

EXPLANATION

Uppermost part of the Inyan Kara Group surface elevation—Plate 5 shows the elevation from sea level for the uppermost horizon of the Inyan Kara Group model unit as used in the three-dimensional geologic framework model. Elevation is in meters

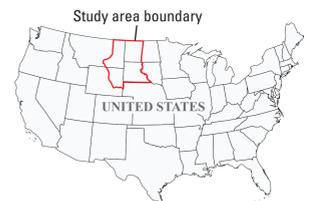
2,513.66

-3,063.76

Northern Great Plains model outline

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

Surface structure



References Cited

Bader, J.W., 2017, Mapping sandstones of the Inyan Kara Formation for saltwater disposal in North Dakota: North Dakota Department of Mineral Resources, Geo News, North Dakota Geological Survey Investigations, v. 44, no. 1, p. 6-9, accessed March 5, 2023, at <https://www.dmr.nd.gov/ndgs/geo-news/investigation-2017/Inyan-Kara%20Sandstone%20in%20the%20Inyan-Kara%20Formation%20for%20Saltwater%20Disposal%20in%20North%20Dakota.pdf>.

Gelman, S.E., 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/P9N7030T>.

Hosking, C.M., 2013, Elevation contour map of the Inyan Kara Group, Bartle, Meade, and Lawrence Counties, South Dakota: Belle Fourche River Watershed Partnership, prepared by R4SPIC Consulting & Services, 1 sheet, scale 1:100,000, accessed May 19, 2023, at https://www.bellefourchewatershed.org/media/bellefourche/watershed/documents/Groundwater%20elder%20Inyan-Kara_Structure.pdf.

Lisbee, A.L., 1985, Tectonic map of the Black Hills uplift, Montana, Wyoming and South Dakota: Geological Survey of Wyoming, Map Series 13, 1 sheet, scale 1:250,000, accessed March 5, 2023, at <https://sales.wy.gov/wygeo/tectonic-map-of-the-black-hills-uplift-mont-wyoming-and-south-dakota-1985/>.

Love, J.D., and Christiansen, A.C., comps., 1985, Geologic map of Wyoming: U.S. Geological Survey, 3 sheets, scale 1:500,000, accessed March 5, 2023, at <https://sales.usgs.gov/wygeo/geologic-map-of-wyoming-1985/> [Revised in 2014 by the Wyoming State Geological Survey].

Martin, J.E., Swayer, J.E., Fahrenbach, M.B., 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://doi.org/10.26907/1010-1010> [Also available at <https://www.sdgs.edu/publications/default.aspx>].

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://ogapps.dnr.gov/dataset/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/ndgs/premium-subscription.aspx>.

Riddon, J.A., and DeWitt, E., 2008, Map 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/sim2777>.

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.edu/ndgs/online_databases.aspx.

Spangler, L.R., 2024a, Digital database for a 3D geologic model of the Powder River Basin and Williston Basin regions, USA: U.S. Geological Survey data release, <https://doi.org/10.5066/P1R3SC3V>.

Spangler, L.R., 2024b, Digital database for a 3D geologic model of western South Dakota, USA: U.S. Geological Survey data release, <https://doi.org/10.5066/P9L84Q11>.

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, Minnehaha Formation, Minnehaha 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/P9H19W7N>.

U.S. Geological Survey, 2021, USGS 1 arc-second digital elevation model: OpenTopography, accessed March 2, 2023, at <https://doi.org/10.5066/P9H19W7N>.

Vuk, 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 42-A, 2 sheets, 75 p., scale 1:500,000, [also available at <https://ibmg.mttech.edu/Pubs/SpecialInterest/asptgic/ibmg-0/>].

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

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Digital files available at <https://doi.org/10.3133/sir2026-5127>.

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Spangler, L.R., 2024b, Digital data for a 3D Geologic Model of western South Dakota, USA: U.S. Geological Survey data release, <https://doi.org/10.5066/P9L84Q11>.

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

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