Ground-water Regions of the Conterminous United States

Data format: Shapefile

File or table name: GWRegions_US

Coordinate system: Geographic

Theme keywords: ground water, region, aquifer

Abstract: This data set describes ground-water regions in the United States defined by the U.S. Geological Survey. These ground-water regions are useful for dividing the United States into areas of roughly similar hydrologic characterstics and water-use patterns. These regions are very generalized and were developed from a illustration published at a scale of approximately 1:20 million.

FGDC and ESRI Metadata:

- Identification Information
- Data Quality Information
- Spatial Data Organization Information
- Spatial Reference Information
- Entity and Attribute Information
- Distribution Information
  - Distributor 1
  - Distributor 2
- Metadata Reference Information
- Binary Enclosures

Metadata elements shown with blue text are defined in the Federal Geographic Data Committee's (FGDC) *Content Standard for Digital Geospatial Metadata (CSDGM)*. Elements shown with green text are defined in the *ESRI Profile of the CSDGM*. Elements shown with a green asterisk (*) will be automatically updated by ArcCatalog. ArcCatalog adds hints indicating which FGDC elements are mandatory; these are shown with gray text.

Identification Information:

Citation:

Citation information:

Originators: Clawges, Rick, Price, Curtis

Title:

Ground-water Regions of the Conterminous United States

***File or table name:** GWRegions_US

Publication date: 1999

Edition: 1.0

***Geospatial data presentation form:** vector digital data

Series information:

Series name: Open-File Report
Issue identification: 99-77

Publication information:

Publication place: Rapid City, SD
Publisher: U.S. Geological Survey

Online linkage: http://water.usgs.gov/lookup/getspatial?ofr99-77_gwregion

Description:

Abstract:

This data set describes ground-water regions in the United States defined by the U.S. Geological Survey. These ground-water regions are useful for dividing the United States into areas of roughly similar hydrologic characterstics and water-use patterns. These regions are very generalized and were developed from a illustration published at a scale of approximately 1:20 million.

Purpose:

This data set is a generalized representation of ground-water areas in the United States and was created for use in the analysis of ground-water quality data on volatile organic compounds (VOCs) by the U.S. Geological Survey (USGS) National Water-Quality Assessment Program (NAWQA) VOC National Synthesis Team. Polygons from this data set were used with common ranges of hydraulic characteristics provided in the Entity_and_Attribute_Overview below to relate ground-water resources with NAWQA study areas on a broad scale.

Supplemental information:

One source map for this data set is figure 12, from p. 17 of Heath (1984).

Coastlines and political boundaries are modified from a digital version of U.S. Geological Survey 1:2,000,000 county boundaries (USGS, 1984).

REVIEWS APPLIED TO DATA

This electronic report was subjected to the same review standard that applies to all U.S. Geological Survey reports. Reviewers were asked to check the topological consistency, tolerances, attribute frequencies and statistics, projection, and geographic extent. Reviewers were given a paper copy of the map from p. 17 of Heath (1984) along with the digital data set to verify the linework and attributes. The reviewers checked the metadata and a_readme.1st files for completeness and accuracy.

RELATED SPATIAL AND TABULAR DATA SETS

The data set GWREGUW is similar to this data set (GWREGION) but also contains polygons for unconsolidated watercourses taken from the AQUIF75M data set from the National Atlas of the United States (U.S. Geological Survey, 1970).

REFERENCES CITED

Environmental Systems Research Institute, Inc. (ESRI), 1997, Arc/INFO 7.1.1 Help, Redlands, California, [on-line documentation].

Heath, R.C., 1984, Ground-Water Regions of the United States: U.S. Geological Survey Water-Supply Paper 2242, 78 p.

Lanfear, K.J., 1984, Digital map of counties and county equivalents in the conterminous United States: U.S. Geological Survey data available on the World Wide Web, accessed July 21, 1998, at URL http://water.usgs.gov/lookup/getspatial?county2m

U.S. Geological Survey, 1970, The National Atlas of the United States of America, Washington, D.C., U.S. Government Printing Office, 417 p.

NOTES

The accuracy of this data set is extremely limited. No map projection or registration points were included in the source map (figure 12 from Heath (1984)). The map projection appeared to be Albers Conical Equal Area, so an Albers-projected data set of U.S. states was used to define registration points between a scanned image of the figure and the state boundary linework.

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

Although this data set has been used by the U.S. Geological Survey, U.S. Department of the Interior, no warranty expressed or implied is made by the U.S. Geological Survey as to the accuracy of the data and related materials.

The act of distribution shall not constitute any such warranty, and no responsibility is assumed by the U.S. Geological Survey in the use of this data, software, or related materials.

Although this Federal Geographic Data Committee-compliant metadata file is intended to document the data set in nonproprietary form, as well as in ARC/INFO format, this metadata file may include some ARC/INFO-specific terminology.

***Language of dataset:** en

Time period of content:

Time period information:

Single date/time:

Calendar date: 1984

Currentness reference:

The data is based on the map in Heath's report published in 1984.

Status:
Progress: Complete
Maintenance and update frequency: None planned.

Spatial domain:
Bounding coordinates:
*__West bounding coordinate:__ -124.733887
*__East bounding coordinate:__ -66.982723
*__North bounding coordinate:__ 49.371736
*__South bounding coordinate:__ 25.120687

Local bounding coordinates:
*__Left bounding coordinate:__ -124.733887
*__Right bounding coordinate:__ -66.982723
*__Top bounding coordinate:__ 49.371736
*__Bottom bounding coordinate:__ 25.120687

Keywords:
Theme:
Theme keywords: ground water, region, aquifer
Theme keyword thesaurus: None

Place:
Place keywords: Conterminous 48 United States
Place keyword thesaurus: None

Access constraints: None
Use constraints:
None

Point of contact:
Contact information:
Contact person primary:
Contact person: Curtis V. Price
Contact organization: U.S. Geological Survey
Contact position: Physical Scientist

Contact address:
Address type: mailing address
Address:
1608 Mountain View Rd
City: Rapid City
State or province: South Dakota
Postal code: 57702
Country: United States of America

Contact voice telephone: (605) 355-4560
Contact facsimile telephone: (605) 355-4523

Contact electronic mail address: cprice@usgs.gov

Contact instructions:
none

Data set credit:

Compilation of the data sets was supported by the National Water-Quality Assessment (NAWQA) Program of the U.S. Geological Survey. The objectives of the NAWQA Program are to: (1) describe current water-quality conditions for a large part of the Nation's freshwater streams, rivers, and aquifers, (2) describe how water quality is changing over time, and (3) improve the understanding of the primary natural and anthropogenic factors that affect water-quality conditions. National analysis of data, based on aggregation of comparable information obtained from across the United States, is a major component of the NAWQA Program. These data sets were created in support of NAWQA national data analysis activities.

Security information:
Security classification system: Public
Security classification: Unclassified
Security handling description: None

***Native dataset format:** Shapefile
***Native data set environment:**
Microsoft Windows XP Version 5.1 (Build 2600) Service Pack 2; ESRI ArcCatalog 9.1.0.780

Cross reference:
Citation information:
Originators: Clawges, Rick, and Price, Curtis

Title:
Ground-water regions of the conterminous United States with unconsolidated watercourses

Publication date: 1998
Edition: 1.0
Geospatial data presentation form: map

Publication information:
Publication place: Rapid City, SD
Publisher: U.S. Geological Survey

Online linkage: http://water.usgs.gov/lookup/getspatial?ofr99-77_gwreguw

Larger work citation:
Citation information:
Originators: Clawges, Rick and Price, Curtis

Title:
Digital data sets describing principal aquifers, surficial geology, and ground-water regions of the conterminous United States

Publication date: 1999
Edition: 1.0

Series information:
Series name: Open-File Report
Issue identification: 99-77

Publication information:

Publication place: Rapid City, SD
Publisher: U.S. Geological Survey

Online linkage: http://water.usgs.gov/pubs/ofr/ofr99-77/index.html

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Data Quality Information:

Logical consistency report:
Polygon and chain-node topology present.

Completeness report:
This data set includes all of the ground-water region boundaries presented on Figure 12 on p. 17 of Heath (1984).

Positional accuracy:
Horizontal positional accuracy:
Horizontal positional accuracy report:
No tests performed, except a visual check to see how well the data set lines corresponded to those on the paper map.

Lineage:
Source information:
Source citation:
Citation information:
Originators: Ralph C. Heath

Title:
Ground-Water Regions of the United States

Publication date: 1984
Geospatial data presentation form: map

Series information:
Series name: USGS Water Supply Paper
Issue identification: 2242

Publication information:
Publication place: Reston, VA
Publisher: U.S. Geological Survey

Source scale denominator: 20000000
Type of source media: paper
Source citation abbreviation:
none
Source contribution:
Ground-water region polygon boundaries from Fig. 12 on page 17 of the report.

Source time period of content:
Time period information:
Single date/time:
Calendar date: 1984

Source currentness reference:
publication date

Source information:
Source citation:
Citation information:
Originators: Lanfear, K.J.

Title:
Counties and county equivalents in the conterminous United States

Publication date: 19840816
Geospatial data presentation form: map

Publication information:
Publication place: Reston, Virginia, USA
Publisher: U.S. Geological Survey

Online linkage: http://water.usgs.gov/lookup/getspatial?county2m

Type of source media: online
Source citation abbreviation:
county2m
Source contribution:
US boundary and coastlines

Source time period of content:
Time period information:
Single date/time:
Calendar date: 19840816

Source currentness reference:
as of 1983

Process step:
Process description:
The source map was scanned to produce an image file. ARC/INFO software and commands (Environmental Systems Research Institute, Inc., 1997) were used to convert the image file to a coverage. ARC/INFO commands and modules are shown below in capitals.

Step 1. Converted image to a grid using IMAGEGRID command.

Step 2. Used GRID functions to select only grid cells corresponding to ground-water region boundaries. This was done using geometric functions.

Step 3. Raster to vector conversion using GRIDLINE command.

Step 4. Edited line coverage using ARCEDIT module. Removed dangles, added and deleted arcs.

Step 5. Transformed coordinate data from inches to Albers Conical Equal Area, North American Datum of 1927 (NAD27) using

TRANSFORM command. CONTROLPOINTS command was used to register points on the image to points on the coverage /home/vocgis/lib/pol/stategen. Details of CONTROLPOINTS:

```
>Scale (X,Y) = (683001.735,672871.472)  Skew (degrees) = (-0.139)
>Rotation (degrees) = (-0.627)  Translation = (-2725624.058,9074340.876)
>RMS Error (input,output) = (0.033,22644.965)
```

Added United States boundary using coverage /home/vocgis/lib/pol/stategen, which is a generalized version of county2m coverage.

Step 6. Used CLEAN to build polygon topology. Used fuzzy tolerance of 1.0 and dangle length of 0.

Step 7. Added attribute features to polygons.

Process date: 19970606

Process step:

Process description:

Step 8. GENERALIZEd coverage with a weed tolerance of 1000 meters using the POITREMOVE method for line generalization. Rebuilt topology.

Process date: 19981026

Process step:

Process description:

Step 9. Used UNSPLIT in Arcedit to remove unnecessary pseudo nodes.

Step 10. Rebuild topolgy

Step 11. Copied coverage from DOUBLE to SINGLE precision and CLEANed. Used fuzzy tolerance of 1.0 and dangle length of 0.

Step 12. Used RENODE to sequentially number nodes.

Process date: 19981028

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Spatial Data Organization Information:

***Direct spatial reference method:** Vector

Point and vector object information:

SDTS terms description:

***Name:** GWRegions_US

***SDTS point and vector object type:** G-polygon

***Point and vector object count:** 34

SDTS terms description:

SDTS point and vector object type: String

Point and vector object count: 78

SDTS terms description:
SDTS point and vector object type: GT-polygon composed of chains
Point and vector object count: 35

ESRI terms description:
*__Name:__ GWRegions_US
*__ESRI feature type:__ Simple
*__ESRI feature geometry:__ Polygon
*__ESRI topology:__ FALSE
*__ESRI feature count:__ 34
*__Spatial index:__ TRUE
*__Linear referencing:__ FALSE

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Spatial Reference Information:

Horizontal coordinate system definition:
Coordinate system name:
*__Geographic coordinate system name:__ GCS_North_American_1983

Geographic:
*__Latitude resolution:__ 0.000001
*__Longitude resolution:__ 0.000001
*__Geographic coordinate units:__ Decimal degrees

Geodetic model:
*__Horizontal datum name:__ North American Datum of 1983
*__Ellipsoid name:__ Geodetic Reference System 80
*__Semi-major axis:__ 6378137.000000
*__Denominator of flattening ratio:__ 298.257222

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Entity and Attribute Information:

Detailed description:
*__Name:__ GWRegions_US

Entity type:
*__Entity type label:__ GWRegions_US
*__Entity type type:__ Feature Class
*__Entity type count:__ 34

Attribute:
*__Attribute label:__ FID
*__Attribute alias:__ FID
*__Attribute definition:__
Internal feature number.
*__Attribute definition source:__
ESRI

*Attribute type: OID
*Attribute width: 4
*Attribute precision: 0
*Attribute scale: 0

Attribute domain values:
*Unrepresentable domain:
Sequential unique whole numbers that are automatically generated.

Attribute:
*Attribute label: Shape
*Attribute alias: Shape
*Attribute definition:
Feature geometry.
*Attribute definition source:
ESRI

*Attribute type: Geometry
*Attribute width: 0
*Attribute precision: 0
*Attribute scale: 0

Attribute domain values:
*Unrepresentable domain:
Coordinates defining the features.

Attribute:
*Attribute label: AREA
*Attribute alias: AREA

*Attribute type: Number
*Attribute width: 15
*Attribute number of decimals: 3

Attribute:
*Attribute label: PERIMETER
*Attribute alias: PERIMETER

*Attribute type: Number
*Attribute width: 15
*Attribute number of decimals: 3

Attribute:
*Attribute label: GWREGIONS_
*Attribute alias: GWREGIONS_

*Attribute type: Number
*Attribute width: 11

Attribute:
*Attribute label: GWREGIONS1
*Attribute alias: GWREGIONS1

*Attribute type: Number
*Attribute width: 11

Attribute:

*__Attribute label:__ CODE
*__Attribute alias:__ CODE

*__Attribute type:__ Number
*__Attribute width:__ 2

Attribute:

*__Attribute label:__ DESC_
*__Attribute alias:__ DESC_

*__Attribute type:__ String
*__Attribute width:__ 40

Overview description:

Entity and attribute overview:

There are two attribute files associated with this data set.

An arc attribute table:

```
>DATAFILE NAME: GWREGION.AAT
>8 ITEMS: STARTING IN POSITION    1
> COL   ITEM NAME         WDTH OPUT TYP N.DEC  ALTERNATE NAME
>01  FNODE#              4    5  B    -
>05  TNODE#              4    5  B    -
>09  LPOLY#              4    5  B    -
>13  RPOLY#              4    5  B    -
>17  LENGTH              8   18  F    5
>25  GWREGION#           4    5  B    -
>29  GWREGION-ID         4    5  B    -
>33  USBND               1    1  I    -
```

FNODE# is the internal number of the from-node

TNODE# is the internal number of the to-node

LPOLY# is the internal number of the polygon to the left of the arc

RPOLY# is the internal number of the polygon to the right of the arc

LENGTH is the length of the arc in meters

GWREGION# is a program-generated feature identity number

GWREGION-ID is a user-assigned feature identity number

USBND is an item used to indicate if the arc is on the boundary of the United States. Arcs representing the United States boundary are flagged USBND = 1, others are coded USBND = 0.

There also is a polygon attribute table associated with this data set:

```
>DATAFILE NAME: GWREGION.PAT
>6 ITEMS: STARTING IN POSITION    1
```

```
>COL  ITEM NAME         WDTH OPUT TYP N.DEC  ALTERNATE NAME
>01  AREA               8   18  F    5
>09  PERIMETER          8   18  F    5
>17  GWREGION#          4    5  B    -
>21  GWREGION-ID        4    5  B    -
>25  CODE               2    2  I    -
>27  DESC              40   40  C    -
```

AREA is the area of the polygon in square meters

PERIMETER is the perimeter of the polygon in meters

GWREGION# is a program-generated feature identity number

GWREGION-ID is a user-assigned feature identity number

CODE is the region number with values as shown in the table from Heath (below). A CODE of 99 has been added for water areas.

DESC is the region name from the same table. "WATER" in this item indicates a water body.

Heath (1984) also designates ground water regions 12 (alluvial valleys), 13 (Hawaiian islands), 14 (Alaska), and (15) Puerto Rico/Virgin Islands. These areas are not included in this data set, however, alluvial valleys is included in the data set "gwreguw", which is provided on this CD.

A modified version of Table 6 from p. 19 of Heath (1984) is provided below. This table contains common ranges on the hydraulic characteristics of ground-water regions of the United States.

```
>Region
>number   Region name                          Geologic situation
>-------------------------------------------------------------------------------
>
> 1       Western mountain ranges.............Mountains with thin soils over
>                                              fractured rocks, alternating with
>                                              narrow alluvial, and, in part,
>                                              glaciated valleys
> 2       Alluvial basins.....................Thick (an average thickness of about
>                                              5m was used as the breakpoint between
>                                              thick and thin) alluvial (locally
>                                              glacial) deposits in basins and
>                                              valleys bordered by mountains
> 3       Columbia lava plateau...............Thick sequence of lava flows inter-
>                                              bedded with unconsolidated deposits
>                                              and overlain by thin soils
> 4       Colorado plateau and Wyoming basin..Thin (an average thickness of about
>                                              5m was used as the breakpoint between
>                                              thick and thin) soils over fractured
>                                              sedimentary rocks
> 5       High Plains.........................Thick alluvial deposits over frac-
>                                              tured sedimentary rocks
> 6       Nonglaciated central region.........Thin regolith over fractured sedi-
>                                              mentary rocks
> 7       Glaciated central region............Thick glacial deposits over fractured
>                                              sedimentary rocks
> 8       Piedmont and Blue Ridge.............Thick regolith over fractured crystal-
>                                              line and metamorphosed sedimentary
>                                              rocks
> 9       Northeast and Superior uplands......Thick glacial deposits over fractured
>                                              crystalline rocks
```

```
>10       Atlantic and Gulf Coastal Plain.....Complexly interbedded sands, silts,
>                                             and clays
>11       Southeast Coastal Plain.............Thick layers of sand and clay over
>                                             semiconsolidated carbonate rocks
>
>
>      Transmissivity     Hydraulic cond.      Recharge rate          Well yield
>Reg.    sq. m / day           m / day              mm / yr         cub. m / min
>-------------------------------------------------------------------------------
>1           -     100    0.0003 -     15       3     -    50        0.04 -  0.4
>2      20   -  20,000   30      -    600       0.03  -    30        0.4  - 20
>3   2,000   - 500,000  200      -  3,000       5     -   300        0.4  - 80
>4       0.5 -     100    0.003  -      2       0.3   -    50        0.04 -  2
>5   1,000   -  10,000   30      -    300       5     -    80        0.4  - 10
>6     300   -  10,000    3      -    300       5     -   500        0.4  - 20
>7     100   -   2,000    2      -    300       5     -   300        0.2  -  2
>8       9   -     200    0.001  -      1      30     -   300        0.2  -  2
>9      50   -     500    2      -     30      30     -   300        0.1  -  1
>10    500   -  10,000    3      -    100      50     -   500        0.4  - 20
>11  1,000   - 100,000   30      -  3,000      30     -   500        4    - 80
```

Abbreviations:

```
>Reg.  - Ground water region number
>cond. - conductivity
>sq.   - square
>m     - meter
>mm    - millimeter
>yr    - year
>cub.  - cubic
>min   - minute
```

Entity and attribute detail citation:
None

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Distribution Information:

Distributor:

Contact information:

Contact person primary:

Contact person: Water Webserver Team
Contact organization: U.S. Geological Survey

Contact address:

Address type: Mailing address
Address:
12201 Sunrise Valley Drive, MS 440
City: Reston
State or province: VA
Postal code: 20192
Country: USA

Contact voice telephone: (800) 426-9000

Contact electronic mail address: h2oteam@qvarsx.er.usgs.gov

Contact instructions:

Contact via email

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Standard order process:
Digital form:
Digital transfer information:
*__Transfer size:__ 0.080
*__Dataset size:__ 0.080

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Distribution Information:

Distributor:
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Contact person primary:
Contact person: Branch of Information Services
Contact organization: U.S. Geological Survey
Contact position: Branch of Information Services

Contact address:
Address type: mailing address
Address:
Box 25286
City: Denver Federal Center
State or province: Colorado
Postal code: 80225-0286
Country: United States of America

Contact voice telephone: (303) 202-4210

Hours of service: 8 AM to 4 PM Mountain Time Zone, Monday through Friday

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Standard order process:
Digital form:
Digital transfer information:
***Transfer size:** 0.080
***Dataset size:** 0.080

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Metadata Reference Information:

***Metadata date:** 20070803

***Language of metadata:** en

Metadata contact:
Contact information:
Contact person primary:
Contact person: Rick Clawges and Curtis Price
Contact organization: USGS NAWQA VOC National Synthesis

Contact address:
Address type: Mailing address
Address:
1608 Mountain View Rd
City: Rapid City
State or province: SD
Postal code: 57702
Country: USA

Contact voice telephone: (605) 355-4560

Contact electronic mail address: rclawges@usgs.gov,cprice@usgs.gov

Contact instructions:
Contact via email

***Metadata standard name:** FGDC Content Standards for Digital Geospatial Metadata
***Metadata standard version:** FGDC-STD-001-1998
***Metadata time convention:** local time

Metadata extensions:
***Online linkage:** http://www.esri.com/metadata/esriprof80.html
***Profile name:** ESRI Metadata Profile

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Binary Enclosures:

Thumbnail:
Enclosure type: Picture

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