Sublette County Surface and Ground Water Monitoring 2000 - 2008

Compiled from Credible Data collected by the Sublette County Conservation District's water monitoring programs

Brought to you by the Sublette County Conservation District April 2009

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Ground Water Monitoring for the Pinedale Anticline Project Area

Sublette County Conservation District ground water monitoring program history:

The Sublette County Conservation District (SCCD) began its ground water quality monitoring program in 2001 as a component of the Pinedale Anticline Record of Decision (ROD), that was released by the Bureau of Land Management in July of 2000. The National Environmental Policy Act (NEPA) requires a series of environmental documents in order to disclose the impacts of a proposed management plan. The ROD is the final environmental document required in the NEPA process and it provides an outline of the final management plan.

The Pinedale Anticline ROD was written to address the environmental concerns brought by oil and gas exploration that are specific to the Pinedale Anticline Project Area (PAPA), a 197,354 acre area south of Pinedale. The ROD states that, "the operators will conduct a survey and a complete water analysis (static water level, alkalinity, salinity, benzene, oil, etc) of all water wells within a one mile radius of existing and proposed development, and annually monitor and maintain a complete record of water analysis of all new water supply wells drilled in the project area to evaluate the quality of source options in the event some mitigation is required."

The Pinedale Anticline Working Group (PAWG) was then formed in order to make recommendations and provide advice to the Pinedale office of the Bureau of Land Management (BLM). The PAWG would oversee seven different resource task groups, one of which is the Water Resources Task Group.

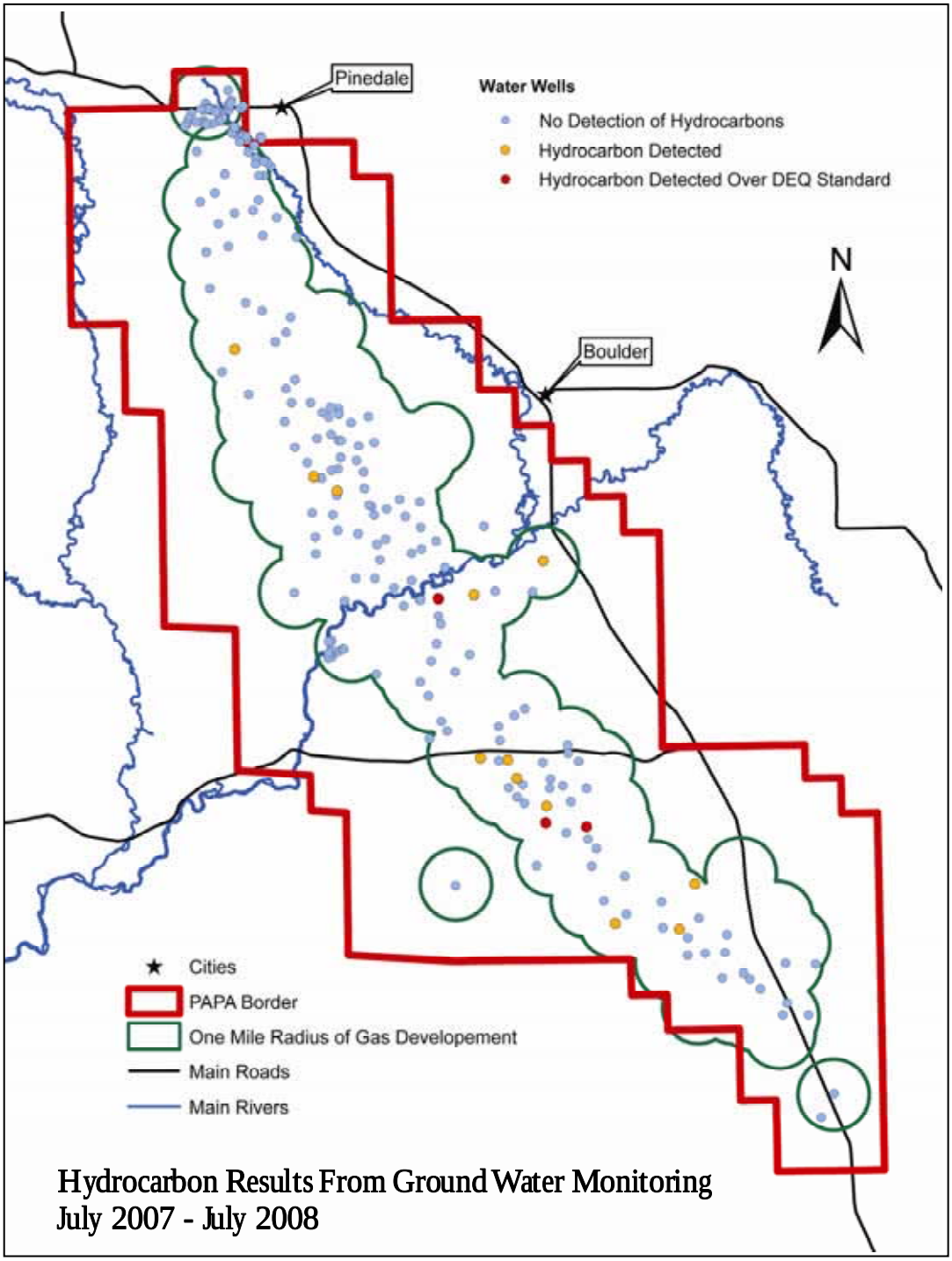
The SCCD was selected by the Water Resources Task Group as the non-biased third party to conduct the ground water monitoring for the oil and gas operators. The SCCD, the Water Resources Task Group and the PAWG then worked together to create a Sampling and Analysis Plan (SAP) for the program in 2001.

The SAP is reviewed annually in order to meet the needs of the program. Some of the operators that are involved with the program include Ultra, Shell, Questar, Newfield, Jed Oil, Yates Petroleum and Neilson & Associates. The entire project is funded by the operators.

Inventory and water level data was collected by the district and water sampling began in 2004. When the program began sampling, there were approximately 170 wells within the one-mile radius. The SCCD now monitors around 300 permitted wells annually within the sampling area. Each well is tested for Total Petroleum Hydrocarbons (TPH) which is the main gas development related concern. The complete list of parameters sampled (see next page) have been set by the ROD and the Water Resources Task Group in order to help determine the possible impact to the ground water within the PAPA.

SCCD's ground water data is released to the Water Resources Task Group on an annual basis, during a public meeting, usually held in the fall. Once the reports have been reviewed and accepted by the task group and the PAWG, the data is released to the BLM and becomes public information through the BLM.

In the summer of 2006, the program began detecting TPH, and some of these detection levels were over Wyoming Department of Environmental Quality (DEQ) standards (considered exceedances). When the program receives lab data that shows any such levels, the SCCD immediately passes this information onto the operator who owns the water well in question. The operator is then responsible for contacting the DEQ and BLM.



Hydrocarbon Results From Ground Water Monitoring
July 2007 - July 2008

Above left: Samples being collected with polyethylene bailers. Above right: Samples being taken at an industrial water well with the aid of a pump.

Since the first detection in 2006, through July 2007, 8 wells with detectable hydrocarbons were located. All of these wells were industrial-use wells. Of these 8 wells, 4 of them had hydrocarbon levels that exceeded DEQ's standards and therefore were considered contaminated by EPA's definition. Wyoming DEQ is the regulatory agency who oversees the remediation of any contaminated well.

Hydrocarbon detections in 2006 prompted a separate ground water quality study overseen by the DEQ. This study involved one-time samples on wells within the project area, as well as the Jonah Field. These samples were analyzed with a more sensitive hydrocarbon method. This resulted in additional hydrocarbon detections than the SCCD ground water monitoring study had shown.

From July 2007 through July 2008 (see map on previous page) the SCCD's data showed a total of 15 wells with hydrocarbons present. A more sensitive method was also used for part of this time period. Three of the 15 wells contained hydrocarbons over DEQ standards.

One of the under-standard wells was a stock well with a very low amount of hydrocarbons being detected. Toluene was the only hydrocarbon found in this well at a level of 1.3 ug/L (parts per billion). For a toluene level to be above DEQ standard it has to show 1,000 or more ug/L. It should be noted that the BLM had just installed a new pump in the well prior to the district sampling the water. The other 14 wells were all industrial-use wells.

Data collected by the SCCD for wells sampled August 2008 through July 2009 will be available this fall.

Ground Water Chemical Parameters Sampled :

- Alkalinity
- Calcium
- Chloride
- Fluoride
- Magnesium
- Phosphorus
- Potassium
- Sodium
- Sulfate
- Conductivity
- Total Dissolved Solids
- Anions, Cations, Anion/Cation Balance
- Hydrocarbons*

Field Parameters Sampled:

- Conductivity
- pH
- Temperature
- Total Dissolved Solids
- Water level

* TPH (Total Petroleum Hydrocarbon): GRO (Gasoline Range Organics) and DRO (Diesel Range Organics); BTEX (Benzene, Ethylbenzene, m+p-Xylenes, o-Xylene and Toluene) is also sampled as needed.

Glossary of terms, EPA definitions:

Contamination: Introduction into water, air, and soil of microorganisms, chemicals, toxic substances, wastes, or wastewater in a concentration that makes the medium unfit for its next intended use. Also applies to surfaces of objects, buildings, and various household and agricultural use products.

Exceedance: Violation of the pollutant levels permitted by environmental protection standards.

Safe Water: Water that does not contain harmful bacteria, toxic materials or chemicals, and is considered safe for drinking even if it may have taste, odor, color and certain mineral problems.

Water Quality Criteria: Levels of water quality expected to render a body of water suitable for its designated use. Criteria are based on specific levels of pollutants that would make the water harmful if used for drinking, swimming, farming, fish production or industrial processes.

Standards: Norms that impose limits on the amount of pollutants or emissions produced. EPA establishes minimum standards, but states are allowed to be stricter.

Water Quality Standards: State-adopted and EPA-approved ambient standards for water bodies. The standards prescribe the use of the water body and establish the water quality criteria that must be met to protect designated uses.

Detection Limit: The lowest concentration of a chemical that can reliably be distinguished from a zero concentration.

Static Water Level: 1. Elevation or level of the water table in a well when the pump is not operating. 2. The level or elevation to which water would rise in a tube connected to an artesian aquifer or basin in a conduit under pressure.

SCCD Ground Water Monitoring Program Supervisor: Delsa Allen, delsa.allen@wy.nacdnet.net

Surface water monitoring within Sublette County and the PAPA

Sublette County Conservation District Surface Water Quality Monitoring Program History:

The SCCD began the surface water monitoring program in 2000. The goal was to build a monitoring program to establish baseline surface water quality data throughout Sublette County. The district also wanted to ensure that data collection was locally led. The SCCD received financial support from the Sublette County Commissioners to begin the monitoring effort and continues to receive their support to ensure the program continues. The Wyoming Department of Agriculture and Wyoming Association of Conservation Districts have also provided funds since the beginning of the program. The SCCD cooperates with several entities including the US Forest Service, the Bureau of Land Management, the Wyoming Game and Fish Department and the Wyoming Department of Environmental Quality by providing information to assist these agencies in managing our natural resources.

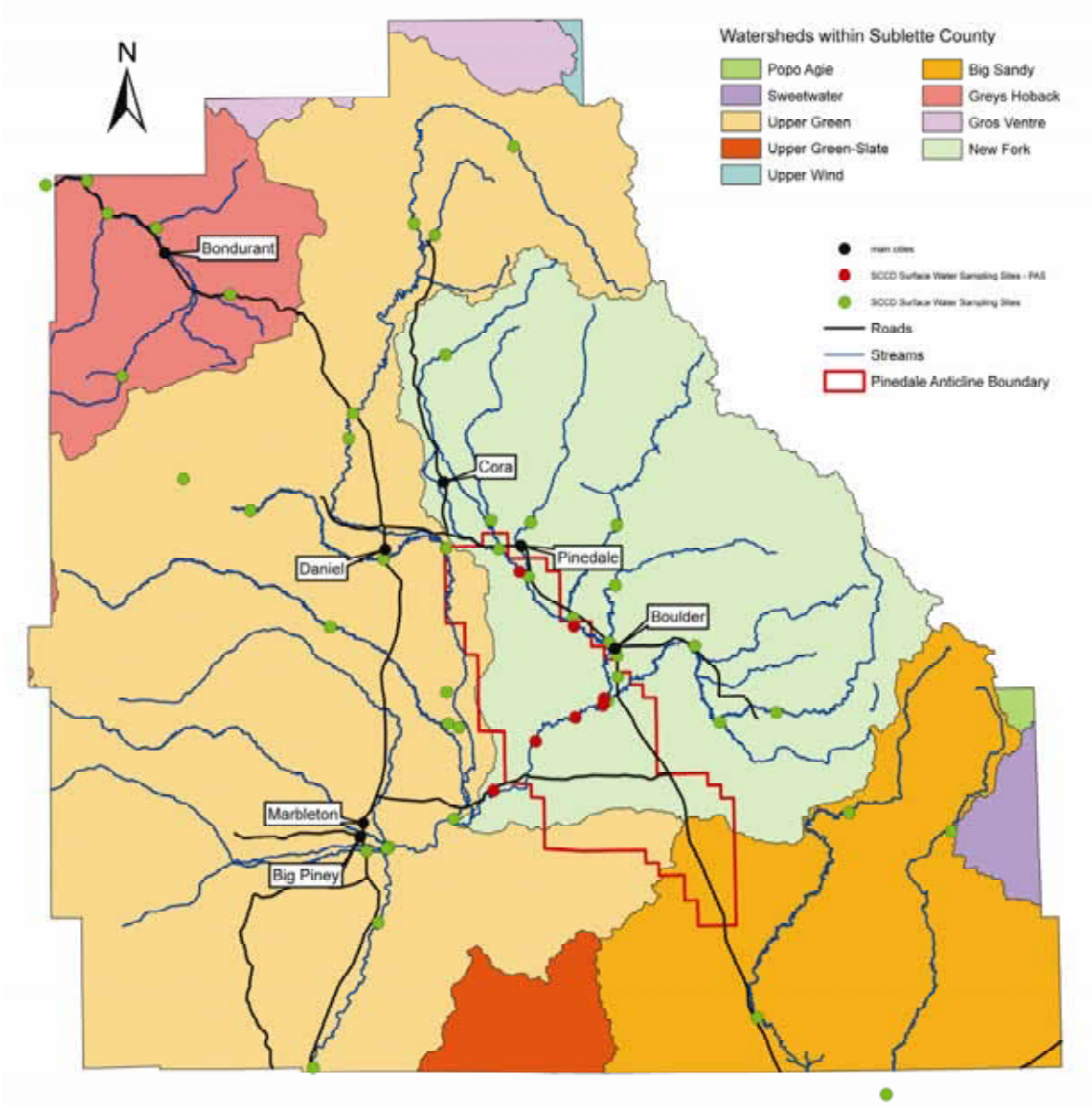
Macroinvertebrates (aquatic insects) are a valuable tool to determine the health of a fresh water stream because most aquatic insects remain in the stream during the majority of their lives, and aquatic insects are unable to avoid pulses of pollution or contamination. As a result the species present in a sample can reflect the health of the stream and/or quality of the water. Macroinvertebrate samples are collected annually and sent to an accredited laboratory for identification.

Chemical sampling is only a "snapshot in time" and does not completely reflect the quality of water year-round, but rather the moment the sample was collected.

Trend Analysis: Trend Analysis determines the health of a stream, not only by looking at the chemical qualities, but also biological integrity. The SCCD has retained an aquatic ecologist to analyze and interpret all macroinvertebrate data collected by SCCD staff. Results have been received for all data collected on the Green and New Fork Rivers through 2007.

Pinedale Anticline Surface (PAS) Sites: In conjunction with the SCCD's surface water monitoring program, a number of sites along

SCCD Surface Water Monitoring Sites



Chemical Parameters Sampled at Surface Water Sites:

- Alkalinity
- Bicarbonate
- Calcium
- Carbonate
- Chloride
- Hardness
- Magnesium
- Nitrogen
- Phosphorus
- Potassium
- Sodium
- Sulfate
- Total Dissolved Solids
- Total Suspended Solids
- Turbidity
- Anions, Cations, Anion/Cation Balance
- Hydrocarbons*

Field Parameters Sampled:

- Conductivity
- Dissolved Oxygen
- Flows
- pH
- Temperature
- Total Dissolved Solids
- Turbidity

* TPH (Total Petroleum Hydrocarbon): GRO (Gasoline Range Organics), DRO (Diesel Range Organics) and BTEX (Benzene, Ethylbenzene, m+p-Xylenes, o-Xylene and Toluene) are sampled at PAS sites.

Flows being taken in Granite Creek, part of the Hoback River's watershed.

the New Fork River are monitored as part of the PAPA water monitoring program, referred to as Pinedale Anticline Surface (PAS) sites by SCCD. Funds for monitoring these sites are paid for by oil and gas operators in the PAPA.

No exceedances of Wyoming Department of Environmental Quality Surface Water Quality Standards for chemical parameters have been detected at any SCCD sampling sites, including PAS sites collected by the SCCD.

Future Sampling: The SCCD continues to re-evaluate the surface water monitoring program to determine the effectiveness of the program. The SCCD plans to continue monitoring the surface water quality within the county to ensure our precious resource is protected and the current quality of water is maintained.

For more information, visit www.sublettecountycd.com.

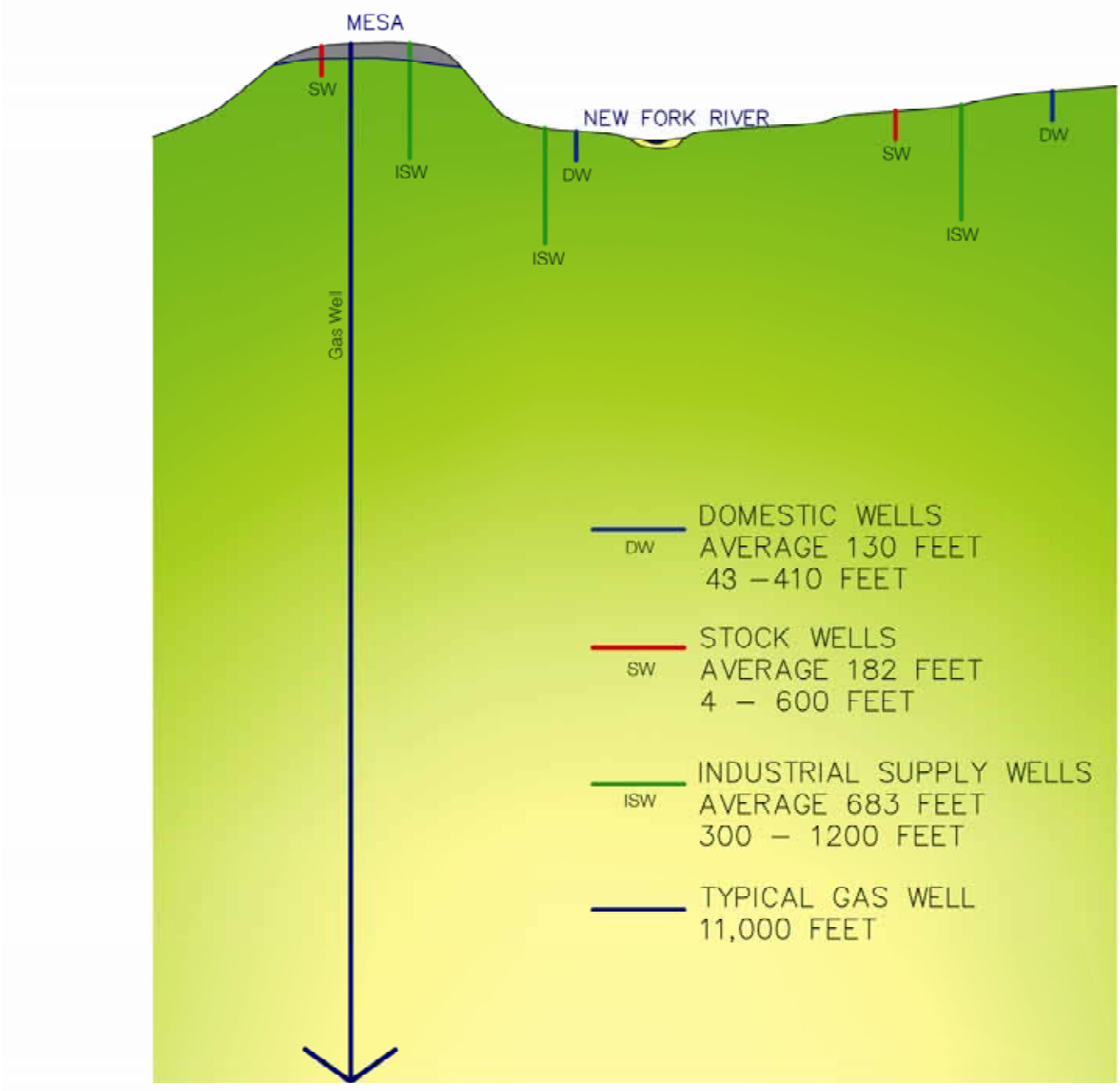
River drainages monitored by SCCD	Tributaries monitored within river drainages	Year monitoring began	Number of chemical samples collected per year	Number of macroinvertebrate samples collected per year	Number of sites that chemical samples are collected 5 times a year	Number of sites that chemical samples are collected 4 times a year	Total number of sites
New Fork River	New Fork River, Willow Creek, Duck Creek, Pine Creek, Pole Creek, Boulder Creek, East Fork River, Silver Creek and Muddy Creek	2000	53	13	1	12	13
PAS sites	New Fork River	2001	17	8	1	3	8
Green River	Green River, Gypsum Creek, Beaver Creek, Horse Creek, Green River, Soaphole Basin, Cottonwood Creek, Muddy Creek, North Piney Creek, Middle Piney Creek and South Pine Creek	2001	82	18	2	18	20
Hoback River	Hoback River, Jamb Creek, Fisherman Creek, Bell Creek, Cliff Creek and Granite Creek	2002	30	7	2	5	7
Big Sandy River	Big Sandy River	2008	10	2	2	0	2
Little Sandy River	Little Sandy River	2008	10	2	2	0	2
Yearly totals			202	50	10	38	52

Chemical samples are collected four to five times per year: before spring runoff, during runoff (select sites only), after high water, early fall and late fall. Chemical samples are sent to an EPA approved laboratory for analysis

A stonefly found in many water bodies of Sublette County

SCCD Surface Water Monitoring Program Supervisor: Kathy Raper, kathy.raper@wy.nacdnet.net

Water Well Depths within the Pinedale Anticline Project Area



Well depths in the Pinedale Anticline Project Area vary, with the industrial-use wells typically being much deeper than any domestic or stock well. Also, there are currently no domestic-use wells in the upper elevations of the Mesa where a majority of the industrial-use wells exist.

SCCD Board of Supervisors:

Darrell Walker, Chairman
Brad Bousman, Vice Chairman
Dan Stroud, Treasurer
Colin Barney
Chad Espenscheid

Informative websites:

BLM Record of Decision for the PAPA:
http://www.blm.gov/wy/st/en/info/NEPA/pfodocs/anticline.html
Wyoming Department of Environmental Quality, water quality rules and regulations:
http://soswy.state.wy.us/Rules/RULES/6547.pdf
http://deq.state.wy.us/wqd/WQDrules/Chapter_08.pdf
SCCD 2008 PAPA Surface and Ground Water Reports:
http://www.blm.gov/wy/st/en/field_offices/Pinedale/pawg/DataResults.html