Geologic Resource Evaluation Scoping Summary
Fort Union National Monument, New Mexico

This report highlights a geologic resource evaluation scoping session that was held for Fort Union National Monument in Los Vegas, New Mexico, on March 28, 2006. The NPS Geologic Resources Division (GRD) organized this scoping session in order to discuss the monument's geologic resources, address the status of geologic maps and digitizing, and assess resource management issues and needs. Participants at the meeting included GRD staff, park staff, and cooperators from the New Mexico Bureau of Geology and Mineral Resources and Colorado State University (table 1).

Table 1. Scoping Session Participants

Name	Affiliation	Phone	E-mail
Doug Bland	New Mexico Bureau of Geology and Mineral Resources (geologist)	505-466-6696	dbland@gis.nmt.edu
Tim Connors	NPS Geologic Resources Division (geologist)	303-969-2093	tim_connors@nps.gov
Dennis Ditmanson	Fort Union National Monument and Pecos National Historical Park (superintendent)	505-757-6414	dennis_ditmanson@nps.gov
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Dan Jacobs	Pecos National Historical Park (chief ranger)	505-757-6414	daniel_j_jacobs@nps.gov
Katie KellerLynn	Colorado State University (geologist/research associate)	801-364-1716	katiekellerlynn@msn.com
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On ***Monday, March 27,*** staff members of the Geologic Resources Division and Colorado State University visited Fort Union National Monument on the way to Las Vegas, New Mexico, where the scoping meeting for Fort Union National Monument and Pecos National Historical Park would take place.

Tuesday, March 28, involved a welcome and introduction to the Geologic Resource Evaluation (GRE) Program, including the status of reports and map products. The morning's discussion focused on map coverage of the monument and other "quadrangles of interest" in the vicinity. Bruce Heise facilitated a group discussion regarding the geologic processes and features at Fort Union National Monument and Pecos National Historical Park.

Overview of Geologic Resource Evaluation Program

Geologic features and processes serve as the foundation of park ecosystems and an understanding of geologic resources yields important information for park decision making. The National Park Service (NPS) Natural Resource Challenge, an action plan to advance the management and protection of park resources, has focused efforts to inventory the natural resources of parks. Ultimately, the inventory and monitoring of natural resources will become integral parts of park planning, operations and maintenance, visitor protection, and interpretation.

The Geologic Resource Evaluation (GRE) Program, which the NPS Geologic Resources Division administers, carries out the geologic component of the inventory. Staff associated with other programs within the Geologic Resources Division (e.g., abandoned mine land, cave, coastal, disturbed lands restoration, minerals management, and paleontology) provide expertise to the GRE effort. The goal of the GRE Program is to provide each of the identified "natural area" parks with a digital geologic map and a

geologic resource evaluation report. In addition, the Inventory, Monitoring, and Evaluation Office of the Natural Resource Program Center is preparing a geologic bibliography for each of these parks. Each product is a tool to support the stewardship of park resources and is designed to be user friendly to non-geoscientists.

The scoping process includes a site visit with local experts, evaluation of the adequacy of existing geologic maps, and discussion of park-specific geologic management issues. Scoping will result in a summary (this document), which along with the digital geologic map, will serve as the starting point for the final GRE report. The emphasis of scoping is not to routinely initiate new geologic mapping projects but to aggregate existing information and identify where serious geologic data needs and issues exist in the National Park System. Scoping meetings are usually held for individual parks though some address an entire Vital Signs Monitoring Network.

Bedrock and surficial geologic maps and information provide the foundation for studies of groundwater, geomorphology, soils, and environmental hazards. Geologic maps describe the underlying physical framework of many natural systems and are an integral component of the physical inventories stipulated by the National Park Service in its Natural Resources Inventory and Monitoring Guideline (NPS-75) and the 1997 NPS Strategic Plan. The NPS geologic resource evaluation is a cooperative implementation of a systematic, comprehensive inventory of the geologic resources in National Park System units by the Geologic Resources Division; the Inventory, Monitoring, and Evaluation Office of the Natural Resource Program Center; the US Geological Survey; state geological surveys; and universities.

For additional information regarding the content of this summary, please consult the NPS Geologic Resources Division, located in Denver, Colorado. Up-to-date contact information is available on the GRE Web site at http://www2.nature.nps.gov/geology/inventory/.

The objectives of the geologic resource evaluation scoping meetings are as follows:

- To identify geologic mapping coverage and needs
- To identify distinctive geologic processes and features
- To identify resource management issues
- To identify potential monitoring and research needs

Outcomes of the scoping process include the following items:

- A scoping summary (this document)
- A digital geologic map
- A geologic resource evaluation report

Status of Scoping and Products

As of April 2006, the NPS Geologic Resources Division had completed the scoping process for 160 of 272 “natural resource” parks. Staff and partners of the GRE Program have completed digital maps for 68 parks. These compiled geologic maps are available for downloading from the NR-GIS Metadata and Data Store at http://science.nature.nps.gov/nrdata. The US Geological Survey, various state geological surveys, and investigators at academic institutions are in the process of preparing mapping products for 42 parks. Writers have completed 22 GRE reports with 18 additional reports to be completed by the end of fiscal year 2006.

Geologic Maps for Fort Union National Monument

During the scoping session on March 28, 2006, Tim Connors (GRD) presented a demonstration of some of the main features of the digital geologic map model used by the GRE Program. This model incorporates the standards of digitization set for the GRE Program. The model reproduces all aspects of a paper map, including notes, legend, and cross sections, with the added benefit of being GIS compatible. GRE staff members digitize maps using ESRI ArcView/ArcGIS format with shape files and other features, including a built-in help file system to identify map units.

Parks in Inventory and Monitoring Network have identified "quadrangles of interest" mapped at one or more of the following scales: 7.5' × 7.5' (1:24,000), 15' × 15' (1:62,500), or 30' × 60' (1:100,000). Often for simplicity, geologic map makers compile maps at scale 1:100,000 (30' × 60'), which provides greater consistency and covers more area. However, for the purpose of geologic resource evaluations, GRE staff would like to obtain digital geologic maps of all identified 7.5-minute (1:24,000-scale) quadrangles of interest for a particular park. The geologic features mapped at this scale are equivalent to the width of a one-lane road.

Figure 1. Quadrangles of interest for Fort Union National Monument, New Mexico. Names in black indicate 7.5-minute quadrangles (scale 1:24,000); names in blue indicate 30-minute by 60-minute quadrangles (scale 1:100,000). Green outline indicates the boundary of the monument. The smaller unit to the west is the site of the first Fort Union.

With respect to Fort Union National Monument, geologic data are useful when they help identify or interpret historic places and events, such as the Santa Fe Trail. Possible uses may include identification of historic quarries and their building stones (e.g., in the jail and latrines) and interpretation of the adobe fields. It may also help identify hazards (e.g., faults and rockfall areas) and eolian deposits, which could be reactivated through land-use practices such as grazing.

Map coverage for Fort Union National Monument initially consisted of four quadrangles of interest (scale 1:24,000): Maxson Crater, Fort Union, Watrous, and Loma Parda. The Maxson Crater and Watrous

quadrangles are situated on the Roy 30' × 60' sheet; the Fort Union and Loma Parda are situated on the Santa Fe 30' × 60' sheet (fig. 1)

Only one of the four quadrangles of interest—Fort Union—has been published as a geologic map. The US Geological Survey published this quadrangle in 1974 (see reference below). The site of the first fort and the ruins of the other two successive forts are situated on this quadrangle. The New Mexico Bureau of Geology and Mineral Resources is not conducting any new mapping that would cover the other three quadrangles of interest for Fort Union National Monument. Nonetheless, Dennis Ditmanson (Fort Union National Monument, superintendent) determined that having geologic coverage of just the Fort Union quadrangle would be sufficient for resource management at Fort Union. Hence, GRE staff will digitize the existing geologic map of the Fort Union quadrangle (GMAP 2531).*

Johnson, R.B., 1974, Geologic map of the Fort Union quadrangle, Mora County, New Mexico: US Geological Survey Geologic Quadrangle Map GQ-1164, scale 1:24,000 (GMAP 2531).*

*"GMAP" numbers throughout this summary are identification codes associated with the GRE database.

Geologic Resource Evaluation Report

Geologic Resource Evaluation reports include sections about geologic resources of concern for management (referred to as "issues"), geologic features and processes, the park's geologic history, a map unit properties table that highlights the significant features and resource concerns for each map unit in the park, references (different from the bibliography), and various appendices (e.g., map graphics and scoping summary). This document (scoping summary) will serve as a starting point for information to be included in the GRE report that will accompany the digital geologic map for Fort Union National Monument.

Geologic Features, Processes, and Issues at Fort Union National Monument

The scoping session at Fort Union National Monument provided the opportunity to capture a list of geologic features and processes operating in the monument, which will be highlighted and expanded in the final GRE report. Some of these features and processes may be of management concern.

Streams and Lakes

Wolf Creek flows near the southern boundary of Fort Union National Monument. Participants identified one issue with this stream: it flows near the monument's sewage lagoons and meandering could affect the integrity of the lagoons over time.

No lakes occur at Fort Union National Monument; however, a large, dry playa occurs outside the boundary.

Volcanic Features and Caves

Though no caves or karstic features are known to occur in the monument, lava tubes are thought to occur in the volcanic flows in the vicinity of Fort Union National Monument. Investigators have conducted geochronological dating on many of these flows. These data are recorded in the New Mexico geochronological database (Wilks and Chapin, 1997). In addition, Olmsted (2000) highlights geologic age points in the vicinity of the monument.

Wilks, M., and Chapin, C.E., 1997, The New Mexico geochronological database: New Mexico Bureau of Geology and Mineral Resources Digital Data Series Databases DDS DB1 [CD-ROM].

Olmsted, B.W., 2000, $^{40}Ar/^{39}Ar$ investigations of the Ocate volcanic field, north-central New Mexico [MS thesis]: Socorro, New Mexico, New Mexico Institute of Mining and Technology, 92 p.

Hillslope Features and Processes

Though mass wasting is not a major issue at Fort Union National Monument, park managers are aware that rockfall does occur in the area, in particular, from the cliffs to the west of the smaller unit of the monument. This ridge, which is composed of the Dakota Formation (sandstone), is not within the boundary. Additionally, though apparently stable now, a small amount of displacement has occurred on the Fort Union fault that runs near the monument; seismic activity (though quite rare) and general weathering could dislodge bounders that would affect the historic ruins at the base.

Seismic Features and Processes

The New Mexico Bureau of Geology and Mineral Resources has a catalog on seismic activity in the state. Earthquakes have been fairly common recently around Raton, New Mexico, and Sanford and others (2002) has some small earthquake epicenters mapped in the vicinity of Fort Union. The Fort Union fault lies along the western boundary of the site of the first Fort Union (fig. 2). Allan Sanford at New Mexico Tech is in the process of updating the earthquake catalog for New Mexico (Virgil Lueth, New Mexico Bureau of Geology and Mineral Resources, written communication, April 18, 2006). The current reference is as follows:

Sanford, A.R., Lin, Kuo-wan, Tsai, I., and Jaksha, L.H., 2002, Earthquake catalogs for New Mexico and bordering areas—1869–1998: New Mexico Bureau of Geology and Mineral Resources Circular 210, 104 p.

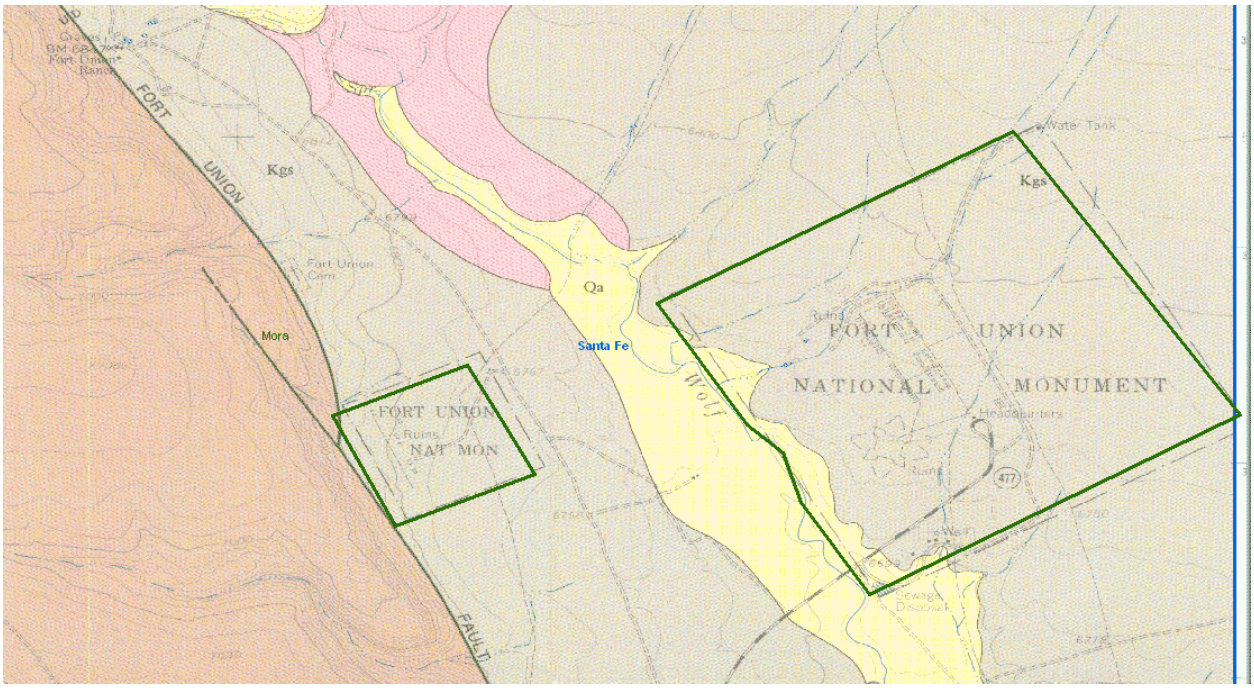

Figure 2. The Fort Union fault runs along the western boundary of the site of the first Fort Union. Seismologists have mapped some small earthquake epicenters in the vicinity of Fort Union National Monument. Green outline indicates the boundary of the monument. The smaller unit to the west is the site of the first Fort Union.

Disturbed Lands

In many cases the “disturbed lands” at Fort Union National Monument are significant cultural resources, for example, clay excavation for adobe production. Hence, restoration of these lands is contrary to the monument’s mission. Grazing occurred for nearly 60 years when Fort Union was an active military supply depot; however, this disturbance no longer occurs at the fort.

Eolian (Windblown) Features and Processes

Dust storms were a characteristic feature in the fort's historic past. For example, the "park guide" displays a quotation from 1872 resident of the fort, Mrs. Orsemus B. Boyd:

Many ladies greatly dislike Fort Union. It has always been noted for severe duststorms. Situated on a barren plain, the nearest mountains…three mile distant, it has the most exposed position of any military fort in New Mexico…. The hope of having any trees, or even a grassy parade-ground, had been abandoned long before our residence there…. Every eye is said to form its own beauty. Mine was disposed to see much in Fort Union, for I had a home there.

In contrast to 1850–1890 when a thousand people and two thousand horses occupied the fort, today's landscape is well vegetated and grazing no longer occurs at the fort. Hence, though dust storms can occur, they are rare and not of concern for resource management.