PS2014 Wyoming Stratigraphic Nomenclature Chart*

Lyn George¹, Don Cardinal¹, and Gary Winter²

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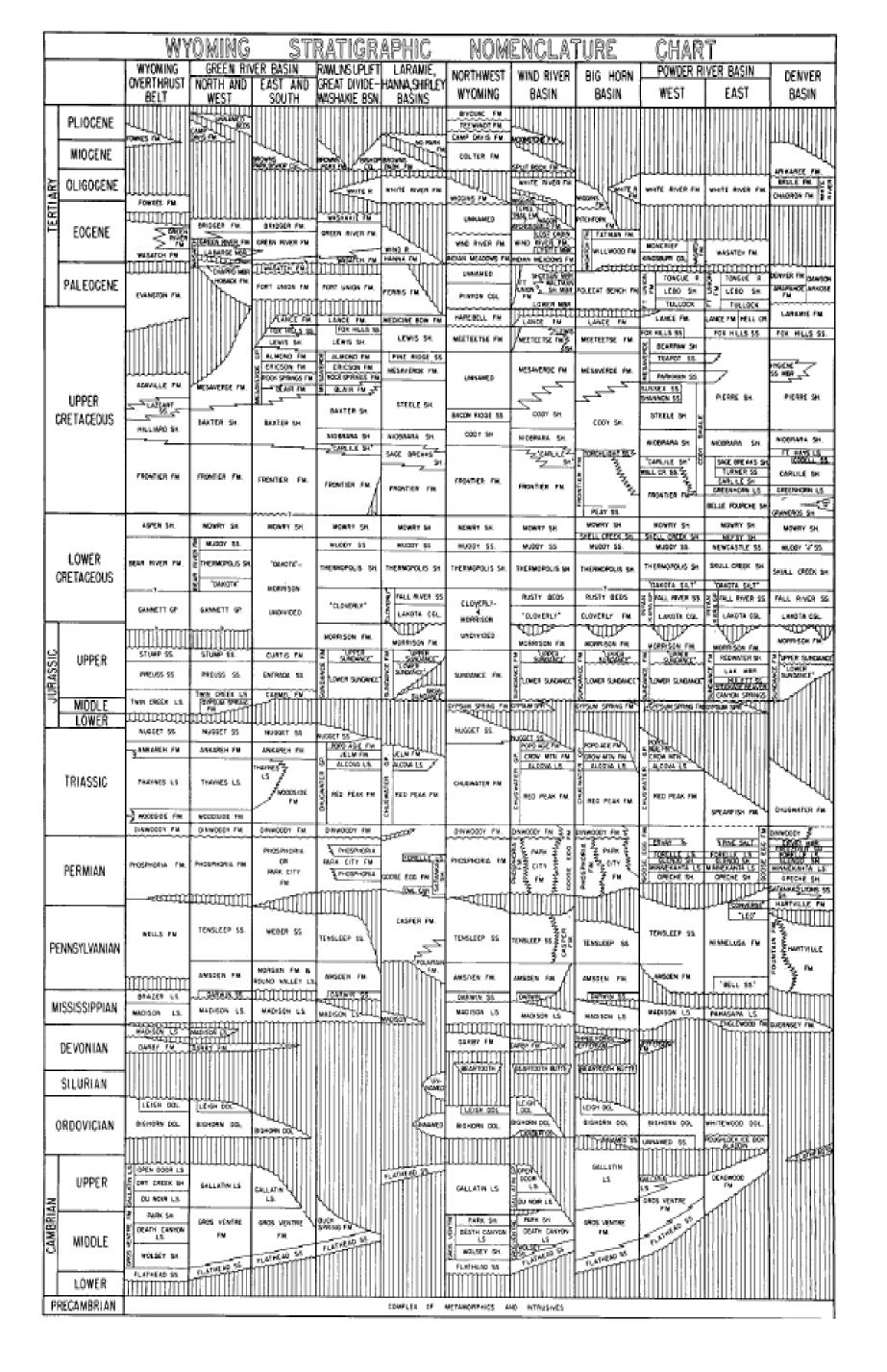
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Abstract

In 2014, the Wyoming Geological Association (WGA) published an updated Wyoming Stratigraphic Nomenclature Chart. WGA published its first comprehensive chart for Wyoming in 1969 and used it in its publications through 2010. The working committee began its efforts in 2001 and selected eighteen areas for individual stratigraphic columns - Fish Creek Basin, Absaroka Basin, Big Horn Basin, Northern Powder River Basin West, Northern Powder River Basin East, Southern Powder River Basin, Green River Basin North and West, Wind River Basin, Shirley Basin, Hartville Uplift, Thrust Belt, Green River Basin South, Washakie Basin, Great Divide Basin, Rawlins Uplift, Hanna Basin, Laramie Basin and North Denver Basin. Sixteen authors contributed to the eighteen columns. The columns were constructed to cover from the Holocene into the Precambrian. The chart incorporated the International Commission on Stratigraphy's Geologic Time Scale 2004 and displayed both global and North American ages. A datasheet was prepared for all units shown on the chart with information on ages, bounding units, lithology, thickness and related unconformities. In addition, fossil, radiometric, economic and other data were included. References were compiled into a summary list and cited on the datasheets. The final chart was published as a 55 by 39 inch, printed color version with an accompanying DVD. The DVD included an interactive chart with index map, linked to the datasheets. Datasheets were presented as pdf and html files and as a database. The chart itself was provided as pdf files and as Adobe Illustrator files. Individual columns were included as separate pdf and Illustrator files. The committee's intent was to deliver to geologists a useful tool for deciphering Wyoming's stratigraphic record.



Lyn George¹, Don Cardinal¹, Carl Babb¹, and Gary Winter² (1) Consulting Geologist, Casper, WY and (2) Consulting Geologist, Jackson, WY



1969 Wyoming Chart

Abstract

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Purpose

- Understanding of Wyoming stratigraphy
- For working geologists by working geologists
- Usually petroleum geologists
- Formal, officially defined units
- Informal, applied stratigraphic units
- Surface and subsurface
- Economic and academic



18 stratigraphic columns 1,372 Stratigraphic units with datasheets 2004 Time Scale 724 References cited 16 Authors 6 Technical contributors 4 Editors

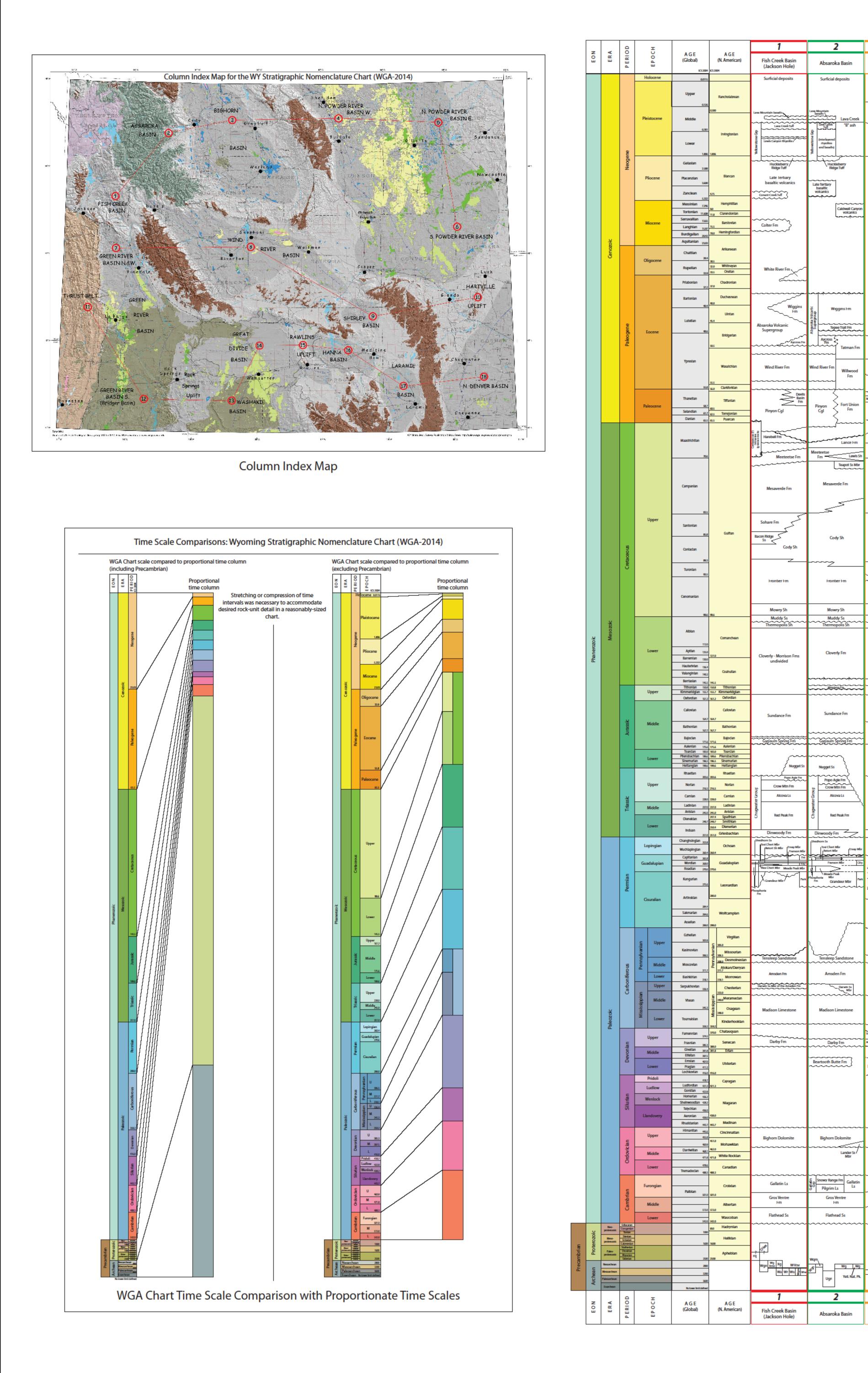
Project History

- 2001 Donation from John Lockridge to WGA
- Memorial to honor Wally Stewart, long-time WGA member
- Working committee formed as a part of the WGA Stratigraphic Nomenclature Committee
- 18 areas selected for individual columns
- Datasheets prepared for each unit on chart
- Chart designed and assembled in Adobe Illustrator
- Data compiled in an Access Database
- Chart revised to fit the ICS 2004 Time Scale
- Donation from Skip Curry for publication costs
- 2014 Chart published





Project Details



Moncrief Mbr Kingsbury Cgl Mbr nd River Fm Willwood Willwood Fm Lake DeSmet coal Lake DeSmet coal _____ Zan teksori a Wyodak-Anderson coal zone Wyodak-Anderson coal zone Beliry Mbr < <u>mp</u> Pinyon Fort Union Cgl Fm Fort Union Fm Tongue River Mbr Lebo Sh Mbr Tongue River Mbr 🗋 Lebo Sh Mbr Tullock Mbr Tullock Mbr Lance Fm ance Em Lance Fm Fox Hills Ss Lance Hm Meeteetse Fm Lewis Sh Teapot Ss Mbr Bearpaw Sh/ Lewis Sh Fm _____ Kasa Bentonitic Mbr Lewis Sh br Monument Hill Bentonitic Mor Teapot Ss Mbr unramed mbr Perguson Mbr Mesaverde Fm (main body) Parkman Ss Mbr Red Bird Silty Mbr Mesaverde Fm Mitten Black Sh Mbr Claggett Sh Mbr Lower mbr tik Beein Sk Mbr Sussex Ss Shannon Ss Garmon Ferruginous Mbr Steele Sh Mbr Niobrara Fm $\overline{}$ Cody Sh Cody Sh Niobrara Sh Mbr \sim Sage Breaks Sh Mbr Sage Breaks Sh Mbr ~~~~ ~____ _ Turner Sa Mbr Pool Creek Mbr Wall Creek Sa Mbr Frontier Fm hanna Frontier Fm Greenhorn Fm Frontier Frontier Fm Frontier Fm Belle Fourche Sh Benionite. Mowry Sh Mowry Sh Mowry Sh Mowry Sh Muddy Ss Thermopolis Sh Muddy Ss Newcastie Ss (Muddy Ss) Muddy Ss Skull Craek Sh Fall River Fm (Dakota) Thermopolis Sh Thermopolls Sh "Rusty beds" Rusty Beds Mbr -----Greybull Sa Mbr Cloverly Fm Lakota Fm Lakota Fm (Cloverly Fm) "main body Cloverly" Pryor Cgl Mbr Monteon Fra Morrison Fm Morrison Fm Morrison Fm heater Shale Mar Redwater Shale Mbr U. Sundance mbr Pine Butte Mbr Sundance Fm Lower Sundance mbr Sockade Boy Sh Mbr Stockade Boy aver Sh Mbr Canyon Springs Ss Mbr Gypsum Spring Fm Gypsum Spring Fm Gypsum Spring Fm Nugget Ss Popo Agle Fm Crow Mtn Fm Popo Agle Fm Crow Mtn Fm Alcova Ls Crow Mountain Sa Alconala Alcova Ls ليعتمدهم Red Peak Fm Red Peak Fm Red Peak Fm Spearfish Fm Dinwoody Fm Little Medicine Mbr G-top Presecut Sh Mbr I'm Little Medicine Mbr G-Eog Prezencut Sh Mbr Prin Dinwoody Fm Ervey Mbr Officulty Sh N Forelle La M Difficulty Sh Mbr Pomile La Mb Difficulty Sh Mb Toal Chert Mbr Retort Mbr Ervay Mbr Hinnekatta Is Mbr Opeche Sh Transce Mor Phosphora Mor Pro Grandeur Mbr Wolfcamp 'Red Shale marker' Nowcod mbr ------Virgil Tensleep Ss Hyatt Ranch mbr Missouri Medicine Lodge Creek mbr Tensleep Sandstone Desmoines Ranchester La Mbr Ranchester Ls Mbr J. Black Amsden Fm Homeshoe Sh Mbr Darwin Sa Cox, Mbr Horseshoe Sh Mbr Darwin Sa Mbr Little Tongue Mbr Madison Ls/Pahasapa Ls Madison Limestone Woodhuni Mbr Little Bighorn Mbr Madison Fm Cottonwood Canyon Mbr ~~~~~ Englewood Fm Same man Darby Fm inten Im Beartooth Butte Fm Beartooth Butte Fm Bighorn Dolomite Lander Ss Mbr Whitewood Ls Bighorn Dolomite **Bighorn Dolomite** Roughlock Mbr Kabox Sh Mbr Winnipeg Fm mana montinp Lander Ss / Mbr Snowy Range Fm Pilgrim Ls Gros Ventre Fm Deadwood Fm Gallatin Group Gros Ventre Fm Gros Ventre Fm 2-2-2 -2--2--2--2 ر lathead Ss Flathead Ss Flathead Ss -----Xsv ? . Wq w 4 Wgm Wgn Xms Xg Wgn Wg Wgn Wgn Vg As Ugn 4 2 N. Powder River Basin West East Absaroka Basin **Bighorn Basin** WYOMINO

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Alluvium

Bighorn Basin

Surficial deposits

Shell Creek ash

Lava Creek "B" ash

Quaternary alluvium

Tatman Fm

Lava Creek "A" a

a Creek

Huckleberry Ridge Tuff

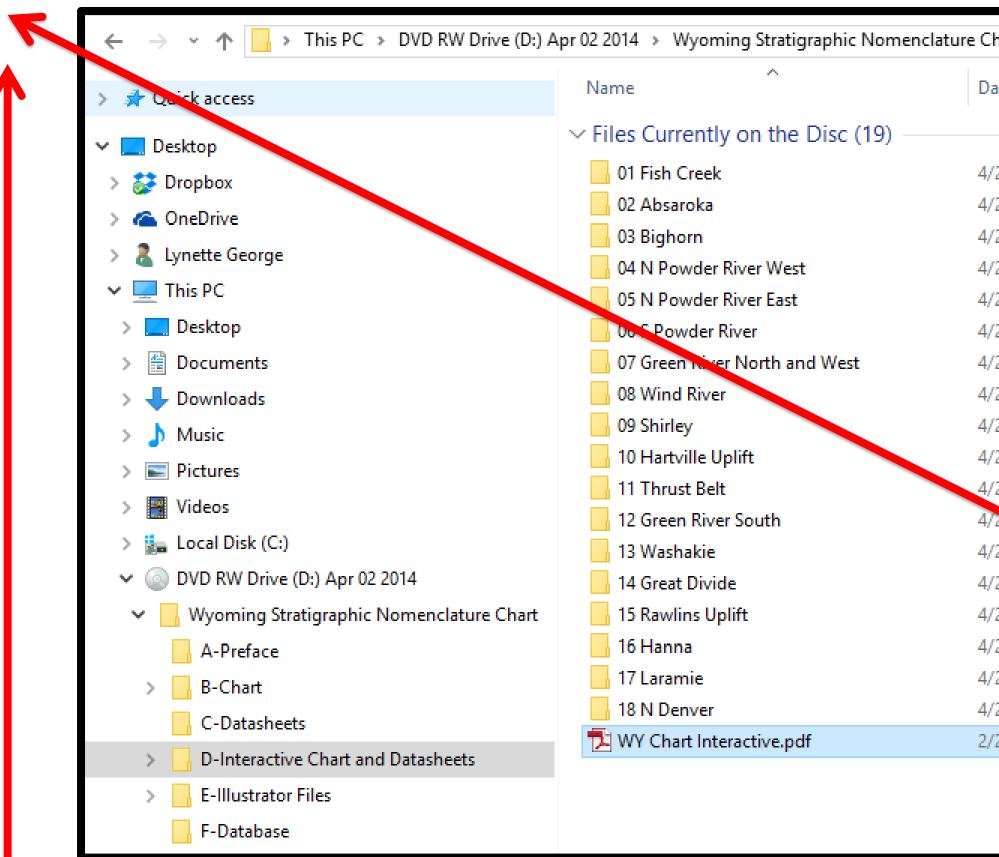
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Wiggins Fm

N. Powder River Basin N. Powder River Basin

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<b>16</b><br>Hanna Basin                                                   | <b>17</b><br>Laramie Basin                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  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| Revised 2014 by WGA Stratigraphic Committee. Copyright 2014 Wyoming Geological Association, P.O. Box 545, Casper, WY 82602. Use in full or in part requires acknowledgement.<br>WGA Stratigraphic Committee: Don Cardinal (Lead Chair); Carl Babb, Lyn George, Gary Winter (Co-Chairs); Jerry Bush, William (Skip) Curry, Andy Finley, Graeme Finley,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                    | Basin S. 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Box 545, Casper<br>Gary Winter (Co-Chairs)                              | WY 82602. Use in full or in pa<br>; Jerry Bush, William (S                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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R., T. M. Fin                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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R. Keefer and J. E.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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D.<br>A Cretaceous time sca                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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|                                              | Cretaceous                            | ESS<br>Coniacian<br>893<br>Turonian<br>935<br>Cenomanian<br>996                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Gulfian                                     | Bacon Ridge<br>Ss<br>Cody Sh<br>Frontier Fm<br>Mowry Sh<br>Muddy Ss                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | And Mowry Sh<br>Muddy Ss                                             | Frontier Fm<br>Unnamed<br>Frontier<br>Frontier Fm<br>Mowry Sh<br>Muddy Ss<br>Thermopolis Sh<br>Rusty Beds Mbr                                                              | Sage Breaks Sh Mbr<br>Wall Creek Ss Mbr<br>Frontier Fm<br>Clay Spur Bentonite<br>Shell Creek Sh<br>Muddy Ss<br>Thermopolis Sh<br>"Rusty beds"                                               |                |              |              | Noo-         Ediscaran           Image: stanian stani stanian stanian stanian stanian stanian stanian stanian stania                                                           |
| erozoic<br>Mesozoic                          | Cetaceous                             | ECONIACIAN B9.3<br>CONIACIAN B9.3<br>TURONIAN 93.5<br>CENOMANIAN 99.6<br>99.6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                             | Bacon Ridge<br>Ss<br>Cody Sh<br>Frontier Fm<br>Mowry Sh<br>Muddy Ss<br>Thermopolis Sh<br>Cloverly - Morrison Fms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | And Mowry Sh<br>Muddy Ss                                             | Frontier Fm<br>Uunnamed<br>Frontier<br>Frontier Fm<br>Mowry Sh<br>Muddy Ss<br>Thermopolis Sh<br>Rusty Beds Mbr<br>Greybull Ss Mbr<br>Greybull Ss Mbr                       | Sage Breaks Sh Mbr<br>Wall Creek Ss Mbr<br>Frontier Fm<br>Clay Spur Bentonite<br>Shell Creek Sh<br>Muddy Ss<br>Thermopolis Sh<br>"Rusty beds"<br>Lakota Fm                                  |                |              |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                              | Cretaceous                            | B5.8<br>Coniacian<br>89.3<br>Turonian<br>93.5<br>Cenomanian<br>99.6<br>99.6<br>127.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                             | Bacon Ridge<br>Ss<br>Cody Sh<br>Frontier Fm<br>Mowry Sh<br>Muddy Ss<br>Thermopolis Sh                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Mowry Sh<br>Muddy Ss<br>Thermopolis Sh<br>Cloverly Fm                | Frontier Fm<br>Unnamed<br>Frontier<br>Frontier Fm<br>Mowry Sh<br>Muddy Ss<br>Thermopolis Sh<br>Rusty Beds Mbr<br>Greybull Ss Mbr<br>"main body Cloverly"<br>Pryor Cgl Mbr  | Sage Breaks Sh Mbr<br>Wall Creek Ss Mbr<br>Frontier Fm<br>Clay Spur Bentonite<br>Shell Creek Sh<br>Muddy Ss<br>Thermopolis Sh<br>"Rusty beds"<br>Lakota Fm<br>(Cloverly Fm)                 | Inyan Kara Grp |              |              | Hore Protecosoic Ectasian Palao Oroginan Palao Orog |
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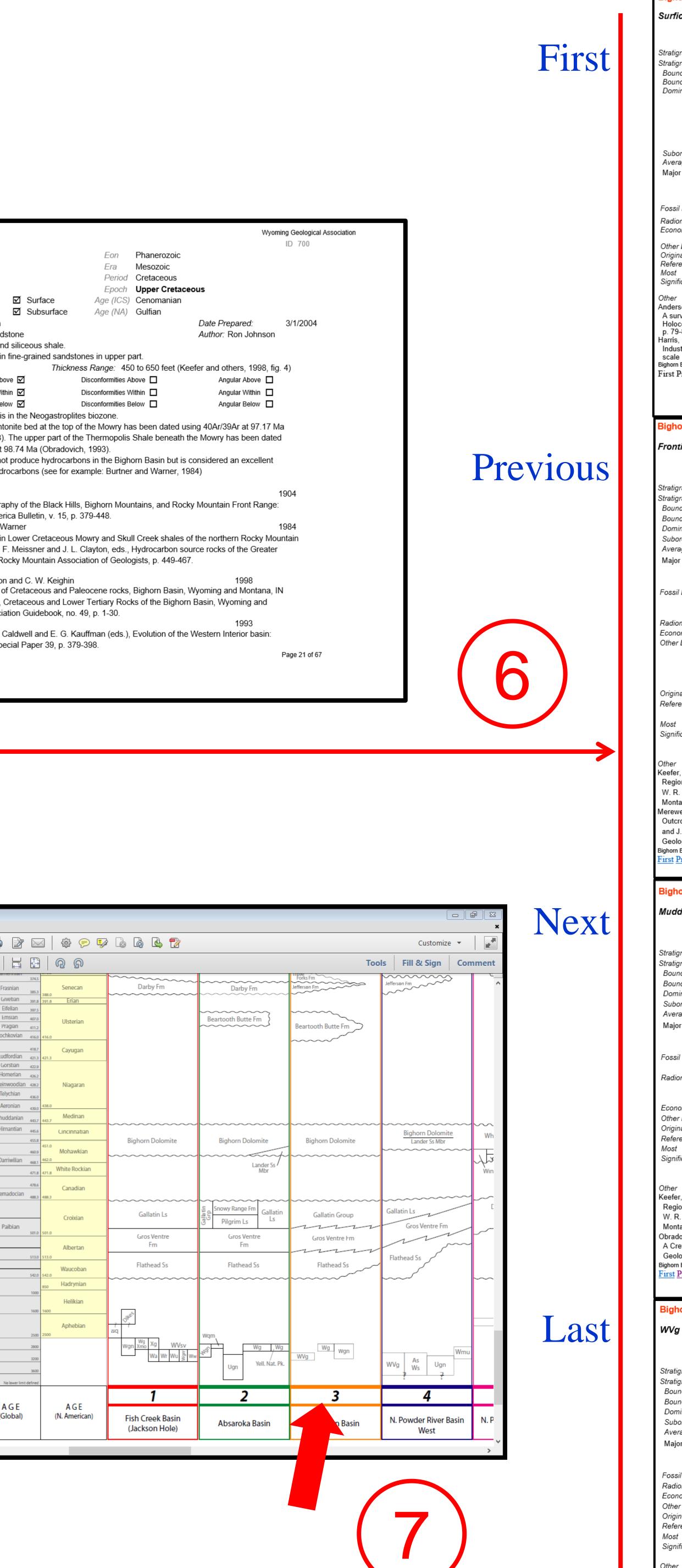
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|                   |                        | ΡE         | Holocene      | ICS 2004                               | (N. American)                                        | Fish Creek Basin<br>(Jackson Hole)   | Absaroka Basin                                         | Bighorn Basin        | West                                       |                 | Note the color of the   | Averag                                    | ge Thickness:<br>Unconformities:                                           |
|                   |                        |            | Holocene      | 0.0115                                 |                                                      | Surficial deposits                   | Surficial deposits                                     | Surficial deposits   | Alluvium<br>Terrace deposits and pediments | ~~~             | color of the column     | Fossil L                                  | Data: The                                                                  |
|                   |                        |            |               | 0.126                                  | Rancholabrean                                        |                                      |                                                        | Shell Creek<br>ash   | _                                          |                 | outline                 | Radior                                    | <i>netric</i> The<br>(Ob                                                   |
|                   |                        |            | Pleistocene   | Middle                                 | 0.300                                                | Lava Mountain basalts                | Lava Creek                                             | Lava Creek "B" ash   |                                            | Allı<br>winc    |                         | Econom                                    | usin<br><i>mic Data:</i> The<br>sou                                        |
|                   |                        |            |               | 0.781                                  | Irvingtonian                                         | Lava Creek Tuff                      | <u>e</u>                                               | Lava Creek "A" ash   |                                            |                 |                         | Other D<br>Origina                        | Data:<br>al Darton, N. I                                                   |
|                   |                        | e          |               | Lower                                  | 1.806                                                | Lewis Canyon Rhyolite                | e (interlayered<br>rhyolites<br>and basalts)           | Quaternary alluvium  |                                            |                 |                         | Referen<br>Most                           | nce: Compariso<br>Geological<br>Burtner, R                                 |
|                   |                        | Neogen     |               | Gelasian                               |                                                      | Huckleberry<br>Ridge Tuff            | Huckleberry<br>Ridge Tuff                              |                      | ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~    | ~~~~            |                         |                                           | ant Hydrocarb<br>area, IN J.                                               |
|                   |                        | 2          | Pliocene      | Piacenzian 3.600                       | Blancan                                              | Late Tertiary<br>basaltic volcanics  |                                                        |                      |                                            |                 |                         | Other<br>Koster                           | Rocky Mou                                                                  |
|                   |                        |            |               | Zanclean                               | 4.75                                                 | Conant Creek Tuff                    | Late Tertiary<br>basaltic<br>volcanics                 |                      |                                            |                 |                         | Region                                    | W. R., T. M. Finr<br>nal stratigraphy a<br>Keefer and J. E.                |
|                   |                        |            |               | Messinian 7.246                        | Hemphillian<br>9.0<br>11.8 Clarendonian              |                                      | Caldwell Canyon<br>volcanics                           |                      |                                            |                 |                         | Montar<br>Obradov                         | na: Wyoming Ge<br>vich, J. D.                                              |
|                   |                        |            | Miocene       | Serravallian 13.65<br>Langhian 15.97   | Barstovian                                           | Colter Fm                            |                                                        |                      |                                            |                 |                         | Geolog                                    | aceous time scal<br>gical Association<br>Basin Mowry Sha                   |
|                   | oic                    |            |               | Burdigalian 20.43<br>Aquitanian 23.03  | 19.0 Hemingfordian                                   |                                      |                                                        |                      | Arikaree Fm                                |                 |                         | <u>First</u> Pr                           | revious Next La                                                            |
|                   | Cenozoic               |            | Oligocene     | Chattian<br>28.4                       | Arikareean                                           |                                      |                                                        |                      |                                            |                 | /                       |                                           |                                                                            |
|                   |                        |            | Sigurene      | Rupelian<br>33.9                       | 30.5<br>32.0 Whitneyan<br>33.5 Orellan               | White River Fm                       | -                                                      |                      | White River Fm                             | ×× "            |                         |                                           |                                                                            |
|                   |                        |            |               | Priabonian                             | Chadronian<br>37.0                                   |                                      |                                                        |                      |                                            |                 |                         |                                           |                                                                            |
|                   |                        |            |               | Bartonian                              | Duchesnean                                           |                                      |                                                        |                      |                                            |                 |                         |                                           |                                                                            |
|                   |                        |            |               | Lutetian                               | Uintan<br>45.4                                       | E Wiggins<br>Fm                      | Wiggins Fm<br>on b<br>e do of caulic<br>e do of caulic |                      |                                            |                 |                         |                                           |                                                                            |
| 54.00 x 39.       | 9.00 in                | sne *      |               |                                        |                                                      | Absaroka Volcanic                    | Tepee Trail Fm                                         |                      |                                            | ×               |                         |                                           |                                                                            |
|                   |                        |            |               |                                        |                                                      |                                      |                                                        |                      |                                            | 71              |                         |                                           |                                                                            |
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|                   | / 1   []               |            | 995           | » 🔽   📇 🕀                              | <u>୍ୟ</u>   ୟ ରୁ                                     | Meeteetse min                        | Teapot Ss Mbr                                          | Teapot Ss Mbr        | ools Fill & Sign Co                        | Teapot          |                         |                                           |                                                                            |
|                   |                        |            |               |                                        |                                                      |                                      | Teapot Ss Mbr                                          | E<br>Mesaverde Fm    | Unnamer nbr                                | Mesuverdi<br>Fm |                         |                                           | Devonian                                                                   |
|                   |                        |            |               | Campanian                              |                                                      | Mesaverde Fm                         | Mesaverde Fm                                           | Claggett Sh Mbr      | Sursex Ss                                  | Parkmar<br>Mit  |                         |                                           | Lo                                                                         |
|                   |                        |            |               |                                        |                                                      |                                      |                                                        | Lower mbr            | nannon Ss                                  | Gai<br>Ferrug   |                         | Ø                                         | Pri                                                                        |
|                   |                        |            | Upper         | 5antonian                              | 5                                                    | Sohare Fm                            |                                                        | Elk Basin Ss Mbr     | Steele Sh Mbr<br>중                         | Nic             |                         | *                                         | Silurian                                                                   |
|                   |                        |            |               | Santonian<br>85.8                      | B Gulfian                                            | Bacon Ridge Ss                       | Cody Sh                                                | Cody Sh              | 8<br>Niobrara Sh Mbr                       |                 |                         |                                           | Lland                                                                      |
|                   |                        | ceous      |               | Coniacian                              |                                                      | Cody Sh                              |                                                        |                      |                                            |                 |                         |                                           | un<br>Lian                                                                 |
|                   |                        | Creta      |               | B9.3<br>Turonian                       | 3                                                    |                                      |                                                        | Frontier Fm          | Sage Breaks Sh Mbr                         |                 |                         |                                           | Ordovici                                                                   |
|                   |                        |            |               | 93.5                                   | 5                                                    | Frontier Fm                          | P                                                      | unnamed<br>Frontier  |                                            | ~ 5             |                         |                                           | Lo                                                                         |
|                   |                        |            |               | Cenomanian                             |                                                      |                                      |                                                        | Frontier Fm          | Frontier Fm<br>Clay Spur Bentonite         | Clay Spu        |                         |                                           | Furo                                                                       |
|                   |                        |            |               | 99.6                                   | 6 99.6                                               | Mowry Sh<br>Muddy Ss                 | Mowry Sh<br>Muddy Ss                                   | Mowry Sh<br>Muddy Ss | Shell Creek Sh                             | Ne              |                         |                                           | Cambri                                                                     |
|                   | iozoic                 |            |               | Albian                                 |                                                      | Thermopolis Sh                       | Muddy Ss<br>Thermopolis Sh                             | Thermopolis Sh       | Muddy Ss<br>Thermopolis Sh<br>"Rusty beds" |                 |                         | Neo-                                      | Ediscaran<br>Lryogenian                                                    |
| rozoic            | Mes                    |            |               | 112.0                                  | Comanchean                                           |                                      |                                                        | Rusty Beds Mbr       |                                            | a L             |                         |                                           | Ionian<br>Stanian<br>Ectasian<br>Calymmian                                 |
| has been          |                        |            | Lower         | Aptian 125.0<br>Barremian 130.0        | 127.0                                                | Cloverly - Morrison Fms<br>undivided | Cloverly Fm                                            | iloverly             | ~ Lakota Fm                                | iyan Kara       |                         | j j                                       | Statherian<br>Orosirian<br>Rhyacian<br>Siderian                            |
| Phane             |                        |            |               | Hauterivian 136.4<br>Valanginian 140.2 | Conhuling                                            |                                      |                                                        | Pryor Cgl Mbr        |                                            |                 |                         | Neoarchear<br>Mesoarchear<br>Heleoarchear | in East                                                                    |
| Phane             |                        |            | Upper         | Tithonian 150.8                        | 5 145.5<br>8 150.8 Tithonian<br>7 155.7 Kimmeridgian |                                      | Morrison Hm                                            | Morrison I-m         |                                            | Mori            |                         | Eoarchean                                 | • · · · · · · · · · · · · · · · · · · ·                                    |
| Phane             |                        |            | Upper         |                                        |                                                      |                                      |                                                        | E Upper Sundance mbr | Redwater Shale Mbr                         | Redwat          |                         | z 4                                       | DO I                                                                       |
| Phane             |                        |            | opper         |                                        | 2 161.2 Oxfordian                                    | -                                    |                                                        | ance F               | U. Sundance mbr                            | ~~~~~           |                         | ER EO                                     | E S                                                                        |
| Phane             |                        | ic         | Middle        | Callovian                              | 2 161.2 Oxfordian<br>Callovian<br>7 164.7            | Sundance Fm                          | Sundance Fm                                            | Lower Sundance mbr   | U. Sundance mbr                            |                 |                         |                                           | PERI                                                                       |

1. Open Interactive Chart available on DVD Go to Index Map

Click on column number to move to the column on the chart Slide down chart to unit of interest

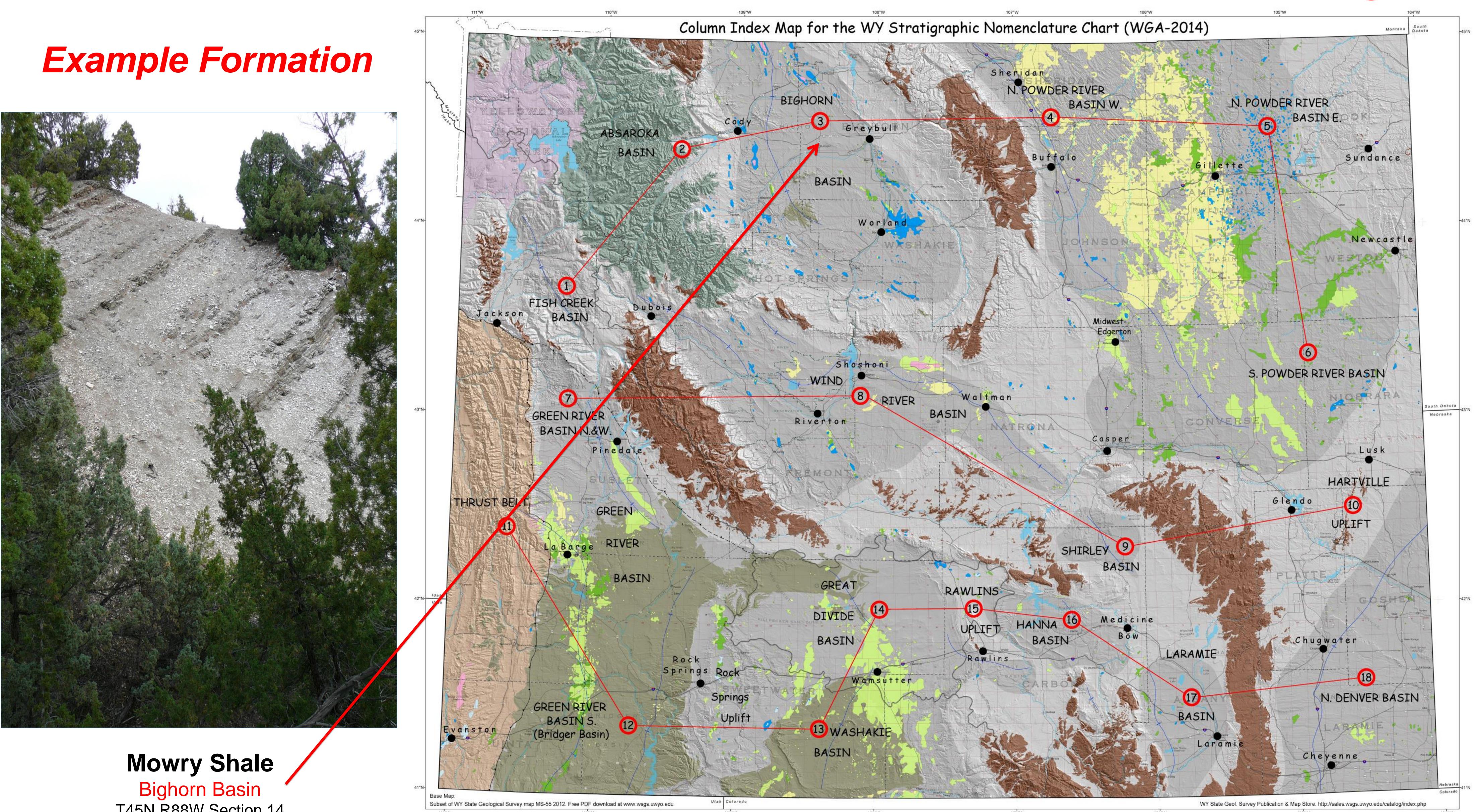
Click on unit name to display datasheet Navigate among datasheets

Return to index map by clicking on column number at the top or bottom of the chart



| Bighorn Basin                                                               |                                                |                                                                |                                        |                                       | Wyo                                                                    | ming Geological Association<br>ID 1761 |
|-----------------------------------------------------------------------------|------------------------------------------------|----------------------------------------------------------------|----------------------------------------|---------------------------------------|------------------------------------------------------------------------|----------------------------------------|
| Surficial deposits                                                          | and Quaterna                                   | ry alluvium                                                    | Eon<br>Era                             | Phanerozoic<br>Cenozoic               |                                                                        |                                        |
| Stratigraphia Dest                                                          | Pad                                            | Surface                                                        | Period<br>Epoch<br>Age (ICS)           | Neogene<br>Holocene - Pleis           | tocene                                                                 |                                        |
| Stratigraphic Status: I                                                     |                                                | <ul><li>✓ Surface</li><li>☐ Subsurface</li></ul>               | Age (ICS)<br>Age (NA)                  | Recent - Irvingtor                    |                                                                        | 4/16/2011                              |
| Bounding Unit Above:<br>Bounding Unit Below:<br>Dominant Lithology:         | Variable                                       | and colluvium: clav                                            | , silt, sand and                       | gravel in flood plair                 | Date Prepared:<br>Author: Don Cardinal<br>ns, fans, terraces and       | -110/2011                              |
|                                                                             | slopes.                                        |                                                                | ,                                      |                                       | and some glacial dep                                                   | osits                                  |
|                                                                             | and Tertiary gra                               | avels.                                                         |                                        |                                       |                                                                        |                                        |
| Subordinate Lithology                                                       | rock glacier de                                | posits.                                                        |                                        | ≠u ianosiide and gl                   | acial deposits, talus ar                                               | IU                                     |
| Average Thickness:<br>Major Unconformities                                  |                                                |                                                                | ess Range:<br>Disconformities A        | bove                                  | Angular Above 🔲                                                        |                                        |
|                                                                             | None With<br>None Belo                         |                                                                | Disconformities V<br>Disconformities B | _                                     | Angular Within 🔲<br>Angular Below 🔲                                    |                                        |
| Fossii Data: (Ai                                                            |                                                | ve been found at se                                            |                                        | —                                     |                                                                        |                                        |
|                                                                             |                                                | n the basin have pit<br>1 or other local uses                  |                                        | the Quaternary, p                     | resumably, used for                                                    |                                        |
| Other Data:<br>Original Campbell,                                           | M. R., W. B. Eme                               | ry, K. C. Heald, G. '                                          | W. Stose, T. W                         |                                       |                                                                        | 1925                                   |
| Reference: The geolo<br>Most Love, J. [                                     | gic map of Wyomi<br>). and A. C. Christ        | ng: U.S. Geological<br>iansen                                  | Survey, Specia                         | al Geologic Map, s                    |                                                                        | 1985                                   |
| Other                                                                       | ap or veyoming:                                | U.S. Geological Su                                             | avey, scale 1:5                        | ວວ,ວວບ, ວ sneets.                     |                                                                        |                                        |
| Anderson, E.<br>A survey of the late P                                      |                                                |                                                                |                                        |                                       |                                                                        |                                        |
| p. 79-87.<br>Harris, R. E.                                                  |                                                |                                                                | -                                      |                                       | of Investigations, no. 1<br>2004                                       | ν,                                     |
| Industrial minerals an scale 1:500,000.                                     |                                                |                                                                | Wyoming State                          | e Geological Surve                    |                                                                        | Page 1 of 67                           |
| Bighorn Basin Surficial d<br>First Previous <u>Next</u> <u>L</u>            |                                                | y απαντάπτ                                                     |                                        |                                       |                                                                        | Page 1 of 67                           |
|                                                                             |                                                |                                                                |                                        |                                       |                                                                        |                                        |
| Bighorn Resin                                                               |                                                |                                                                |                                        |                                       | 164-00-                                                                | ning Geological Association            |
| Bighorn Basin<br>Frontier Formation                                         | n                                              |                                                                | Eon                                    | Phanorozale                           | Wyor                                                                   | ning Geological Association            |
| , ionaer rormatioi                                                          |                                                |                                                                | Eon<br>Era<br>Period                   | Phanerozoic<br>Mesozoic<br>Cretaceous |                                                                        |                                        |
| Stratigraphic Dools                                                         | Formation                                      | ☑ Surface                                                      | Period<br>Epoch<br>Age (ICS)           | Upper Cretaceou                       |                                                                        |                                        |
| Stratigraphic Status: F                                                     |                                                | ☑ Surface ☑ Subsurface                                         | Age (ICS)<br>Age (NA)                  | Coniacian - Ceno<br>Gulfian           | manian<br>Date Prepared:                                               | 2/1/2004                               |
| Bounding Unit Above:<br>Bounding Unit Below:<br>Dominant Lithology:         | Mowry Shale                                    | stone and shale.                                               |                                        |                                       | Date Prepared:<br>Author: Ron Johnson                                  | בו 172004                              |
| Dominant Lithology:<br>Subordinate Lithology<br>Average Thickness:          |                                                | bentonite and coal.                                            |                                        | ) to 650 feet (Koof                   | er and others, 1998)                                                   |                                        |
| Major Unconformities:                                                       |                                                | re 🗹                                                           | Disconformities A                      | bove                                  | Angular Above                                                          |                                        |
| Foreil Data                                                                 | None Withi<br>None Belo<br>e lower part of Ero |                                                                | Disconformities W<br>Disconformities B | elow                                  | Angular Within 🔲<br>Angular Below 🔲                                    | an an                                  |
| of                                                                          | as much as 97-94                               | Ma. Above the disc                                             | onformity, the f                       | -                                     | in in age with a time sp<br>n with an age of about                     |                                        |
| Radiometric 97-                                                             | -88.9 Ma using 40                              | r and others, 1998).<br>Ar/39Ar method.<br>on produces oil and |                                        | us fielde in the Pie                  | horn Basin                                                             |                                        |
| Other Data: Su                                                              | bdivided into a lov                            | ver unit, equivalent t                                         | to the Belle Fou                       | Irche Member of th                    | horn Basin.<br>ie Frontier Formation,<br>ormation by Mereweth          | er                                     |
| an                                                                          | d others (1998) in                             | the southeastern Bi                                            | ighorn Basin. M                        | erewether and Co                      | ormation by Mereweth<br>bban (1986) described<br>ier Formation at Cody | la                                     |
|                                                                             | e northwestern par                             | •                                                              | grant i i dil Mi                       | I I I I I I I I I I I I I I I I I     | simulion at GOUY                                                       | in<br>1916                             |
| Reference: Oil and ga                                                       | s near Basin, Big                              | Horn County, Wyon<br>al Survey Bulletin, 6                     | -                                      |                                       | c geology, 1915; Part 2                                                |                                        |
| Most Mereweth                                                               | er, E. A. and W. A                             | . Cobban                                                       |                                        |                                       | Colorado, and adjoini                                                  | 1986<br>ng                             |
| areas, IN                                                                   | J. A. Peterson, ed                             |                                                                | nd Sedimentatio                        | on in the Rocky Mo                    | untain Region, United                                                  | •                                      |
| Other<br>Keefer, W. R., T. M. Fir                                           | nn, R. C. Johnson                              | and C. W. Keighin                                              | -                                      |                                       | 1998                                                                   |                                        |
| Regional stratigraphy<br>W. R. Keefer and J. E                              | and correlation of<br>. Goolsby, eds., C       | Cretaceous and Pa<br>retaceous and Low                         | er Tertiary Roc                        | · · ·                                 |                                                                        | N                                      |
| Montana: Wyoming G<br>Merewether, E. A., R. V                               | V. Tillman, W. A. (                            | Cobban, and J. D. C                                            | bradovich                              |                                       | 1998                                                                   |                                        |
| Outcrop-sections of th<br>and J. E. Goolsby, ed.<br>Geological Association  | s., Cretaceous and                             | d Lower Tertiary Ro                                            |                                        | -                                     |                                                                        |                                        |
| Geological Association<br>Bighorn Basin Frontier F<br>First Previous Next L | ormation                                       | нэ, р. 31-42.                                                  |                                        |                                       |                                                                        | Page 20 of 67                          |
| Indi                                                                        |                                                |                                                                |                                        |                                       |                                                                        |                                        |
| Bighorn Basin                                                               |                                                |                                                                |                                        |                                       | Wyo                                                                    | ming Geological Association            |
| Muddy Sandstone                                                             | )                                              |                                                                | Eon<br>Era                             | Phanerozoic<br>Mesozoic               |                                                                        |                                        |
|                                                                             |                                                |                                                                | Period<br>Epoch                        | Cretaceous                            | retaceous                                                              |                                        |
| Stratigraphic Rank:  <br>Stratigraphic Status:                              | Formation<br>Formal                            | ☑ Surface<br>☑ Subsurface                                      | Age (ICS)                              | Cenomanian - Al<br>Gulfian - Coman    | bian                                                                   |                                        |
| Bounding Unit Above<br>Bounding Unit Below:                                 | Mowry Shale                                    |                                                                | 3- 1-419                               |                                       | Date Prepared:<br>Author: Ron Johnson                                  | 3/1/2004                               |
| Dominant Lithology:<br>Subordinate Lithology                                | Very-fine to me                                | edium-grained sands<br>ne, siltstone, lignitic                 |                                        | rt pebble conalome                    |                                                                        |                                        |
| Average Thickness:<br>Major Unconformities                                  |                                                | Thickne                                                        |                                        | o 100 feet (Keefer                    |                                                                        |                                        |
| ,                                                                           | None With<br>None Belo                         | in 🗹                                                           | Disconformities V<br>Disconformities E | Vithin                                | Angular Within Angular Below                                           |                                        |
|                                                                             |                                                | —                                                              |                                        | —                                     | Angular Below<br>si biozone of earliest                                |                                        |
| Radiometric Th                                                              | e upper part of the                            |                                                                |                                        | -                                     | nas been dated using<br>In boundary was estim                          | ated                                   |
| by                                                                          | Obradovich (1993                               | s -                                                            |                                        |                                       | -                                                                      |                                        |
| Other Data: In<br>Other Data:<br>Original Hintze, F.                        |                                                |                                                                |                                        | orginoriti dasl                       |                                                                        | 1915                                   |
| Reference: The Basin<br>Most Paull, R.                                      | and Greybull oil a                             | and gas fields, Wyor                                           | ming Geologist                         | s Office Bulletin 10                  | , 62 p.                                                                | 1962                                   |
| Significant Depositio                                                       | nal History of the                             |                                                                | <u> </u>                               |                                       | Enyert and W. H. Cu<br>al Association Field                            |                                        |
|                                                                             | ce Guidebook, v.                               |                                                                | , onning.                              | .,                                    |                                                                        |                                        |
| Keefer, W. R., T. M. Fi<br>Regional stratigraphy                            | and correlation of                             | Cretaceous and Pa                                              |                                        | -                                     | 1998<br>yoming and Montana,                                            | IN                                     |
| W. R. Keefer and J. E<br>Montana: Wyoming G                                 | . Goolsby, eds., C                             | retaceous and Low                                              | er Tertiary Roc                        | -                                     | Basin, Wyoming and                                                     |                                        |
| Obradovich, J. D.<br>A Cretaceous time sc<br>Coological Accessiatio         | -                                              |                                                                |                                        | Evolution of the W                    | 1993<br>/estern Interior basin:                                        |                                        |
| Geological Associatio<br>Bighorn Basin Muddy Sa<br>First Previous Next I    | andstone                                       | uai ⊬aper 39, p. 37                                            | J-JYÖ.                                 |                                       |                                                                        | Page 22 of 67                          |
| - IST FICTIOUS INCXL                                                        |                                                |                                                                |                                        |                                       |                                                                        |                                        |
| Bighorn Basin                                                               |                                                |                                                                |                                        |                                       |                                                                        | oming Geological Association           |
| WVg                                                                         |                                                |                                                                | Eon                                    | Archean                               | mbrian                                                                 | ID 1789                                |
|                                                                             |                                                |                                                                | Era<br>Period<br>Enoch                 |                                       |                                                                        |                                        |
| Stratigraphic Rank:<br>Stratigraphic Status:                                |                                                | Surface                                                        | Epoch<br>Age (ICS                      | )                                     |                                                                        |                                        |
| Stratigraphic Status:<br>Bounding Unit Above                                |                                                | Subsurface                                                     | Age (NA)                               |                                       | Date Prepared:<br>Author: Corl Bobb                                    | 5/11/2010                              |
| Bounding Unit Below<br>Dominant Lithology:<br>Subordinate Litholog          | Granite gneiss                                 | , quartz diorite and                                           | quartz monzor                          | ite.                                  | Author: Carl Babb                                                      |                                        |
| Subordinate Litholog<br>Average Thickness:                                  | -                                              |                                                                | iess Range:                            | Abarra 🗖                              |                                                                        |                                        |
| Major Unconformities                                                        | None Wit                                       | hin 🗖                                                          | Disconformities                        | Within                                | Angular Above                                                          | 1                                      |
| Fossil Data:                                                                | None Bel                                       | ow 🗖                                                           | Disconformities                        | Below                                 | Angular Below                                                          | 1                                      |
| Economic Data:                                                              | 9+ BA.                                         |                                                                |                                        |                                       |                                                                        |                                        |
| Other Data:<br>Original                                                     |                                                |                                                                |                                        |                                       |                                                                        |                                        |
|                                                                             | D. and B. R. Fros                              |                                                                |                                        |                                       |                                                                        | 1993                                   |
| Geology                                                                     |                                                | Wyoming province<br>ming State Geologi                         |                                        |                                       | n, and S. M. Roberts,<br>76.                                           | eas.,                                  |
| Other<br>Love, J. D. and A. C. C<br>Geologic map of Wyo                     |                                                | gical Survey scale                                             | 1:500 000 3 6                          | heets                                 | 1985                                                                   |                                        |
| Bighorn Basin WVg                                                           |                                                | Jan Garroy, sudie                                              |                                        |                                       |                                                                        | Page 67 of 67                          |

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- 2. Absaroka Basin Kent Sundell
- 3. Big Horn Basin -- Woody Herrod and Ron Johnson
- 4. N Powder River Basin West *Terry Miller*, Ralph Specht, Don Cardinal, Forest Twiford
- 5. N Powder River Basin East *Terry Miller*, Ralph Specht, Forest Twiford, Don Cardinal

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- 6. S Powder River Basin Forest Twiford, Ray Harris, Don Cardinal
- 7. Green River Basin, N and W *Doug Morton* 8. Wind River Basin – Jerry Bush 9. Shirley Basin – William Shields, Don Cardinal
- 10. Hartville Uplift Don Cardinal, Ray Harris
- 11. Thrust Belt *Carl Babb*
- 12. Green River Basin S Andrew Finley



- George, Don Cardinal
- 14. Great Divide Basin Don Cardinal
- 15. Rawlins Uplift Don Lawson

- 18.N Denver Basin Andrew Finley

13. Washakie Basin – Herb Waterman, Lyn 16. Hanna Basin – Don Lawson, Don Cardinal 17. Laramie Basin – Don Lawson, Don Cardinal