



*Available Groundwater Determination
Technical Memoranda for the Powder
and Northeast River Basins Plans*

WSGS – USGS – WRDS - WWDO

Wyoming State Geological Survey (WSGS)

Laramie, Wyoming

Karl Taboga, PG

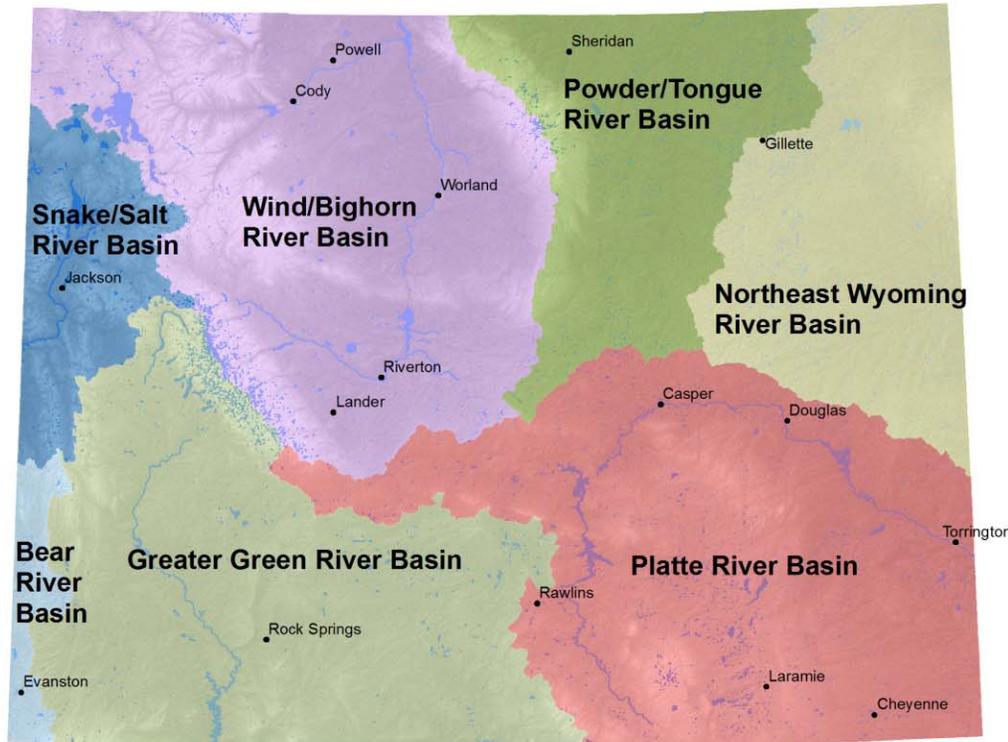


Groundwater Technical Memoranda Team

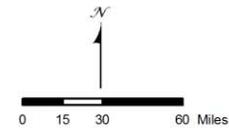
- **Wyoming State Legislature**
- **Wyoming Water Development Office (WWDO)**
- **Wyoming State Geological Survey (WSGS)**
- **United States Geological Survey (USGS) Wyoming-Montana Water Science Center**
- **University of Wyoming Water Resources Data System (WRDS)**

Additional data is provided by: Wyoming State Engineer's Office, Department of Environmental Quality, Oil and Gas Conservation Commission; United States Environmental Protection Agency; Bureau of Land Management and U.S. Forest Service.

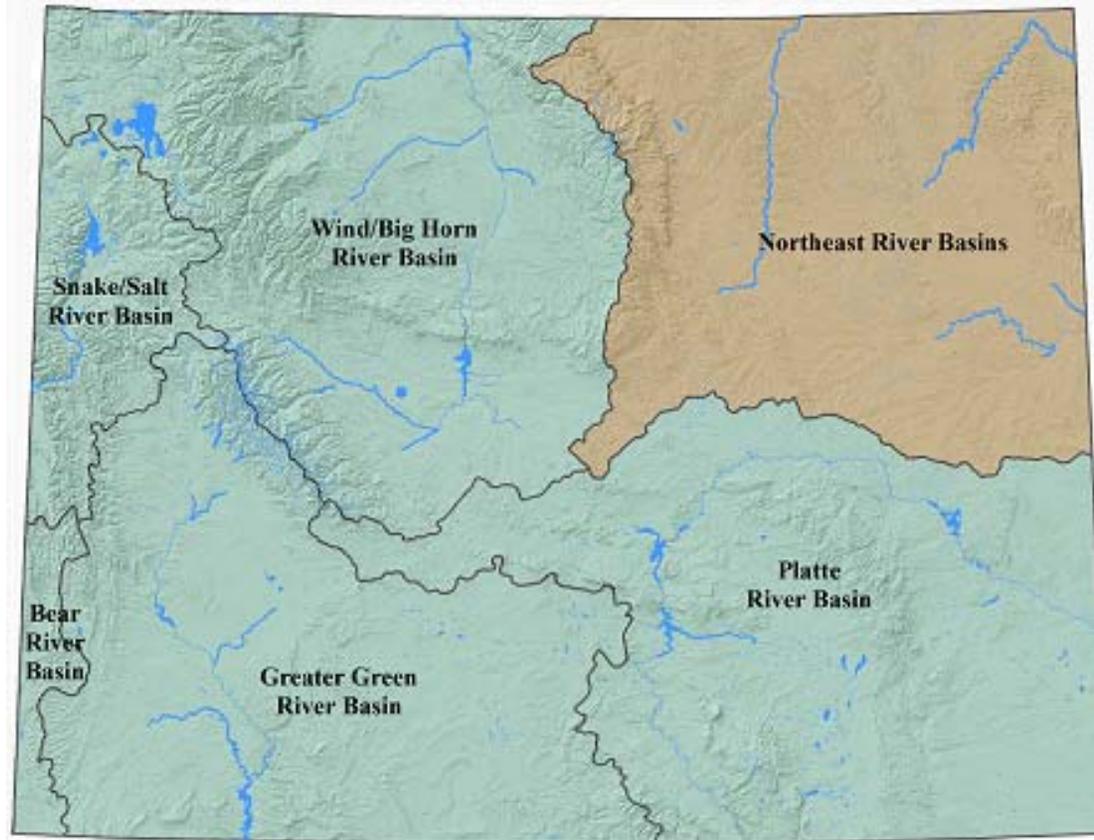
Wyoming Water Planning River Basins



WSGS 2012
Projection: NAD 1983
UTM Zone 12N



A combined groundwater study for the Powder, Tongue and Northeast River Basins will be released in July 2017.





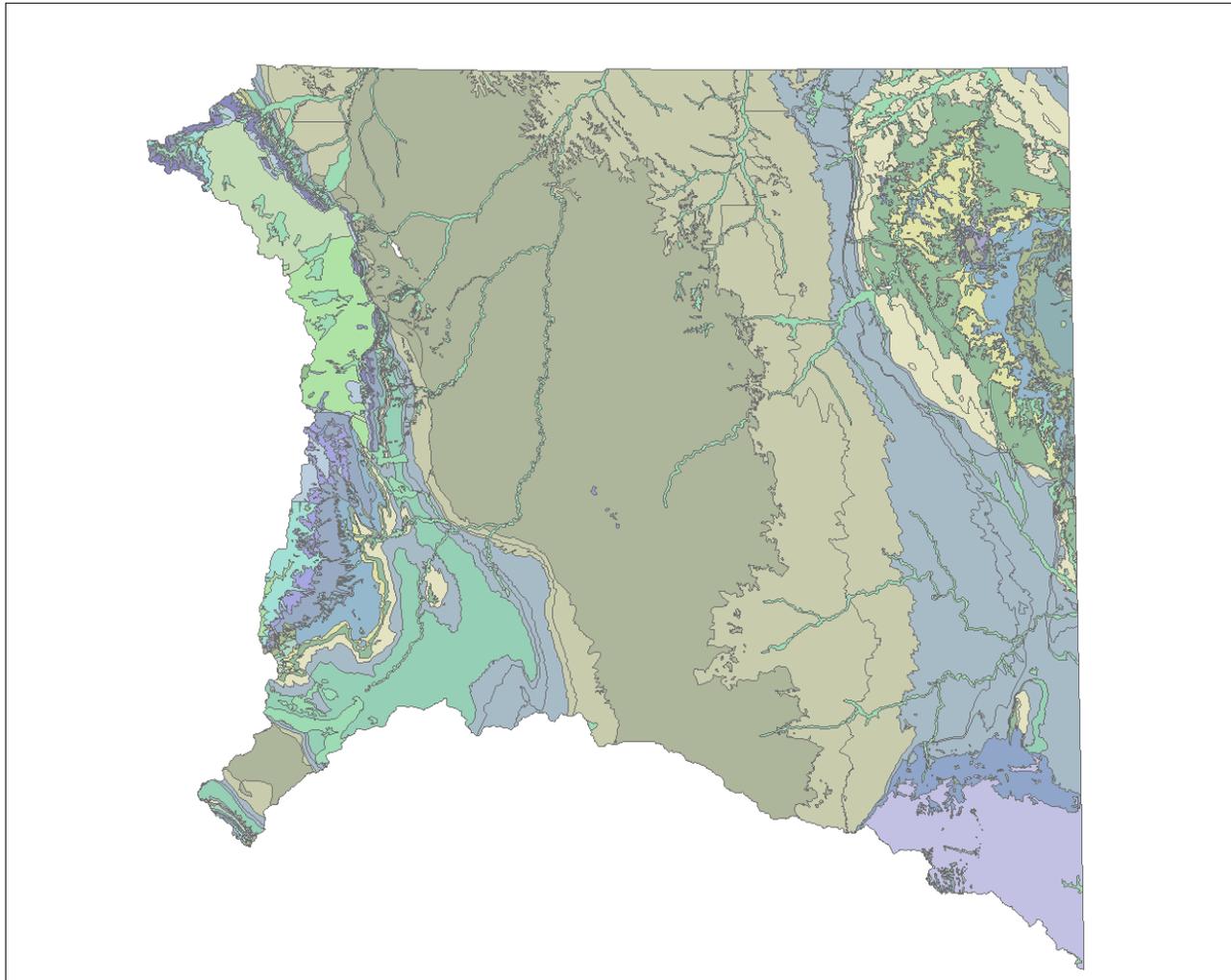
Objectives

- Identify major aquifers.
- Define the three dimensional extents of the aquifers (outcrop areas, geologic structures, & depths).
- Describe aquifer hydrogeologic and chemical properties.
- Describe aquifer recharge areas and rates.
- Investigate the usage of groundwater in the basin.
- Identify water development opportunities.
- Identify and describe existing studies/models.



The presence and extents of major aquifers are identified in large format geologic and hydrogeologic plates, aquifer isochore maps (limited), cross-sections and potentiometric surfaces.

Bedrock Geology Plate 1



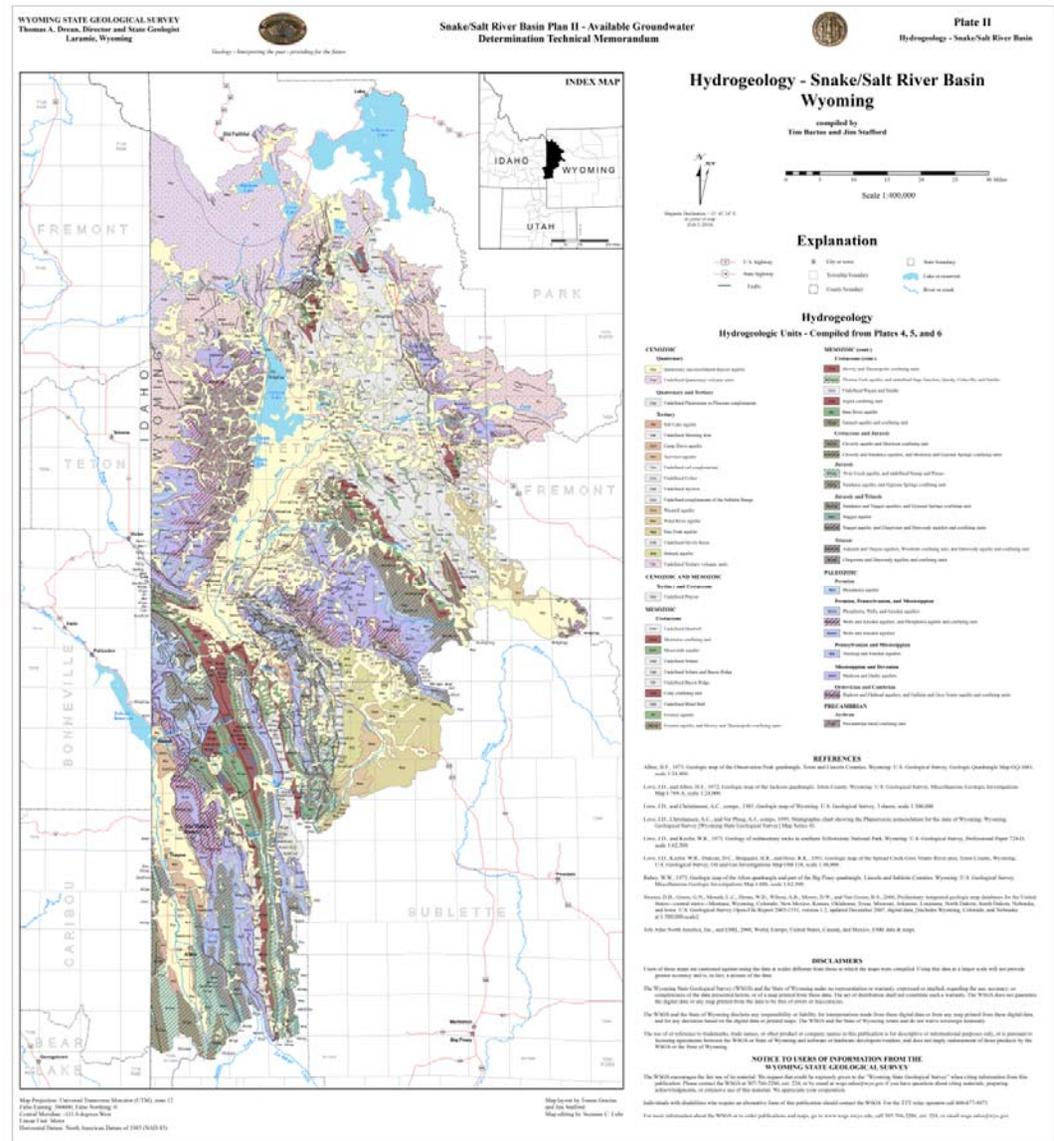
Explanation

Geologic Units

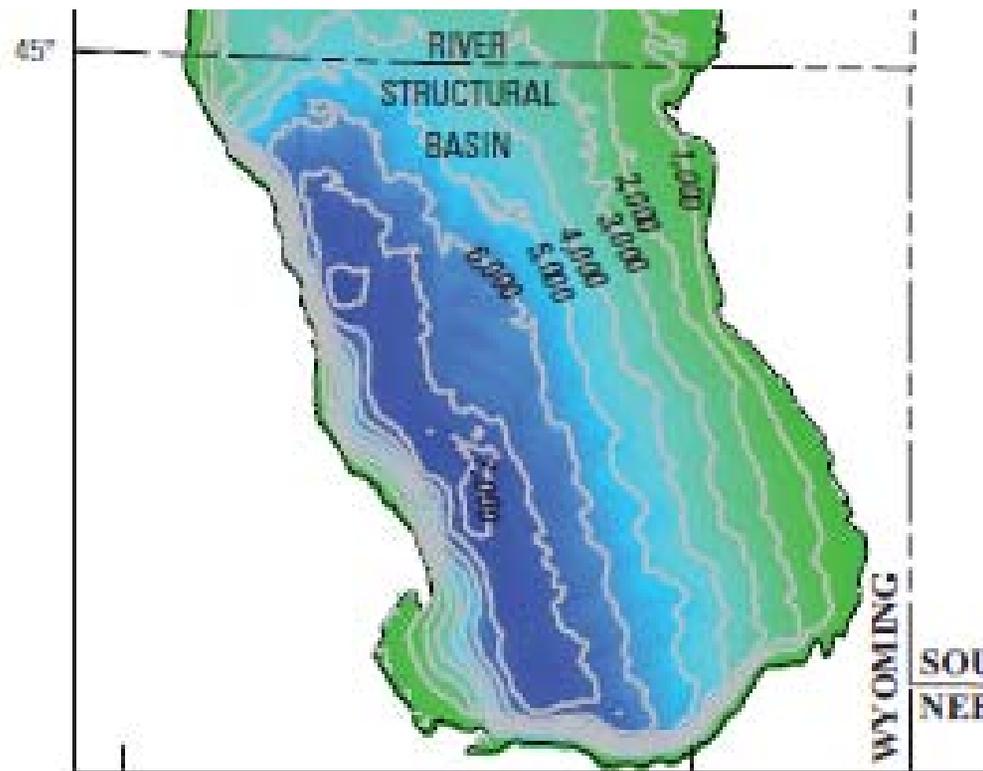
	Cambrian-Permian
	Early Archean
	Early Proterozoic
	Eocene
	Late Archean
	Late Cretaceous
	Lower Cretaceous
	Lower Cretaceous-Upper Cretaceous
	Lower Miocene
	Lower Mississippian-Upper Mississippian
	Lower Pennsylvanian-Permian
	Lower Triassic-Upper Triassic
	Middle Archean-Late Archean
	Middle Cambrian-Upper Cambrian
	Middle Cambrian-Upper Ordovician
	Middle Jurassic-Lower Cretaceous
	Middle Jurassic-Upper Jurassic
	Middle Ordovician-Upper Mississippian
	Middle Ordovician-Upper Ordovician
	Oligocene
	Paleocene
	Permian
	Permian-Lower Triassic
	Permian-Upper Triassic
	Pleistocene-Holocene
	Pliocene-Pleistocene
	Upper Cretaceous
	Upper Devonian-Lower Mississippian
	Upper Devonian-Upper Mississippian
	Upper Jurassic-Lower Cretaceous
	Upper Miocene
	Upper Mississippian-Permian
	Upper Oligocene-Upper Miocene

Hydrogeology Plate

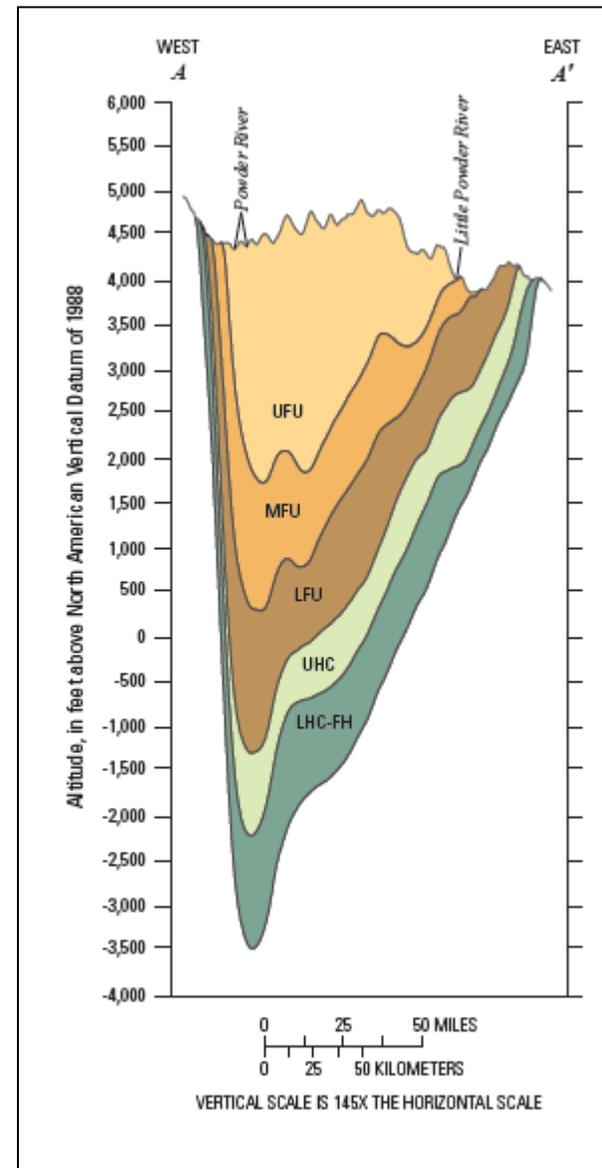
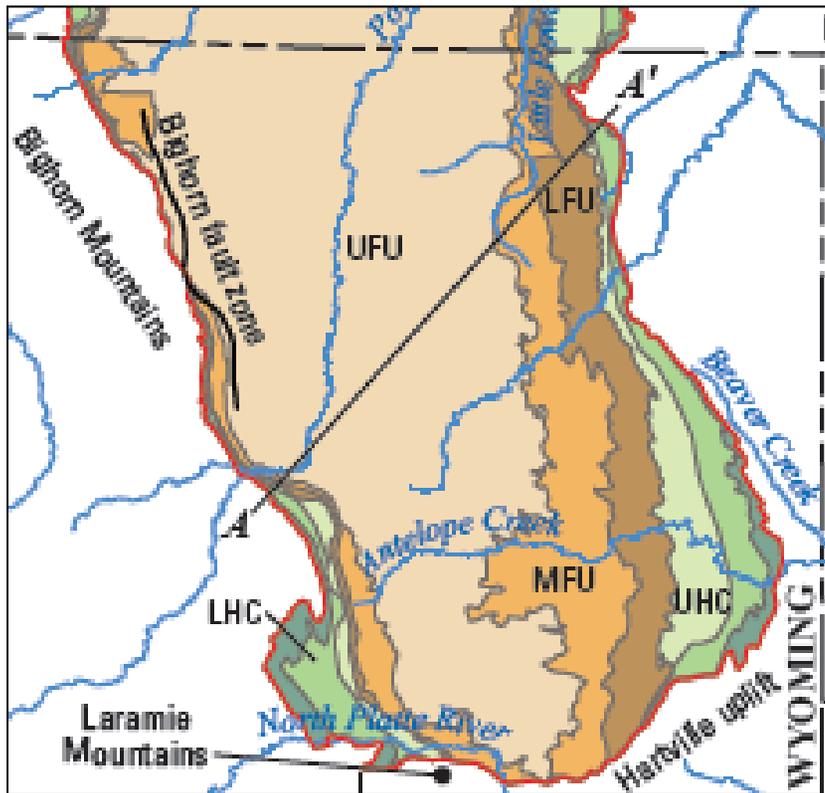
- Created from bedrock geology map and the hydrostratigraphic charts developed by USGS.



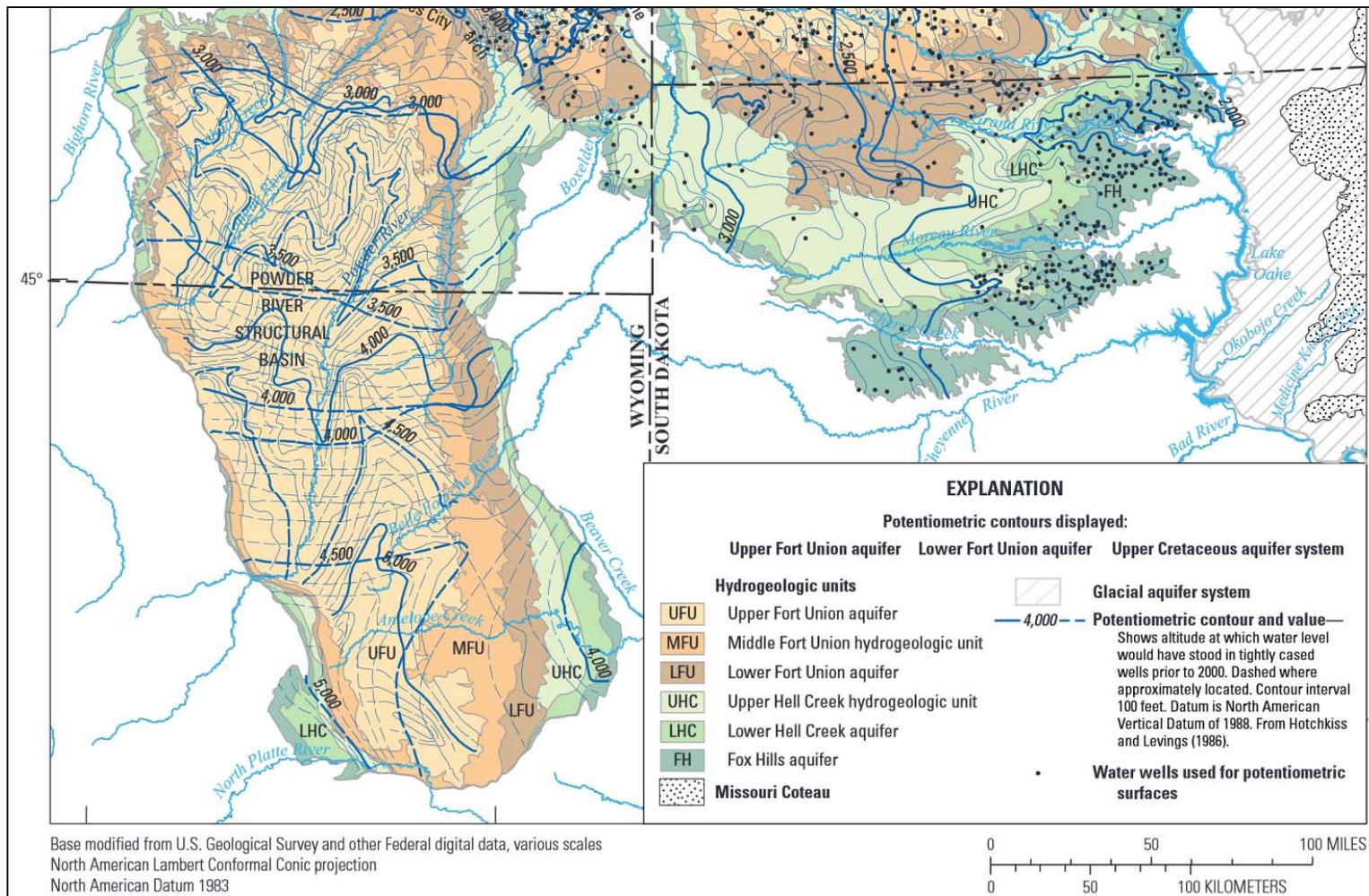
Aquifer thickness, elevation and depth are shown in isochore and elevation maps (Long et al, 2014)



Cross sections, (Long et al, 2014)

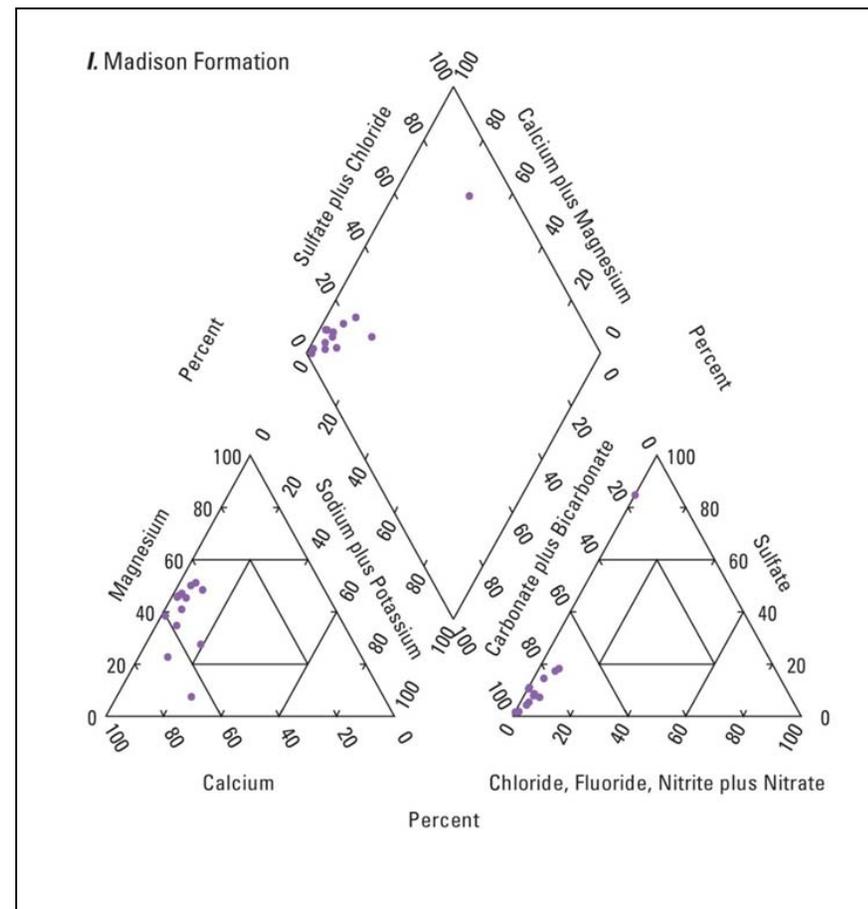


Potentiometric surfaces (Thamke et al, 2014)



The USGS Wyoming-Montana Water Science Center provides extensive descriptions of aquifer chemical and physical properties.

- USGS water quality data is presented in trilinear diagrams and statistical tables for produced and environmental water samples.



Typically, the USGS water chemistry analysis includes numerous samples.

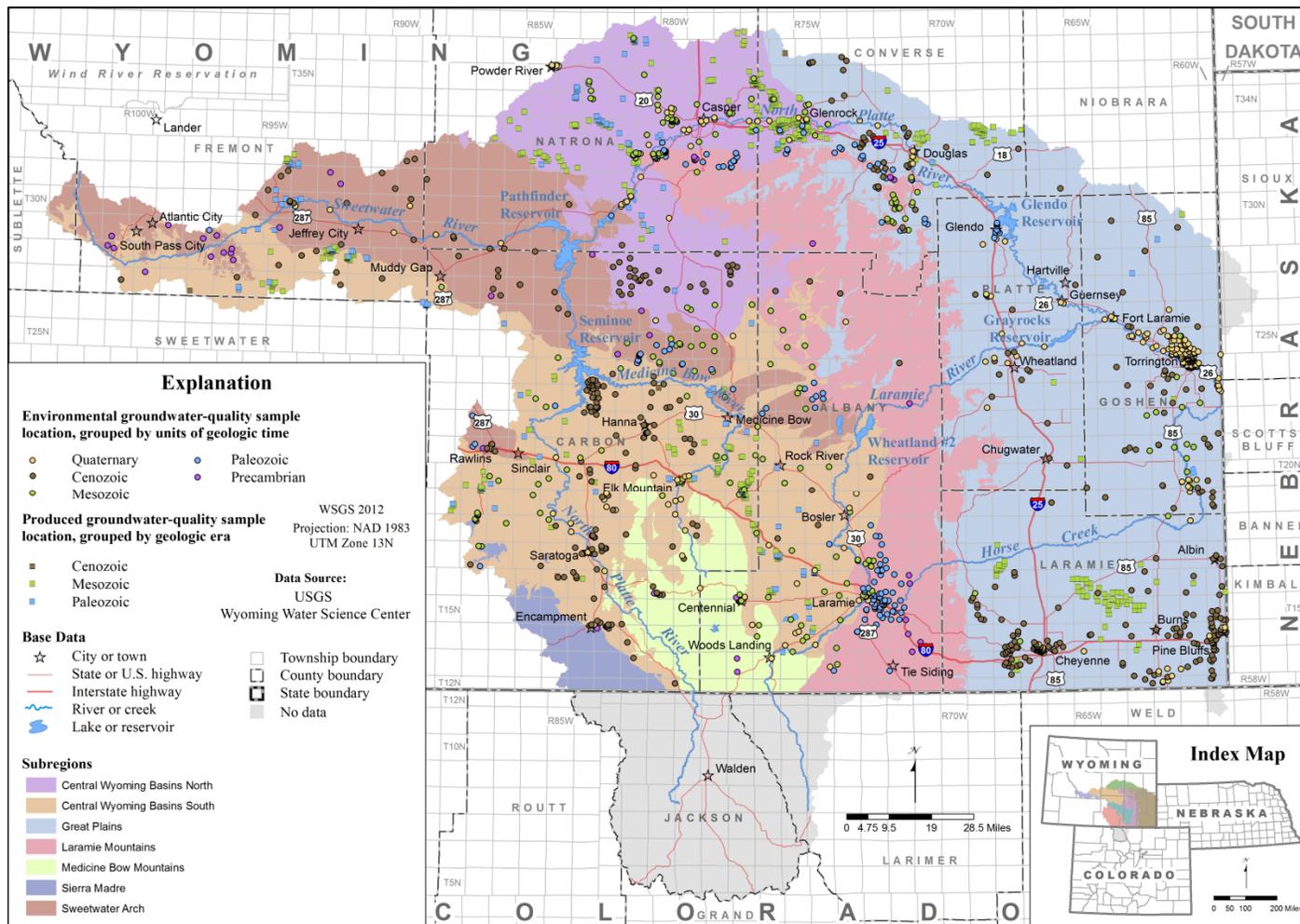
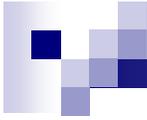
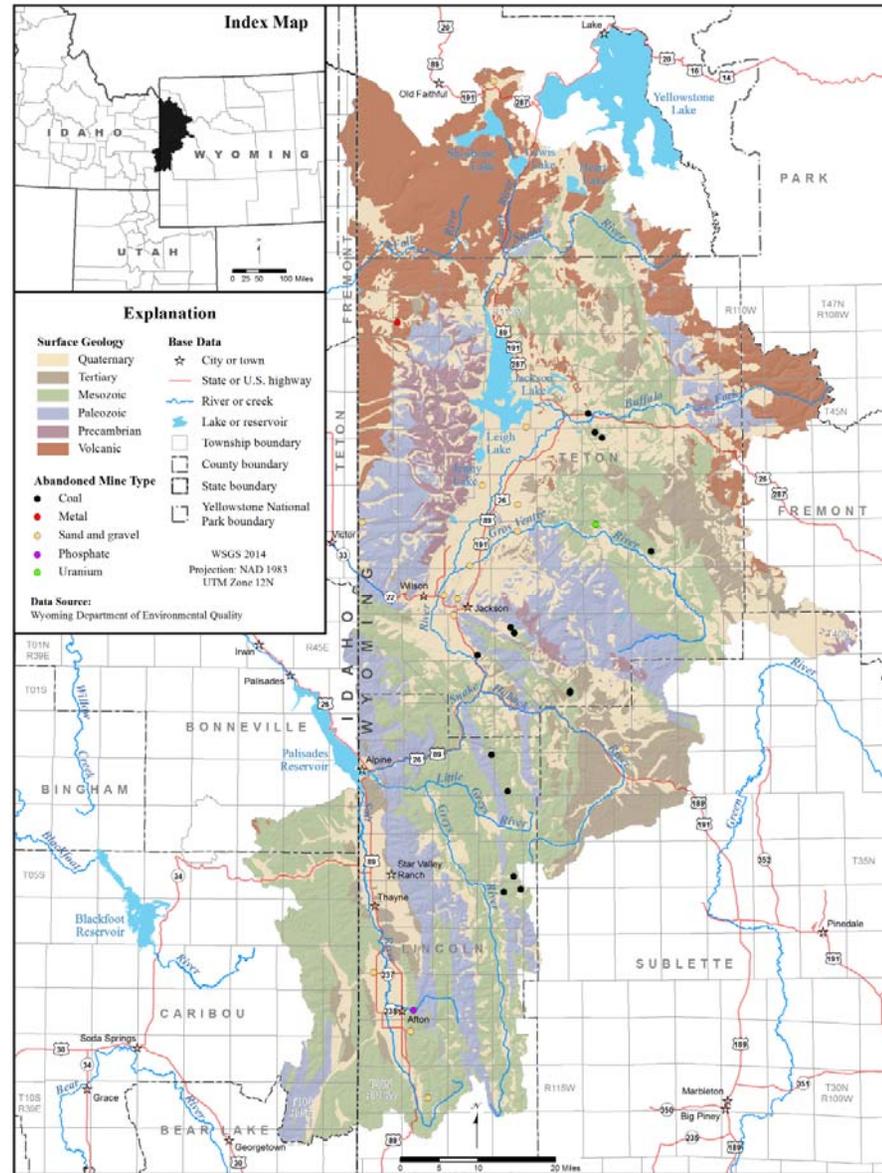
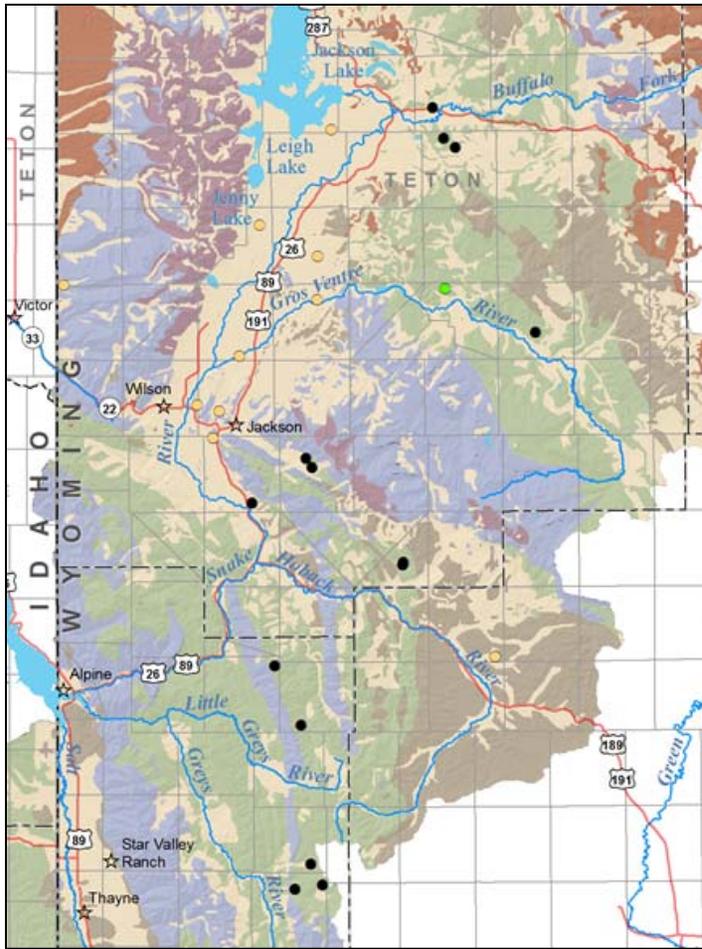


Figure 7-1. Environmental and produced groundwater quality sample locations, grouped by units of geologic time, Platte River Basin, Wyoming.

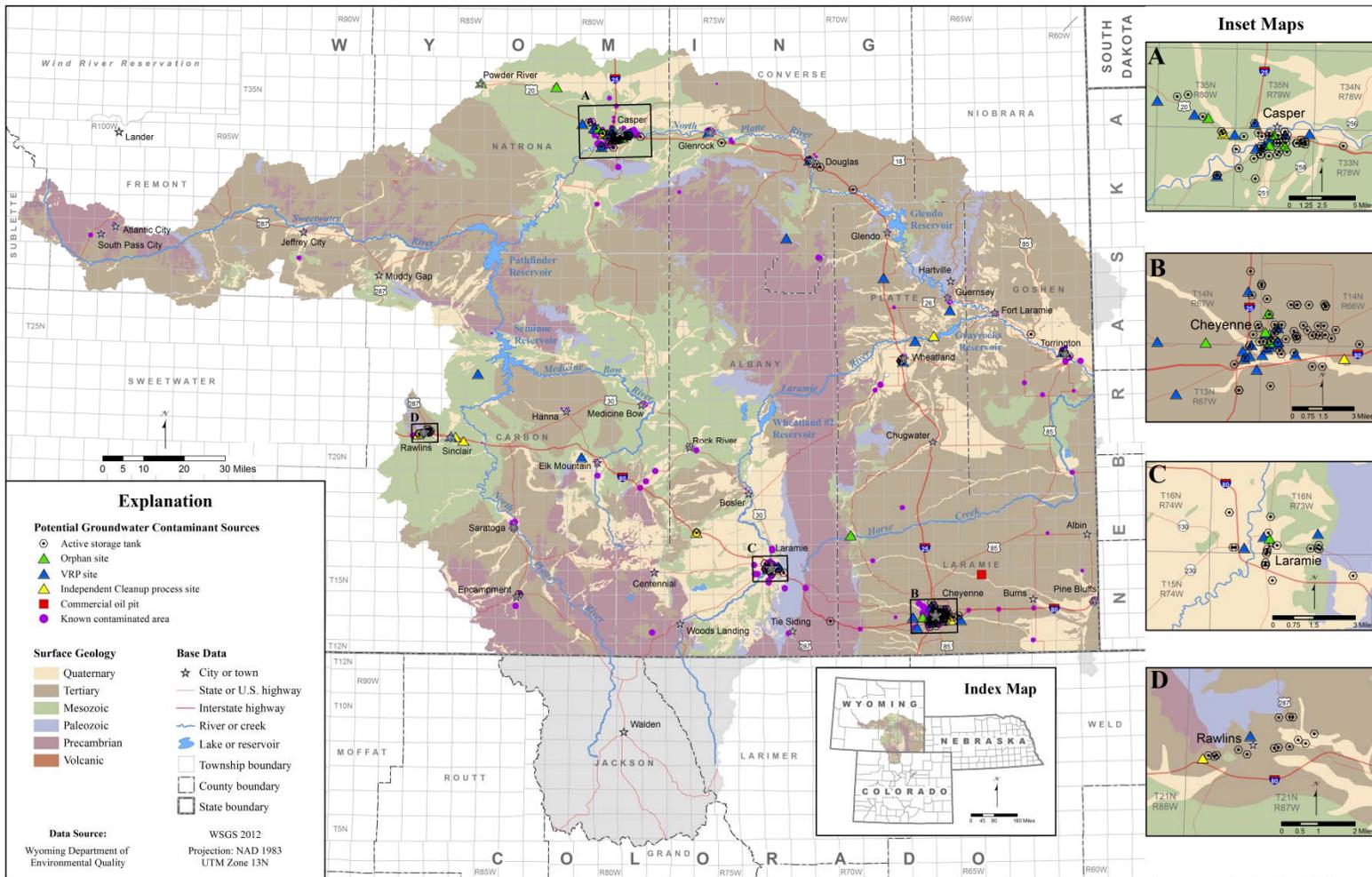


Additional water chemistry information includes maps of potential groundwater contaminant sites identified from WDEQ and WOGCC data.

Abandoned mine lands

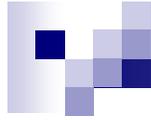


Known contaminated areas, orphan sites, active storage tanks and commercial oil pits

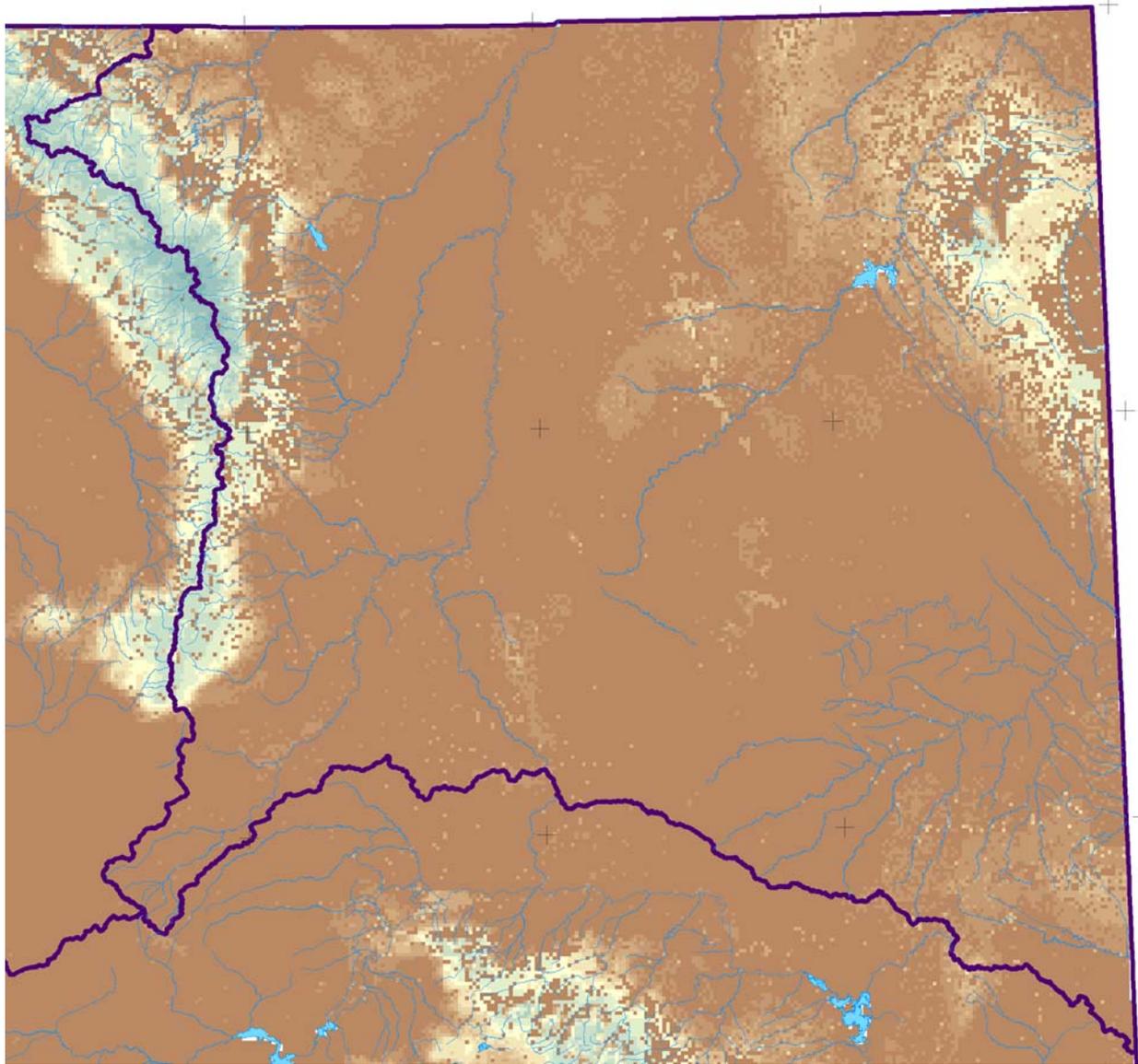
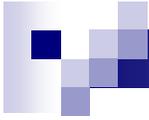


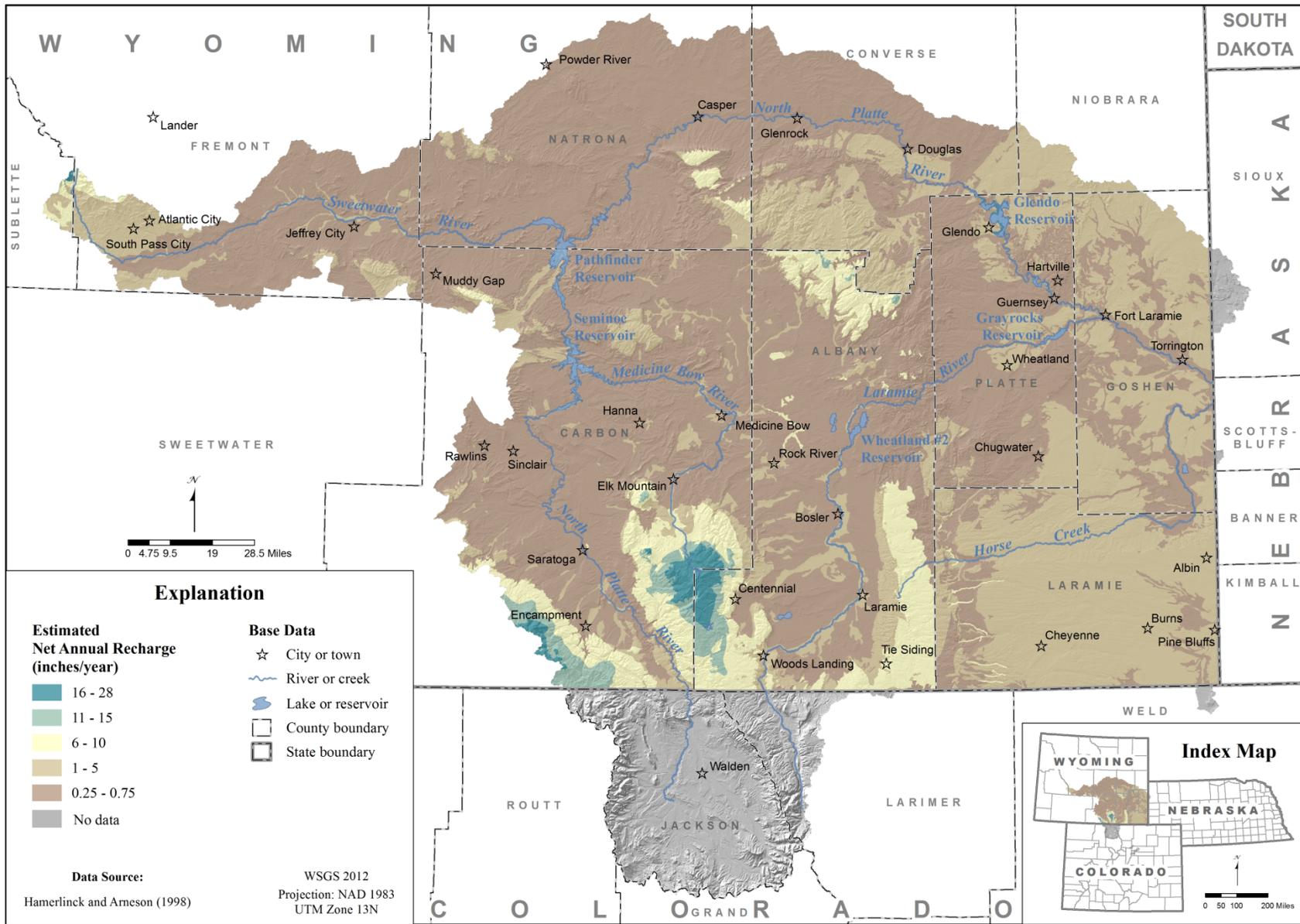
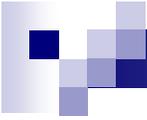


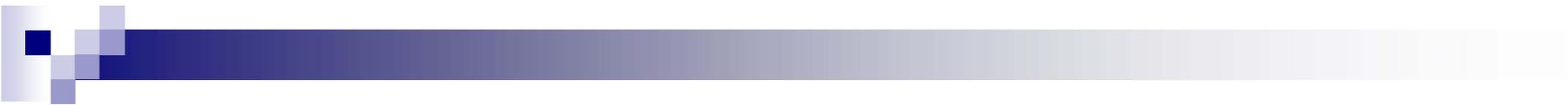
USGS provides an extensive review of the physical characteristics of the major hydrogeologic units in each basin as well as hydrostratigraphic charts obtained from numerous existing studies.



To identify aquifer recharge areas and rates, WSGS generates maps of estimated net annual recharge in the Wyoming portion of the basins (Hamerlinck and Arneson, 1998; PRISM climate data).



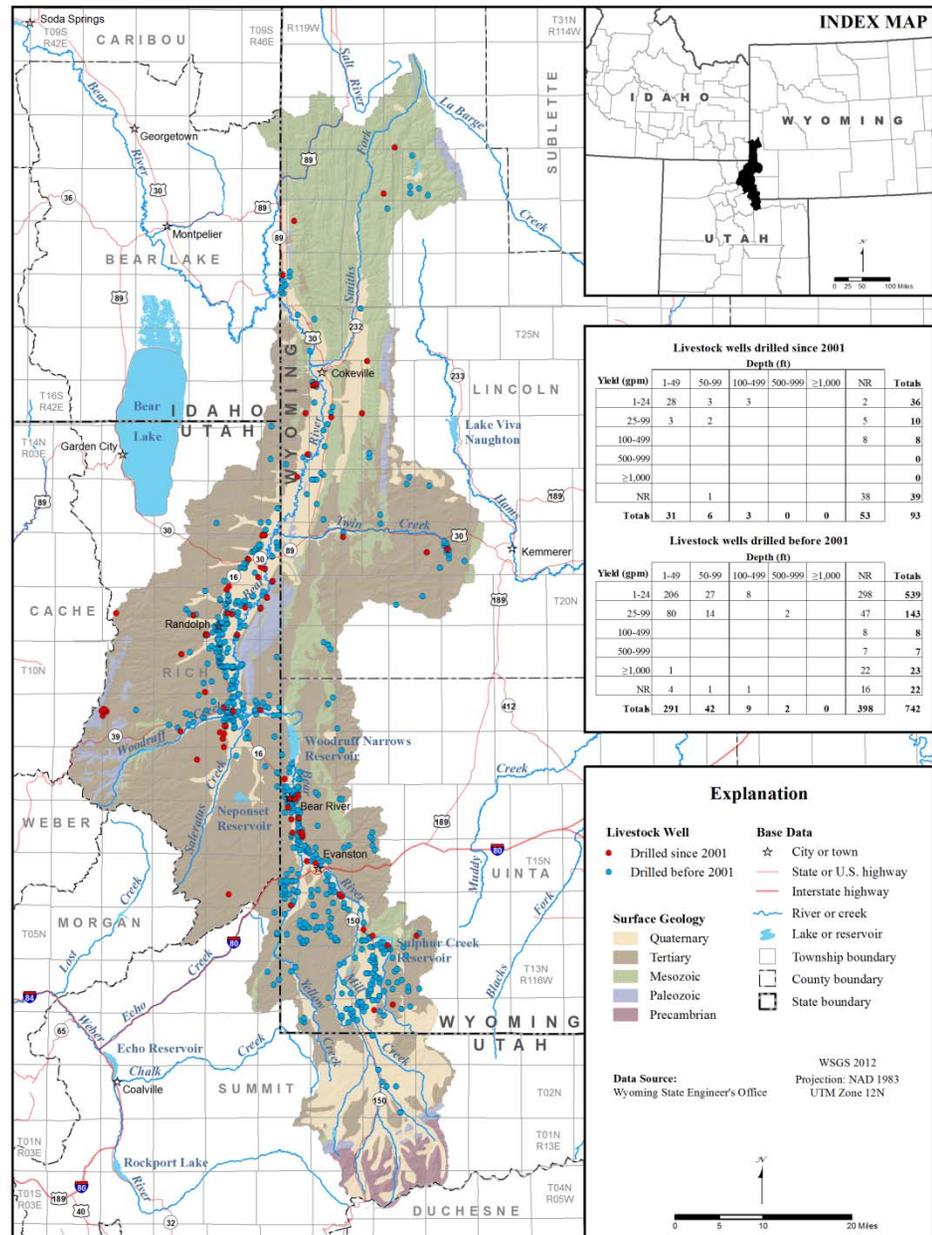
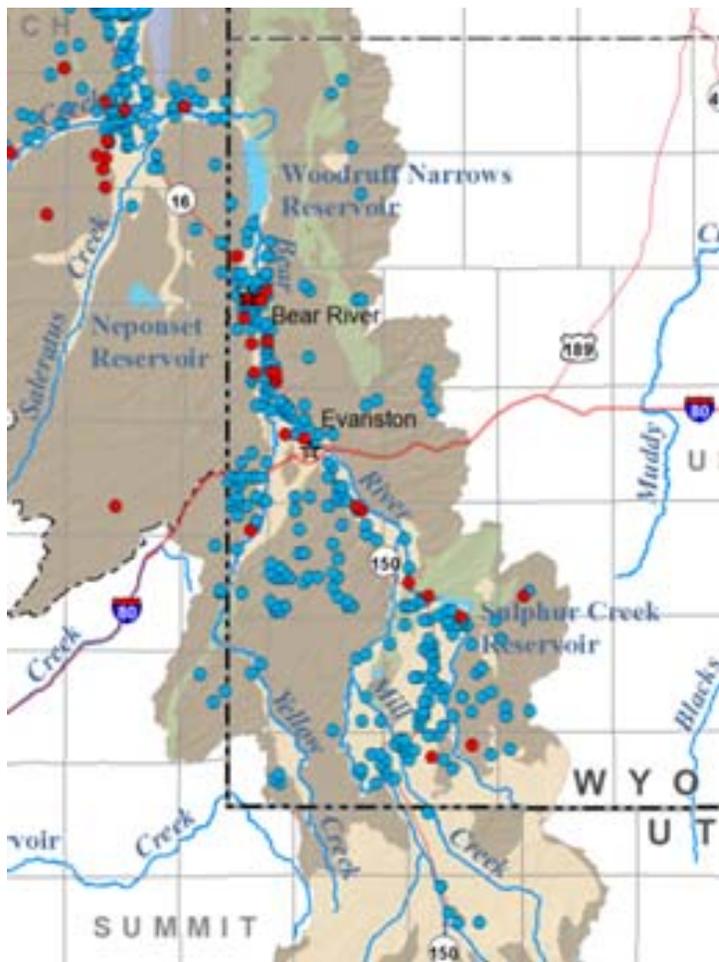




Groundwater usage is shown in detailed maps.

- Agricultural, livestock, domestic, industrial and municipal uses are considered.
- Recent and historical well completions are differentiated.
- Well depth and yield data are shown in attached tables.

Livestock wells





To identify future water development opportunities in each basin, WSGS discusses recent and current WWDC groundwater development projects and summarizes all WWDC projects in tabular form.

Previous groundwater studies from academia, consultants and federal and state agencies are discussed and cited throughout the memoranda.

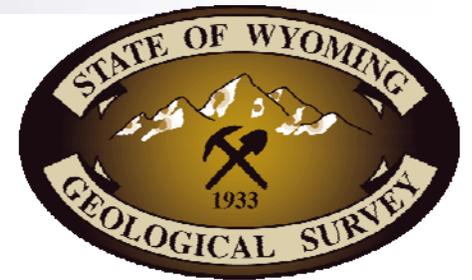


Access

- Wyoming State Geological Survey – Reports and data
<http://www.wsgs.wyo.gov/water/river-basin-plans>
- Wyoming Water Development Office - Reports
<http://waterplan.state.wy.us/>
- Water Resources Data System - Reports and data
<http://library.wrds.uwyo.edu/rbplans.html>

In many cases, WSGS can provide available GIS data files.

*Thank you,
questions?*



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