, silver, platinum, and palladium) has a grossly similar variation in value over this time period as do the base metals (copper, zinc, and lead). If price was the controlling factor, we would expect exploration for these commodities to follow a similar, maybe slightly lagging trend.

One problem with trying to test this hypothesis is a lack of statistically useful data for all the commodities involved. Because the majority of exploration projects in this two state region focused on gold, we can examine the pattern of exploration activity for this one commodity. Exploration for gold increased after 1968 when the 2-tier gold price was instituted allowing free market pricing in private transactions. The price of gold increased from the government controlled price of $35 to its highest daily price of $850 per troy ounce on January 21, 1980 (Lucas, 1993, p. 58).

This study examines exploration activity that has occurred since gold reached its highest value. Exploration activity for gold (primary or coproduct commodity) in Idaho and Montana does not seem to be entirely correlated to price fluctuations and, while similar, even varies between the states both in timing and intensity (figs. 5, 6). More gold exploration activity occurred in Montana than Idaho during this period. The one factor that seems to be consistent during this time period is the cyclic nature of exploration. However, the only years when the exploration activity in the two states peaked at the same time was 1983 and 1991. In 1987, the gold price

peaked, but exploration activity in Idaho decreased significantly. What is not clear from the data is why many of the cycles do not occur at the same time in the two states. Six possible explanations for the variation between the states are:

1. The data set is too small to be statistically accurate.
2. Exploration occurred that was not documented or found during this research.
3. Geologic knowledge/understanding related to gold deposits was not equal between the two states. This factor may cause companies to wait for research to help guide exploration efforts.
4. Political, permitting, and land acquisition considerations may have affected timing of exploration efforts.
5. There may be a perception in gold company's management that the geology of Idaho is not as favorable for gold as Montana.
6. Mineral rights to land with the most permissive geology may not be available.

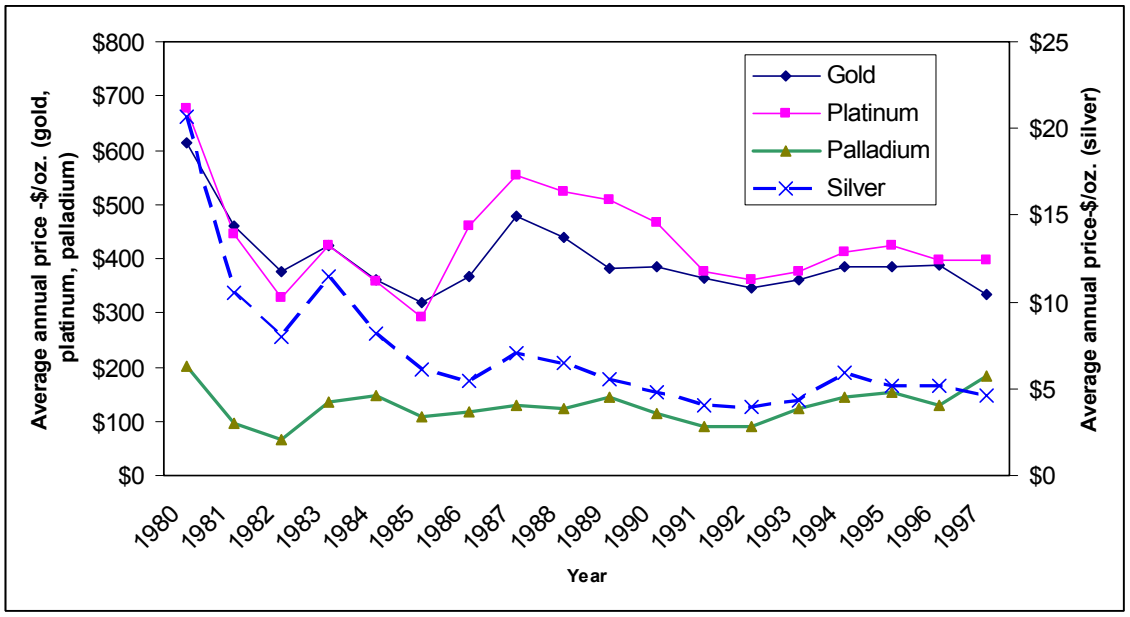

Figure 3. Average precious metal prices (1980-1997) (U.S. Geological Survey, 1999).

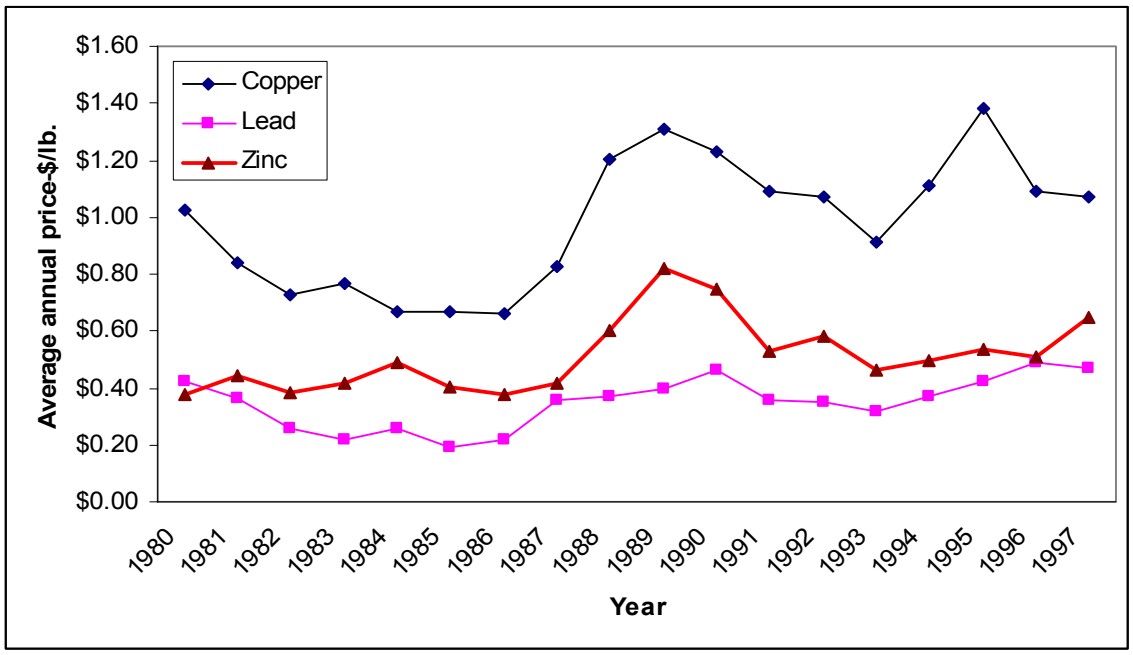

Figure 4. Average base metal prices (1980-97) (U.S. Geological Survey, 1999).

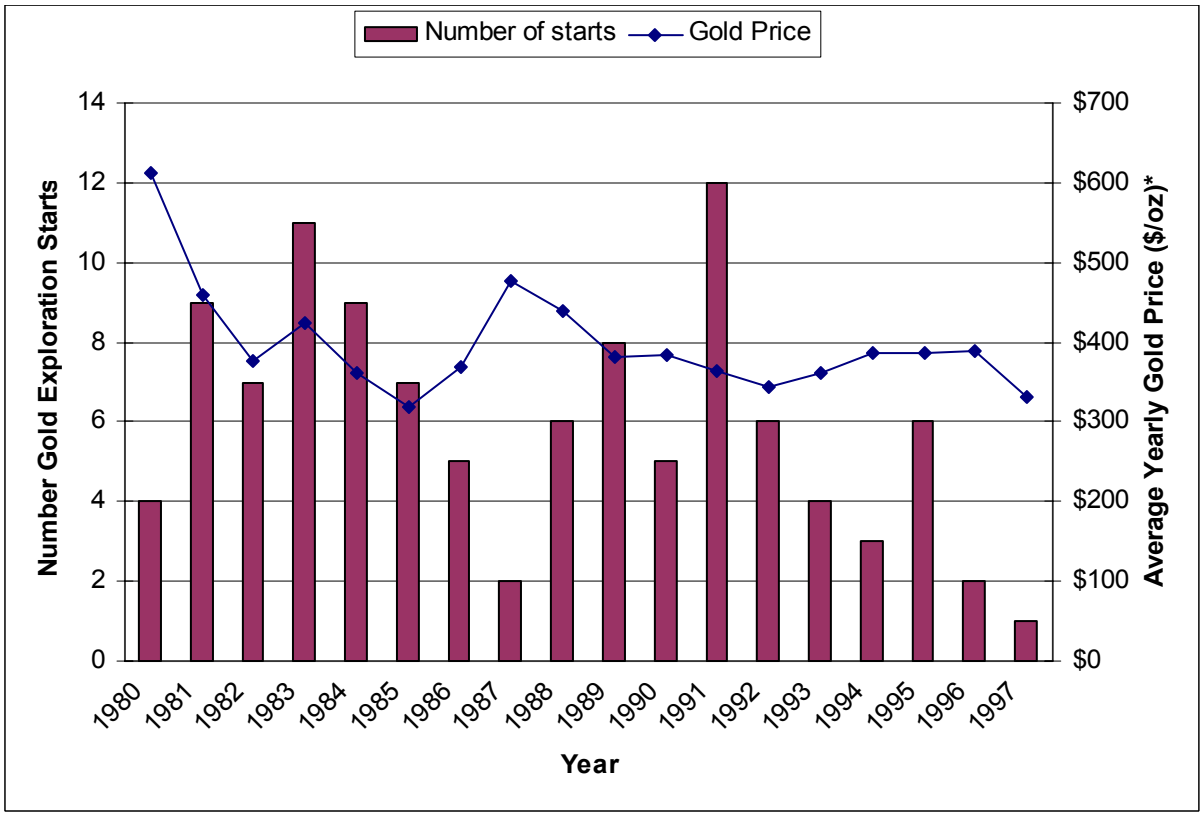

Figure 5. Number of new gold exploration starts in Idaho compared to gold price on a yearly basis (1980-97).

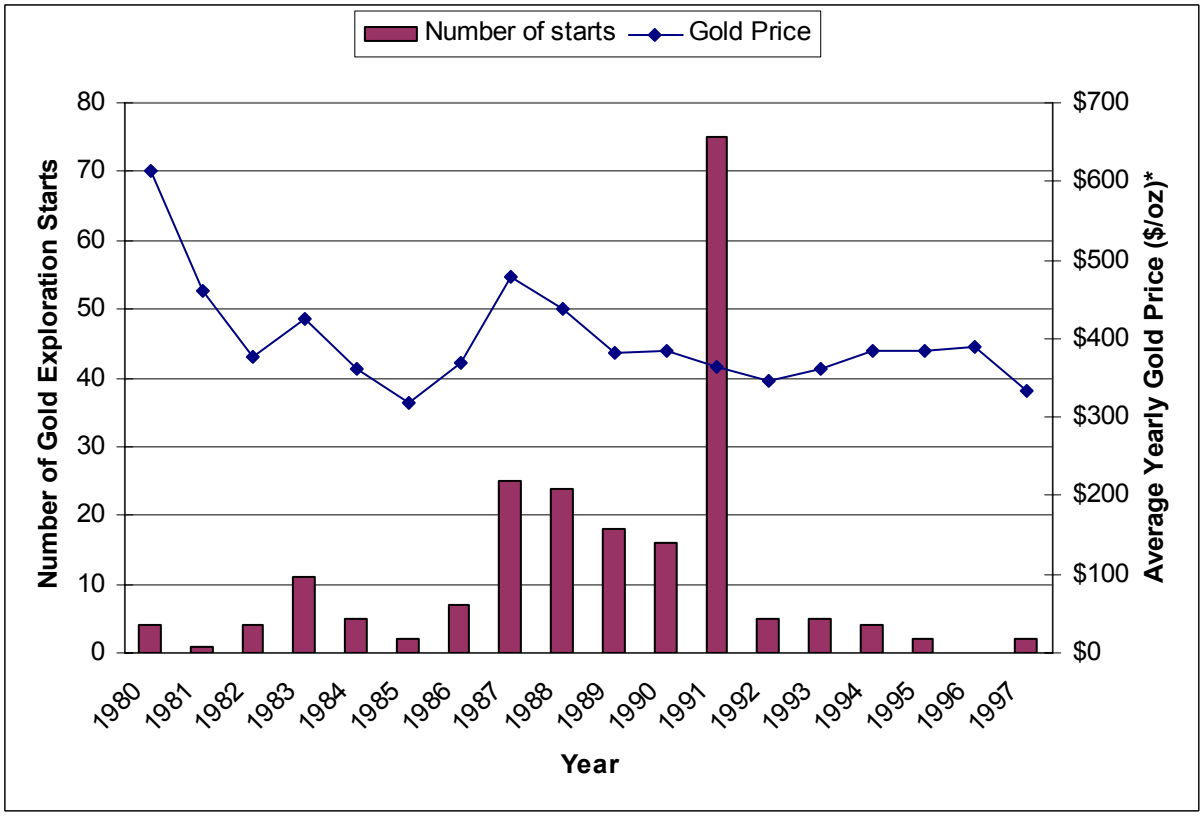

Figure 6. Number of new gold exploration starts in Montana compared to gold price on a yearly basis (1980-97).

Because price alone does not seem to be a controlling factor in exploration activity, several other factors may also influence exploration decisions and contribute to the fluctuation in gold exploration over the 18 years examined in this study—the price of gold, new exploration concepts and models, increased geologic knowledge of the area, and the development of technologies associated with mining and recovery of gold from low-grade ores. Other factors such as inflation or recession, stock market performance, interest rates, pending land re-classifications (for example, wilderness and roadless area designations), and the permitting and EIS process may have affected exploration efforts in the recent past and could affect them in the future. Additional factors such as the ban on cyanide heap leaching in Montana (1998, Initiative 137) might also contribute to a future decrease in gold exploration in that state.

Conclusion

Information was collected in a database on 596 sites at which some form of mineral exploration occurred between 1980 and 1997. Gold was the most common exploration target in Idaho and Montana. However, less than half of the properties that began production during this period were primarily gold mines. Most of the exploration activity was located on or near Federally managed lands.

On at least 11 of the exploration sites, an EIS was written. Proposed operations at sites where gold was not the primary commodity like Stillwater, Troy, Rock Creek, and Hamilton generated intense scrutiny, which is identified by the EISs done on those projects.

Analysis of exploration activity in Idaho and Montana reveals patterns in the commodities being sought and the areas of greatest interest for exploration. An understanding of where mineral exploration and mine development might occur, based on historical activities, provides insights for land-use planning and for the development of company exploration programs. A ban on cyanide use for gold processing, and Federal purchase of mineral rights may reduce exploration in Montana.

This data does not point to a single controlling factor that can be used to predict future exploration activity. The data indicates that mineral exploration may be affected by factors other than metal price. The removal of trade restrictions to communist block countries and increased access to mineral resources in Third World nations with less stringent regulations and faster permitting than the United States also affect the willingness of companies to spend exploration dollars domestically. Mining is a high risk business and most exploration projects do not discover economic deposits of materials. When reserves are plentiful, or the profitability of existing mines is low or negative; decreased funding for exploration is often the first step taken by mining companies to improve their finances.

A database devoted to tracking mineral exploration activities has value because it allows both industry and regulators to examine of the effects of a variety of factors. One of the advantages of obtaining information about the mining industry using the methods employed in this study is that data are not limited to Federal land. This prototype design shows that much information on mineral exploration activities can be gleaned using available resources.

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List of Files Associated with this Report

File name	File size	Description
exp.mdb[9]		Microsoft Access 2000 database containing information on mineral exploration projects in Idaho and Montana between 1980 and 1997.
exp.dbf, exp.prj, exp.sbn, exp.sbx, exp.shp, exp.shp. xml, exp.shx		Shapefiles that make up the point coverage of mineral exploration sites in Idaho and Montana (1980-1997). Included in these files is a metadata file (exp.shp.xml) .
Exp.txt		Metadata file describing exp spatial data.
exp.pdf		This document.
exp_readme.txt		ASCII file describing files in this report and how to access them. Also software requirements.

[9]If this file is obtained on a CD, the database must be copied to a writable medium such as a hard drive and the property attributes modified in order to make any changes, additions, or deletions.

Appendixes A–C

Appendix A—Abbreviated Exp.mdb Database Documentation

The abbreviated documentation for the ***EXP.MDB*** database below is extracted from the full documentation available using the Access 2000 documenter tool. It includes descriptions of the tables and queries in ***EXP.MDB.*** Most of the information provide by the documenter tool is not needed by database users. A complete report can be generated from the EXP database at any time and therefore is not included here.

Table: _MAIN

Properties

Description: Data table: The _MAIN table contains the project identification and geographic location information; it is linked to most of the other tables through the *PROPID* field.

Fields

Table A-1. Design of _MAIN table.

Field Name	Type	Size	Description
PROPID	Long Integer	4	Unique identification number for an exploration project – use this number to join to other data tables.
State	Text	30	U.S. state name (Idaho, Montana) where project is located.
County	Text	30	Idaho or Montana county name where project is located, if known.
Current Owner	Text	40	Owner or operator of the project as of the end of 1997 or most current available if prior to 1997, if known.
Type Operation	Text	19	The type of mining taking place, proposed or assumed, for this project (for example, surface, underground, combined), if known.
Current Status	Text	21	The operational status as of the end of 1997, or the most current known, if prior to this (for example, past producer, exploration deposit), if known.
Mining Method	Text	35	*Mining method* describes the major method of mining (for example, block caving, open pit) utilized, proposed, or assigned to this project if developed (if known).
Mining Waste	Text	30	*Mining waste* describes the type of waste (for example, sulfide, oxide) produced from mining activities if the project is, or ever was, developed (if known).
Milling Method	Text	12	*Milling method* describes the major method, (for example, flotation, bio-leach) of processing ore utilized, proposed, or assigned to this project if developed (if known).
Milling Waste	Text	30	*Milling waste* describes the type of waste (for example, carbonate, oxide), produced from processing ore if the project is, or ever was developed (if known).
Year of Discovery	Text	4	Year of initial discovery of mineralization in the project area, if known.
Production Start	Text	4	First year of production for the most recent period of production for the project, if known.
Longitude	Double	8	Longitude of the location in decimal degrees, NAD27 datum.
Latitude	Double	8	Latitude of the location in decimal degrees, NAD27 datum.
PLS Mer	Text	14	Public Land Survey system – Meridian.
PLS Twn	Text	7	Public Land Survey system – Township.
PLS Rng	Text	7	Public Land Survey system – Range.

Table A-1. Design of _Main table.—Continued

Field Name	Type	Size	Description
PLS Sec	Text	12	Public Land Survey system – Section.
PLS Frac	Text	12	Public Land Survey system - part of a section.
Mining District	Text	30	Mining District name, if any.
Exploration Potential	Text	1	The estimated potential for exploration determined by history of exploration and production and any known resources. The potential can be ranked as: 1. high; 2. medium; 3. low.
Development Potential	Text	1	The estimated potential for development determined by history of exploration and production, any known resources, and proposed mining/milling methods. This potential can be ranked as: 1. high; 2. medium; 3. low.
Nature of Site	Text	10	*Nature of site* describes whether the site is in an area of historic mineral development (Brownfield), or completely new area (Greenfield).
Environmental Sensitivity	Text	1	The estimated sensitivity to environmental disturbances determined by evaluating proposed exploration, development, mining, milling, and reclamation methods. This sensitivity can be ranked as; 1. high; 2. medium; 3. low.
MAS No	Text	10	*MAS No* is the SEQ number from the U.S. Bureau of Mines MAS/MILS database.
MRDS No	Text	7	*MRDS No* is the seven character alphanumeric code used to uniquely identify a project file in the USGS's original Mineral Resources Data System (MRDS Database) (McFaul, and others, 2000).
Comments	Memo	-	Free form field to enter comments.
Name	Text	50	Current name of exploration project.

Relationships

Table A-2. Table relationship for_Main table.

Table Name	Field name	Relationship		Field name	Table name	Attributes
_Main	*PROPID*	1	∞	*PROPID*	Commodities	Enforced
_Main	*PROPID*	1	1	*PROPID*	MapNo	Not Enforced
_Main	*PROPID*	1	∞	*PROPID*	Activity info	Enforced, Cascade Updates
_Main	*PROPID*	1	∞	*PROPID*	Resource data	Enforced, Cascade Updates
_Main	*PROPID*	1	∞	*PROPID*	Geology data	Enforced, Cascade Updates
_Main	*PROPID*	1	∞	*PROPID*	Names	Enforced, Cascade Updates
_Main	*PROPID*	1	∞	*PROPID*	Reference data	Enforced, Cascade Updates
_Main	*PROPID*	1	∞	*PROPID*	Status data	Enforced, Cascade Updates
_Main	*PROPID*	1	∞	*PROPID*	Ownership data	Enforced, Cascade Updates
_Main	*PROPID*	1	∞	*PROPID*	Domain data	Enforced, Cascade Updates
County	*County*	1	∞	*County*	_Main	Enforced
County	*State*	1	∞	*State*	_Main	Enforced
Millmet	*Milling Method*	1	∞	*Milling Method*	_Main	Enforced
Minemet	*Mining Method*	1	∞	*Mining Method*	_Main	Enforced

Table: Activity Info

Properties

Description: Data table: The Activity Info table contains a description of the exploration activities at the site.

Fields

Table A-3. Design of the Activity Info table.

Field Name	Type	Size	Description
PROPID	Long Integer	4	Unique identification number for an exploration project - use to join to _Main table.
Activity recno	Long Integer	4	Unique identification number for the Activity info table records.
Begin Year	Text	4	The year for which activity described in this record started.
Ending Year	Text	4	The year for which activity described in this record ended.
Activity	Text	100	For each year, describes the exploration and development activity that has taken place on the project.
Area Disturbed	Text	15	An estimate of the surface area being explored at the project site, (for example: the drilling site, trenching site, etc.).
Comments	Memo	-	Any comment referring to the activity.

Relationships

Table A-4. Table relationship for Activity Info table.

Table Name	Field name	Relationship		Field name	Table name	Attributes
_Main	*PROPID*	1	∞	*PROPID*	Activity info	Enforced, Cascade Updates

Table: Commodities

Properties

Description: Data table: The Commodities table lists the commodities being sought the project site or commodities that have been identified at the site.

Fields

Table A-5. Design of the Commodities table.

Field Name	Type	Size	Description
PROPID	Long Integer	4	Unique identification number for an exploration project - use to join to _Main table.
Commodity recno	Long Integer	4	Unique identification number for records in Commodities table.
Commodity	Text	20	The commodities that are found in this project area.
Significance Ranking	Integer	2	The ranking of the commodity being sought or mined. In cases where multiple commodities are being sought, selection is based on some measure of the relative value the company places on the commodities.
Comments	Memo	-	Comments related to the commodities in the record.

Relationships

Table A-6. Table relationship for Commodities table.

Table Name	Field name	Relationship	Field name	Table name	Attributes
_Main	*PROPID*	1 ∞	*PROPID*	Commodities	Enforced
Commodity	*Commodity*	1 ∞	*Commodity*	Commodities	Enforced
Significance	*Significance Ranking*	1 ∞	*Significance Ranking*	Commodities	Enforced

Table: Commodity

Properties

Description: Lookup table: The Commodity table contains a list of all the commodities used in the commodities table.

Fields

Table A-7. Design of the Commodity table.

Field Name	Type	Size	Description
Commodity	Text	20	Mineral commodity name
Industry_Group	Text	1	Mineral industry group for the commodity. Groups include: I = Industrial mineral, N = Non-metallic commodity, F = Ferrous metal, P = Precious metal, B = Base metal, M = Other metallic commodities, C = Contaminant.

Relationships

Table A-8. Table relationship for Commodity table.

Table Name	Field name	Relationship		Field name	Table name	Attributes
Commodity	*Commodity*	1	∞	*Commodity*	Commodities	Enforced

Table: County

Properties

Description: Lookup table: The County table lists all the county names for Idaho and Montana.

Fields

Table A-9. Design of the County table.

Field Name	Type	Size	Description
MAPINFO_ID	Long Integer	4	Unique Identification number for the county-state combination.
County	Text	16	County name where project occurs. Valid county names are those for Idaho or Montana.
State	Text	25	State name where project occurs. Valid names are Idaho or Montana.

Relationships

Table A-10. Table relationship for County table.

Table Name	Field name	Relationship		Field name	Table name	Attributes
County	*County*	1	∞	*County*	_Main	Enforced
County	*State*	1	∞	*State*	_Main	Enforced

Table: Deposits Types

Properties

Description: Lookup table: The Deposit Types table contains USGS deposit types, which can be joined to the geology data table using *Deposit Model No* field.

Fields

Table A-11. Design of the Deposit Types table.

Field Name	Type	Size	Description
Deposit Model No	Text	10	U.S. Geological Survey deposit model number.
Deposit Model Name	Text	55	U.S. Geological Survey deposit model name.

Relationships

Table A-12. Table relationships for Deposit Types table.

Table Name	Field name	Relationship		Field name	Table name	Attributes
Deposit Types	*Deposit Model No*	1	∞	*Deposit Model No*	Geology data	Enforced

Table: Domain Data

Properties

Description: Data table: The Domain Data table describes the type of ownership (for example, private, Federal), and land holdings.

Fields

Table A-13. Design of the Domain Data table.

Field Name	Type	Size	Description
PROPID	Long Integer	4	Unique identification number for an exploration project - use to join to _Main table.
Begin Year	Text	4	The year for which the domain described in this record began.
Ending Year	Text	4	The year for which the domain described in this record ended.
Domain	Text	20	For each year, describes the type of ownership (for example, private vs. Federal), and land holdings (for example, mineral and access rights) of the project.
Type Holding 1	Text	13	The type of property holding (for example, located claim, patented claim, or type of lease arrangement).
Type Holding 2	Text	13	The type of property holding (for example, located claim, patented claim, or type of lease arrangement). Used if there is more than one type.
Type Holding 3	Text	13	The type of property holding (for example, located claim, patented claim, or type of lease arrangement). Used if there are more than two types.
Total Area	Text	20	The total surface area extent of the holdings including the area currently undergoing exploration.
Comments	Memo	-	Comments related to the domain.

Relationships

Table A-14. Table relationships for Domain Data table.

Table Name	Field name	Relationship		Field name	Table name	Attributes
_Main	*PROPID*	1	∞	*PROPID*	Domain data	Enforced, Cascade Updates

Table: Geology Data

Properties

Description: Data table: The Geology Data table contains information about geology and mineral deposits being explored.

Fields

Table A-15. Design of the Geology Data table.

Field Name	Type	Size	Description
PROPID	Long Integer	4	Unique identification number for an exploration project - use to relate to _Main table.
Deposit Model No	Text	10	The number for the U.S. Geological Survey deposit model type that best describes the deposit. This number can be joined to the DEPOSIT TYPES table field of the same name.
Type Ore Body	Text	13	The type of ore body in standard geological terms selected from list in TOB table.
Host Rock	Text	70	Rock formation that hosts the mineralization and (or) brief description of lithology.
Ore Minerals	Text	50	List of minerals associated with the commodities being sought in decreasing order of abundance.
Gangue Minerals	Text	120	List of minerals associated with the waste portion of the deposit in decreasing order of abundance.
Type Mineralization	Text	35	Process or processes that produced a concentration of ore minerals.
Comments	Memo	-	Additional information on the geology of the deposit.

Relationships

Table A-16. Table relationships for Geology Data table.

Table Name	Field name	Relationship		Field name	Table name	Attributes
_Main	*PROPID*	1	∞	*PROPID*	Geology data	Enforced, Cascade Updates
Deposit Types	*Deposit Model No*	1	∞	*Deposit Model No*	Geology data	Enforced
TOB	*Type Ore Body*	1	∞	*Type Ore Body*	Geology data	Enforced

Table: MAPNO

Properties

Description: GIS data table: The MAPNO table combines information from several tables that can be used to make a digital map in a GIS. It has a unique number within each state. The numbering sequence generally starts in the northwest part of the state and progresses to the southeast part of the state.

Fields

Table A-17. Design of the MAPNO table.

Field Name	Type	Size	Description
MAPNO	Long Integer	4	Unique number for a property within a state. It is designed to use in visual displays and numbers the properties in a spatial arrangement that makes them easier to find on a printed map.
County	Text	30	Name of county where property is located.
Name	Text	30	Current name of the project.
Commodity	Text	150	Main commodity that is object of exploration project.
Longitude	Double	8	Longitude in decimal degrees, NAD27, of the project.
Latitude	Double	8	Latitude in decimal degrees, NAD27, of the project.
PROPID	Long Integer	4	Unique identification number for an exploration project - use to join to _Main table.

Table: Master Reference Data

Properties

Description: Lookup table: The Master Reference Data table contains the primary reference information—author, date, and publication.

Fields

Table A-18. Design of the Master Reference Data table.

Field Name	Type	Size	Description
Master Reference recno	Long Integer	4	Unique number for a reference.
Author(s)	Text	90	Author(s) of the reference.
Year	Text	20	Year reference was published (4 digit).
Publication	Text	100	Name of publication, or publishing or source organization.
Volume No	Text	30	Volume number.
Date	Text	30	Specific date of publication if mentioned and more detailed than year (for example - month, day).
Total Pages	Text	20	Number of pages in the publication.

Relationships

Table A-19. Table relationships for Master Reference Data table.

Table Name	Field name	Relationship		Field name	Table name	Attributes
Master Reference data	*Master Reference recno*	1	∞	*Master Reference recno*	Reference data	Enforced

Table: MILLMET

Properties

Description: Lookup table: The MILLMET table contains a list of valid terms for the *Milling Method* field in the _Main table.

Fields

Table A-20. Design of the MILLMET table.

Field Name	Type	Size	Description
Milling Method	Text	12	Abbreviated milling method term that can be used in Mill Method field of _Main table.
Milling Method Description	Text	50	Long form of milling method term.

Relationships

Table A-21. Table relationships for MILLMET table.

Table Name	Field name	Relationship		Field name	Table name	Attributes
MILLMET	*Milling Method*	1	∞	*Milling Method*	_MAIN	Enforced

Table: MINEMET

Properties

Description: Lookup table: The MINEMET table contains a list of valid terms for the *Mining Method* field in the _Main table.

Fields

Table A-22. Design of the MINEMET table.

Field Name	Type	Size	Description
Mining Method	Text	35	Mining methods that can be used in Mine Method field of _Main table.

Relationships

Table A-23. Table relationships for MINEMET table.

Table Name	Field name	Relationship	Field name	Table name	Attributes
MINEMET	*Mining Method*	1 ∞	*Mining Method*	_MAIN	Enforced

Table: NAMES

Properties

Description: Data table: The NAMES table contains the name or names the project was referred to in the literature.

Fields

Table A-24. Design of the NAMES table.

Field Name	Type	Size	Description
PROPID	Long Integer	4	Unique identification number for an exploration project - use to join to _Main table.
Names recno	Long Integer	4	Unique identification number for records in Names table.
Name	Text	50	Names by which project or site have been known.
Type	Text	30	Defines whether the name is current or past.
Comments	Memo	-	Comments on name.

Relationships

Table A-25. Table relationships for NAMES table.

Table Name	Field name	Relationship	Field name	Table name	Attributes
_MAIN	*PROPID*	1 ∞	*PROPID*	NAMES	Enforced, Cascade Updates

Table: Ownership Data

Properties

Description: Data table: The Ownership Data table provides ownership information.

Fields

Table A-26 Design of the Ownership Data table.

Field Name	Type	Size	Description
PROPID	Long Integer	4	Unique identification number for an exploration project— use to join to _Main table.
Begin Year	Text	4	The year for which ownership described in this record started.
Ending Year	Text	4	The year for which ownership described in this record ended.
Company Name	Text	50	Includes the full company name for all owners, operators and lease holders that have been, or are currently involved with, the project.
Type Ownership	Text	22	Included for each name in Company Name field, is the type of ownership or involvement in the project (for example; Owner, Owner-Operator, Operator, Lessee, Leases Operator, Lease/Joint Venture, Joint Venture, Joint Venture Operator, Joint Venture Owner, Joint Venture Partner, Unknown).
Pct Ownership	Text	10	The percent of ownership or involvement in the project is included for each name in Company Name field, if known.
Comments	Memo	-	Describes the ownership of the project.

Relationships

Table A-27. Table relationships for Ownership Data table.

Table Name	Field name	Relationship		Field name	Table name	Attributes
_main	*PROPID*	1	∞	*PROPID*	OWNERSHIP DATA	Enforced, Cascade Updates

Table: Reference Data

Properties

Description: Data table: The Reference Data table contains the bibliographic source(s) of the information for each exploration project.

Fields

Table A-28. Design of the Reference Data table.

Field Name	Type	Size	Description
PROPID	Long Integer	4	Unique identification number for an exploration project— use to join to _Main table.
Category	Text	30	Describes the major topic to which the reference refers (for example, activity, ownership, general geology).
Master Reference recno	Long Integer	4	Unique number for a reference found in the MASTER REFERENCE DATA table.
Title	Text	100	The title of the article or source, or part of sentence leading into descriptive information.
Pages	Text	25	The page(s) for the citation.

Relationships

Table A-29. Table relationships for Reference Data table.

Table Name	Field name	Relationship		Field name	Table name	Attributes
_MAIN	*PROPID*	1	∞	*PROPID*	REFERENCE DATA	Enforced, Cascade Updates
MASTER REFERENCE DATA	*Master Reference recno*	1	∞	*Master Reference recno*	REFERENCE DATA	Enforced

Table: Resource Data

Properties

Description: Data table: The Resource Data table contains information about the resource class (for example, resources, measured, estimated).

Fields

Table A-30. Design of the Resource Data table.

Field Name	Type	Size	Description
PROPID	Long Integer	4	Unique identification number for an exploration project - use to join to _Main table.
Resource recno	Long Integer	4	Unique identification number for records in the Resource data table.
Begin Year	Text	4	The starting year for which the resource in this record was estimated.
Ending Year	Text	4	The ending year for which the resource in this record was estimated.
Resource Class	Text	30	Reserve and (or) resource classification for reported data in source form. Convert to U.S. Bureau of Mines and U.S. Geological Survey (1980) if possible. This can be supplemented by the Australasian Code (Anonymous, 1999).
Resource Amount	Long Integer	4	Resource or reserve estimate, either tonnage of ore, or amount of commodity in ore. Value used is reported units because these are usually numbers that have already been rounded to two or three decimal places.
Amt Units	Text	10	Units for Resource Amount field value.
Resource Grade	Long Integer	4	Grade of Resource/Reserve, if appropriate
Resource Units	Text	10	Units for Resource Grade, if appropriate.
Commod Amount	Long Integer	4	Estimate of the amount of contained metal or other commodity in the ore.
Commod Units	Text	10	Units for the Commod Amount field.
Commodity	Test	35	Commodity for which resources/reserves was estimated. One commodity per record.
Comments	Memo	-	Miscellaneous information related to the resource/reserves estimates.

Relationships

Table A-31. Table relationships for Resource Data table.

Table Name	Field name	Relationship		Field name	Table name	Attributes
_MAIN	*PROPID*	1	∞	*PROPID*	RESOURCE DATA	Enforced, Cascade Updates

Table: SIGNIFICANCE

Properties

Description: Lookup table: The SIGNIFICANCE table shows economic significance types and a ranking value used in the Commodities table.

Fields

Table A-32. Design of the SIGNIFICANCE table.

Field Name	Type	Size	Description
Significance Text	Text	20	Text description of the Signficance Ranking number.
Significance Ranking	Integer	2	The ranking of the commodity being sought or mined from 1 (most important) to 6 (detrimental).

Relationships

Table A-33. Table relationships for SIGNIFICANCE table.

Table Name	Field name	Relationship		Field name	Table name	Attributes
SIGNIFICANCE	*Significance Ranking*	1	∞	*Significance Ranking*	COMMODITIES	Enforced

Table: STATUS DATA

Properties

Description: Data table: The STATUS DATA table describes the status of exploration activity.

Fields

Table A-34. Design of the STATUS DATA table.

Field Name	Type	Size	Description
PROPID	Long Integer	4	Unique identification number for an exploration project— use to join to _Main table.
Status recno	Long Integer	4	Unique Identification number for Status data table records.
Begin Year	Text	4	The starting year for which the status information in this record is true.
Ending Year	Text	4	The ending year for which the status information in this record is true.
Status	Text	35	The exploration related operational status for the project.
Comments	Memo	-	Comments referring to the status for this record.

Relationships

Table A-35. Table relationships for STATUS DATA table

.

Table Name	Field name	Relationship	Field name	Table name	Attributes
_MAIN	*PROPID*	1 ∞	*PROPID*	STATUS DATA	Enforced, Cascade Updates

Table:TOB

Properties

Description: Lookup table: The TOB table contains a list of valid Type of Orebody terms for use in *TOB* field of _Main table

Fields

Table A-36. Design of theTOB table.

Field Name	Type	Size	Description
Type Ore Body	Text	13	List of possible ore body types.

Relationships

Table A-37. Table relationships for TOB table.

Table Name	Field name	Relationship		Field name	Table name	Attributes
TOB	*Type Ore Body*	1	∞	*Type Ore Body*	GEOLOGY DATA	Enforced

Query: ActivityYear_parameter_qry

Query on exploration activity occurring between years that are defined by user at runtime.

SQL

SELECT [_MAIN].*PROPID*, [_MAIN].*County*, [_MAIN].[*Type Operation*], [_MAIN].[*Current Status*], [_MAIN].*Name*, [ACTIVITY INFO].[*Begin Year*], [ACTIVITY INFO].[*Ending Year*]
FROM _MAIN INNER JOIN [ACTIVITY INFO] ON [_MAIN].*PROPID* = [ACTIVITY INFO].*PROPID*
WHERE ((([ACTIVITY INFO].[*Begin Year*]) Between [Enter start year (1XXX)-to return all records, leave blank] And [Enter ending year]));

Fields

Table A-38. Design of output fields for ActivityYear_parameter_qry query.

Field Name	Type	Size
PROPID	Long Integer	4
County	Text	30
Type Operation	Text	19
Current Status	Text	21
Name	Text	30
Begin Year	Text	4
Ending Year	Text	4

Query: Commodities_crosstab_qry

Query to make a crosstab table showing the number of exploration targets for each commodity based on the significance of that commodity.

SQL

```
TRANSFORM Count(COMMODITIES.PROPID) AS CountOfPROPID
SELECT COMMODITIES.Commodity, Count(COMMODITIES.PROPID) AS [Total Of PROPID]
FROM COMMODITIES
GROUP BY COMMODITIES.Commodity
PIVOT COMMODITIES.[Significance Ranking];
```

Fields

Table A-39. Design of output fields for Commodities_crosstab_qry query.

Field Name	Type	Size
Commodity	Text	20
Total Of PROPID	Long Integer	4
0	Long Integer	4
1	Long Integer	4
2	Long Integer	4
3	Long Integer	4
4	Long Integer	4
5	Long Integer	4
6	Long Integer	4

Query: Commodity_parameter_qry

Query database for exploration projects of a specific commodity defined by user at runtime.

SQL

SELECT [_Main].*PROPID*, [_main].*County*, [_main].[*Current Owner*], [_main].[*Type Operation*], [_main].[*Current Status*], [_main].[*Mining Method*], [_main].[*Mining Waste*], [_main].[*Milling Method*], [_main].[*Milling Waste*], [_main].[*Year of Discovery*], [_main].[*Production Start*], [_main].[*PLS Twn*], [_main].[*PLS Rng*], [_main].[*PLS Sec*], [_main].[*PLS Frac*], [_main].[*Mining District*], [_main].[*Exploration Potential*], [_main].[*Development Potential*], [_main].[*Nature of Site*], [_main].[*Environmental Sensitivity*], [_main].[*MAS No*], [_main].[*MRDS No*], [_main].*Name*, commodities.*Commodity*, commodities.[*Significance Ranking*]
FROM _main INNER JOIN commodities ON [_main].*PROPID* = commodities.*PROPID*
WHERE (((commodities.*Commodity*)=[Type a commodity such as gold, talc]));

Fields

Table A-40. Design of output fields for Commodity_parameter_qry query.

Field Name	Type	Size
PROPID	Long Integer	4
County	Text	30
Current Owner	Text	40
Type Operation	Text	19
Current Status	Text	21
Mining Method	Text	35
Mining Waste	Text	30
Milling Method	Text	12
Milling Waste	Text	30
Year of Discovery	Text	4
Production Start	Text	4
PLS Twn	Text	7
PLS Rng	Text	7
PLS Sec	Text	12
PLS Frac	Text	12
Mining District	Text	30
Exploration Potential	Text	1
Development Potential	Text	1
Nature of Site	Text	10
Environmental Sensitivity	Text	1
MAS No	Text	10
MRDS No	Text	7
Name	Text	30
Commodity	Text	20
Significance Ranking	Integer	2

Query: CommodityType_parameter_qry

Query for projects of a specific commodity (significance ranking=1) group (I = Industrial mineral, N = Nonmetallic commodity, F = Ferrous metal, P = Precious metal, B = Base metal, M = Other metallic commodities, C = Contaminant) defined by user at runtime.

SQL

SELECT [_MAIN].*PROPID*, [_MAIN].*Name*, COMMODITIES.*Commodity*, COMMODITIES.[*Significance Ranking*], COMMODITY.*Industry_group*, [_MAIN].*County*

FROM COMMODITY INNER JOIN (_MAIN INNER JOIN COMMODITIES ON [_MAIN].*PROPID* = COMMODITIES.*PROPID*) ON COMMODITY.*Commodity* = COMMODITIES.*Commodity*

WHERE (((COMMODITIES.[*Significance Ranking*])=1) AND ((COMMODITY.*Industry_Group*)=[Enter commodity type: B, M, I, N, F, P, or C]));

Fields

Table A-41. Design of output fields for Commodity Type_parameter_qry query.

Field Name	Type	Size
PROPID	Long Integer	4
Name	Text	30
Commodity	Text	20
Significance Ranking	Integer	2
Industry_Group	Text	1
County	Text	30

Query: County_Commodity_qry

Query provides source fields for County_Commodity_Crosstab_qry query.

SQL

SELECT [_MAIN].*County*, COMMODITIES.*Commodity*, COMMODITIES.[*Significance Ranking*]
FROM _MAIN INNER JOIN COMMODITIES ON [_MAIN].*PROPID* = COMMODITIES.*PROPID*
WHERE (((COMMODITIES.[*Significance Ranking*])=1));

Fields

Table A-42. Design of output fields for County_Commodity_qry query.

Field Name	Type	Size
County	Text	30
Commodity	Text	20
Significance Ranking	Integer	2

Query: County_Commodity_crosstab_qry

Crosstab query of county versus commodity counting number of exploration projects for which the listed commodity was the primary one of interest.

SQL

TRANSFORM Count(County_Commodity_qry.[*Significance Ranking*]) AS [CountOf*Significance Ranking*]
SELECT County_Commodity_qry.*County*, Count(County_Commodity_qry.[*Significance Ranking*]) AS [Total Of *Significance Ranking*]
FROM County_Commodity_qry
GROUP BY County_Commodity_qry.*County*
PIVOT County_Commodity_qry.*Commodity*;

Fields

Table A-43. Design of output fields for County_Commodity_crosstab_qry query.

Field Name	Type	Size
County	Text	30
Total Of Significance Ranking	Long Integer	4
Abrasive (Garnet)	Long Integer	4
Antimony	Long Integer	4
Barite	Long Integer	4
Building Stone	Long Integer	4
Chromium	Long Integer	4
Clay (Bentonite)	Long Integer	4
Cobalt	Long Integer	4
Copper	Long Integer	4
Diatomite	Long Integer	4
Fluorspar	Long Integer	4
Garnet	Long Integer	4
Gemstone (Diamond)	Long Integer	4
Gemstone (Jasper)	Long Integer	4
Gemstone (Opal)	Long Integer	4
Gemstone (Turquoise)	Long Integer	4
Gold	Long Integer	4
Graphite	Long Integer	4
Gypsum	Long Integer	4
Iron	Long Integer	4
Kyanite Group	Long Integer	4
Lead	Long Integer	4
Limestone	Long Integer	4
Manganese	Long Integer	4
Molybdenum	Long Integer	4
Perlite	Long Integer	4

Table A-43. Design of output fields for County_Commodity_crosstab_qry query.—Continued

Field Name	Type	Size
Phosphate	Long Integer	4
Platinum Group	Long Integer	4
Pumice	Long Integer	4
Quartz Crystal	Long Integer	4
Rare Earth	Long Integer	4
Sapphire	Long Integer	4
Silica Flux	Long Integer	4
Silicon	Long Integer	4
Silver	Long Integer	4
Stone	Long Integer	4
Stone (Granite)	Long Integer	4
Stone (Limestone)	Long Integer	4
Stone (Quartzite)	Long Integer	4
Stone (Sandstone)	Long Integer	4
Stone (Slate)	Long Integer	4
Talc	Long Integer	4
Talc (chlorite)	Long Integer	4
Thorium	Long Integer	4
Titanium	Long Integer	4
Tungsten	Long Integer	4
Unspecified	Long Integer	4
Vermiculite	Long Integer	4
Zeolites	Long Integer	4
Zinc	Long Integer	4

Query: County_MiningMethod_qry

Query provides source fields for Count_MiningMethod_Crosstab_qry query for exploration projects that listed gold as a commodity.

SQL

SELECT COMMODITIES.*Commodity*, [_MAIN].[*Mining Method*], [_MAIN].*County*
FROM _MAIN INNER JOIN COMMODITIES ON [_MAIN].*PROPID*=COMMODITIES.*PROPID*
WHERE (((COMMODITIES.*Commodity*)=”gold”));

Fields

Table A-44. Design of output fields for County_MiningMethod_qry query.

Field Name	Type	Size
Commodity	Text	20
Mining Method	Text	35
County	Text	30

Query: County_MiningMethod_crosstab_qry

Crosstab query of mining methods versus county giving number of each type of mining method used for exploration projects that list gold as a commodity.

SQL

```
TRANSFORM Count(County_MiningMethod_qry.Commodity) AS CountOfCommodity
SELECT County_MiningMethod_qry.County, Count(County_MiningMethod_qry.Commodity) AS [Total Of Commodity]
FROM County_MiningMethod_qry
GROUP BY County_MiningMethod_qry.County
PIVOT County_MiningMethod_qry.[Mining Method];
```

Fields

Table A-45. Design of output fields for County_MiningMethod_crosstab_qry query.

Field Name	Type	Size
County	Text	30
Total Of Commodity	Long Integer	4
Alluvial mining	Long Integer	4
Alluvial/Combined	Long Integer	4
Combined methods	Long Integer	4
Horiz cut & fill w/tailings	Long Integer	4
Horiz cut & fill w/waste rock	Long Integer	4
Open cut	Long Integer	4
Open pit	Long Integer	4
Open stope	Long Integer	4
Other combined methods	Long Integer	4
Other filled stope methods	Long Integer	4
Other open stope methods	Long Integer	4
Overhand shrinkage	Long Integer	4
Room and pillar	Long Integer	4
Shrinkage methods	Long Integer	4
Strip-level	Long Integer	4
Unknown	Long Integer	4

APPENDIX B—Exploration Projects in Idaho and Montana

Idaho

Table B-1. Idaho exploration projects.

Map No.	County	Project or Property Name	Primary Commodity	Actual or Potential Type of Operation	Status
1*	Ada	Adelmann mine	Gold	Unknown	Exploration Deposit
2	Ada	Willow Creek Jasper mine	Gemstone (Jasper)	Unknown	Intermittent Producer
3*	Ada	Boise Queen mine	Unspecified	Unknown	Exploration Deposit
4	Adams	Red Ledge mine	Copper	Underground	Reclaimed
5	Adams	Copper Cliff Mine	Copper	Surface	Reclaimed
6	Bannock	Mink Creek Property	Unspecified	Unknown	Exploration Deposit
7	Bear Lake	Treasure Canyon quarry #2 & 9	Stone (Limestone)	Surface	Intermittent Producer
8	Bear Lake	Paris Canyon	Phosphate	Underground	Past Producer
9	Benewah	Emerald Creek	Abrasive (Garnet)	Surface	Producer
10	Bingham	Gay Mine	Phosphate	Surface	Past Producer
11	Blaine	Webfoot mine	Silver	Unknown	Exploration Deposit
12	Blaine	Rook's Creek project	Unspecified	Unknown	Reclaimed
13	Blaine	Treasure Vault	Silver	Underground	Past Producer
14	Blaine	Colorado Gulch	Gold	Unknown	Past Producer
15	Blaine	Minnie Moore Mine	Silver	Unknown	Past Producer
16	Blaine	Homestake	Silver	Underground	Exploration Deposit
17*	Blaine	Warm Springs	Gold	Unknown	Unknown
18	Boise	Gold Hill mine	Gold	Unknown	Exploration Deposit
19	Boise	Warm Springs Creek project	Gold	Unknown	Exploration Deposit
20	Boise	Century project	Unspecified	Unknown	Exploration Deposit
21	Boise	Trail Creek project	Gold	Unknown	Unknown
22*	Boise	Cartwright Canyon	Gold	Unknown	Exploration Deposit
23*	Boise	Elk Creek project	Unspecified	Unknown	Exploration Deposit
24*	Boise	Table Rock quarry	Stone (Sandstone)	Surface	Producer
25	Bonner	Silver Butte/Talache Property	Silver	Underground	Past Producer
26	Bonner	Keep Me Cool	Lead	Unknown	Exploration Deposit
27	Bonneville	Rock Hollow mine	Pumice	Unknown	Producer
28	Bonneville	Morning Glory project	Stone (Limestone)	Unknown	Exploration Deposit
29	Bonneville	Fall Creek quarry	Stone (Limestone)	Surface	Producer
30	Bonneville	Caribou Mtn. Project	Gold	Unknown	Exploration Deposit
31*	Bonneville	Sunnyside pit	Pumice	Unknown	Intermittent Producer
32	Boundary	Hall Mountain Thorium Group	Thorium	Surface-Underground	Exploration Deposit
33	Butte	Elbow Canyon quarry	Stone (Quartize)	Surface	Exploration Deposit
34	Butte	Champagne Mine	Gold	Surface	Reclaimed
35	Butte	Little Pittsburgh	Silver	Underground	Past Producer
36	Camas	Princess Blue Ribbon mine	Lead	Unknown	Past Producer

Table B-1. Idaho exploration projects.—Continued

Map No.	County	Project or Property Name	Primary Commodity	Actual or Potential Type of Operation	Status
37*	Camas	Fletcher Creek Claims	Lead	Unknown	Exploration Deposit
38*	Camas	Moonstone Pit	Pumice	Unknown	Unknown
39	Caribou	Trail Canyon mine	Stone (Limestone)	Surface	Past Producer
40	Caribou	Ballard	Phosphate	Surface	Past Producer
41	Caribou	Henry	Phosphate	Surface	Producer
42	Caribou	Swan Lake Gulch	Phosphate	Unknown	Exploration Deposit
43	Caribou	Enoch Valley mine	Phosphate	Surface	Producer
44	Caribou	Rasmussen Ridge mine	Phosphate	Surface	Producer
45	Caribou	Lanes Creek mine	Phosphate	Unknown	Exploration Deposit
46	Caribou	Dry Valley	Phosphate	Surface	Producer
47	Caribou	Smoky Canyon Mine	Phosphate	Surface	Producer
48	Caribou	Soda Springs pit.	Pumice	Unknown	Producer
49*	Caribou	Ten Mile Pass quarry	Stone (Limestone)	Surface	Producer
50	Cassia	Rocky Mountain Quartzite	Stone (Quartzite)	Unknown	Producer
51	Cassia	Valley View mine	Stone (Quartzite)	Unknown	Intermittent Producer
52	Cassia	Black Pine	Gold	Surface	Producer
53	Clark	White Rock quarry	Stone (Limestone)	Unknown	Exploration Deposit
54	Clark	Morning Glory quarry	Clay (Bentonite) Coal	Surface	Unknown
55	Clark	Spencer Opal mine	Gemstone (Opal)	Surface	Intermittent Producer
56	Clark	Kilgore	Gold	Unknown	Exploration Deposit
57	Clearwater	Sewell Pit	Stone (Limestone)	Unknown	Exploration Deposit
58	Clearwater	Shale Mtn. Project	Gold	Unknown	Exploration Deposit
59*	Clearwater	King David mine	Zinc	Unknown	Exploration Deposit
60	Custer	Porphory Peak	Stone (Granite)	Surface	Past Producer
61	Custer	Valley Creek Mine	Gold	Surface-Underground	Past Producer
62	Custer	Stanley Basin project	Gold	Surface	Unknown
63	Custer	Lost Packer mine	Gold	Unknown	Exploration Deposit
64	Custer	Loon Creek-Yankee Fork	Gold	Unknown	Exploration Deposit
65	Custer	Grouse Creek Mine	Gold	Surface	Temp Shutdown
66	Custer	Estes Mountain property	Silver	Surface-Underground	Past Producer
67	Custer	Lucky Boy mine	Gold	Unknown	Exploration Deposit
68	Custer	Hoodoo Mine	Zinc	Underground	Exploration Deposit
69	Custer	White Cloud	Molybdenum	Surface	Raw Prospect
70	Custer	Thompson Creek Mine	Molybdenum	Surface	Temp Shutdown
71	Custer	Saturday Mountain	Silver	Underground	Past Producer
72	Custer	Clayton Silver Mine	Silver	Underground	Temp Shutdown
73	Custer	Bayhorse District project	Gold	Unknown	Exploration Deposit
74	Custer	Turtle Mine	Silver	Unknown	Unknown
75	Custer	Red Bird	Gold	Underground	Temp Shutdown
76	Custer	Copper Basin	Copper	Underground	Past Producer
77	Custer	Sultana	Copper	Unknown	Exploration Deposit

Table B-1. Idaho exploration projects.—Continued

Map No.	County	Project or Property Name	Primary Commodity	Actual or Potential Type of Operation	Status
78*	Custer	Greer claims	Unspecified	Unknown	Unknown
79*	Custer	DSA Property	Silver	Unknown	Exploration Deposit
80*	Custer	Pole Creek Rd & Abe's Chair	Unspecified	Unknown	Unknown
81*	Custer	Three Rivers Stone quarry	Stone (Slate)	Surface	Producer
82	Elmore	Rocky Bar	Gold	Unknown	Exploration Deposit
83	Elmore	Talache mine	Gold	Unknown	Exploration Deposit
84	Elmore	Tahoma mine	Gold	Unknown	Exploration Deposit
85	Elmore	Atlanta Property	Gold	Surface	Developing Deposit
86*	Elmore	James Creek Summit project	Gold	Unknown	Exploration Deposit
87	Fremont	Garner Canyon	Gemstone (Turquoise)	Unknown	Exploration Deposit
88	Fremont	St. Anthony pit	Pumice	Unknown	Producer
89	Idaho	Blue Jacket	Copper	Underground	Exploration Deposit
90	Idaho	Ophir	Copper	Unknown	Unknown
91	Idaho	Kimberly	Gold	Unknown	Unknown
92	Idaho	Golden Anchor	Gold	Underground	Exploration Deposit
93	Idaho	Wallawalla mine	Unspecified	Unknown	Exploration Deposit
94	Idaho	Rescue mine	Gold	Unknown	Producer
95	Idaho	Unity mine	Gold	Unknown	Reclaimed
96	Idaho	Big Buffalo	Gold	Underground	Past Producer
97	Idaho	Iola mine	Gold	Unknown	Producer
98	Idaho	Monte Cristo	Gold	Unknown	Raw Prospect
99	Idaho	War Eagle Mountain	Gold	Surface-Underground	Past Producer
100	Idaho	Umatilla	Gold	Unknown	Past Producer
101	Idaho	Golden Eagle	Gold	Unknown	Exploration Deposit
102	Idaho	Petsite	Gold	Underground	Past Producer
103	Idaho	Erickson Reef	Gold	Surface	Past Producer
104	Idaho	Elk City Mines	Gold	Surface	Exploration Deposit
105	Idaho	Red River mine	Gold	Surface	Past Producer
106	Idaho	Robinson-Dike	Gold	Surface	Exploration Deposit
107	Idaho	Center Star	Gold	Unknown	Past Producer
108*	Idaho	Firecracker mine	Unspecified	Unknown	Exploration Deposit
109*	Idaho	Slate Creek quarry	Stone (Limestone)	Surface	Exploration Deposit
110*	Idaho	Majestic JV	Gold	Unknown	Unknown
111*	Idaho	Kodan mine	Gold	Unknown	Unknown
112*	Idaho	Eckert Hill	Gold	Unknown	Unknown
113	Kootenai	Silver Strand Mine	Silver	Underground	Exploration Deposit
114*	Latah	Lad project	Copper	Unknown	Unknown
115*	Latah	LBC project	Copper	Unknown	Exploration Deposit
116	Lemhi	Salmon Canyon	Copper	Underground	Exploration Deposit
117	Lemhi	Yellow Jacket Mine	Gold	Surface	Producer

Table B-1. Idaho exploration projects.—Continued

Map No.	County	Project or Property Name	Primary Commodity	Actual or Potential Type of Operation	Status
118	Lemhi	St. Clair mine project	Gold	Unknown	Producer
119	Lemhi	Allison project	Gold	Unknown	Exploration Deposit
120	Lemhi	Sunshine	Cobalt	Surface-Underground	Exploration Deposit
121	Lemhi	Blackbird Mine	Copper	Surface-Underground	Reclaimed
122	Lemhi	Musgrove	Gold	Unknown	Exploration Deposit
123	Lemhi	Musgrove Property	Gold	Unknown	Exploration Deposit
124	Lemhi	Black Pine	Copper	Underground	Exploration Deposit
125	Lemhi	Arnett Creek	Gold	Surface	Exploration Deposit
126	Lemhi	Humbug project	Gold	Unknown	Exploration Deposit
127	Lemhi	Leesburg Placer	Gold	Surface	Producer
128	Lemhi	Iron Creek	Copper	Underground	Past Producer
129	Lemhi	Bowman project	Copper	Unknown	Exploration Deposit
130	Lemhi	King Solomon project	Gold	Unknown	Exploration Deposit
131	Lemhi	Bobcat	Gold	Surface	Exploration Deposit
132	Lemhi	Gilt Edge project	Gold	Underground	Exploration Deposit
133	Lemhi	Diamond Creek	Thorium	Unknown	Exploration Deposit
134	Lemhi	Queen of the Hills	Zinc	Surface-Underground	Past Producer
135	Lemhi	Harmony mine	Copper	Unknown	Exploration Deposit
136	Lemhi	Kirtley Creek Placer	Gold	Surface	Producer
137	Lemhi	Freeman Creek	Silver	Surface	Exploration Deposit
138	Lemhi	Beartrack	Gold	Surface	Producer
139	Lemhi	Kenny Creek project	Lead	Surface-Underground	Exploration Deposit
140	Lemhi*	Eclipse mine	Gold	Unknown	Exploration Deposit
141	Lewis	Mission Creek quarry	Stone (Limestone)	Surface	Producer
142	Madison	Rexburg Pit	Pumice	Surface	Intermittent Producer
143	Oneida	Wrights Creek mine	Pumice	Unknown	Producer
144	Oneida	Wrights Creek	Perlite	Unknown	Past Producer
145	Owyhee	Chrisman Hill Pit	Zeolites	Surface	Intermittent Producer
146	Owyhee	Succor Creek deposit	Diatomite	Surface	Past Producer
147	Owyhee	Twin Peaks	Gold	Surface	Exploration Deposit
148	Owyhee	Stone Cabin mine	Gold	Surface	Producer
149	Owyhee	Monarca	Gold	Underground	Past Producer
150	Owyhee	Berg	Silver	Underground	Past Producer
151	Owyhee	Delmar Silver/Gold Mine	Silver	Surface	Producer
152	Owyhee	Ida Belle	Gold	Underground	Past Producer
153	Owyhee	Sinker Tunnel	Unspecified	Unknown	Exploration Deposit
154	Owyhee	Castle Creek quarry	Zeolites	Surface	Exploration Deposit
155	Owyhee	BenJel	Clay (Bentonite)	Unknown	Exploration Deposit
156	Owyhee	Indian Bath Tubs project	Stone (Limestone)	Unknown	Exploration Deposit
157*	Owyhee	Deep Creek deposit	Diatomite	Unknown	Exploration Deposit

Table B-1. Idaho exploration projects.—Continued

Map No.	County	Project or Property Name	Primary Commodity	Actual or Potential Type of Operation	Status
158*	Owyhee	Castle Creek mine	Stone (Limestone)	Surface	Producer
159*	Owyhee	Silver Soldier mine	Unspecified	Unknown	Exploration Deposit
160*	Owyhee	Glen Silver Pit	Silver	Surface	Unknown
161*	Owyhee	Black Sheep	Unspecified	Unknown	Exploration Deposit
162	Shoshone	Coeur d'Alene Syndicate Mine	Gold	Surface-Underground	Past Producer
163	Shoshone	Liberal King mine property	Gold	Underground	Past Producer
164	Shoshone	Bunker Hill	Lead	Underground	Producer
165	Shoshone	Sunshine Mine	Silver	Underground	Temp Shutdown
166	Shoshone	Crescent Mine	Silver	Underground	Past Producer
167	Shoshone	New Jersey Mine	Gold	Surface	Exploration Deposit
168	Shoshone	Mineral Mountain. project	Silver	Unknown	Exploration Deposit
169	Shoshone	Bonanza Gold Claims	Gold	Unknown	Raw Prospect
170	Shoshone	Consolidated Silver	Gold	Underground	Exploration Deposit
171	Shoshone	American Silver Mines	Gold	Underground	Temp Shutdown
172	Shoshone	Coeur Mine	Silver	Underground	Producer
173	Shoshone	Galena Mine	Silver	Underground	Temp Shutdown
174	Shoshone	Placer Creek	Gold	Surface	Unknown
175	Shoshone	Caladay Property	Silver	Underground	Temp Shutdown
176	Shoshone	Silver Buckle/Placer Creek	Gold	Unknown	Raw Prospect
177	Shoshone	Wake-Up-Jim Mine	Gold	Surface	Past Producer
178	Shoshone	Canyon Silver Mine	Silver	Underground	Past Producer
179	Shoshone	Beaver Creek project	Silver	Unknown	Exploration Deposit
180	Shoshone	Monitor mine	Silver	Unknown	Exploration Deposit
181	Shoshone	Rock Creek Tunnel	Silver	Underground	Exploration Deposit
182	Shoshone	Allied Silver-Lead Property	Silver	Underground	Exploration Deposit
183	Shoshone	Blackdome Peak	Kyanite Group	Unknown	Exploration Deposit
184	Shoshone	Mother Lode	Gold	Unknown	Exploration Deposit
185	Shoshone	Golden Chest	Gold	Surface	Past Producer
186	Shoshone	Star Morning Unit Area	Zinc	Underground	Past Producer
187	Shoshone	Lucky Friday Mine	Silver	Underground	Producer
188	Shoshone	Atlas Property	Silver	Underground	Exploration Deposit
189	Shoshone	Champion Claims	Copper	Unknown	Exploration Deposit
190	Shoshone	Snowshoe Claims	Gold	Surface	Unknown
191	Shoshone	Galena Giant	Silver	Underground	Exploration Deposit
192	Shoshone	Golden Dream	Gold	Underground	Past Producer
193	Shoshone	Silver Mountain	Silver	Underground	Past Producer
194	Shoshone	Silver Cable Property	Gold	Unknown	Unknown
195	Shoshone	Beacon Light Property	Silver	Unknown	Past Producer
196*	Shoshone	Hornsilver-Peerless	Gold	Unknown	Exploration Deposit

Table B-1. Idaho exploration projects.—Continued

Map No.	County	Project or Property Name	Primary Commodity	Actual or Potential Type of Operation	Status
197*	Shoshone	Sierra Silver Mine	Gold	Surface-Underground	Exploration Deposit
198*	Shoshone	Bear Creek Mining Claims	Gold	Unknown	Exploration Deposit
199*	Shoshone	Harlow Property	Gold	Unknown	Unknown
200	Twins Falls	Rock Creek project	Unspecified	Unknown	Exploration Deposit
201	Valley	Long Valley-Big Meadow Placer	Rare Earth	Surface	Unknown
202	Valley	Red Mountain Mine	Gold	Unknown	Exploration Deposit
203	Valley	Antimony Ridge	Antimony	Underground	Exploration Deposit
204	Valley	Profile Creek project	Gold	Unknown	Exploration Deposit
205	Valley	Moscow mine	Gold	Unknown	Unknown
206	Valley	McCrae mine	Unspecified	Unknown	Exploration Deposit
207	Valley	Fourth of July Mine	Gold	Unknown	Exploration Deposit
208	Valley	Yellow Pine	Gold	Surface	Past Producer
209	Valley	Dewey Mine	Gold	Surface	Exploration Deposit
210	Valley	Thunder Mountain Mine	Gold	Surface	Past Producer
211	Valley	KC property	Gold	Unknown	Exploration Deposit
212*	Valley	Bear Basin/Ecks Flats	Gemstone (Diamond)	Unknown	Exploration Deposit
213*	Valley	Velvet Quartz mine	Stone (Quartzite)	Unknown	Unknown
214	Washington	Blue Dog mine	Gold	Surface	Exploration Deposit
215	Washington	Hercules	Silver	Underground	Temp Shutdown
216	Washington	Almaden Gold Project	Gold	Surface	Exploration Deposit
217*	Washington	Slyter Prospect	Gold	Unknown	Raw Prospect
218*	Washington	Iron Mtn. Deposit	Gypsum	Unknown	Intermittent Producer
219*	Washington	New Dog project	Gold	Unknown	Exploration Deposit
220*	Washington	WDVAR claims	Unspecified	Unknown	Exploration Deposit
221*	Washington	Chandler Property	Gold	Unknown	Unknown
222*	Washington	Olfer project	Unspecified	Unknown	Exploration Deposit
300*		East Eagle Creek Project	Gold	Surface	Exploration Deposit
301*		Recopense mine	Stone (Sandstone)	Unknown	Producer
302*		Doniphen mine	Unspecified	Unknown	Unknown
303*		Goose Creek	Gemstone (Diamond)	Unknown	Unknown
304*		Freeman Peak project	Copper	Unknown	Exploration Deposit

* No latitude/longitude location information. These properties are not in the spatial database.

Montana

Table B-2. Montana exploration projects.

Map No.	County	Project or Property Name	Primary Commodity	Actual or Potential Type of Operation	Status
1	Beaverhead	Ruby Placer	Gold	Surface	Exploration Deposit
2	Beaverhead	Lemhi Pass	Thorium	Unknown	Past Producer
3	Beaverhead	Dry Creek	Gold	Surface	Exploration Deposit
4	Beaverhead	Elkhorn Mine	Silver	Unknown	Unknown
5	Beaverhead	Chinatown	Gold	Surface	Unknown
6	Beaverhead	Jeff Davis Gulch	Gold	Surface	Reclaimed
7	Beaverhead	Polaris Mine	Silver	Underground	Past Producer
8	Beaverhead	Dyce Creek	Gold	Surface	Unknown
9	Beaverhead	Garrett Hill	Gold	Underground	Past Producer
10	Beaverhead	Bannack Placer	Gold	Surface	Past Producer
11	Beaverhead	Pioneer Mountains	Molybdenum	Unknown	Exploration Deposit
12	Beaverhead	Southmont Mine	Gold	Underground	Past Producer
13	Beaverhead	Bonnecord Placer	Gold	Surface	Intermittent Producer
14	Beaverhead	Hecla District	Silver	Underground	Past Producer
15	Beaverhead	New Departure Mine	Silver	Underground	Unknown
16	Beaverhead	Ermont Group	Gold	Surface-Underground	Past Producer
17	Beaverhead	Badger Pass	Gold	Underground	Unknown
18	Beaverhead	Shafer Gold	Gold	Surface-Underground	Past Producer
19	Beaverhead	Lone Pine Mine (Quartz Hill)	Silver	Underground	Past Producer
20	Beaverhead	Madison	Gold	Underground	Exploration Deposit
21	Beaverhead	Groundhog	Gold	Surface	Past Producer
22	Beaverhead	May Day Mine	Gold	Underground	Intermittent Producer
23	Beaverhead	MON Placer	Gold	Surface	Exploration Deposit
24	Beaverhead	White Lime Mine	Limestone	Surface	Past Producer
25	Beaverhead	Browne's Lake Tungsten/Ivanhoe	Tungsten	Surface	Past Producer
26	Beaverhead	Lentung (Prospect) Deposit	Tungsten	Unknown	Exploration Deposit
27	Beaverhead	Greenstone Mine	Copper	Unknown	Past Producer
28	Beaverhead	Maidan Rock Quarry	Silicon	Surface	Producer
29	Beaverhead	Barretts Talc mill	Talc	Surface	Producer
30	Beaverhead	Jake Canyon	Gold	Underground	Exploration Deposit
31	Beaverhead	Monolite Mine	Vermiculite	Surface	Producer
32	Beaverhead	Centennial Phosphate Mine	Phosphate	Underground	Reclaimed
33	Broadwater	Dobler	Gold	Underground	Exploration Deposit
34	Broadwater	East Pacific Gold Mine	Gold	Underground	Past Producer
35	Broadwater	Silverwave	Gold	Underground	Past Producer
36	Broadwater	Diamond Hill	Gold	Underground	Producer
37	Broadwater	Keating	Gold	Underground	Past Producer
38	Broadwater	Chartam	Gold	Surface	Past Producer

Table B-2. Montana exploration projects.—Continued

Map No.	County	Project or Property Name	Primary Commodity	Actual or Potential Type of Operation	Status
39	Broadwater	Iron Mask	Gold	Underground	Past Producer
40	Broadwater	Black Diamond Mine	Graphite	Surface	Past Producer
41	Broadwater	Bar Gulch	Gold	Surface	Reclaimed
42	Broadwater	Townsend Mine	Gold	Surface	Reclaimed
43	Broadwater	Indian Creek Lime	Limestone	Surface	Producer
44	Broadwater	B and B Mine	Gold	Surface	Intermittent Producer
45	Broadwater	Seahawk Placer	Gold	Surface	Reclaimed
46	Broadwater	Avalanche Placer	Gold	Surface	Reclaimed
47	Broadwater	Jimmys Gulch	Gold	Surface	Reclaimed
48	Broadwater	Miller Mountain	Gold	Underground	Exploration Deposit
49	Broadwater	Irish Gulch	Gold	Underground	Past Producer
50	Broadwater	Granite Hill Mine #1 & #2	Gold	Surface	Past Producer
51	Carbon	Warren Quarry	Limestone	Surface	Producer
52	Cascade	Florence Mine	Silver	Underground	Past Producer
53	Cascade	Ponderosa 102 & 102-A Mine	Zinc	Surface-Underground	Past Producer
54	Deer Lodge	Anaconda Range	Molybdenum	Unknown	Exploration Deposit
55	Deer Lodge	Georgetown Placer	Gold	Surface	Past Producer
56	Deer Lodge	Gold Coin Mine	Gold	Underground	Past Producer
57	Deer Lodge	Southern Cross Mine	Gold	Underground	Past Producer
58	Deer Lodge	Cable Mountain Placer	Gold	Surface	Past Producer
59	Deer Lodge	Dry Cottonwood Creek	Sapphire	Surface	Intermittent Producer
60	Fergus	CR Kendall mine	Gold	Surface	Reclaimed
61	Fergus	North Mocassin Project	Gold	Surface-Underground	Past Producer
62	Fergus	Abby Mine	Gold	Surface-Underground	Exploration Deposit
63	Fergus	Gilt Edge	Gold	Surface-Underground	Temp Shutdown
64	Fergus	Judith Mountains Drilling	Gold	Underground	Exploration Deposit
65	Fergus	Gold Hill Property	Gold	Surface-Underground	Exploration Deposit
66	Fergus	Spotted Horse Mine	Gold	Underground	Reclaimed
67	Fergus	Tail Holt	Gold	Underground	Exploration Deposit
68	Fergus	Chicago Gulch	Gold	Underground	Exploration Deposit
69	Fergus	Geis Mine	Gold	Surface-Underground	Past Producer
70	Fergus	Linster	Gold	Underground	Exploration Deposit
71	Flathead	Star Meadow	Copper	Unknown	Past Producer
72	Flathead	Hog Heaven	Silver	Surface-Underground	Past Producer
73	Gallatin	Trident Cement Quarry	Limestone	Surface	Producer
74	Gallatin	Squaw Creek Gold Prospect	Gold	Underground	Past Producer
75	Granite	Bagdad mine	Gold	Underground	Reclaimed
76	Granite	Stony Creek	Gold	Surface	Developing Deposit
77	Granite	Gem Mountain Sapphire Mine	Sapphire	Surface	Past Producer
78	Granite	Skalkaho Grazing Association	Sapphire	Surface	Past Producer

Table B-2. Montana exploration projects.—Continued

Map No.	County	Project or Property Name	Primary Commodity	Actual or Potential Type of Operation	Status
79	Granite	Basin Gulch	Gold	Surface	Exploration Deposit
80	Granite	Brewster Creek	Gold	Surface	Past Producer
81	Granite	Sliderock	Gold	Surface	Past Producer
82	Granite	Scotchman-Sawpit	Gold	Surface	Exploration Deposit
83	Granite	Miner Gulch Placer	Gold	Surface	Past Producer
84	Granite	Silver King Mine	Gold	Underground	Past Producer
85	Granite	Day Creek	Gold	Surface	Past Producer
86	Granite	Upper Willow Creek	Gold	Surface	Unknown
87	Granite	Mountain Ram	Gold	Underground	Past Producer
88	Granite	Black Pine mine	Silica Flux	Underground	Intermittent Producer
89	Granite	Garnet	Gold	Underground	Exploration Deposit
90	Granite	Elkhorn and Mardell Group	Gold	Surface	Producer
91	Granite	Rat	Gold	Surface	Past Producer
92	Granite	San Francisco Mine	Gold	Underground	Past Producer
93	Granite	Phillipsburg Area	Silver	Unknown	Past Producer
94	Granite	Londonderry	Gold	Surface-Underground	Past Producer
95	Granite	Golden Eagle	Gold	Unknown	Exploration Deposit
96	Granite	Hidden Lake	Gold	Underground	Exploration Deposit
97	Granite	Robinson Mine	Gold	Underground	Unknown
98	Granite	HB/McCoy Claims	Gold	Underground	Past Producer
99	Granite	Red Lion Mine	Gold	Underground	Past Producer
100	Granite	Golden Jubille Mine	Gold	Underground	Past Producer
101	Granite	Lila Dixon Claim Group	Gold	Surface-Underground	Past Producer
102	Granite	Northern Cross Mine	Gold	Underground	Past Producer
103	Granite	Debbie Jo	Gold	Surface	Exploration Deposit
104	Granite	Master Mine Placer	Gold	Surface	Reclaimed
105	Granite	Gold Creek	Gold	Surface-Underground	Reclaimed
106	Jefferson	Infinite/Blackbird	Gold	Surface-Underground	Past Producer
107	Jefferson	Ruby	Gold	Underground	Past Producer
108	Jefferson	East Ridge Group	Gold	Surface-Underground	Exploration Deposit
109	Jefferson	Homestake Creek Placer	Gold	Surface	Reclaimed
110	Jefferson	Crystal Claims Group	Gold	Surface-Underground	Past Producer
111	Jefferson	P. C. Crystal Mine	Quartz Crystal	Surface	Producer
112	Jefferson	Beef Straight	Gold	Surface	Past Producer
113	Jefferson	Pipestone Mine	Limestone	Surface	Past Producer
114	Jefferson	Eureka Lead #1 Mine	Lead	Unknown	Temp Shutdown
115	Jefferson	Lex Group	Gold	Underground	Exploration Deposit
116	Jefferson	Golden Assets	Gold	Underground	Past Producer
117	Jefferson	Silver Bell	Gold	Surface-Underground	Exploration Deposit
118	Jefferson	Argentine Edelweiss	Gold	Underground	Past Producer

Table B-2. Montana exploration projects.—Continued

Map No.	County	Project or Property Name	Primary Commodity	Actual or Potential Type of Operation	Status
119	Jefferson	Kady Gulch Group	Silver	Unknown	Past Producer
120	Jefferson	Comet	Gold	Underground	Past Producer
121	Jefferson	Baltimore	Silver	Underground	Past Producer
122	Jefferson	Montana Tunnels Mine	Zinc	Surface-Underground	Producer
123	Jefferson	Gregory Property & Dumps	Gold	Surface-Underground	Past Producer
124	Jefferson	Haywood Santiago	Gold	Surface	Developing Deposit
125	Jefferson	Big Indian	Gold	Surface-Underground	Past Producer
126	Jefferson	Golden Sunlight Mine	Gold	Surface	Producer
127	Jefferson	Jackson Creek	Limestone	Surface	Producer
128	Jefferson	Elkhorn	Gold	Underground	Producer
129	Jefferson	Mt. Haggin project	Gold	Surface	Reclaimed
130	Jefferson	Hardcash	Gold	Underground	Past Producer
131	Jefferson	McClellan Quarry	Limestone	Surface	Producer
132	Jefferson	Montana City Quarry	Limestone	Surface	Producer
133	Judith Basin	Gypsum mine	Gypsum	Underground	Reclaimed
134	Judith Basin	Hughesville Project	Silver	Underground	Exploration Deposit
135	Judith Basin	Snow Creek Placer	Gold	Surface	Exploration Deposit
136	Judith Basin	Blue Dick Mine	Gold	Underground	Exploration Deposit
137	Judith Basin	Vortex	Sapphire	Underground	Producer
138	Judith Basin	Yogo Sapphire Mine	Sapphire	Underground	Producer
139	Lake	Jumbo Mines	Copper	Unknown	Exploration Deposit
140	Lewis and Clark	Lincoln Gulch Placer	Gold	Surface	Past Producer
141	Lewis and Clark	Big Blackfoot	Gold	Surface	Past Producer
142	Lewis and Clark	Sauerkraut Gulch Placer	Gold	Surface	Producer
143	Lewis and Clark	Baldy Mountain Claims	Gold	Underground	Intermittent Producer
144	Lewis and Clark	Keep Cool Creek	Gold	Underground	Exploration Deposit
145	Lewis and Clark	Ethel Gulch	Gold	Surface	Unknown
146	Lewis and Clark	Seven-Up Pete Creek	Gold	Underground	Past Producer
147	Lewis and Clark	McDonald project	Gold	Surface	Exploration Deposit
148	Lewis and Clark	Crater Mountain	Gold	Underground	Past Producer
149	Lewis and Clark	Omo	Copper	Unknown	Unknown
150	Lewis and Clark	Jay Gould Mine	Gold	Underground	Past Producer
151	Lewis and Clark	Uncle Ben Placer	Gold	Surface	Reclaimed
152	Lewis and Clark	Spring Fever Placers	Gold	Surface	Past Producer
153	Lewis and Clark	Heddleston	Copper	Surface	Past Producer
154	Lewis and Clark	Cruse-Belmont	Gold	Underground	Past Producer
155	Lewis and Clark	Basin Creek	Gold	Surface	Reclaimed
156	Lewis and Clark	Drumlummon Mine	Gold	Underground	Past Producer
157	Lewis and Clark	Luttrell Ridge	Gold	Surface	Reclaimed
158	Lewis and Clark	Red Mountain	Gold	Surface-Underground	Unknown

Table B-2. Montana exploration projects.—Continued

Map No.	County	Project or Property Name	Primary Commodity	Actual or Potential Type of Operation	Status
159	Lewis and Clark	Greenhorn Placer	Gold	Surface	Past Producer
160	Lewis and Clark	Spring Hill Mine	Gold	Underground	Past Producer
161	Lewis and Clark	Pretty Girl Placer	Gold	Surface	Reclaimed
162	Lewis and Clark	Grizzly Gulch	Gold	Surface	Past Producer
163	Lewis and Clark	Butcher Knife	Gold	Surface	Past Producer
164	Lewis and Clark	Little Prickly Pear Creek	Gold	Underground	Exploration Deposit
165	Lewis and Clark	Scratchgravel Gold	Gold	Surface	Unknown
166	Lewis and Clark	Toehead Gulch	Stone	Surface	Other
167	Lewis and Clark	Eldorado Bar	Gold	Surface	Intermittent Producer
168	Lewis and Clark	Lovestone Placer	Sapphire	Surface	Past Producer
169	Lewis and Clark	French Bar Placer	Sapphire	Surface	Past Producer
170	Lewis and Clark	Happy Jack Mine	Gold	Underground	Exploration Deposit
171	Lewis and Clark	Oregon Gulch	Gold	Surface	Reclaimed
172	Lewis and Clark	York Gulch	Gold	Surface	Exploration Deposit
173	Lewis and Clark	Cave Gulch	Gold	Unknown	Producer
174	Liberty	Sweet Grass Hills	Gold	Underground	Exploration Deposit
175	Liberty	Royal East Project	Gold	Surface-Underground	Exploration Deposit
176	Lincoln	Black Diamond	Gold	Surface	Past Producer
177	Lincoln	Ruby Star	Gold	Surface	Exploration Deposit
178	Lincoln	Can-Am	Lead	Unknown	Unknown
179	Lincoln	Ross Point	Copper	Unknown	Exploration Deposit
180	Lincoln	Troy Mine	Silver	Underground	Other
181	Lincoln	Mount Vernon	Copper	Unknown	Exploration Deposit
182	Lincoln	J.F. Claims	Copper	Unknown	Exploration Deposit
183	Lincoln	Keystone	Gold	Underground	Exploration Deposit
184	Lincoln	YF	Gold	Surface	Past Producer
185	Lincoln	Morning Glory mine	Gold	Underground	Past Producer
186	Lincoln	Flower Creek Mining	Gold	Underground	Exploration Deposit
187	Lincoln	Libby	Gold	Surface-Underground	Past Producer
188	Lincoln	Harry Howard Claim	Gold	Surface	Past Producer
189	Lincoln	Lost Grouse	Gold	Surface	Developing Deposit
190	Lincoln	Tip Top	Gold	Underground	Exploration Deposit
191	Lincoln	Mustang Mine	Gold	Underground	Past Producer
192	Lincoln	Midas Mine / Rose Consolidated	Gold	Underground	Past Producer
193	Lincoln	Government Mountain	Copper	Underground	Exploration Deposit
194	Lincoln	Raven	Gold	Underground	Past Producer
195	Lincoln	Zonolite mine	Vermiculite	Surface	Reclaimed
196	Lincoln	Houghton Creek	Gold	Surface-Underground	Exploration Deposit
197	Lincoln	Zigler	Building Stone	Surface	Unknown
198	Madison	Triplets	Gold	Surface-Underground	Unknown

Table B-2. Montana exploration projects.—Continued

Map No.	County	Project or Property Name	Primary Commodity	Actual or Potential Type of Operation	Status
199	Madison	Rochester Camp	Gold	Underground	Past Producer
200	Madison	Dougherty Butte	Gold	Underground	Exploration Deposit
201	Madison	Granite Creek	Garnet	Surface	Exploration Deposit
202	Madison	Regal Mine	Talc	Surface	Intermittent Producer
203	Madison	Nez Pierce Creek/Greiss	Gold	Surface	Exploration Deposit
204	Madison	Green Campbell	Gold	Underground	Past Producer
205	Madison	Iron Rod	Gold	Underground	Past Producer
206	Madison	Frida Marie/Yellow Jacket Mine	Gold	Underground	Past Producer
207	Madison	Broadway/Victoria Mine	Gold	Surface-Underground	Past Producer
208	Madison	Hudson Mine	Gold	Underground	Exploration Deposit
209	Madison	Antler Chlorite mine	Talc (chlorite)	Surface	Reclaimed
210	Madison	Treasure Mine	Talc	Surface	Producer
211	Madison	Beaverhead mine	Talc	Underground	Producer
212	Madison	Ruby Range (Montana Talc Co.)	Talc	Unknown	Unknown
213	Madison	Absolut Garnet	Garnet	Surface	Past Producer
214	Madison	Ruby Range (Canyon Resource)	Talc	Unknown	Unknown
215	Madison	Tidal Wave	Gold	Underground	Unknown
216	Madison	Smith Claims	Gold	Underground	Past Producer
217	Madison	Dry Georgia	Gold	Surface	Past Producer
218	Madison	Western Gold Expl. & Mining	Gold	Surface	Past Producer
219	Madison	Fairview Mine Project	Gold	Underground	Past Producer
220	Madison	Strawn Mine	Gold	Underground	Past Producer
221	Madison	B & H-Pete & Joe Mines	Gold	Underground	Past Producer
222	Madison	Toledo Mine	Gold	Surface	Past Producer
223	Madison	Helios Mine	Gold	Underground	Exploration Deposit
224	Madison	Mary Ingabar Mine	Gold	Underground	Past Producer
225	Madison	Red Pine Mine	Gold	Underground	Past Producer
226	Madison	Piedra Blanca Lode Claims	Gold	Underground	Exploration Deposit
227	Madison	Alder Garnet Deposit	Garnet	Surface	Producer
228	Madison	Dark Hollow	Talc	Unknown	Unknown
229	Madison	Battle Mountain	Gold	Underground	Exploration Deposit
230	Madison	Ramshorn Creek Placer	Gold	Surface	Unknown
231	Madison	Paymaster Mine	Gold	Underground	Past Producer
232	Madison	Willow Creek Mines	Gold	Surface	Past Producer
233	Madison	Nicholson Mine	Gold	Underground	Past Producer
234	Madison	Uncle Sam	Gold	Underground	Past Producer
235	Madison	Mayflower mine	Gold	Underground	Developing Deposit
236	Madison	California Creek Placer	Gold	Surface	Past Producer
237	Madison	Mountain Chief	Gold	Underground	Past Producer
238	Madison	Bins Mine/Bins Mines	Gold	Underground	Past Producer

Table B-2. Montana exploration projects.—Continued

Map No.	County	Project or Property Name	Primary Commodity	Actual or Potential Type of Operation	Status
239	Madison	Atlantic and Pacific Mine	Gold	Surface-Underground	Past Producer
240	Madison	High Hope Mine	Gold	Underground	Past Producer
241	Madison	Brown's Gulch	Gold	Surface	Past Producer
242	Madison	Pacific Mine(s)	Gold	Surface-Underground	Past Producer
243	Madison	Boss Tweed	Gold	Underground	Past Producer
244	Madison	Alder Gulch Project	Gold	Surface-Underground	Past Producer
245	Madison	Garrison	Gold	Unknown	Past Producer
246	Madison	Virginia City Property	Gold	Surface-Underground	Past Producer
247	Madison	U.S. Grant	Gold	Underground	Past Producer
248	Madison	Strawberry	Gold	Underground	Past Producer
249	Madison	Missouri-McKee+Snowslide Mines	Gold	Surface	Past Producer
250	Madison	Kennett project	Zinc	Underground	Past Producer
251	Madison	New London Placer	Gold	Unknown	Exploration Deposit
252	Madison	Maltbys Mound	Gold	Surface	Exploration Deposit
253	Madison	Revenue project	Gold	Surface	Producer
254	Madison	Yellowstone Mine	Talc	Surface	Past Producer
255	Madison	Madison	Gold	Surface	Exploration Deposit
256	Madison	Yellowstone Mine	Talc	Surface	Producer
257	Madison	North Meadow Trench	Gold	Surface	Reclaimed
258	Madison	Norris Comstock	Gold	Underground	Exploration Deposit
259	Madison	Tobacco Root Mine	Gold	Underground	Past Producer
260	Madison	Red Chief Mine	Gold	Underground	Past Producer
261	Meagher	Vermont Gulch Placer	Gold	Surface	Reclaimed
262	Meagher	Benton Placer	Gold	Surface	Past Producer
263	Meagher	Mary Sue Placer	Gold	Surface	Exploration Deposit
264	Meagher	Atlanta Gulch Placer	Gold	Surface	Exploration Deposit
265	Meagher	Snowbank	Gold	Underground	Producer
266	Meagher	Bigler mine	Gold	Underground	Intermittent Producer
267	Meagher	Thompson Gulch Placer	Gold	Surface	Past Producer
268	Meagher	Buckingham project	Gold	Underground	Exploration Deposit
269	Meagher	High Tarrif	Silver	Unknown	Exploration Deposit
270	Meagher	Black Butte Mine	Iron	Surface	Producer
271	Meagher	White Sulphur Springs	Gold	Surface-Underground	Unknown
272	Meagher	Sheep Creek Deposit	Copper	Underground	Exploration Deposit
273	Meagher	Moose Mountain	Copper	Unknown	Exploration Deposit
274	Mineral	Silver Cable	Zinc	Underground	Producer
275	Mineral	Tarbox-Mineral King	Silver	Underground	Past Producer
276	Mineral	Cedar Creek Placer	Gold	Surface	Intermittent Producer
277	Mineral	Dry Creek	Fluorspar	Underground	Past Producer
278	Mineral	Nancy Lee Mine	Silver	Underground	Past Producer

Table B-2. Montana exploration projects.—Continued

Map No.	County	Project or Property Name	Primary Commodity	Actual or Potential Type of Operation	Status
279	Mineral	Big Nugget Placer	Gold	Surface	Past Producer
280	Mineral	Quartz Creek Placers	Gold	Surface	Producer
281	Missoula	Nine Mile Operation	Gold	Underground	Past Producer
282	Missoula	Four V's Claims	Quartz Crystal	Surface	Producer
283	Missoula	B & S Placer	Gold	Surface	Producer
284	Missoula	McQuarrie Quarry	Stone	Surface	Developing Deposit
285	Missoula	Copper Cliff	Copper	Underground	Past Producer
286	Missoula	Montana mine	Silver	Unknown	Unknown
287	Missoula	Quartzite Placer	Gold	Surface	Reclaimed
288	Missoula	Elk Creek Mine	Barite	Underground	Reclaimed
289	Park	Emigrant Gulch	Gold	Surface-Underground	Exploration Deposit
290	Park	Livingston Quarry	Stone	Surface	Producer
291	Park	Mineral Hill	Gold	Underground	Past Producer
292	Park	Crevice	Gold	Underground	Developing Deposit
293	Park	Independence	Gold	Surface	Exploration Deposit
294	Park	Golden Grizzly	Gold	Surface-Underground	Exploration Deposit
295	Park	New World	Gold	Surface-Underground	Past Producer
296	Phillips	Zortman Mine	Gold	Surface	Past Producer
297	Phillips	Little Rockies Mining Co.	Gold	Surface	Past Producer
298	Powell	Douglas Creek Placer	Gold	Surface	Past Producer
299	Powell	Nevada Creek Gold Prospects	Gold	Unknown	Exploration Deposit
300	Powell	Tibbetts Mine	Gold	Underground	Exploration Deposit
301	Powell	Pioneer Placer	Gold	Unknown	Raw Prospect
302	Powell	Indigo	Gold	Underground	Past Producer
303	Powell	Warm Springs Creek	Phosphate	Underground	Past Producer
304	Powell	Washington Gulch	Gold	Surface	Past Producer
305	Powell	Hidden Hand Mine	Gold	Surface-Underground	Past Producer
306	Powell	Blackfoot City	Gold	Underground	Past Producer
307	Powell	Ophir Mine	Gold	Underground	Past Producer
308	Powell	Meadow Creek	Gold	Underground	Past Producer
309	Powell	Karger	Gold	Underground	Past Producer
310	Powell	Golden Anchor	Gold	Underground	Reclaimed
311	Powell	Johnny B. Good Placers	Gold	Surface	Exploration Deposit
312	Powell	Viking Mine/New Deal	Gold	Surface-Underground	Reclaimed
313	Powell	Uncle George Basin Gold Projec	Gold	Underground	Exploration Deposit
314	Ravalli	Hughes Creek Placer	Gold	Surface	Developing Deposit
315	Ravalli	Rob Gulch Placer	Gold	Surface	Past Producer
316	Ravalli	Larrigon Mine	Gold	Surface-Underground	Past Producer
317	Ravalli	Mine Creek	Gold	Surface	Past Producer

Table B-2. Montana exploration projects.—Continued

Map No.	County	Project or Property Name	Primary Commodity	Actual or Potential Type of Operation	Status
318	Ravalli	Hamilton Vermiculite deposit	Vermiculite	Unknown	Developing Deposit
319	Sanders	Hereford Bar	Copper	Unknown	Exploration Deposit
320	Sanders	Minton Pass	Copper	Unknown	Exploration Deposit
321	Sanders	Snake	Copper	Unknown	Exploration Deposit
322	Sanders	Hunt Claims	Copper	Unknown	Exploration Deposit
323	Sanders	Idaho Montana Mining Co.	Antimony	Underground	Exploration Deposit
324	Sanders	Trout Creek Placer	Gold	Surface	Past Producer
325	Sanders	Rock Creek	Copper	Underground	Developing Deposit
326	Sanders	Janstan Group	Silver	Unknown	Developing Deposit
327	Sanders	White Penny Lode	Gold	Underground	Exploration Deposit
328	Sanders	Ripper Creek	Copper	Unknown	Exploration Deposit
329	Sanders	Montanore	Copper	Underground	Exploration Deposit
330	Sanders	Heidelberg Mine	Gold	Underground	Exploration Deposit
331	Sanders	Galena Giant	Gold	Underground	Past Producer
332	Sanders	Stibnite Hill Mine	Antimony	Unknown	Exploration Deposit
333	Sanders	Babbit Mine	Antimony	Underground	Temp Shutdown
334	Sanders	Kohler	Unspecified	Underground	Past Producer
335	Sanders	Walnut Placer	Gold	Surface	Intermittent Producer
336	Sanders	Laura Apex	Copper	Surface	Producer
337	Sanders	Letterman	Gold	Surface-Underground	Past Producer
338	Sanders	Red Bluff quarry	Stone	Surface	Other
339	Sanders	Clearwater Stone Company	Stone	Surface	Producer
340	Sanders	Fork	Lead	Surface	Exploration Deposit
341	Silver Bow	Beal Mountain mine	Gold	Surface	Producer
342	Silver Bow	Tuxedo project	Gold	Surface-Underground	Past Producer
343	Silver Bow	Fourth Estate Mine	Gold	Surface-Underground	Unknown
344	Silver Bow	Wrong Font Claims	Gold	Underground	Past Producer
345	Silver Bow	Flume Gulch (lode)	Gold	Surface-Underground	Past Producer
346	Silver Bow	Humbug Spires	Copper	Underground	Exploration Deposit
347	Silver Bow	Negro Mountain	Gold	Underground	Past Producer
348	Silver Bow	South Butte	Gold	Underground	Past Producer
349	Silver Bow	Agnostic-Mapleton	Manganese	Underground	Past Producer
350	Silver Bow	Nettie Hibernia	Silver	Underground	Past Producer
351	Silver Bow	Minnie Jane/St. Patrick	Manganese	Unknown	Past Producer
352	Silver Bow	Orphan Girl	Lead	Underground	Past Producer
353	Silver Bow	Goldsmith/Margaret Ann Claims.	Manganese	Underground	Exploration Deposit
354	Silver Bow	Rainbow Project	Silver	Underground	Past Producer
355	Silver Bow	Walkerville	Silver	Unknown	Exploration Deposit
356	Silver Bow	Lexington	Gold	Underground	Developing Deposit
357	Silver Bow	Mountain Consolidated	Copper	Unknown	Past Producer

Table B-2. Montana exploration projects.—Continued

Map No.	County	Project or Property Name	Primary Commodity	Actual or Potential Type of Operation	Status
358	Silver Bow	Continental	Copper	Surface	Producer
359	Silver Bow	Butte Highlands	Gold	Underground	Exploration Deposit
360	Silver Bow	Limekiln Hill	Gold	Underground	Exploration Deposit
361	Silver Bow	Horse Creek	Gold	Surface	Exploration Deposit
362	Silver Bow	Cooley Gulch Placers	Gold	Surface	Past Producer
363	Stillwater	Mountain View	Chromium	Underground	Past Producer
364	Stillwater	Stillwater Complex Cr Deposit	Chromium	Underground	Past Producer
365	Stillwater	Stillwater Mine	Platinum Group	Underground	Producer
366	Stillwater	Benbow	Chromium	Underground	Past Producer
367	Sweet Grass	East Boulder Project	Platinum Group	Underground	Developing Deposit
368	Sweet Grass	Picket Pin	Platinum Group	Underground	Unknown
369	Teton	Choteau Project	Titanium	Unknown	Exploration Deposit

APPENDIX C—Database User Forms

Exploration Database dictionary and form sample screens

_Main form (fig. C-1)

The _mainfrrm form also includes links to other forms at the bottom of the form plus two subforms (Names subform (list) and Commodities subform (list)) showing name(s) and commodity(ies), which can be accessed directly (fig. C-1).

A description of the data shown in each window of this form is provided below and the name of the table field that is the source of the data, if different from the form name, is included in brackets.

PROPID—Project identification is a unique Access database assigned number given to each mineral project.

State—The name of the state in which the project is located.

County—The name of the county in which the project is located.

Current Owner—Owner or operator of the project as of the end of 1997 or most current available if prior to 1997. This includes joint ownership's for major participants in the exploration. More detailed historical data is included in the ownership history table.

Type of Operation {*Type Operation*}—The type of mining taking place, proposed, or assumed, for this project (for example, surface, underground, combined).

Current Status—The operational status of the exploration project as of the end of 1997, or the most current known, prior to this (for example, past producer, exploration deposit). More detailed historical data is included in the status history table.

Year of Discovery—Year of initial discovery of mineralized rock in the project area. In many cases, this will be in the 1800's when initial exploration and discovery occurred. Recent exploration may be investigating the potential for redeveloping these older discoveries.

Production Start—First year of production for the most recent period of production for the project area. In some cases,

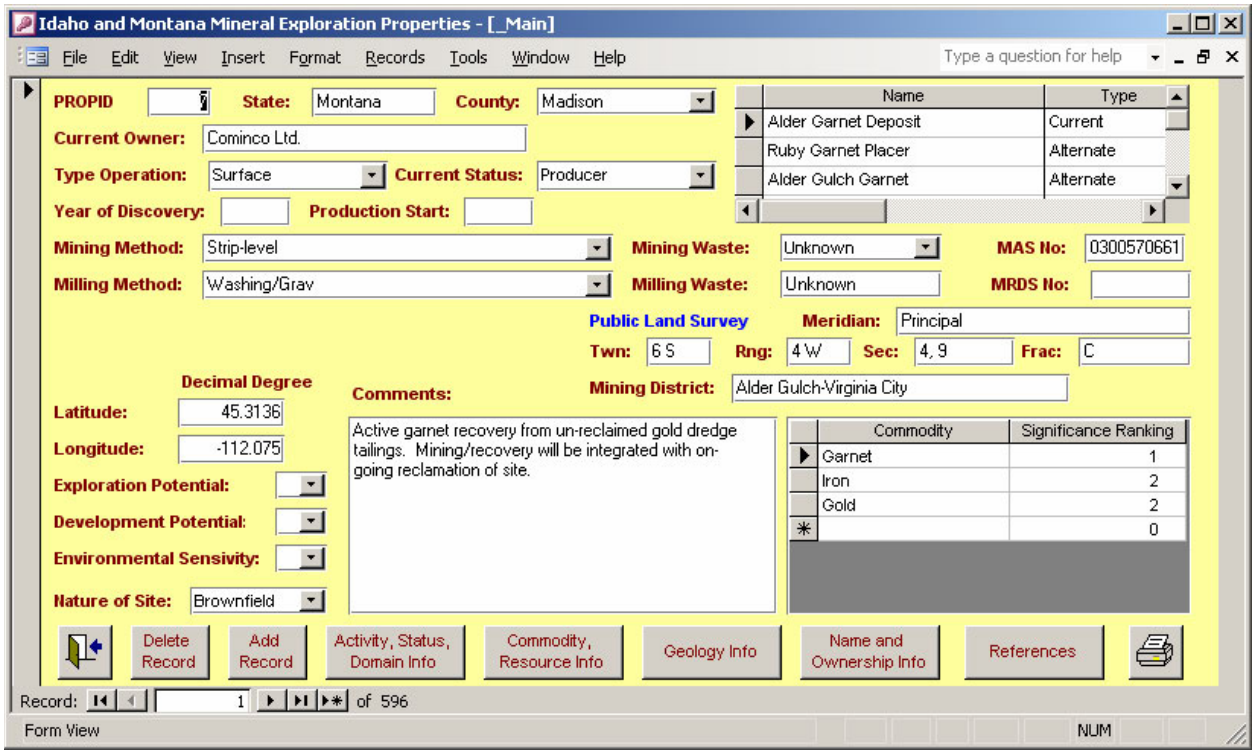

Figure C-1. Main form—identification, location, and general information.

a project area could have had several periods of production separated by periods of inactivity.

Mining Method—Describes the major method of mining (for example, block caving, open pit) utilized, proposed or assigned to this project if developed.

Mining Waste—Describes the type of waste (for example, sulfide, oxide) produced from mining activities if the project is, or ever was, developed.

Milling Method—Describes the major method, (for example, flotation, bio-leach) of processing ore utilized, proposed, or assigned to this project, if developed.

Milling Waste—Describes the type of waste (for example, sulfide, carbonate, oxide), produced from processing ore if the project is, or ever was developed.

MAS No.—Refers to the 10 digit sequence number used by the USGS Minerals Availability System (MAS) Database (McFaul, and others, 2000). This number is used for cross-referencing to the MAS Database.

MRDS No.—Refers to the seven character alphanumeric code used to uniquely identify a project file in the USGS's original MRDS Database (McFaul, and others, 2000). This code is used for cross-referencing to the Database.

Latitude—Latitude in decimal degrees (four decimal places), with the Northern Hemisphere always positive.

Longitude—Longitude in decimal degree (four decimal places), with the Western Hemisphere always negative.
Meridian {*PLS mer*}—Name of the principle meridian for the area where the project is located. Idaho has the Boise Meridian and Montana has the Montana Principle Meridian.

Twn {*PLS twn*}—Township number, followed by either N (north) or S (south).

Rng {*PLS rng*}—Range number, followed by either E (east) or W (west).
Note: The township and range describes an area approximately 6 miles by 6 miles in size and is made up of 36 sections laid out in the pattern shown in figure C-2.

Sec {*PLS sec*}—Section number within the township and range defined in 24 and 25**.** A section encloses an area of approximately one square mile.

Frac {*PLS frac*}—Fraction or subdivision of a section. The standard is to start with the smallest subdivision and work up to the section level (fig. C-3).

Mining District— Mining district name.

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Figure C-2. Arrangement of section numbers in a township.

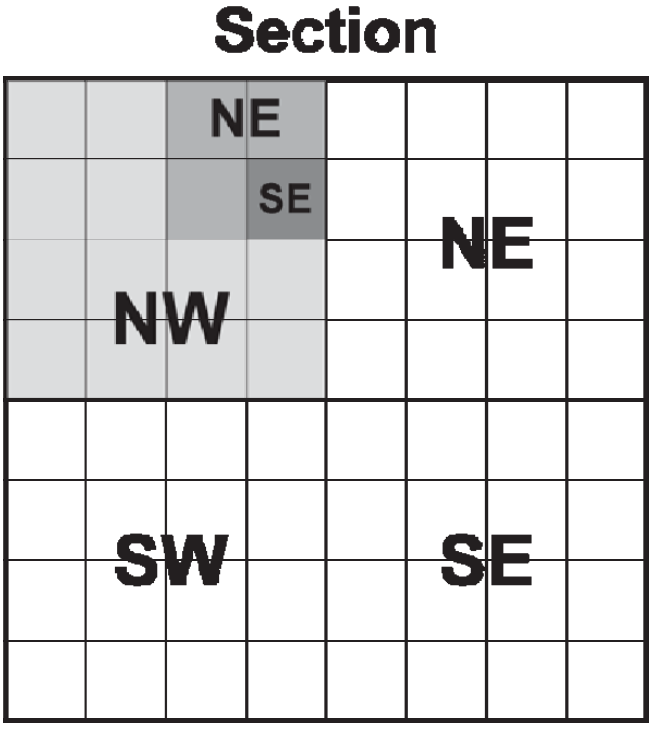

Figure C-3. Public Land Survey section regular subdivisions label procedure. Starting with the smallest fraction or segment, the dark square would be written as SENENW in the database. This reads as SE ¼ of the NE ¼ of the NW ¼. Additional codes are C (center of), and ½ (one-half of section).

Exploration Potential—The estimated potential for exploration determined by history of exploration and production and any known resources. The exploration potential can be ranked as 1 (high), 2 (medium), or 3 (low).

Development Potential—The estimated potential for development determined by history of exploration and production, any known resources, and proposed mining/milling methods. The development potential can be ranked as 1 (high), 2 (medium), or 3 (low).

Environmental Sensitivity—The estimated sensitivity to environmental disturbances determined by evaluating proposed exploration, development, mining, milling, and reclamation methods. The environmental sensitivity can be ranked as 1 (high), 2 (medium), or 3 (low).

Nature of Site—The nature or character of the site (for example, brownfield – a previously developed site or Greenfield—a previously undeveloped mineralized area).

Comments—Gives information on identification and location data.

Name— Current and alternate (if any) project name(s). This is a subform.

Commodity— All mineral commodities associated with the project. This is a subform.

Activity, Status, Domain Info form (fig. C-4)

The Activity, Status, Domain Info form is opened by clicking on the Activity, Status, Domain Info button at the bottom of the _mainfrm form (fig. C-1) or any other form it is on. This form views data in four tables: NAMES, ACTIVITY INFO, STATUS DATA, and DOMAIN DATA.

Activity data

Begin Year—The first year of activity at this project site.

Ending Year—The last year of activity at this project site.

Activity—For each year during which there was activity at the site; describes the exploration and development activity that

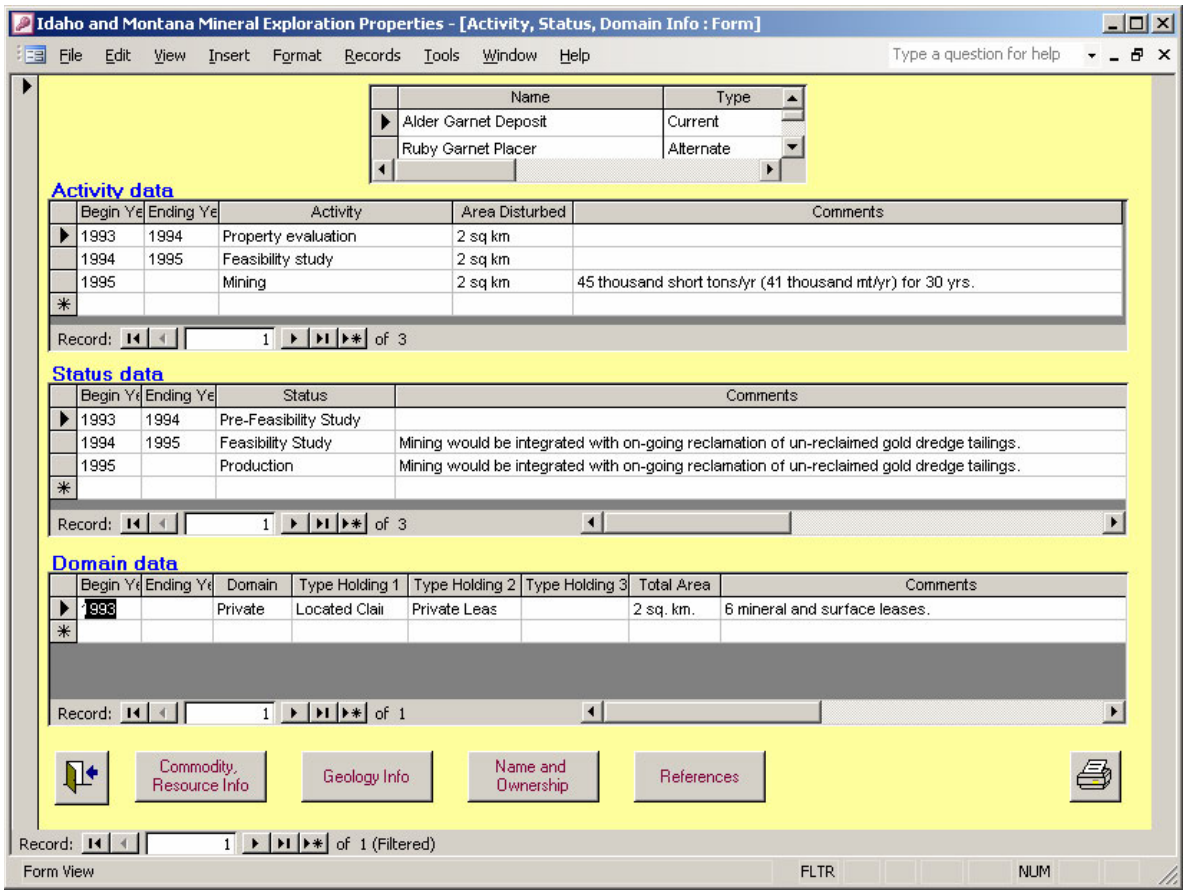

Figure C-4. Activity, status, and domain information form.

has taken place on the project. Activities may include sampling, mapping, type and quantity of drilling, type and amount of geophysical, geochemical and geological surveying, permitting, and development.

Area Disturbed—An estimate of the surface area being explored at the project site (for example, the drilling site, trenching site). Units of measure are included with the area number.

Comments—Refers to the activities for each year.

Status data

Begin Year—The first year for which a status category is known for the project site.

Ending Year—The last year for which a status category is known for the project site.

Status—The exploration related operational status for the project. This should include all periods of activity and inactivity (for example, exploration, permitting, EIS and other, development, production, temporary shutdown, care and maintenance, and inactive).

Comments—Refers to the status for each year.

Domain data

Begin Year—The first year for which a domain category is known for the project site.

Ending Year—The last year for which a domain category is known for the project site.

Domain—For each year that domain information known, describe the type of ownership (for example, private vs. Federal), and land holdings (for example, mineral and access rights) of the project.

Type of Holding—Three "holding type" fields (Type Holding 1, Type Holding 2, Type Holding3) are included to describe the type of holdings (for example, located claim, patented claim, or type of lease arrangement).

Total Area—The total surface areal extent of the holdings including the area currently undergoing exploration are measured or estimated. Units of measure are included with the area number.

Comments—Refers to the domain for each year.

Commodity, Resource Info form (fig. C-5)

The Commodity, Resource Info form is opened by clicking on the Commodity, Resource Info button at the bottom of the mainfrm form (fig. C-1) or any other form it is on. This form views data in three tables: NAMES, COMMODITIES, and RESOURCE DATA.

Commodity data

Commodity—The commodities that are found in this project area.

Significance Ranking—The ranking of the commodity being sought or mined. In cases where multiple commodities are being sought, selection is based on some measure of the relative value the company places on the commodities. In general, the first commodity the company reports is considered the primary commodity. In some cases an arbitrary selection may have been made. After the primary commodity was selected, all other commodities reported for a project are included in order of relative importance. The order for the other commodities should only be viewed as a subjective ranking based on current knowledge of the project and include only commodities of economic or potential economic importance. This would include both commodities with revenue generating potential and those with deleterious impact on the development of a project.

Comments – Descriptive information about commodities in the project.

Resource data

Begin Year—The first year for which a resource was estimated for the project site.

Ending Year—The last year for which a resource was estimated for the project site.

Resource Class—Reserve and (or) resource classification for reported data follows guidelines detailed in U.S. Bureau of Mines and U.S. Geological Survey (1980). This source can be supplemented by the Australasian Code (Anonymous, 1999). The terms "proven" and "probable" are used in conjunction with "reserves" and implies that a mining plan has been developed allowing for the extraction of material and recovery of products economically at commodity prices current at the time of reporting. The terms "measured" and "indicated" are used in conjunction with "resource" and imply the same level of geological assurance as "proven" and "probable", but are not part of a mining plan and reflect the in-situ material from which reserves are defined.

Resource Amount—Amount of a reserve/resource available in a certain year. Value is the number provided by the source document. Value is usually expressed in short tons (st) or metric tones (mt) if measurement was of ore. When value is contained metal, value is usually troy ounces (oz) or grams (g) for precious metals and pounds (lbs) or cubic yards (yd3) for other commodities.

Amount Units (*Amt units*)—Units in which the reserve/resource is reported.

Resource Grade—Grades in grams per metric ton (g/mt) for precious metals or weight percent for all other commodities. To convert from ounces per short ton (oz/st) to grams per metric ton (g/mt) multiply oz/st by 34.28571.

Resource Units—Units in which *Resource Grade* is shown.

Commod Amount— Estimate of the amount of contained metal or other commodity in the ore.

Commod Units— Units for the *Commod Amount* value.

Commodity—Commodity for which resources/reserves was estimated.

Comments—Describe the resource/reserves of the project.

Geology Info form (fig. C-6)

The Geology Info form is opened by clicking on the Geology Info button at the bottom of the _mainfrm form (fig. C-1) or any other form it is on. The Geology Info form views data in two tables: NAMES and GEOLOGY DATA.

Deposit Model No.—The number for the U.S. Geological Survey deposit model type that best describes the deposit (from Stoeser and Heran, 2000).

Type Ore Body—The type of ore body in standard geological terms.

Host Rock—Rock formation that hosts the mineralization and (or) brief description of lithology.

Ore Minerals—List of minerals associated with the commodities being sought in decreasing order of abundance.

Gangue Minerals—List of minerals associated with the waste portion of the deposit in decreasing order of abundance.

Type Mineralization—Process or processes that produced a concentration of ore minerals.

Comments—Describe the information on the geology of the deposit.

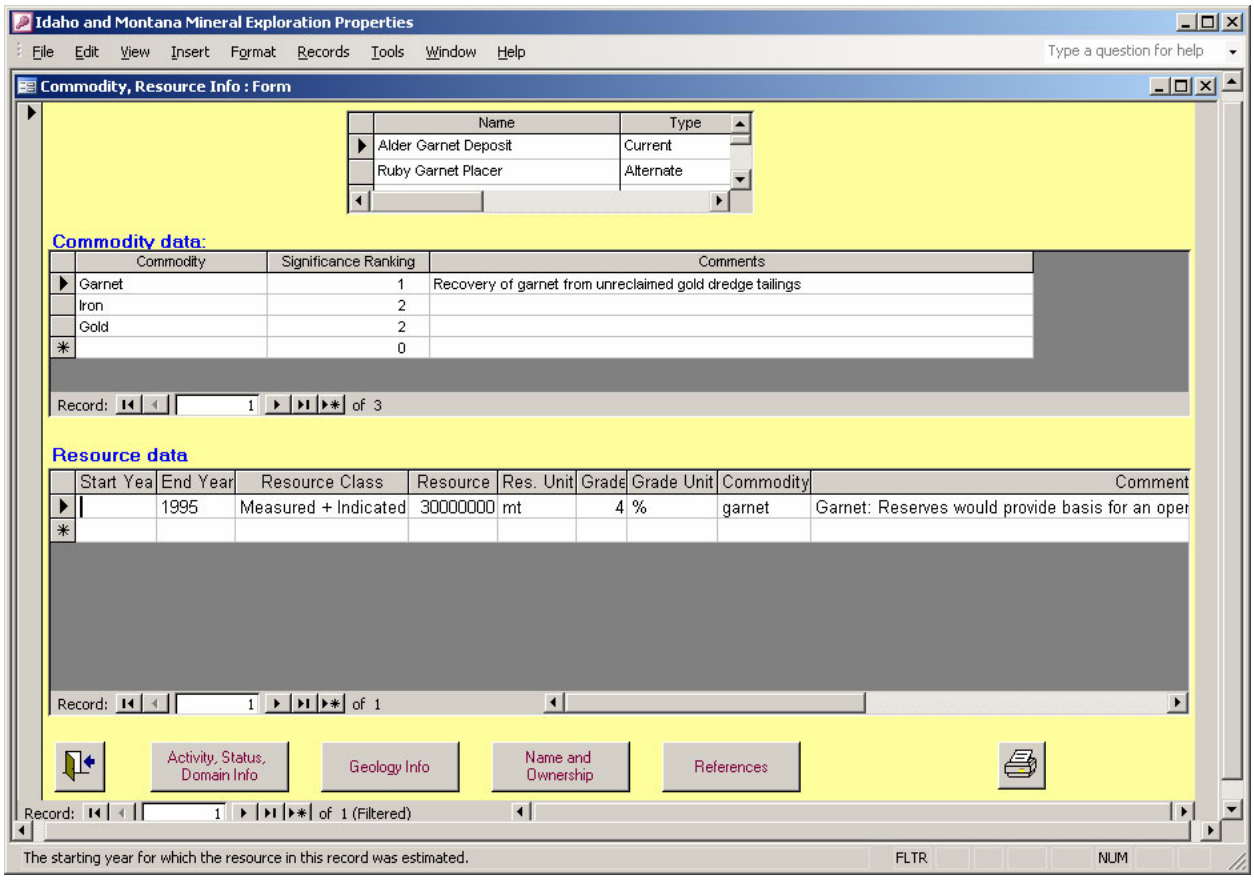

Figure C-5. Commodity, resources information form.

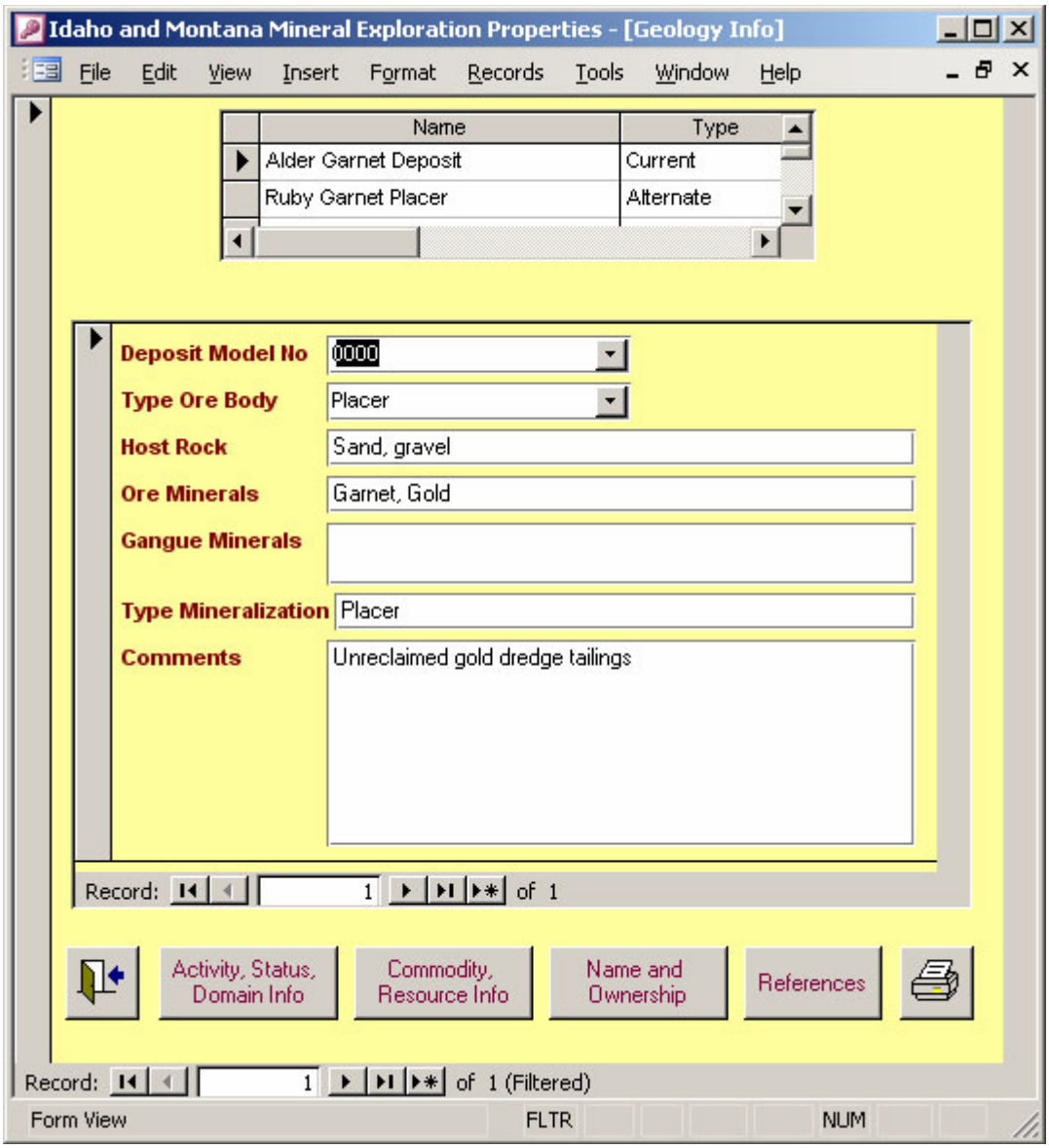

Figure C-6. Geology info form.

Name and Ownership Data form (fig. C-7)

The Name and Ownership Info form is opened by clicking on the Name and Ownership Info button at the bottom of the _mainfrm form (fig. C-1) or any other form it is on. This form views data in two tables: NAMES and OWNERSHIP DATA.

Name

Name—The most commonly used names for a project.

Type—Includes all names by which the project may have been known. This should also be the most current name the project is known by, especially if the project has changed names over time. This could also include multiple mine, deposit, or claim names if there had been a consolidation or grouping of individual properties under one project. It also includes variations of spelling of the project name.

Comments—Describe the names of the project.

Ownership

Begin Year—The first year for which ownership information is known.

Ending Year—The last year for which ownership information is known.

Company Name—Includes the full company name for all owners, operators and lease holders that have been, or are currently involved with, the project. Whenever the "type" or "per-

cent" of involvement changes, a new "company name" entry should be made to reflect the change in status. For example, if company "A" increased the percent of ownership from 40 percent to 80 percent, a new company "A" entry would have to be made to reflect the increase in ownership.

Type Ownership—Included for each name in Company Name field, is the type of ownership or involvement in the project (for example, owner, operator, lessor).

Pct Ownership—The percent of ownership or involvement in the project is included for each name in Company Name field, if known.

Comments—Describe the ownership of the project.

References form (fig. C-8)

The References form is opened by clicking on the References button at the bottom of the _mainfrm form (fig. C-1) or any other form it is on. The References form views data in two tables: NAMES and REFERENCES DATA.

Master Reference—Includes the name of serial publication or other source. The source can be selected from a drop-down list of references as shown in figure C-8. Additional references can be added to the Master Reference list by using the "Add New Master Reference" button.

Category—Describes the major topic to which the reference refers (for example, activity, ownership, general geology).

Title—The title of the article or source.

Pages—The page(s) for the citation.

Master Reference Data form (fig. C-9)

This form is not linked to the _mainfrm form. It is opened from the Add New Master Reference button at the bottom of the References form. It is used to compile a list of all references used and is linked to the References form.

Master Reference Record No.—A unique alphanumeric label assigned the references used in this study.

Author(s)—Includes the name of serial publications or other sources.

Year—The year of the publication.

Date—The month and day of the publication.

Publication—The name of the serial publications or the title of the references used.

Volume No.—The volume and number of a serial publication.

Total Pages—The page(s) included in the citation.

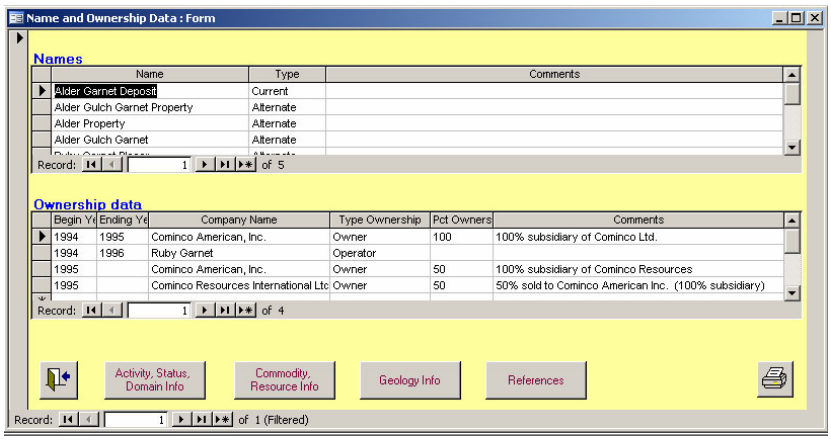

Figure C-7. Name and ownership data form.

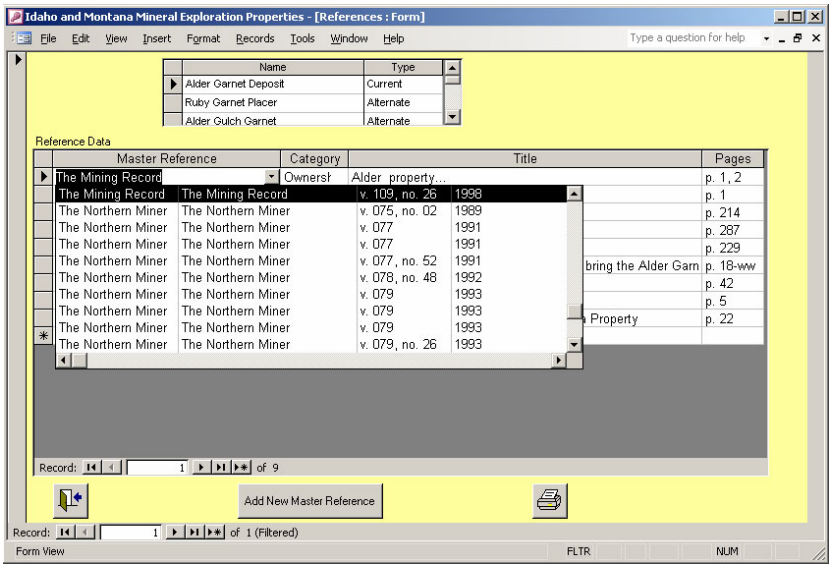

Figure C-8. References form.

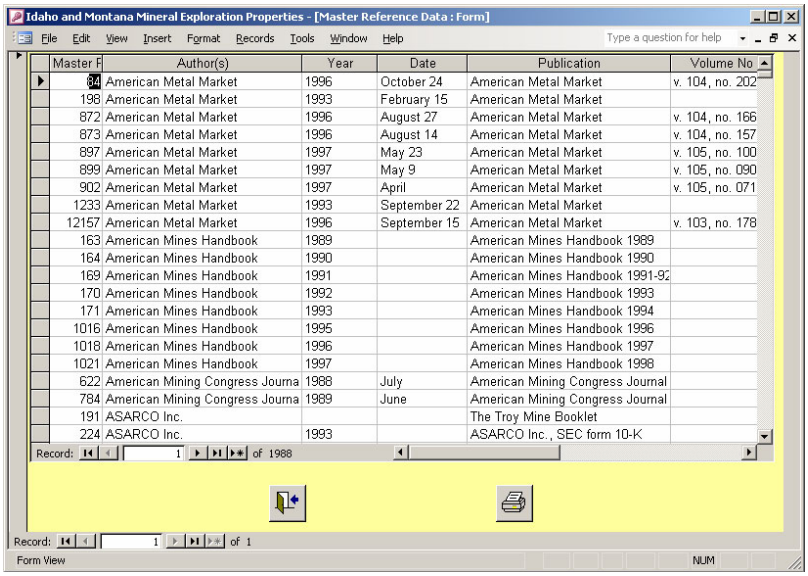

Figure C-9. Master reference data form.

Names subform (list) form (fig. C-10)

The Names subform (list) form (figure C-10) is only used on other forms. It provides the property name(s) used for a project when the user opens any form except the Master Reference Data form. There is no close button on this form. It can be closed using the menu File/Close.

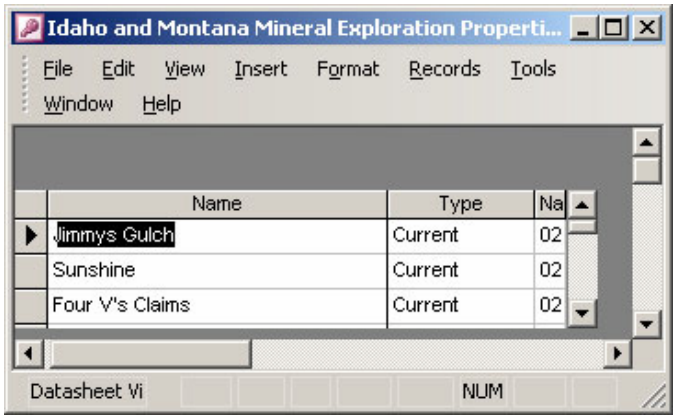

Figure C-10. Names subform (list) form.

Commodities subform (list) form (fig. C-11)

The Commodities subform (list) form (fig. C-11) provides a view of commodity information for an exploration project when the _Main form is open. There is no close button on this form. It can be closed using the menu File/Close.

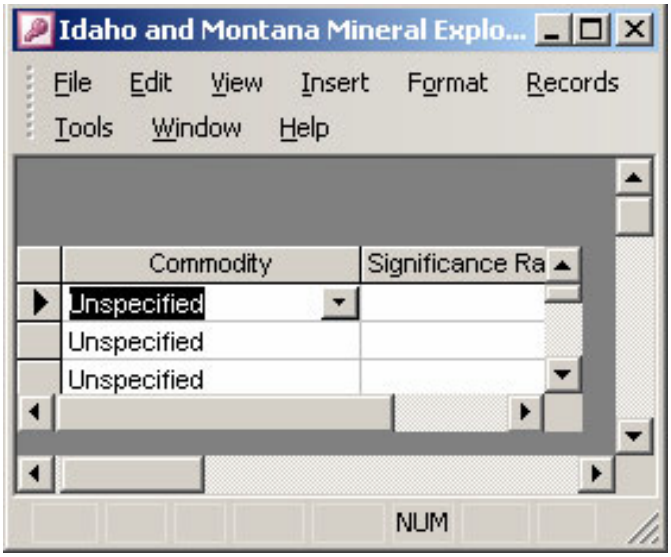

Figure C-11. Commodities subform (list) form.