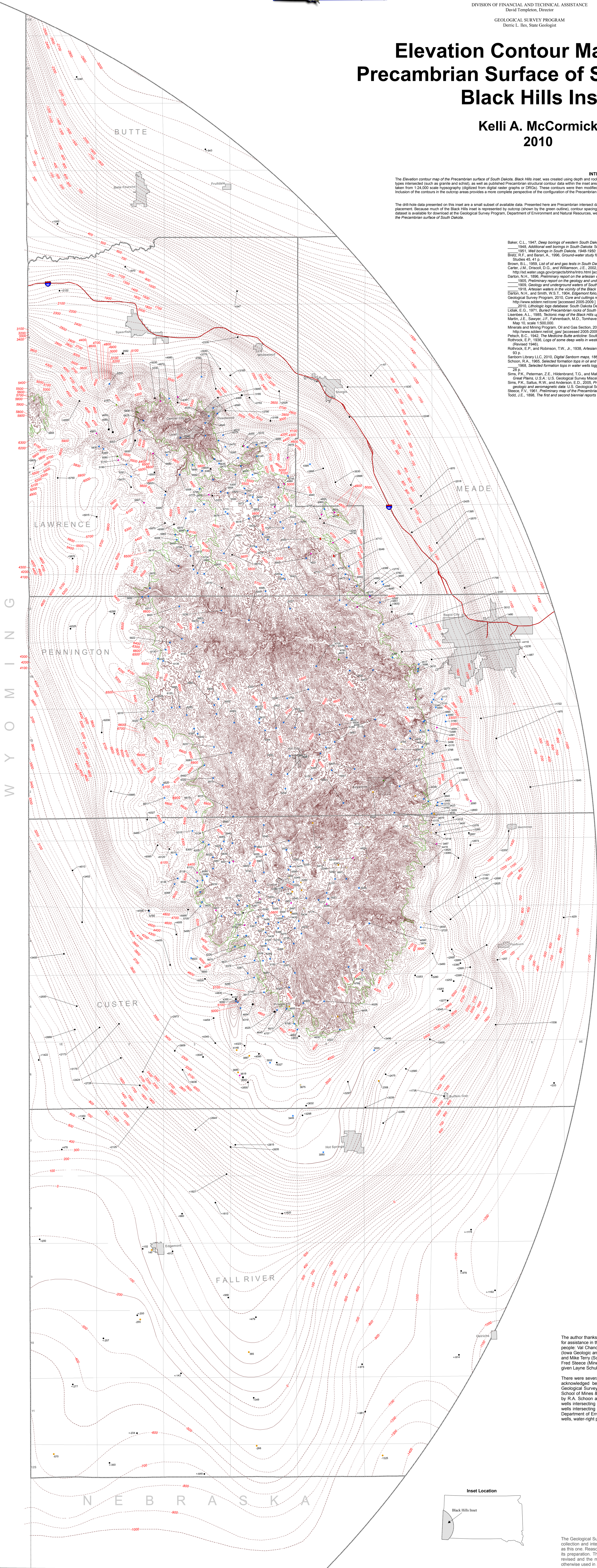


Elevation Contour Map of the Precambrian Surface of South Dakota Black Hills Inset

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2010



INTRODUCTION
The Elevation contour map of the Precambrian surface of South Dakota, Black Hills Inset, was created using depth and rock-type data from more than 2,600 drill holes in combination with published depths to the Precambrian basement and Precambrian rock types intersected (such as granite and schist), as well as published Precambrian structural contour data within the inset area (see SELECTED REFERENCES). For the Black Hills, where Precambrian rocks are exposed at the surface, elevation contours were taken from 1:24,000 scale topography digitized from digital water graphs or DRGs. These contours were then modified where drill data is present and around outcrop areas. A unique aspect of this map is the inclusion of contours in the outcrop area. Inclusion of the contours in the outcrop areas provides a more complete perspective of the configuration of the Precambrian basement in the Black Hills area.

DATA
The drill-hole data presented on this inset are a small subset of available data. Presented here are Precambrian intersect data from 386 drill holes and an additional 162 drill holes that do not intersect the Precambrian basement but help constrain the contour placement. Because much of the Black Hills inset is represented by outcrop (shown by the green outline), contour spacing on the Precambrian surface is tight, considerably limiting the amount of other data that can be presented on this map. The complete dataset is available for download at the Geological Survey Program, Department of Environment and Natural Resources, website. Further discussion on data sources and drill-hole location is included on the 1:500,000-scale map titled Elevation contour map of the Precambrian surface of South Dakota.

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Explanation

DRILL HOLES

- ◆ Data point; number is elevation in feet relative to mean sea level. A "less than" symbol (<) indicates elevation is less than the number shown.

Rock Type

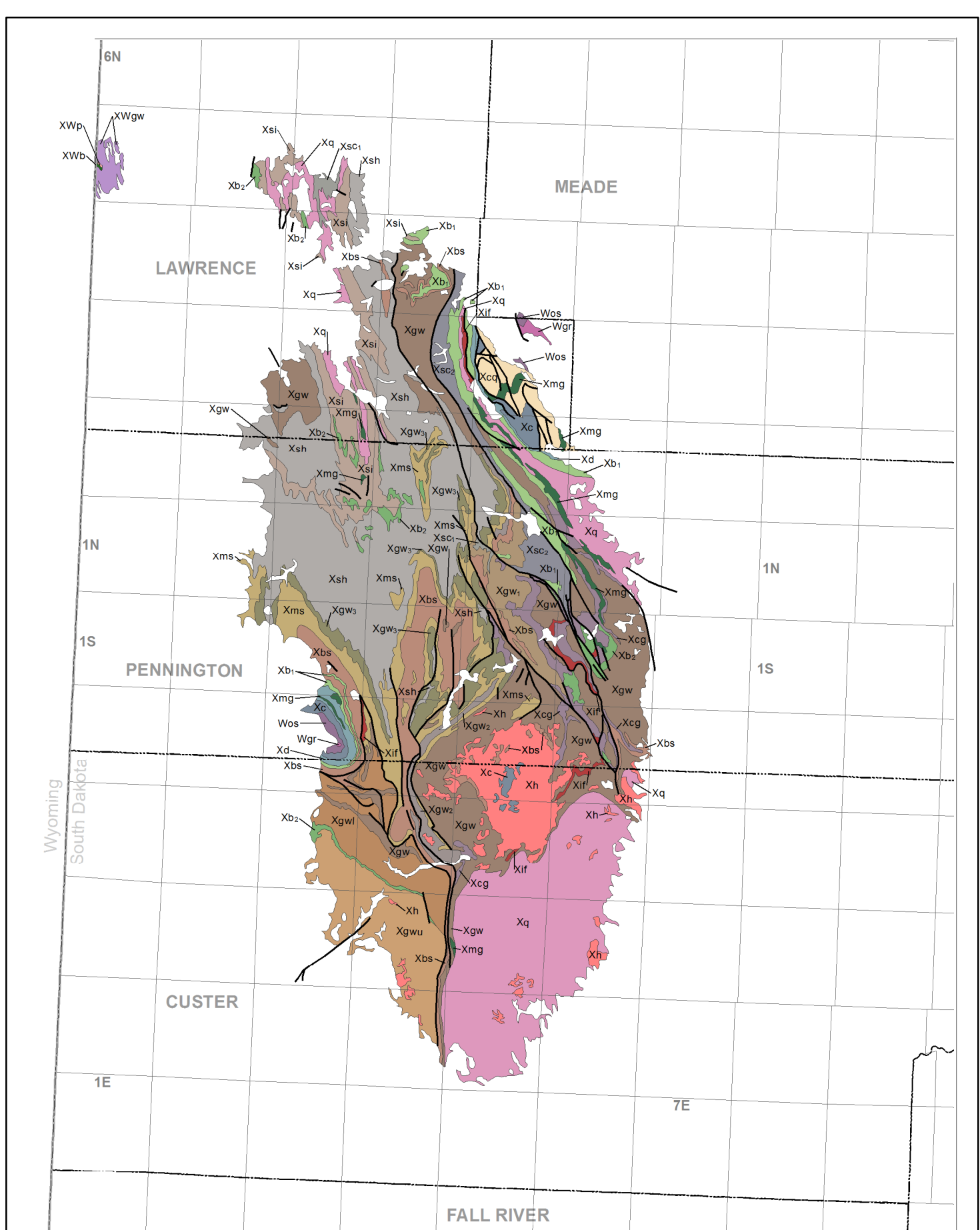
- Basement not intersected
- Schist, phyllite, or slate
- Possible schist, phyllite, or slate
- Schist and granite
- Schist and pegmatite
- Schist and quartzite
- Pegmatite
- Possible pegmatite
- Granite
- Possible granite
- Gabbro
- Amphibolite
- Possible greenstone
- Quartz, quartz vein, or chert
- Quartzite
- Possible quartzite
- Banded iron-formation
- Basement intersected, rock type unknown
- Possible basement intersection

CONTOURS

- 1200 Number is elevation in feet relative to mean sea level
- Major, dashed where uncertain
- Depression, major, dashed where uncertain
- Minor, dashed where uncertain
- Depression, minor, dashed where uncertain

BASE DATA

- Area of Precambrian outcrop in the Black Hills
- City
- County
- Interstate Highway
- Township-Range grid



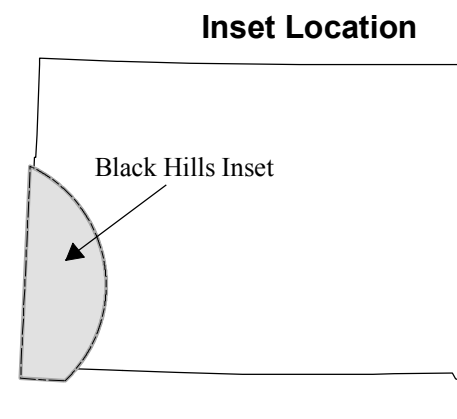
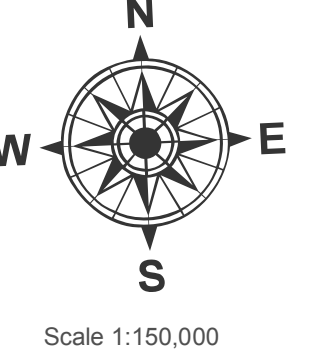
Legend

| | | |
|---|--|--|
| Phanerozoic rocks, surficial deposits, and lake | Upper metagraywacke (Lower Proterozoic) | Metabasalt (Lower Proterozoic) |
| Harvey Peak Granite (Lower Proterozoic) | Lower metagraywacke (Lower Proterozoic) | Metamorphosed dolomite (Lower Proterozoic) |
| Metamorphosed shale (Lower Proterozoic) | Metamorphosed tuffaceous shale (Lower Proterozoic) | Iron-formation (Lower Proterozoic) |
| Metabasalt (Lower Proterozoic) | Metamorphosed black shale (Lower Proterozoic) | Metaconglomerate (Lower Proterozoic) |
| Metagraywacke (Lower Proterozoic) | Metamorphosed carbonaceous shale (Lower Proterozoic) | Metaconglomerate and metaquartzite (Lower Proterozoic) |
| Metagraywacke (Lower Proterozoic) | Metagraywacke (Lower Proterozoic) | Pegmatite (Lower Proterozoic or Upper Archean?) |
| Metagraywacke (Lower Proterozoic) | Metamorphosed conglomerate (Lower Proterozoic) | Metabasalt (Lower Proterozoic or Upper Archean?) |
| Metagraywacke unit 3 (Upper Age) | Metamorphosed siltstone (Lower Proterozoic) | Metagraywacke (Lower Proterozoic or Upper Archean?) |
| Metagraywacke unit 2 (Middle Age) | Metabasalt (Lower Proterozoic) | Granite (Upper Archean) |
| Metagraywacke unit 1 (Lower Age) | Metamorphosed carbonaceous shale (Lower Proterozoic) | Older metasedimentary rocks (Upper Archean) |

Precambrian rock types and major faults within the enclosed Precambrian outcrop area of the Black Hills, South Dakota. Base data defined in Explanation. Figure is modified from Martin and others (2004).

ACKNOWLEDGEMENTS
The author thanks Dan Costello (Geological Survey Program, Department of Environment and Natural Resources) for assistance in the map layout. This map was greatly improved through review and discussions with the following people: Val Chandler (Minnesota Geological Survey), Ray Anderson, Bill Bunker, Caroline Davis, and David Pals (School of Mines & Technology), (3) files of the Geological Survey Program containing geochemical data compiled by R.A. Schoon and a May 1964 letter from R.A. Schoon to "Flace Dome, U.S." listing selected test holes and wells intersecting the Precambrian surface, (4) compilations in 1952 and 1963 by F.V. Steece of test holes and wells intersecting the Precambrian surface, and (5) internal databases developed by the Water Rights Program, Department of Environment and Natural Resources, containing information on a statewide network of observation wells, water-right permits, and well-completion reports.

There were several sources of unpublished information that were used in the development of this map which are acknowledged below. The sources were (1) a database of down-hole geophysical logs developed by the Geological Survey Program, (2) personal files of J.P. Gries to which access was provided by the South Dakota School of Mines & Technology, (3) files of the Geological Survey Program containing geochemical data compiled by R.A. Schoon and a May 1964 letter from R.A. Schoon to "Flace Dome, U.S." listing selected test holes and wells intersecting the Precambrian surface, (4) compilations in 1952 and 1963 by F.V. Steece of test holes and wells intersecting the Precambrian surface, and (5) internal databases developed by the Water Rights Program, Department of Environment and Natural Resources, containing information on a statewide network of observation wells, water-right permits, and well-completion reports.



The Geological Survey Program, Department of Environment and Natural Resources, engages in an ongoing data collection and interpretation process. An outcome of that process is to reflect those interpretations on maps such as this one. Reasonable efforts have been made to ensure that this map accurately reflects the source data used in its preparation. This map is date specific. As additional data become available, geologic interpretations may be revised and the map may be updated by the Geological Survey Program. This map should not be enlarged or otherwise used in an attempt to interpret more detail than can be seen at the 1:150,000 scale.