

EXPLANATION

Uppermost part of the Greenhorn Formation surface elevation—Plate 6 shows the elevation from sea level for the uppermost horizon of the Greenhorn Formation model unit as used in the three-dimensional geologic framework model. Elevation is in meters

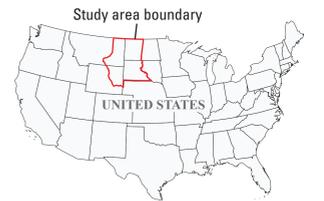
1,967.33

-2,675.60

Northern Great Plains model outline

Contour—Index contour interval 500 meters. Intermediate contour interval 100 meters. Datum is sea level

Surface structure



References Cited

Lichtner, D.T., Tozer, R.N., Wrage, J.M., and Lynds, R.M., 2020, Upper Cretaceous strata in the Powder River Basin—Formation top, database, structure and thickness contour maps, and associated well data. Wyoming State Geological Survey Open File Report 2020-9, 50 p., accessed May 19, 2023, at <https://pubs.usgs.gov/ofr/2020/9/>.

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

Martin, J.E., Sawyer, J.F., Fahrmbach, M.D., Tomhave, D.W., and Schale, L.D., 2004, Geologic maps 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://ndser.nd.gov/pubs/gcm10.pdf>. [Also available at <https://www.sdsu.edu/publications/default.aspx>.]

Montana Board of Oil and Gas Conservation, [undated], [MBOG's Online Oil and Gas Information System]. Montana Board of Oil and Gas Conservation web page, accessed November 2023 at <https://bogsppp.dnr.mt.gov/Gainline/Default.aspx>.

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/nddmr/minres/index.asp>.

Rodden, J.A., and DeWitt, E., 2006, 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 databases: South Dakota Department of Environment and Natural Resources, accessed October 2022 at http://www.sdgs.gov/SDGSI/online_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, <https://doi.org/10.5066/P1R3SCBV>.

Spangler, L.R., 2024b, Digital database for a 3D geological model of western South Dakota, USA: U.S. Geological Survey data release, <https://doi.org/10.5066/P1R3SCBV>.

U.S. Geological Survey, 2021, USGS 1 arc-second digital elevation model: OpenTopography, accessed March 2, 2023, at <https://doi.org/10.5069/G91X19WN>.

Vukic, 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 CC-A, 2 sheets, 75 p., scale 1:500,000. [Also available at <https://mbmg.mtech.edu/Pubs/SpecialInterest.aspx?cat=6>.]

Wyoming Oil and Gas Conservation Commission, [undated], WYOGCC data: Wyoming Oil and Gas Conservation Commission database, accessed November 11, 2023, at <https://open.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 imply 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 store at 1-888-284-2421.

Digital files available at <https://doi.org/10.3133/SI20260517>.

Supporting citation:
 Spangler, L.R., 2026, Elevation from sea level for the uppermost horizon of the Greenhorn Formation unit produced in the three-dimensional geologic model of the northern Great Plains region of Montana, North Dakota, South Dakota, and Wyoming. U.S. Geological Survey Scientific Investigations Report 2026-5127, 1 p., <https://doi.org/10.3133/SI20260517>.

Associated data for 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, <https://doi.org/10.5066/P1R3SCBV>.

Spangler, L.R., 2024b, Digital data for a 3D Geological Model of western South Dakota, USA: U.S. Geological Survey data release, <https://doi.org/10.5066/P1R3SCBV>.

For more information concerning the research in this report, contact the Center Director, USGS Science and Environmental Data Science Center, Box 25048, Mail Stop 985, Denver, CO 80225, (303) 733-5244. © and the Department of the Interior and Environmental Data Science Center website at <https://pubs.usgs.gov/ofr/2026/5127/>. Publishing support provided by the USGS Science Publishing Network, Denver and Baltimore Publishing Service Centers.

ISSN 2204-8226 (online)
<https://doi.org/10.3133/SI20260517>

Elevation from Sea Level for the Uppermost Horizon of the Greenhorn Formation Unit Produced in the Three-Dimensional Geologic Model

By
Leland Spangler
 2026

Base from Esri and its licensors, copyright, 2024. Albers Equal Area Conic projection, USGS Contiguous USA North American Datum of 1983.

