

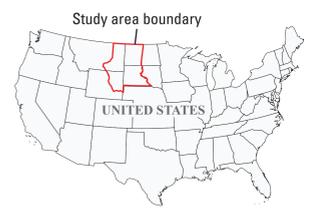
**EXPLANATION**

**Uppermost part of the Madison Group surface elevation**—Plate 3 shows the elevation from sea level for the uppermost horizon of the Madison Group model unit as used in the three-dimensional geologic framework model. Elevation is in meters

2,608.16  
 -3,584.94

**Northern Great Plains model outline**  
 —500—  
**Contour**—Index contour interval 500 meters. Intermediate contour interval 100 meters. Datum is sea level

**Surface structure**



**References Cited**

Gelman, S.F., and Johnson, B.G., 2023, Data release for the 3D petroleum systems model of the Williston Basin, USA: U.S. Geological Survey data release, accessed May 19, 2023, at <https://doi.org/10.5066/955K9101>.

Hooking, C.M., 2013, Elevation contour map of the Madison Limestone Butte, Meade, and Lawrence Counties, South Dakota: Belle Fourche River Watershed Partnership, prepared by RESPEC Consulting & Services, 1 sheet, scale 1:180,000, accessed March 5, 2023, at [https://www.bellefourchewatershed.org/media/bellefourchewatershed/06/06m\\_documents/Groundwater%20Index/Madison\\_Structure.pdf](https://www.bellefourchewatershed.org/media/bellefourchewatershed/06/06m_documents/Groundwater%20Index/Madison_Structure.pdf).

Love, J.D., and Christensen, A.C., comp., 1985, 1985, Geologic map of Wyoming: U.S. Geological Survey, 3 sheets, scale 1:500,000, accessed March 5, 2023, at <https://pubs.usgs.gov/of/of-1985-1000/>. [Rereleased in 2014 by the Wyoming State Geological Survey.]

Martin, J.F., Swyer, J.F., Fahrnbach, M.D., Tomhave, D.W., and Schulz, L.D., 2004, Geologic map of South Dakota: South Dakota Department of Environment and Natural Resources Geological Survey General Map 10, 1 sheet, 20 p., accessed May 19, 2023, at <https://sdcr.usd.edu/pubs/gm10.pdf>. [Also available at <https://www.sdgs.edu/publications/default.aspx>.]

Melick, J.J., 2013, Subsurface description and modeling of geologic heterogeneity in large subsurface datasets—Using temporal and scalar hierarchies, Powder River Basin, WY and MT, USA: Bozeman, Mont., Montana State University, Ph.D. dissertation, 222 p., 2 pls., accessed March 5, 2023, at <https://hdl.handle.net/1791/10000/1751-4882-4462-3ac18-598-07>.

Montana Board of Oil and Gas Conservation, [undated], [MBOGC's Online Oil and Gas Information System]: Montana Board of Oil and Gas Conservation web page, accessed November 2023 at <https://mbogc.com/gis/gisweb/index.cfm>.

North Dakota Department of Mineral Resources, [undated], Premium subscription service [well data]: North Dakota Department of Mineral Resources database, accessed November 2023 at <https://www.dmr.nd.gov/oilgas/subscriptionservice.aspx>.

Redken, J.A., and DeWitt, E., 2008, Maps showing geology, structure, and geophysics of the central Black Hills, South Dakota: U.S. Geological Survey Scientific Investigations Map 2777, 44-p. pamphlet, 2 sheets, accessed November 11, 2023, at <https://doi.org/10.3133/SI2777>.

South Dakota Geological Survey Program, 2022, Oil and gas online database: South Dakota Department of Environment and Natural Resources, accessed October 2022 at [http://www.sdgs.usd.edu/SDOILonline\\_databases.aspx](http://www.sdgs.usd.edu/SDOILonline_databases.aspx).

Spangler, L.R., 2024a, Digital database for a 3D geological model of the Powder River Basin and Williston Basin regions, USA: U.S. Geological Survey data release, accessed March 10, 2024, at <https://doi.org/10.5066/P13R3C3V>.

Spangler, L.R., 2024b, Digital database for a 3D geological model of western South Dakota, USA: U.S. Geological Survey data release, accessed March 10, 2024, at <https://doi.org/10.5066/P90K4K0H>.

Spangler, L.R., Melick, J., and Sweetkind, D.S., 2023, Digital subsurface database of elevation point data and structure contour maps of multiple subsurface units, Powder River Basin, Wyoming and Montana, USA: U.S. Geological Survey data release, accessed March 10, 2024, at <https://doi.org/10.5066/P90K4K0H>.

Spangler, L.R., and Sweetkind, D.S., 2022, Digital subsurface database of previously published well tops, structural features, and contour maps of the Inyan Kara Group, Minnekahta Formation, Minnekahta Formation, Madison Group, and Deadwood Formation, Black Hills region, South Dakota and Wyoming: U.S. Geological Survey data release, accessed March 5, 2023, at <https://doi.org/10.5066/P90K4K0H>.

U.S. Geological Survey, 2021, USGS 1 arc-second digital elevation model: OpenTopography, accessed March 2, 2023, at <https://doi.org/10.5066/955K9101>.

Vaiz, S.M., Porter, K.W., Lonn, J.D., and Lopez, D.A., 2007, Geologic map of Montana: Montana Bureau of Mines and Geology Geologic Map 62-A, 2 sheets, 75 p., scale 1:500,000. [Also available at <https://pubs.mttech.edu/Pubs/SpecialInterest.aspx?tab=01>.]

Wyoming Oil and Gas Conservation Commission, [undated], WYOGCC data: Wyoming Oil and Gas Conservation Commission database, accessed November 11, 2023, at <https://ppp.wyo.gov/>.

Mapped traces of faults and folds shown on this plate were compiled from published State geological survey maps and are presented for illustrative purposes only. Three dimensional renderings of these structures are not shown on the plate, but rather are represented at the structural datum as deviations in the structure-contour surfaces, which were autogenerated from the three-dimensional grid without refinement for cartographic effectiveness. The underlying digital data, rather than the contours on the plate, provide the most accurate and useful representation of the subsurface.

Any use of trade, product, or firm names in this publication is for descriptive purposes only and does not constitute endorsement by the U.S. Government.

Although this information product, for the most part, is in the public domain, it also may contain copyrighted material as indicated in the text. Permission to reproduce copyrighted items must be secured from the copyright owner.

For more information on the USGS—the Federal agency for science about the Earth, its natural and living resources, natural hazards, and the environment—visit <https://www.usgs.gov>.

For an overview of USGS information products, including maps, imagery, and publications, visit <https://www.usgs.gov/> or contact the office at 888-272-4842.

Digital files available at <https://doi.org/10.3133/SI2026013>.

Supporting dataset:  
 Spangler, L.R., 2024, Elevation from sea level for the uppermost horizon of the Madison Group Unit produced in the three-dimensional geologic model, 3 arc-second digital geologic framework model of the northern Great Plains region of Montana, North Dakota, South Dakota, and Wyoming, USA: U.S. Geological Survey Scientific Investigations Report 2026-5127, 51 p., <https://doi.org/10.3133/SI2026013>.

Additional data in this publication:  
 Spangler, L.R., 2024a, Digital database for a 3D Geological Model of the Powder River Basin and Williston Basin Regions, USA: U.S. Geological Survey data release, accessed March 10, 2024, at <https://doi.org/10.5066/P13R3C3V>.

Spangler, L.R., 2024b, Digital database for a 3D Geological Model of western South Dakota, USA: U.S. Geological Survey data release, accessed March 10, 2024, at <https://doi.org/10.5066/P90K4K0H>.

Data from Esri and its licensors, copyright, 2024  
 Albers Equal Area Conic projection, UTM Spheroid USA  
 North American Datum of 1983



**Elevation from Sea Level for the Uppermost Horizon of the Madison Group Unit Produced in the Three-Dimensional Geologic Model**

By  
**Leland Spangler**  
 2026