

Great Basin NP and USGS Cooperate On a Geologic Mapping Program

By Janet L. Brown and Vidal Davila, Jr.

The U.S. Geological Survey (USGS) Geologic Division, through an Interagency Agreement with NPS, is funded to provide basic geologic mapping and geologic thematic data sets to the geographic information System (GIS) newly established at Great Basin NP (GRBA) in Nevada. The GIS is a computer hardware and software system designed to collect, manage, analyze, and display spatially referenced data. The new geologic thematic data sets or themes can then be merged with digital data sets such as hydrography, topography, and transportation, or other themes such as soils or vegetation, to be analyzed for park management purposes. The GIS data sets will be shared between USGS and NPS, as well as local, state, and national data users.

Janet L. Brown (USGS), Vidal Davila, Jr. (NPS-GRBA), and Albert J. Hendricks (NPS-GRBA) developed the research proposal and Interagency Agreement (IA), to provide current large-scale geologic mapping of six quadrangles at 1:24,000 scale. This meets the baseline inventory required by Great Basin NP (Fig. 1).

Interagency Management Plan

The GRBA draft General Management Plan proposes development in several locations in Kious Spring and Lehman Caves 1:24,000 topographic quadrangles, and these proposed developments need geologic evaluation before construction. Brown will act as project manager to coordinate the IA with time frames, budget constraints, and the timely preparation of required maps, reports, and GIS data sets. In addition to having been an interpretive Ranger-Naturalist in two National Parks, Brown has published USGS interpretive geologic maps and USGS bulletins. Her research includes sedimentologic, stratigraphic, and structural analyses of Laramide intermontane basins in the Western Interior.

Academic collaboration for the project is provided by Dr. Elizabeth L. Miller, Associate Professor of Geology at Stanford University, and Dr. Phillip B. Gans, Assistant Professor of Geology, UCA Santa Barbara. Both Drs. Miller and Gans have done extensive geologic mapping in the Great Basin over many years, have published extensively on geometry and kinematics of normal fault systems in the Basin and Range province, and have made metamorphic and geochronologic studies in the North and South Snake Range. Davila is responsible for managing research in the park; Hendricks, Park Superintendent, integrates research programs with

park policy and management needs. Kurt S. Pfaff, Physical Science Technician, acts as archivist to build the park geologic library and provide field assistance.

The project will provide current large-scale geologic mapping of six quadrangles at 1:24,000 scale in two forms:

(1) as published maps, and

(2) as a digitized product compatible with the needs of the GRBA GIS.

These data provide information on suitability and limitations of bedrock and surficial geology for NPS resource uses and activities. The geologic maps will provide data in support of the NPS Global Climate Change Research Plan for GRBA. The USGS Water

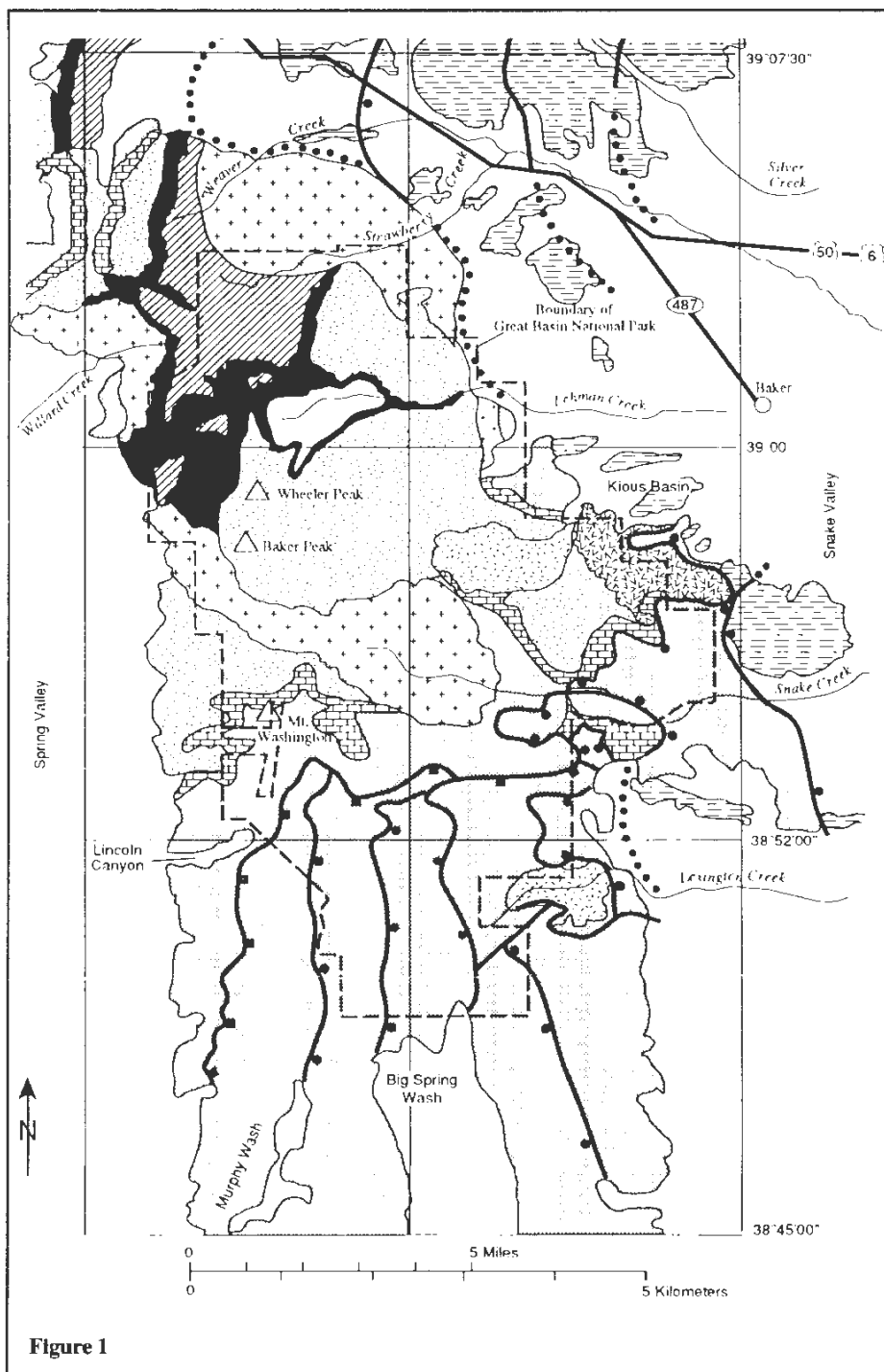


Figure 1

Resources Division and NPS currently are collaborating on research on the water and energy budget for Baker Creek east of the South Snake Range. The geologic mapping and GIS data base support two current USGS Geologic Division Programs: the Evolution of Sedimentary Basins Program in the Eastern Great Basin, NV; and the Basin and Range to Colorado Plateau Transition (BARCO) Program. The maps also will be archived with the national GIS geologic data base in the USGS National Mapping Division Program as well as with the GIS geologic data base being developed for the Nevada Bureau of Mines and Geology in Reno.

Objectives, Methods, and Products

Great Basin NP, a region of great structural complexity, provides important insights into the Cenozoic history of this part of the Basin

and Range province. The South Snake Range represents the transition between the unextended Confusion Range structural block to the east and the more highly extended region encompassing the Snake, Schell Creek, and Egan Ranges to the west (Gans and Miller, 1983). It exposes the southern extent of an important low-angle fault system, the Snake Range decollement (Misch and Hazzard, 1962), interpreted by Misch and Hazzard (1962) and by Whitebread (1969) as a thrust fault. The South Snake Range project will provide up-to-date large-scale geologic mapping and data on the movement history of faults in the range, the deformational and intrusive history of metamorphic and igneous rocks, and information on the young uplift history of this impressive mountain (based on studies of Cenozoic conglomerates and apatite fission-track geochronology).

The South Snake Range project includes six 1:24,000 topographic quadrangles (Fig. 1), from north to south: Windy Peak, Lehman Caves, Wheeler Peak, Kious Spring, Minerva Canyon, and Arch Canyon. To date, there is no published geologic mapping at 1:24,000 scale of the South Snake Range (see Suggested References).

Field procedures for GRBA will include standard geologic field mapping methods, field checking, and compilation. The field compilation will be assisted by aerial photo interpretation of the geology using the Kern computerized photogrammetric mapping (PG-2). As the geology is mapped and compiled, it will be drafted onto registered stable base greenlines and published as paper copy in USGS Open-File Map and Report format. USGS Open-File Reports serve to make the maps quickly available to the NPS and the geologic community. Additionally, the digitized geologic quadrangles will be available in digitized form as either computer discs or possibly as CD-ROM. A USGS Bulletin on the interpretive geology of the park, prepared in cooperation with NPS, will be written by Brown.

Field work commenced in the summer of 1992. Three geologic quadrangles (Lehman Caves, Windy Peak, and Kious Spring) have been submitted already as USGS Open-File Reports. In the following two years of the project, the remaining three quadrangles (Wheeler Peak, Minerva Canyon, and Arch Canyon) will be mapped and then published as paper copy in USGS Open-File Report format and in digital form. The digitized versions of the six large-scale geologic maps can be combined into a smaller scale version that includes the whole park and is appropriate for other management uses.

As our work unfolds, we anticipate presenting our collaborative results at professional meetings, such as the Geological Soci-

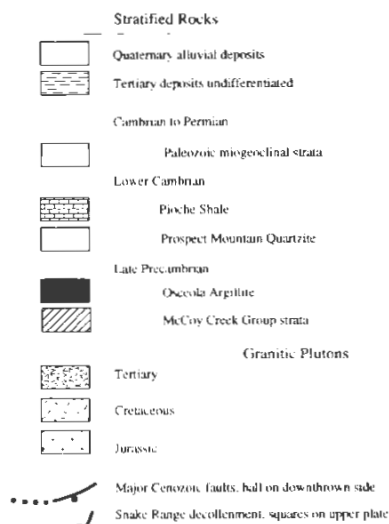
ety of America Section Meeting in Reno, NV in May 1993. The USGS Bulletin on interpretive geology of the park will be a color publication that will include a geologic map of the park and have contributions from NPS staff as well as academia. The project is slated for completion by Dec. 31, 1994.

Brown is a Research Geologist with the USGS; Davila is Resource Management Specialist at Great Basin NP.

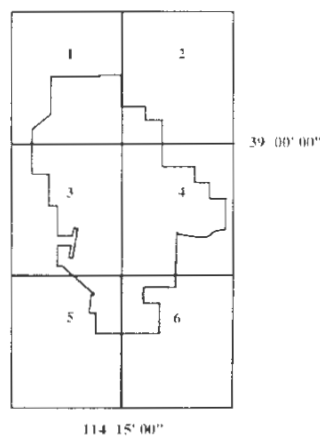
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Legend



Index map showing 7.5' topographic quadrangles for Great Basin National Park



1. Windy Peak
2. Lehman Caves
3. Wheeler Peak
4. Kious Spring
5. Minerva Canyon
6. Arch Canyon