





















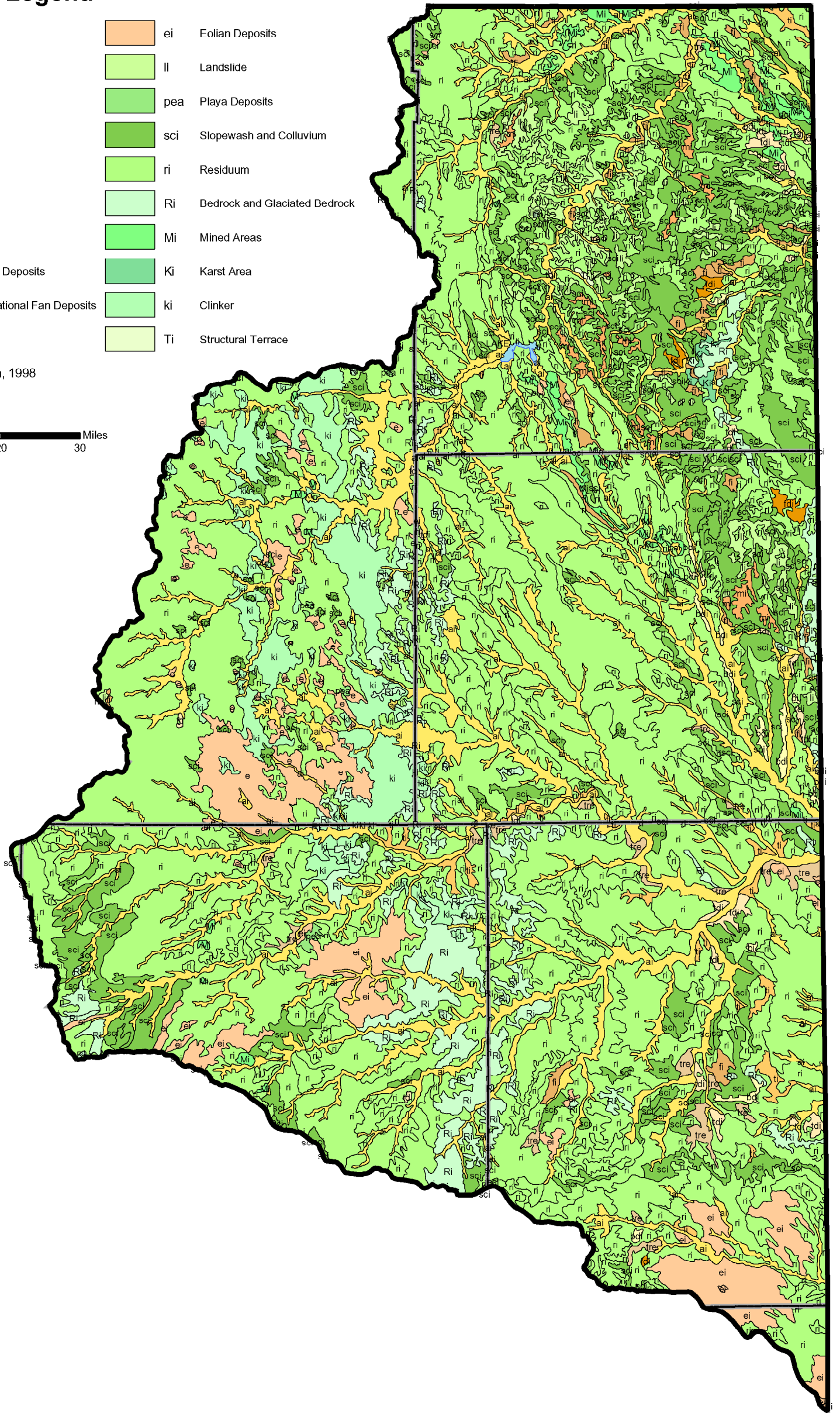
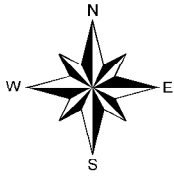
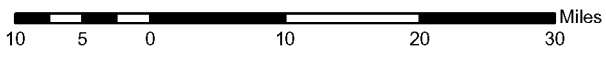
## **APPENDIX B**

### **Geology and Ground Water Use Plates, Northeast Wyoming River Basins Plan Area**

# Legend

- |   |  |
|---|--|
|  Lake Body of Water                                      |  ei Folian Deposits               |
|  ai Alluvium   |  li Landslide                     |
|  bi Bench Deposits                                       |  pea Playa Deposits               |
|  bdi Dissected Bench Deposits                            |  sci Slopewash and Colluvium      |
|  tdi Dissected Terrace Deposits                          |  ri Residuum                      |
|  ti Terrace Deposits                                     |  Ri Bedrock and Glaciated Bedrock |
|  tre Shallow Terrace Deposits                            |  Mi Mined Areas                   |
|  fi Alluvial Fan and Gradational Fan Deposits            |  Ki Karst Area                    |
|  fdi Dissected Alluvial Fan and Gradational Fan Deposits |  ki Clinker                       |
|  mi Mesa   |  Ti Structural Terrace            |

Source: Hamerlinck and Arneson, 1998






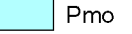


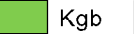











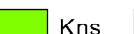


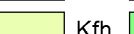
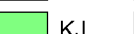



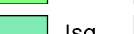










## Surficial Geology



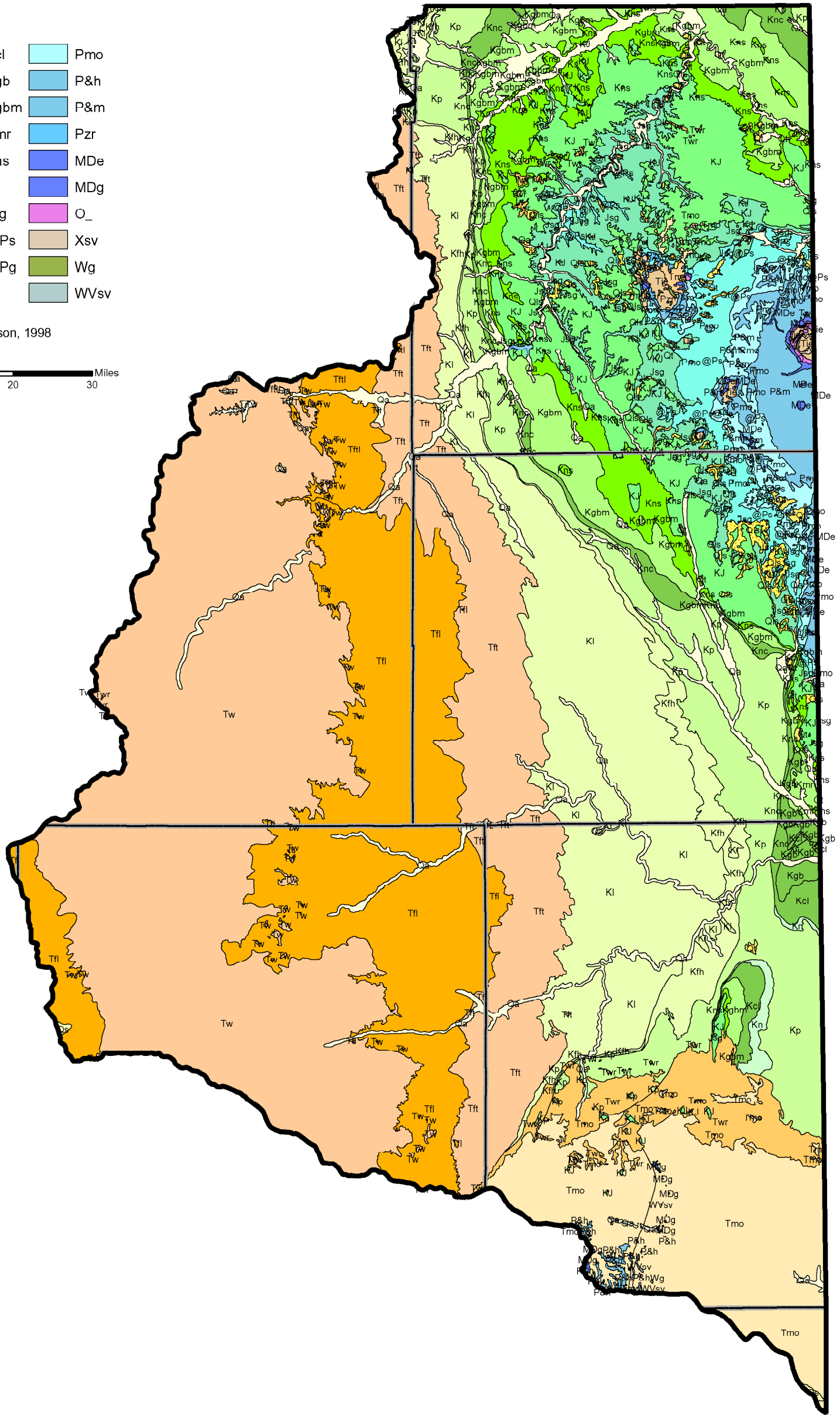
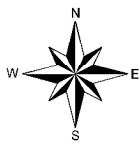
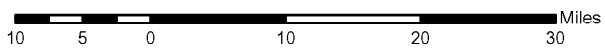
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# PLATE B.1

**Legend**

 Lake	 Tw	 Kcl	 Pmo
 Qa	 Tftl	 Kgb	 P&h
 Qt	 Tfl	 Kgbm	 P&m
 Qls	 Tft	 Kmr	 Pzr
 Qs	 Kl	 Kns	 MDe
 Tmu	 Kfh	 Kj	 MDg
 Tmo	 Kp	 Jsg	 O_
 Twr	 Kn	 @Ps	 Xsv
 Tie	 Knc	 @Pg	 Wg
		 WVsv	

Source: Hamerlinck and Arneson, 1998



**Bedrock Geology**






































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**PLATE  
B.2**

# Bedrock Geology Detailed Legend

Source: Hamerlinck and Arneson, 1998

	Lake	Bodies of Water
	Qa	Alluvium and Colluvium
	Qt	Gravel, Pediment, and Fan Deposits
	Qls	Landslide Deposits
	Qs	Dune Sand and Loess
	Tmu	Upper Miocene Rocks 2
	Tmo	Lower Miocene Rocks and Upper Oligocene Rocks
	Twr	White River Formation
	Tie	Intrusive and Extrusive Igneous Rocks
	Tw	Wasatch Formation
	Tftl	Fort Union Formation: Tongue River and Lebo Members
	Tfl	Fort Union Formation: Lebo Member
	Tft	Fort Union Formation: Tullock Member
	Kl	Lance Formation
	Kfh	Fox Hills Sandstone
	Kp	Pierre Shale
	Kn	Niobrara Formation
	Knc	Niobrara Formation and Carlile Shale
	Kcl	Carlile Shale
	Kgb	Greenhorn Formation and Belle Fourche Shale
	Kgbm	Greenhorn Formation and Belle Fourche and Mowry Shales
	Kmr	Mowry Shale
	Kns	Newcastle Sandstone and Skull Creek Shale
	KJ	Cloverly Formation (Hartville Uplift) or Inyan Kara Group (Black Hills) and Morrison Formation
	Jsg	Sundance and Gypsum Spring Formations
	@Ps	Spearfish Formation
	@Pg	Goose Egg Formation
	Pmo	Minnekahta Limestone and Opeche Shale
	P&h	Hartville Formation
	P&m	Minnelusa Formation
	Pzr	Minnekahta Limestone, Opeche Shale, Minnelusa Formation, Pahasapa and Englewood Limestones, Whitewood Dolomite, and Winnipeg and Deadwood Formations
	MDe	Pahasapa and Englewood Limestones
	MDg	Guernsey Formation
	O_	Whitewood Dolomite and Winnipeg and Deadwood Formations
	Xsv	Metasedimentary and Metavolcanic Rocks
	Wg	Granitic Rocks of 2,600-Ma Age Group
	WVsv	Metasedimentary and Metavolcanic Rocks



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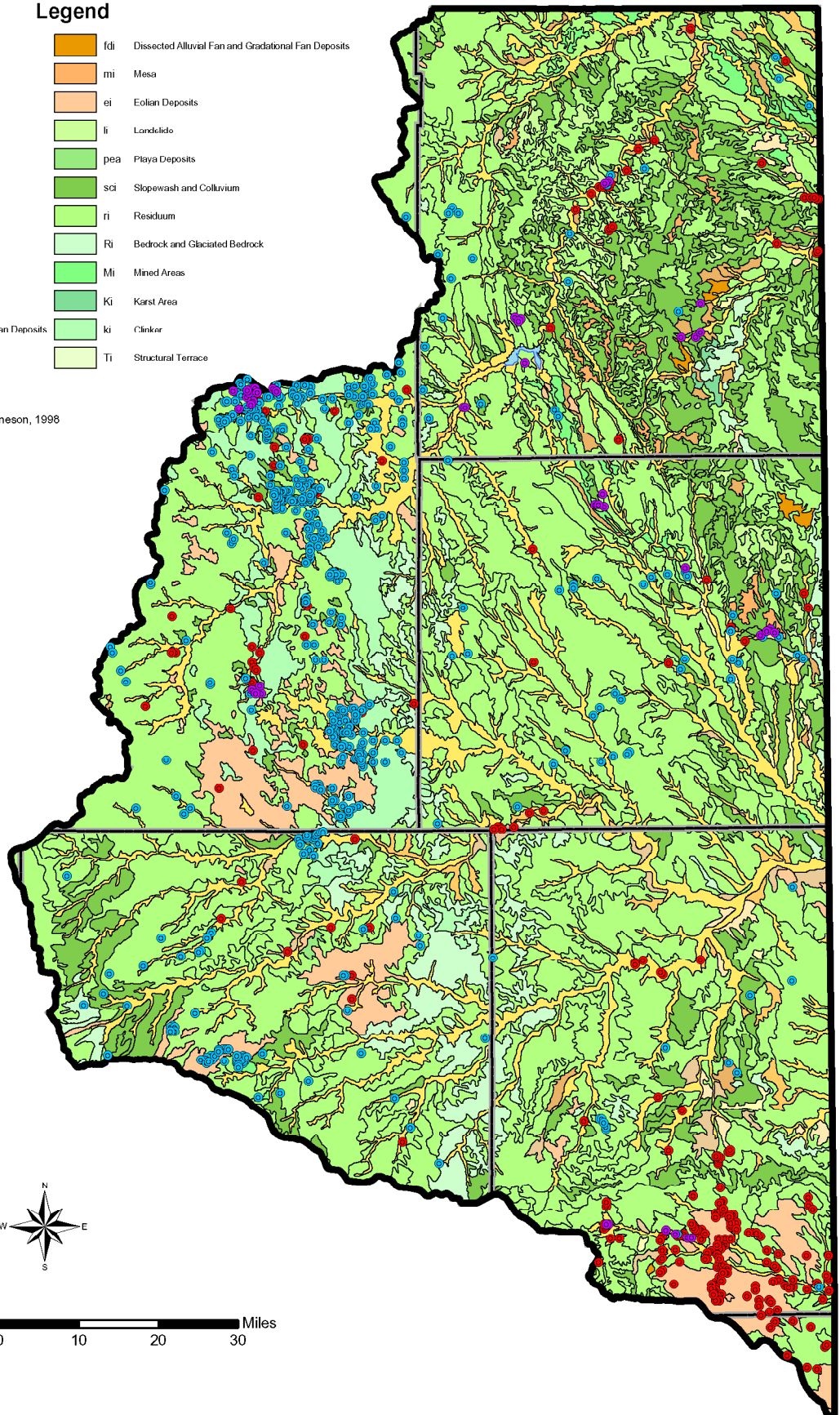
PLATE  
B.2.1



### Legend

- |   |   |
|---|---|
| ● Agricultural Wells                        | fdi Dissected Alluvial Fan and Gradational Fan Deposits |
| ● Municipal Wells                           | mi Mesa   |
| ● Industrial & Misc. Wells                  | ei Eolian Deposits                                      |
| ■ Lake Body of Water                        | li Londekido  |
| ■ alluvium                                  | pea Playa Deposits                                      |
| ■ Bench Deposits                            | sci Slopewash and Colluvium                             |
| ■ Dissected Bench Deposits                  | ri Residuum   |
| ■ Dissected Terrace Deposits                | Ri Bedrock and Glaciated Bedrock                        |
| ■ Terrace Deposits                          | Mi Mined Areas  |
| ■ Shallow Terrace Deposits                  | Ki Karst Area   |
| ■ Alluvial Fan and Gradational Fan Deposits | ki Clinker  |
|   | Ti Structural Terrace                                   |

Source: Hamerlinck and Ameson, 1998  
WSEO, 2000



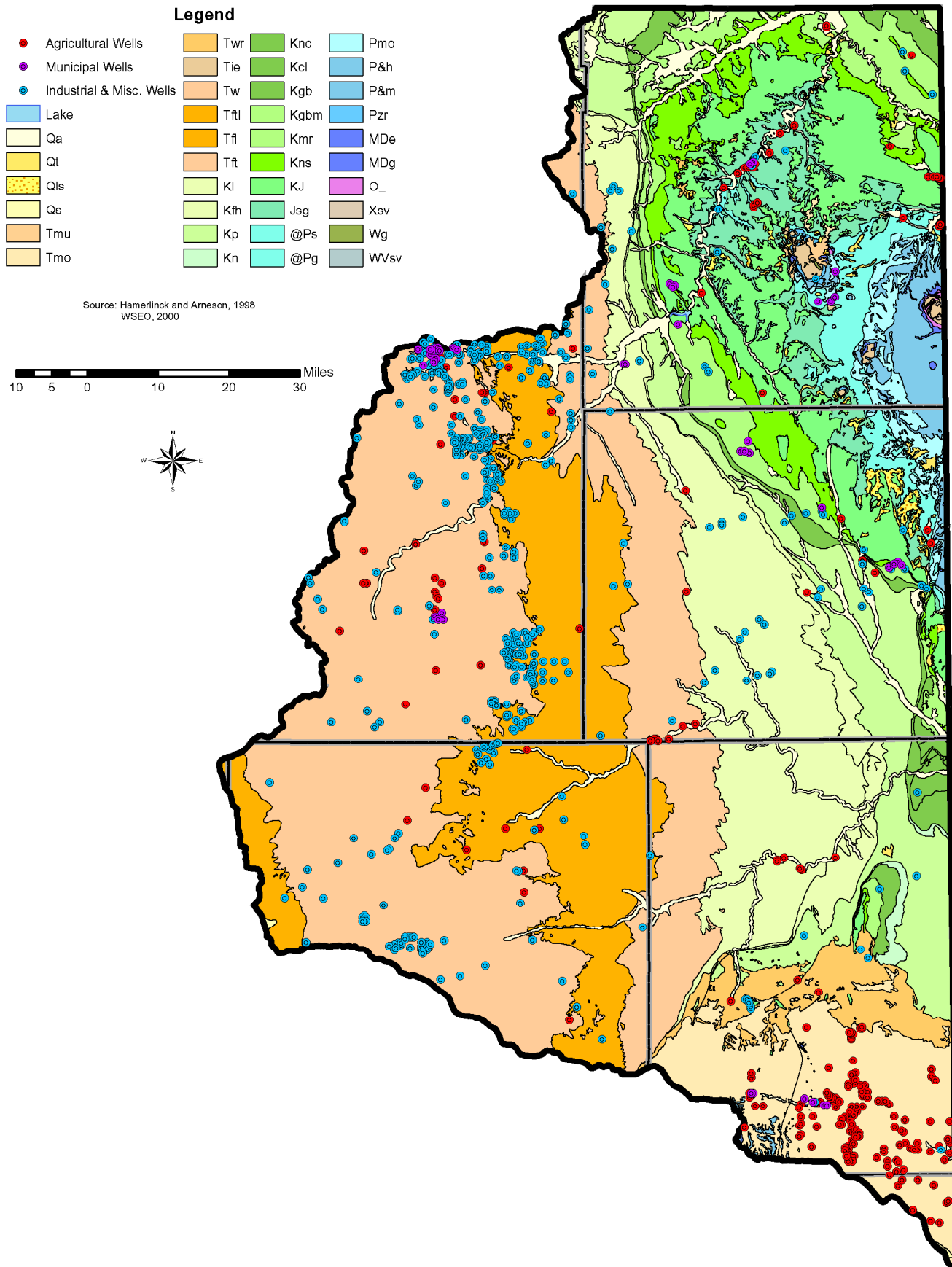
## Surficial Geology

with Permitted Active Agricultural, Municipal, Industrial, and  
Misc. Wells with Production Rates Greater Than 49 gpm



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PLATE  
B.3



## Bedrock Geology

with Permitted Active Agricultural, Municipal, Industrial and  
Misc. Wells with Production Rates Greater Than 49 gpm



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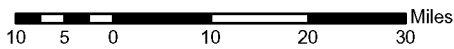
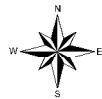
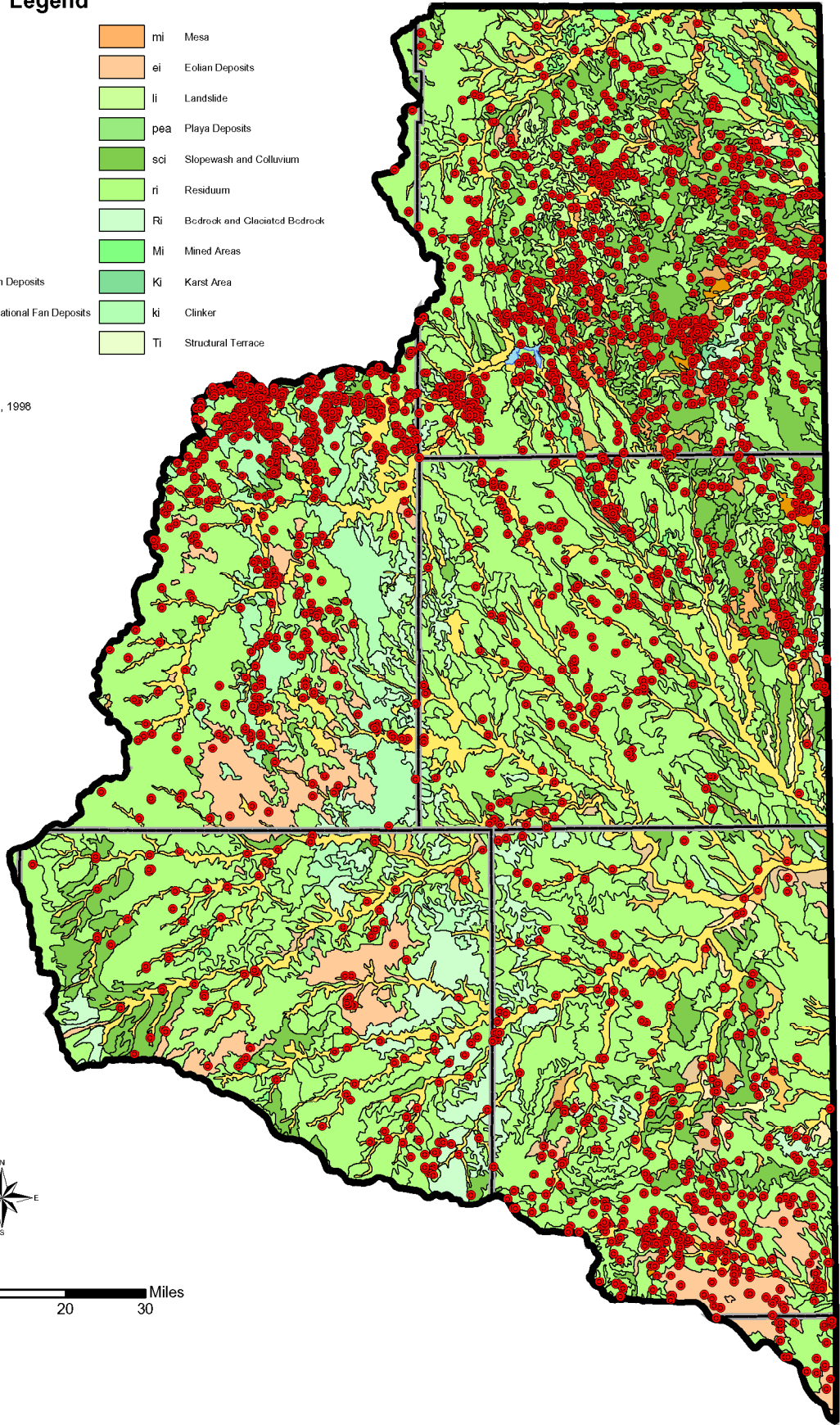
PLATE  
B.4



### Legend

- |   |                                  |
|---|----------------------------------|
| ● Domestic Wells  | mi Mesa                          |
| ■ Lake Body of Water                                      | ei Eolian Deposits               |
| ■ ai Alluvium   | li Landslide                     |
| ■ bi Bench Deposits                                       | pea Playa Deposits               |
| ■ bdi Dissected Bench Deposits                            | sci Slopewash and Colluvium      |
| ■ tdi Dissected Terrace Deposits                          | ri Residuum                      |
| ■ ti Terrace Deposits                                     | Ri Bedrock and Glaciated Bedrock |
| ■ tre Shallow Terrace Deposits                            | Mi Mined Areas                   |
| ■ fi Alluvial Fan and Gradational Fan Deposits            | Kj Karst Area                    |
| ■ fdi Dissected Alluvial Fan and Gradational Fan Deposits | ki Clinker                       |
|   | Ti Structural Terrace            |

Source: Hamerlinck and Ameson, 1996  
WSEO, 2000

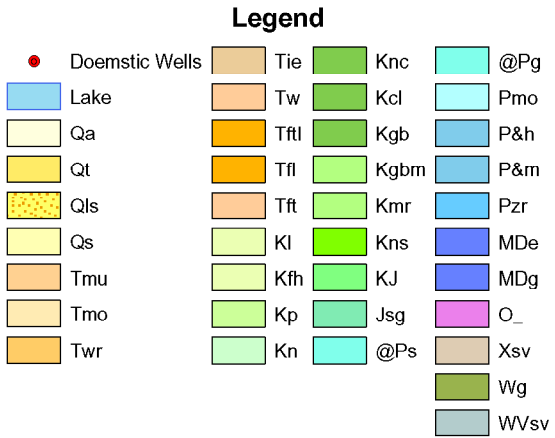


## Surficial Geology with Active Permitted Domestic Wells

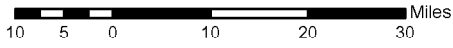
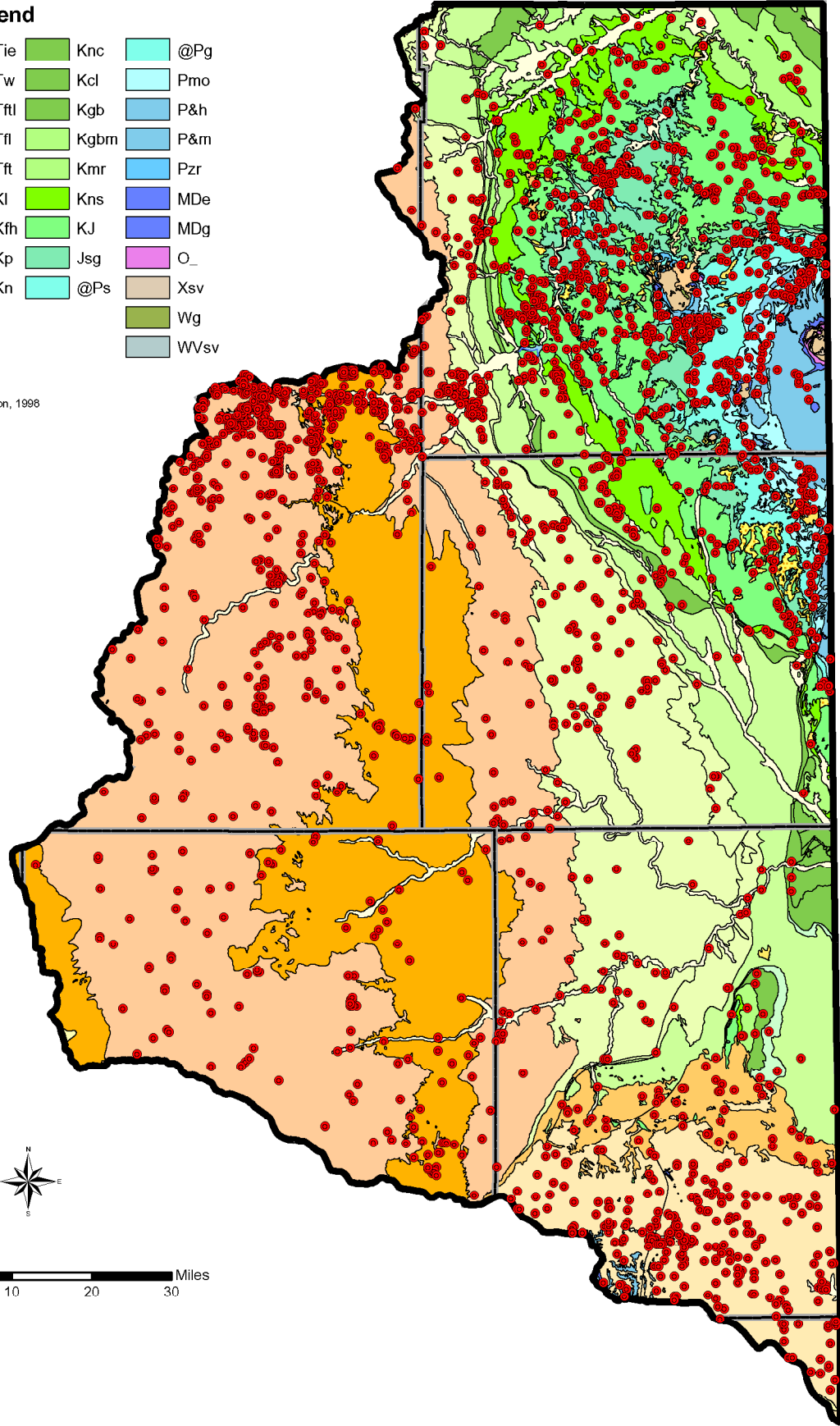


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# PLATE B.5



Source: Hamerlinck and Arneson, 1998  
WSEO, 2000



**Bedrock Geology  
with Active Permitted Domestic Wells**



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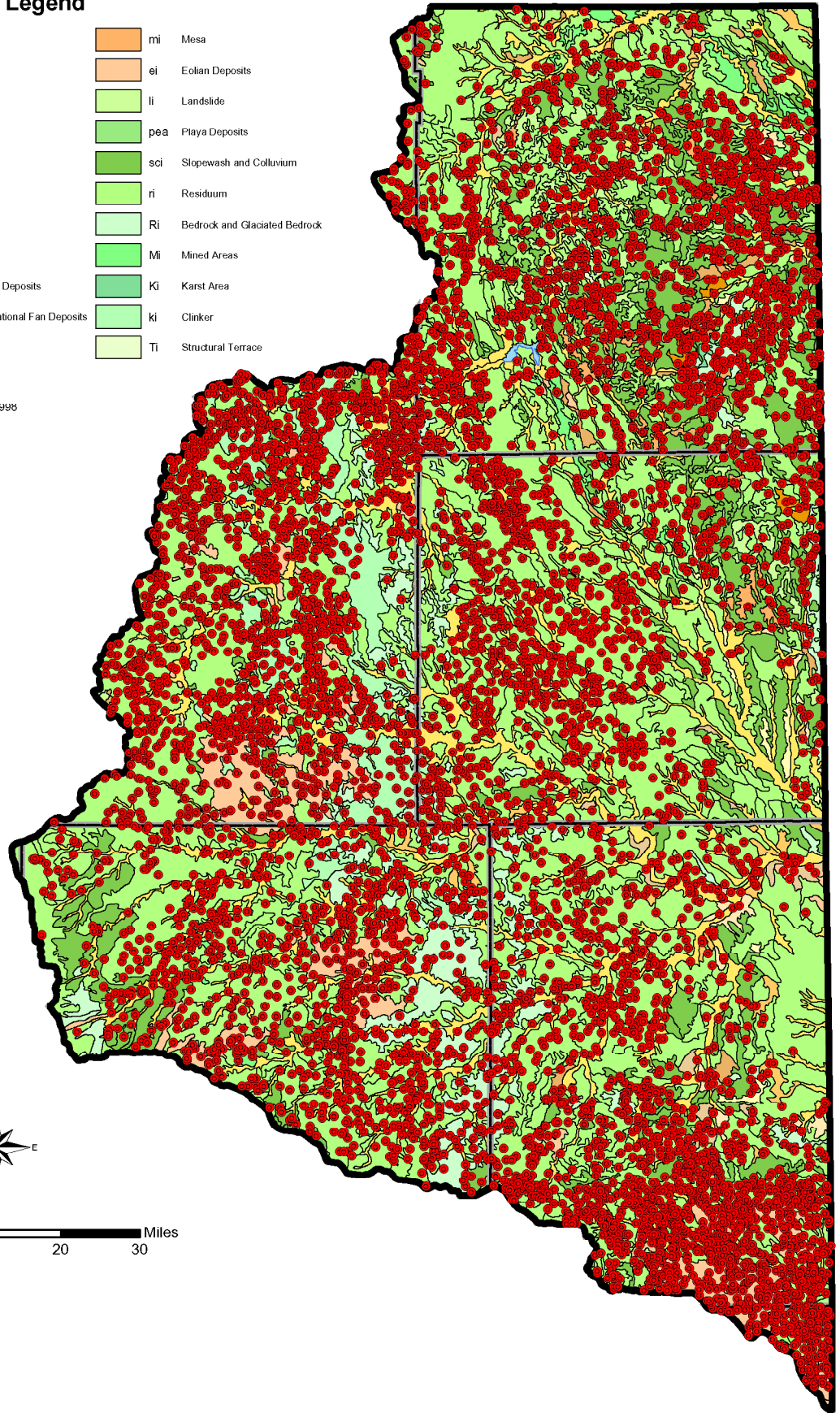
**PLATE  
B.6**



### Legend

- |   |                                  |
|---|----------------------------------|
| ● Stock Wells   | mi Mesa                          |
| ■ Lake Body of Water                                    | ei Eolian Deposits               |
| ai Alluvium   | li Landslide                     |
| bi Bench Deposits                                       | pea Playa Deposits               |
| bdi Dissected Bench Deposits                            | sci Slopewash and Colluvium      |
| tdi Dissected Terrace Deposits                          | ri Residuum                      |
| ti Terrace Deposits                                     | Ri Bedrock and Glaciated Bedrock |
| tre Shallow Terrace Deposits                            | Mi Mined Areas                   |
| fi Alluvial Fan and Gradational Fan Deposits            | Ki Karst Area                    |
| fdi Dissected Alluvial Fan and Gradational Fan Deposits | ki Clinker                       |
|   | Ti Structural Terrace            |

Source: Hamerlinck and Arneson, 1998  
WSEO, 2000



## Surficial Geology with Active Permitted Stock Wells



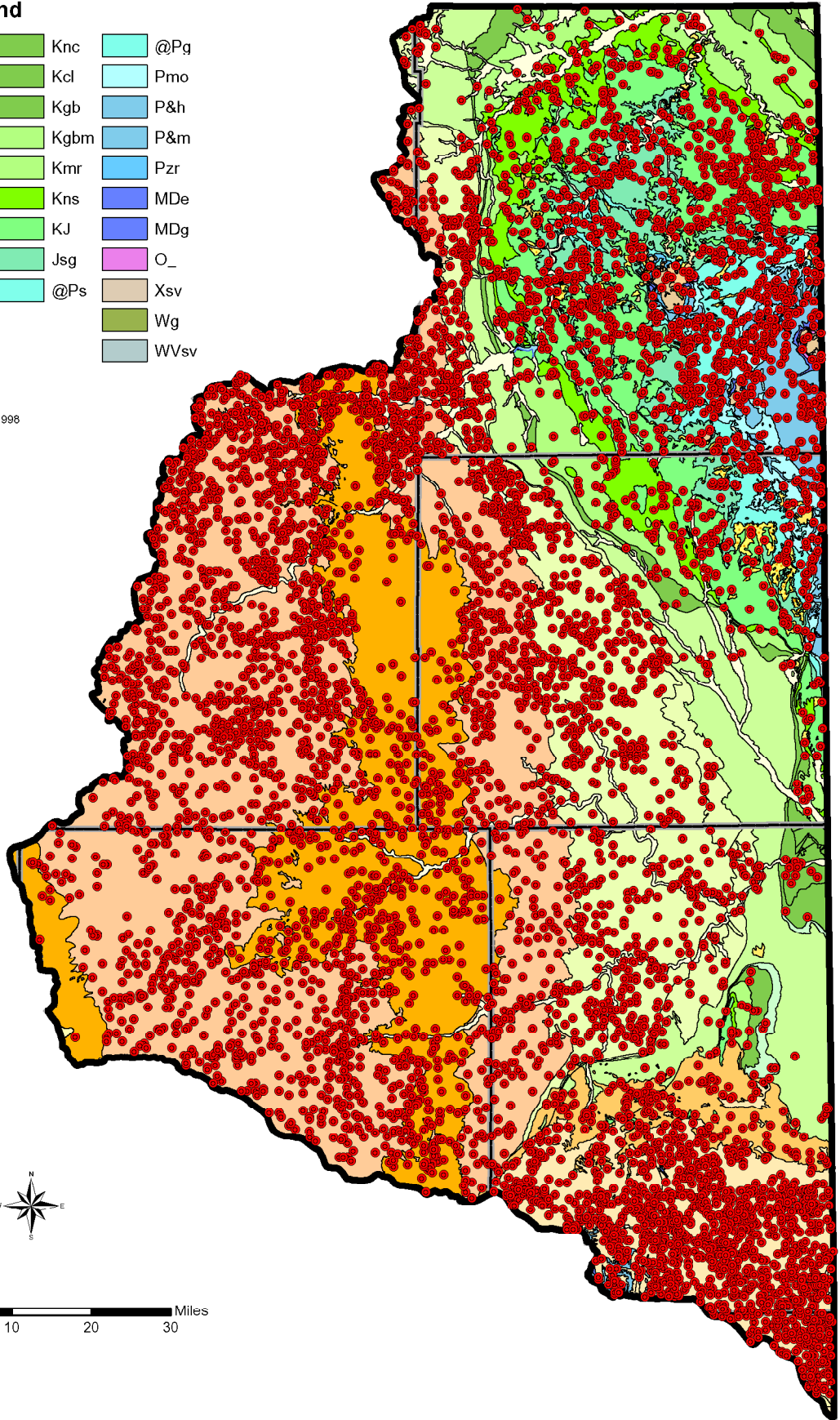
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# PLATE B.7

**Legend**

● Stock Wells	■ Tie	■ Knc	■ @Pg
■ Lake	■ Tw	■ Kcl	■ Pmo
■ Qa	■ Tfl	■ Kgb	■ P&h
■ Qt	■ Tfi	■ Kgbrn	■ P&m
■ Qls	■ Tft	■ Kmr	■ Pzr
■ Qs	■ Kl	■ Kns	■ MDe
■ Tmu	■ Kfh	■ KJ	■ MDg
■ Tmo	■ Kp	■ Jsg	■ O_
■ Twr	■ Kn	■ @Ps	■ Xsv
			■ Wg
			■ WVsv

Source: Hamerlinck and Arneson, 1998  
WSEO, 2000



**Bedrock Geology  
with Active Permitted Stock Wells**



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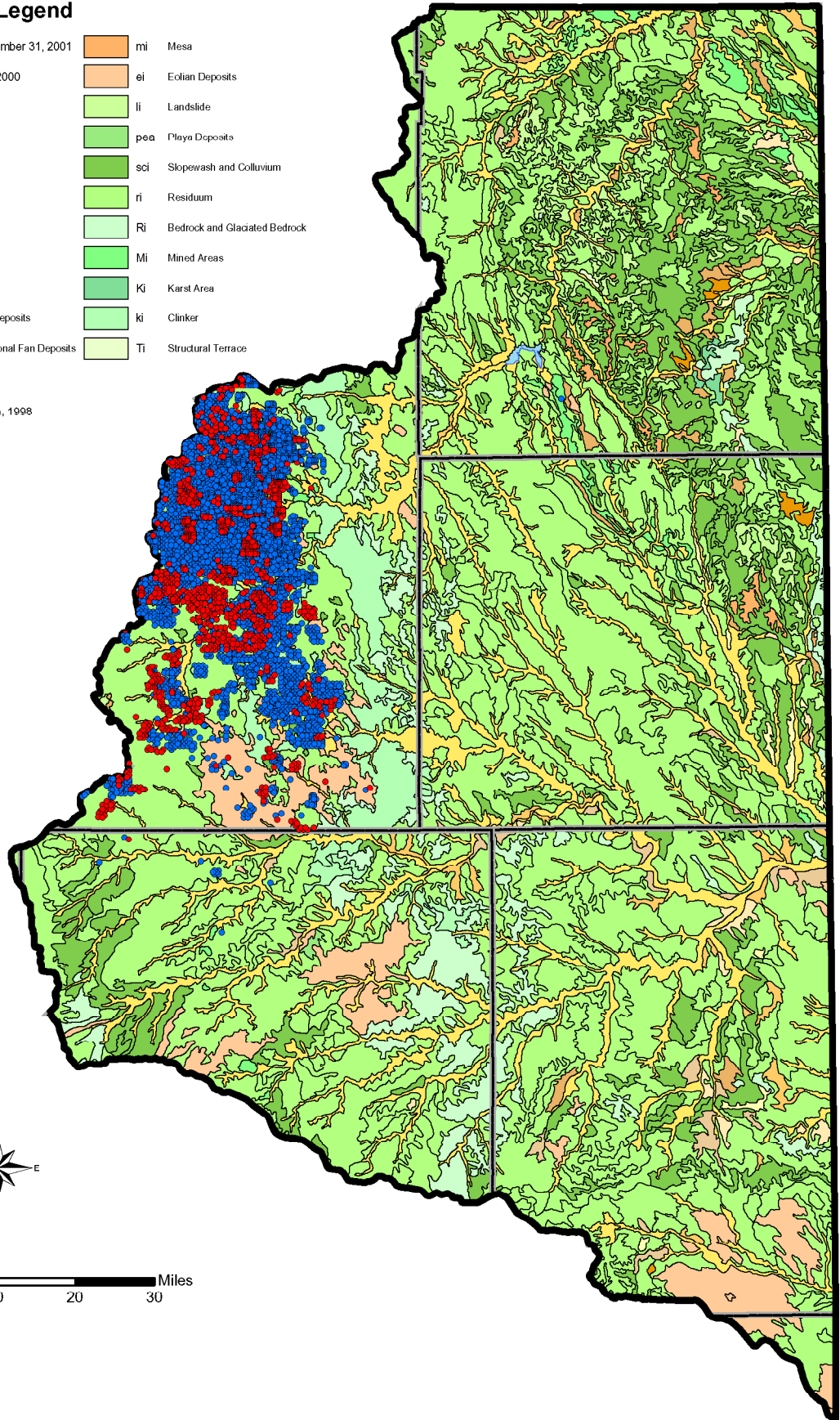
**PLATE  
B.8**



### Legend

- Additional Wells Permitted as of December 31, 2001
- Wells Permitted as of December 31, 2000
- Lake Body of Water
- ai Alluvium
- bi Bench Deposits
- bdi Dissected Bench Deposits
- tdi Dissected Terrace Deposits
- ti Terrace Deposits
- tre Shallow Terrace Deposits
- fi Alluvial Fan and Gradational Fan Deposits
- fdi Dissected Alluvial Fan and Gradational Fan Deposits
- mi Mesa
- ei Eolian Deposits
- li Landslide
- pea Pleyo Deposits
- sci Slopewash and Colluvium
- ri Residuum
- Ri Bedrock and Glaciated Bedrock
- Mi Mined Areas
- KJ Karst Area
- ki Clinker
- Ti Structural Terrace

Source: Hamerlinck and Arneson, 1998  
WSEO, 2001



## Surficial Geology

with Permitted Coal Bed Methane Wells



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










PLATE  
B.9



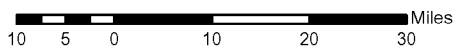
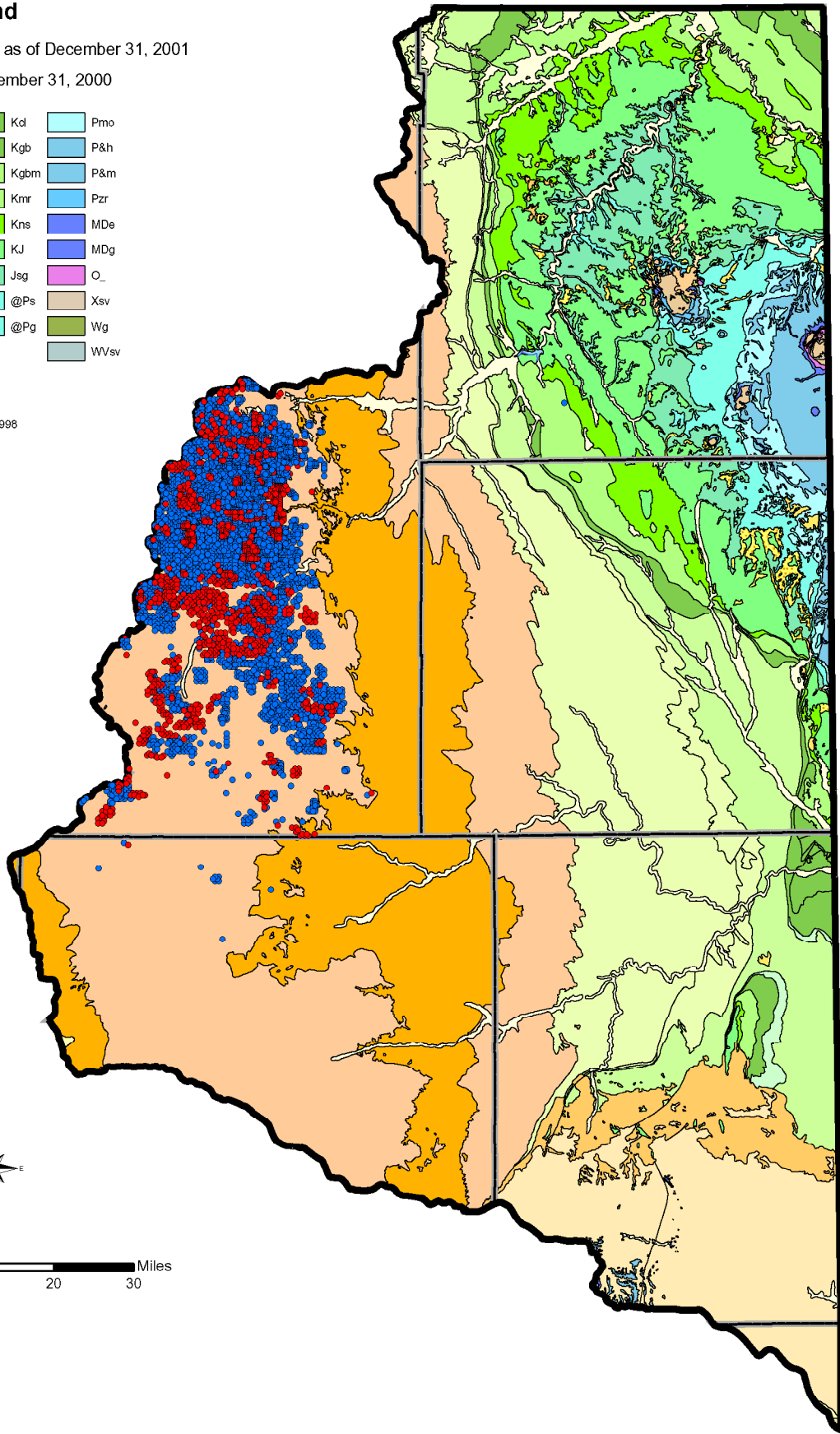
### Legend

• Additional Wells Permitted as of December 31, 2001

• Wells Permitted as of December 31, 2000

 Lake	 Tw	 Kcl	 Pmo
 Qa	 Tfl	 Kgb	 P&h
 Qt	 Tfl	 Kgbm	 P&m
 Qls	 Tft	 Kmr	 Pzr
 Qs	 Kl	 Kns	 MDe
 Trmu	 Kfh	 KJ	 MDg
 Trmo	 Kp	 Jsg	 O_
 Twr	 Kn	 @Ps	 Xsv
 Tie	 Knc	 @Pg	 Wg
			 Wvsv

Source: Hamerlinck and Arneson, 1998  
WSEO, 2001



## Bedrock Geology with Permitted Coal Bed Methane Wells



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PLATE  
B.10