WB_isopach

Type   File Geodatabase Feature Class

Tags   spatial database, GIS, potash, permissive tract, mineral resources, isopach map, Elk Point Basin, Canada, United States

Summary

WB_isopach -- Spatial database for isopach map of the White Bear Member of the Prairie Evaporite, Elk Point Group, in the Elk Point Basin, Canada and U.S. (in Esri file geodatabase feature class format).

The spatial database was created for use in a geographic information system (GIS) as part of a global potash resource assessment by the U.S. Geological Survey.

Description

The Elk Point Basin is an evaporite basin of Middle Devonian age that contains a significant portion of the world's potash resources. Potash-bearing salt is concentrated in the upper 100 meters of the Prairie Evaporite in the Patience Lake, Belle Plaine, White Bear, and Esterhazy Members. Known potash mineralization is concentrated in the southeastern portion of the Elk Point Basin mainly in Saskatchewan and extending short distances into adjacent parts of Alberta, Manitoba, North Dakota, and Montana.

Permissive tracts were delineated by the extent of each member of the Prairie Evaporite where the member is at least 1 meter in thickness and less than 3 kilometers from the surface.

Potash resources were assessed for each tract using a method based on an enhanced geometric analysis of the likely spatial distribution of potash mineralization. We used Monte Carlo simulations to estimate missing or incomplete variables such as density, average grade, and geologic loss due to salt dissolution to calculate the distribution and abundance of estimated undiscovered potash (as K_2O). Potash grades were calculated using both historic (1950s and 1960s) and recent (2007–2011) drill hole analyses. The mean estimated undiscovered K_2O resource (which includes sylvite and carnallite) in these tracts is 864 billion metric tons.

Preferred reference:

Cocker, M.D., Orris, G.J., Dunlap, P., Yang, C., and Bliss, J.D., 2023, Geology and undiscovered resource assessment of the potash-bearing, Middle Devonian (Givetian), Prairie Evaporite, Elk Point Basin, Canada and United States: U.S. Geological Survey Scientific Investigations Report 2010–5090–CC, 145 p. and data files, https://doi.org/10.3133/sir20105090cc.

Credits

Mark Cocker interpreted the data and is responsible for the scientific content.
Pamela Dunlap processed the digital data, built the spatial database, and generated volume data.
Deborah A. Briggs rectified scanned images of paper maps to produce georectified TIFF images (GeoTIFFs) for use in a GIS. She also digitized initial areas for extent of carnallite.

Leila Gass digitized areas of known salt solutioning from the GeoTIFF images and assisted in digitizing revisions to isopachs.

Use limitations

None. The U.S. Geological Survey (USGS) provides these geographic data "as is." The USGS makes no guarantee or warranty concerning the accuracy of information contained in the geographic data. The USGS further makes no warranties, either expressed or implied as to any other matter whatsoever, including, without limitation, the condition of the product, or its fitness for any particular purpose. The burden for determining fitness for use lies entirely with the user. Although these data have been processed successfully on computers of the USGS, no warranty, expressed or implied, is made by the USGS regarding the use of these data on any other system, nor does the fact of distribution constitute or imply such warranty.

Extent

West   -106.645865   East   -100.986197
North 52.124836   South 48.631556

Scale Range

Maximum (zoomed in)   1:5,000
Minimum (zoomed out)   1:150,000,000

Topics and Keywords ▶

Content type   ⇔ Downloadable Data

Citation ▶

Title   ⇔ WB_isopach
Alternate titles   Generalized isopach map of the White Bear Member of the Prairie Evaporite

Presentation formats   ⇔ digital map
FGDC geospatial presentation format   map

Series
    Name   Scientific Investigations Report
    Issue   2010-5090-CC
Collection title   Geology and undiscovered resource assessment of the potash-bearing, Middle Devonian (Givetian), Prairie Evaporite, Elk Point Basin, Canada and United States

Other citation details
Cocker, M.D., Orris, G.J., Dunlap, P., Yang, C., and Bliss, J.D., 2023, Geology and undiscovered resource assessment of the potash-bearing, Middle Devonian (Givetian), Prairie Evaporite, Elk Point Basin, Canada and United States: U.S. Geological Survey Scientific Investigations Report 2010–5090–CC, 145 p. and data files, https://doi.org/10.3133/sir20105090cc.

Resource Details ▶

Dataset languages   ⇔ English (UNITED STATES)

Spatial representation type ⇔ vector

Processing environment ⇔ Microsoft Windows 7 Version 6.1 (Build 7601) Service Pack 1; Esri ArcGIS 10.2.1.3497

Credits
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ArcGIS item properties
Name ⇔ WB_isopach
Location ⇔ file://\\IGSWZEWMWSPDUN2\E$\ElkPoint_revised2014April\ElkPoint\ElkPoint_potash.gdb
Access protocol ⇔ Local Area Network

Extents ▶

Extent
Geographic extent
Bounding rectangle
Extent type
Extent used for searching
West longitude ⇔ -106.645865
East longitude ⇔ -100.986197
North latitude ⇔ 52.124836
South latitude ⇔ 48.631556
Extent contains the resource ⇔ Yes

Extent in the item's coordinate system
westBL ⇔ -729514.528300
eastBL ⇔ -365441.349300
southBL ⇔ 997801.547100
northBL ⇔ 1347447.526200
exTypeCode ⇔ Yes

Resource Maintenance ▶

Resource maintenance
Update frequency not planned

Resource Constraints ▶

Constraints
Limitations of use
None. The U.S. Geological Survey (USGS) provides these geographic data "as is." The USGS makes no guarantee or warranty concerning the accuracy of information contained in the geographic data. The USGS further makes no warranties, either expressed or implied as to any other matter whatsoever, including, without limitation, the condition of the product, or its fitness for any particular purpose. The burden for determining fitness for use lies entirely with the user. Although these data have been processed successfully

Spatial Reference ▶

ArcGIS coordinate system
    Type   ⇔ Projected
    Geographic coordinate reference   ⇔ GCS_North_American_1983
    Projection   ⇔ Canada_Albers_Equal_Area_Conic
    Coordinate reference details   ⇔
       ProjectedCoordinateSystem
          WKID   102001
          XOrigin   -13825800
          YOrigin   -7913700
          XYScale   10000
          ZOrigin   -100000
          ZScale   10000
          MOrigin   -100000
          MScale   10000
          XYTolerance   0.001
          ZTolerance   0.001
          MTolerance   0.001
          HighPrecision   true
          LatestWKID   102001
          WKT
          PROJCS["Canada_Albers_Equal_Area_Conic",GEOGCS["GCS_North_American_1983",DATUM["D_North_Amer

Reference system identifier
    Value   ⇔ 102001
    Codespace   ⇔ ESRI
    Version   ⇔ 10.2.1

Spatial Data Properties ▶

Vector ▶
    Level of topology for this dataset   ⇔ geometry only

    Geometric objects
       Feature class name   WB_isopach
       Object type   ⇔ composite
       Object count   ⇔ 142

ArcGIS Feature Class Properties ▶
    Feature class name   WB_isopach
       Feature type   ⇔ Simple
       Geometry type   ⇔ Polygon
       Has topology   ⇔ FALSE
       Feature count   ⇔ 142
       Spatial index   ⇔ TRUE

Linear referencing   ⇔FALSE

Lineage ▶

Lineage statement
Total thickness of each member of the Prairie Evaporite was determined from well and drill-hole data in the feature class ElkPt_thickness, augmented with data from Fuzesy (1982). These data were used to construct isopach maps of each member (see the feature classes BP_isopach, ES_isopach, PL_isopach, and WB_isopach).

Process step ▶
When the process occurred   2011-11-14   00:00:00
Description
Several steps were taken to process the data to create the isopach maps. Initially, data from drill holes and wells in Canada were used to create a continuous raster surface (using the natural neighbors interpolation algorithm in ArcGIS 9.3) from which contours (line features) were computer generated at 2-m intervals of thickness (starting at 1 m). Additional data from hand-drawn isopach maps of potash-bearing units in the United States were then digitized and incorporated into the existing datasets of thickness contours for Canada. These line features were converted to polygon features which were then attributed for minimum, maximum, and average thickness for each member of the Prairie Evaporite. Areas of known salt solutioning and areas representing thickness less than 1 m were removed; the resultant isopach map datasets were proofed against the drill-hole and well dataset, and areas of salt solutioning were manually revised to exclude data points where thickness was greater than or equal to 1 m.

Source data ▶
Description
ElkPt_thickness -- feature class for thickness, which is included in the ElkPoint.gdb.

Source medium name   online link

Source data ▶
Description
Fuzesy, Anne, 1982, Isopach maps of the White Bear and Esterhazy Members, fig. 6b in Potash in Saskatchewan: Saskatchewan Geological Survey Report 181, 44 p.

Source medium name   hardcopy—drawing on paper

Distribution ▶

Distributor ▶
Contact information - distributor
Organization's name   U.S. Geological Survey

Contact information ▶
Phone
Voice   1-888-275-8747
Voice   1-888-ASK-USGS
Address
Type   postal
Delivery point   Denver Federal Center, P.O. Box 25286

City   Denver
Administrative area   Colorado
Postal code   80225
e-mail address   infoservices@usgs.gov

Transfer options
   Transfer size   ⇔ 0.506

Transfer options
   Online source
      Online location (URL)   https://doi.org/10.3133/sir20105090cc
      Function performed   download

Distribution format
   Name   ⇔ File Geodatabase Feature Class
   Version   ArcGIS 10
   Specification   GIS_ElkPt_potash.zip

   File decompression technique   To open a zipped file, double-click on the zipped file listed in My Computer or Windows Explorer, drag and drop the zipped file onto WINZIP, or use the standard Open dialogue box.
   Format information content   ElkPt_potash.gdb and metadata

Fields ▶

Details for object WB_isopach ▶
   Type   ⇔ Feature Class
   Row count   ⇔ 142
   Definition
   Generalized isopach map of the White Bear Member of the Prairie Evaporite

   Field OBJECTID ▶
      Alias   ⇔ OBJECTID
      Data type   ⇔ OID
      Width   ⇔ 4
      Precision   ⇔ 0
      Scale   ⇔ 0

      Field description   ⇔
      Internal feature number.

      Description source   ⇔
      ESRI

      Description of values   ⇔
      Sequential unique whole numbers that are automatically generated.

   Field Shape ▶
      Alias   ⇔ Shape
      Data type   ⇔ Geometry

Width ⇔ 0
Precision ⇔ 0
Scale ⇔ 0

Field description
Feature geometry.

Description source
ESRI

Description of values
Coordinates defining the features.

Field Thick_min ▶
    Alias ⇔ Thick_min
    Data type ⇔ SmallInteger
    Width ⇔ 2
    Precision ⇔ 0
    Scale ⇔ 0

    Field description
    THICKNESS MINIMUM -- Minimum thickness of unit

    Range of values
        Minimum value   1
        Maximum value   9
        Units of measure   meters

Field Thick_max ▶
    Alias ⇔ Thick_max
    Data type ⇔ SmallInteger
    Width ⇔ 2
    Precision ⇔ 0
    Scale ⇔ 0

    Field description
    THICKNESS MAXIMUM -- Maximum thickness of unit

    Range of values
        Minimum value   3
        Maximum value   11
        Units of measure   meters

Field Thk_range ▶
    Alias ⇔ thk_range
    Data type ⇔ String
    Width ⇔ 20
    Precision ⇔ 0
    Scale ⇔ 0

Field description
THICKNESS RANGE -- Range in thickness

List of values
   Value   1 to 3 m

   Value   3 to 5 m

   Value   5 to 7 m

   Value   7 to 9 m

   Value   9 to 11 m

Field Thick_aver ▶
  Alias   ⇔ Thick_aver
  Data type   ⇔ SmallInteger
  Width ⇔ 2
  Precision ⇔ 0
  Scale ⇔ 0

Field description
THICKNESS AVERAGE -- Average (mean) thickness of the unit.

Range of values
   Minimum value   2
   Maximum value   10
   Units of measure   meters

Field Coded_ID ▶
  Alias   ⇔ Coded_ID
  Data type   ⇔ String
  Width ⇔ 15
  Precision ⇔ 0
  Scale ⇔ 0

Field description
CODED IDENTIFIER -- Coded, unique identifier assigned to permissive tract

List of values
   Value   003sbK0001c
   Description   permissive tract for the White Bear Member of the Prairie Evaporite in the Elk Point Basin, North America

Field Shape_Length ▶
  Alias   ⇔ Shape_Length
  Data type   ⇔ Double
  Width ⇔ 8

Precision ⇔ 0
Scale ⇔ 0

Field description ⇔
Length of feature in internal units.

Description source ⇔
ESRI

Description of values ⇔
Positive real numbers that are automatically generated.

Field Shape_Area ▶
   Alias ⇔ Shape_Area
   Data type ⇔ Double
   Width ⇔ 8
   Precision ⇔ 0
   Scale ⇔ 0

   Field description ⇔
   Area of feature in internal units squared.

   Description source ⇔
   ESRI

   Description of values ⇔
   Positive real numbers that are automatically generated.

Metadata Details ▶

Metadata language ⇔ English (UNITED STATES)
Metadata character set ⇔ utf8 - 8 bit UCS Transfer Format

Scope of the data described by the metadata ⇔ dataset
Scope name ⇔ dataset

Last update ⇔ 2023-09-12

ArcGIS metadata properties
   Metadata format ArcGIS 1.0
   Standard or profile used to edit metadata FGDC
   Metadata style FGDC CSDGM Metadata

   Created in ArcGIS for the item 2011-11-14 08:56:31
   Last modified in ArcGIS for the item 2023-09-12 14:37:30

   Automatic updates
      Have been performed Yes
      Last update 2014-04-07 15:14:29

Metadata Contacts ▶

Metadata contact - author
    Individual's name   Pamela Dunlap
    Organization's name   U.S. Geological Survey
    Contact's position   Geologist

       Contact information ▶
      Phone
        Voice   1-520-670-5573
      Address
        Type   postal
        Delivery point   520 N Park Ave., Ste. 355
        City   Tucson
        Administrative area   Arizona
        Postal code   85719
        Country   US
        e-mail address   pdunlap@usgs.gov

Thumbnail and Enclosures ▶

Thumbnail
    Thumbnail type
      Image file