

WATER IN WYOMING – AVAILABILITY, REGULATORY POLICIES, AND CLIMATE CHANGE IN THE COWBOY STATE

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ABSTRACT

Climate change is real and may have devastating effects to a fragile world that is reaching beyond its capacity. This is especially true in the semi-arid areas of the western United States and particularly in Wyoming. The problem of climate change is serious and its solutions depend on the willingness of people to act on it with zeal in a coordinated and holistic manner. In particular, Wyoming is faced with possible water contamination from hydraulic fracturing operations. In the presence of continuing drought from climate change, such a problem in combination with the sheer amount of water required for fracturing practices can lead to serious water shortage.

The objective of this study is to examine the current environmental policy in Wyoming and evaluate its ability to help adapt to climate change. This is very important and a clear understanding of existing environmental policies is necessary to develop and implement appropriate plans and procedures to protect the quality of the increasingly shrinking and valuable water supply in an effective, holistic and cost-effective manner. In this study, I expect to provide a comprehensive overview and understanding of the quantity, quality, allocation and use of the area's groundwater and surface water under recurring climate change. Such information may lead to actions and steps that can be taken by Wyoming's water stakeholders.

INTRODUCTION

Water policy is a complex and often convoluted body of doctrine that is of particular importance to those of us who live in the arid Western United States, where water can be harder to come by. As climate change and population growth threaten to decrease water availability and the number of stakeholders in western water supplies increases, many people will look to policy to offer some sense of direction. Some key questions then become, who has priority in the case of a water shortage, who should have that priority, and what happens to those who are

shut out? How do we effectively frame and address our water policy problems? These questions are difficult ones; finding an answer to them will not be easy.

Wyoming has many landscape, economic, and cultural characteristics that make it unique among western states. Such distinctions, in turn, have their own influence upon Wyoming's water law and the challenges that pertain to those laws. The intangible nature of studying groundwater in particular, can make understanding its supply and even its governing policies a daunting task. It is for this reason that I have chosen to construct a reference essay for those who wish to address Wyoming's water problems in the shadow of climate change, but first require baseline knowledge of the state's current laws, existing ground and surface water resources and the threat that is created by hydraulic fracturing in oil and gas production.

This essay is broken into five parts. The first describes groundwater in Wyoming, its quantity, availability and demand, and the policies that govern its use. A second section describes surface water in Wyoming, its quantity, availability and demand, and the policies that govern its use. Third is an overview of stakeholders in Wyoming's ground and surface water. The fourth part is dedicated specifically to Wyoming's water quality laws since these apply to a mixture of ground and surface water sources, making it difficult to discuss in the separate ground and surface water sections. The final part of this paper is an exploration of Wyoming's water challenges as they relate to both climate change and hydraulic fracturing operations. This paper may be most useful to decision-makers in forming their background knowledge as they move forward in the water policy realm of Wyoming.¹

GROUNDWATER IN WYOMING

Quantities and Availability

Groundwater is an important water source in Wyoming. Twenty-five percent of municipal water users in the state rely solely on groundwater, 45% rely on a combination

¹ Arneson, C.S., J.D. Hamerlinck, and S.P. Gloss. 1997. Groundwater Protection Issues: Protective Ground Water Resource Management and the Wyoming Ground Water Vulnerability Mapping Project. In Proceedings of Wyoming Water Law Conference, Cheyenne, Wyoming, Novemer 20-21. pp 87-103.

¹ Northern Arizona University, Flagstaff.

of both ground and surface water, and an unspecified number of rural residents rely on private groundwater sources.² The state of Wyoming is estimated to have about 10 million acre-feet of water stored in alluvial aquifers and around 3 billion acre-feet in bedrock aquifers. This amounts to somewhere around 9.8×10^{14} gallons of water stored underneath the earth's surface within Wyoming's borders.³ While 9,800,000,000,000,000 may be an unfathomably large number, we cannot jump to a conclusion of relief quite yet. Unfortunately, we have limited data about the depths of this water beneath the earth's surface, its exact quantity, its quality, and how much it would cost to extract it if needed.⁴ Another problem exists concerning the ability to use some or all of these groundwater sources in a sustainable manner. Even if we could tap into it, the estimated annual recharge rate of alluvial aquifers is estimated at only 1 million acre-feet and bedrock aquifers at 4 million acre-feet.⁵ Because of such uncertainties and questions about whether these sources would be sustainable, it would be unwise to blindly count on this untapped groundwater as a reliable safety net in times of need. Our improved understanding and caution is necessary.

Groundwater Allocation Law in Wyoming

Underlying Wyoming water law is the doctrine of prior appropriation, which means "first in time is first in right."⁶ The Wyoming constitution appoints the State Engineer alongside the Board of Control as the chief administrator of water appropriation laws in Wyoming.⁷ Groundwater laws were first established in 1945, amended in 1947 and then replaced by new laws in 1958; major amendments to these new laws were made effective in 1969.⁸ Currently, groundwater laws in Wyoming dictate that as of March 1, 1958, new priority rights to groundwater are given

in order of the date the permit to drill was received by the State Engineer's Office.⁹ Article 8, Section 1 of the Wyoming Constitution declares that all water within the boundaries of the state, including groundwater, is the property of the state.¹⁰

In Wyoming, many municipalities rely on groundwater as their sole water source. In some cases, groundwater can become limited through any combination of high demand and slow recharge rates. Consequently, restrictions are made on the uses that are allowed access to these sources. This is done through designation of Groundwater Control Areas (GCAs) in accordance with §41-3-912 of the Wyoming State Statutes.¹¹

Wyoming currently has three GCAs: the Laramie County Control Area (established Sept. 1981), the Prairie Center Control Area (established Dec. 1977), and the Platte County Control Area (established Feb. 1982), all three of which are located in southeastern Wyoming.¹² In order for a groundwater source to qualify as a GCA, one or more of the following requirements must apply: water use is near or exceeding the recharge rate, water levels are "excessively" decreasing, there is conflict between users, or regulation of the source is in the public interest.¹³ Within GCAs, water users seeking to use 25 gallons per minute or more must complete the proper application process and receive approval by the State Engineer. For GCA permit applications, regardless of the order an application is received by the State Engineer's office, priority is given first to stock and domestic uses where that use does not exceed 25 gallons per minute.¹⁴ The remaining question however, is whether or not domestic uses would still have priority over, for instance, industrial use if the domestic use were over 25 gallons per minute, but the application was submitted after that of industry. An important note is that these GCAs contain

² Jacobs, J.J. and D.J. Brosz. 1993. Wyoming's Water Resources. Cooperative Extension Service, College of Agriculture and Wyoming Water Resources Center, University of Wyoming, Bulletin B-969. 7 pp.

³ Jacobs, J.J. and D.J. Brosz. 1993.

⁴ Jacobs, J.J. and D.J. Brosz. 1993.

⁵ Jacobs, J.J. and D.J. Brosz. 1993.

⁶ Jacobs, J.J. and D.J. Brosz. 1993.

⁷ Wyoming. Wyoming State Constitution. Article 8, Section 5. State Engineer.

⁸ Jacobs, J.J., G. Fassett and D.J. Brosz. 1990. Wyoming Water Law: A Summary. Cooperative Extension Service, College of Agriculture and Wyoming Water Research Center, University of Wyoming, Bulletin B-849R. 8 pp. (Updated June 1995)

⁹ Jacobs, J.J., G. Fassett and D.J. Brosz. 1990. (Updated June 1995)

¹⁰ Wyoming. Wyoming State Constitution. Article 8, Section 1. Water is State Property.

¹¹ Wyoming. Wyoming State Statutes. Title 41, Chapter 3, Article 9. "Control areas; board member districts; designation; redesignation; duty of state engineer; hearings."

¹² Wyoming State Engineer's Office. Web. 8 Dec. 2011. <http://seo.state.wy.us/index.aspx>

¹³ Parkin, Darren. "High Plains Aquifer in Wyoming." Wyoming State Engineer's Office. n.l. Presented to Northeastern Wyoming iBAG. July 17, 2003. Guest Lecture. and Ashley, Jeffrey S. and Zachary Smith. Groundwater Management in the West. Lincoln: University of Nebraska Press, 1999. Print.

¹⁴ Ashley, Jeffery S. and Zachary Smith. Groundwater Management in the West.

roughly one third of the state's irrigated land¹⁵ as well as growing oil and gas development activities within the Niobrara Shale, an activity with high water demands both for drilling wells and fracturing them, sometimes multiple times.¹⁶

SURFACE WATER

Availability and Allocation in Wyoming

Wyoming contains five river basins, four of which are not closed. Each of the four basins, which drain water out of the state, is a water division and has a superintendent appointed by the state legislature to oversee it.¹⁷ The four open river basins include: the Missouri-Mississippi, which 72 percent of Wyoming's land base drains into; the Green-Colorado, which drains 17 percent of Wyoming's land base; the Snake-Columbia where five percent of the state's land base is drained and the Great Salt Lake, where two percent of Wyoming's land base drains. The closed basin is the Great Divide river basin. Four percent of the state's land base drains into this closed basin.¹⁸

Each year, there is an estimated 18.2 million acre-feet of surface water in the State of Wyoming.¹⁹ 16.3 million of those acre-feet are a result of precipitation within Wyoming's borders and 70 percent of that number is from snow.²⁰ A series of compacts and court decisions allow only 6.4 million acre-feet to be consumed by Wyomingites, the rest must be allowed to flow to other states.²¹ As the chief administrator of appropriation laws in Wyoming, the State Engineer who is also the president of the Board of Control, presides over the allocations of surface water within the state to make sure the allocations adhere to intrastate, interstate and international appropriation laws. The remainder of the Board of Control consists of the four water division superintendents.²²

Within the state of Wyoming, the rivers and streams that have been allocated by decrees of courts are the Laramie River - applicable to Wyoming and Colorado, the North Platte River - a ruling concerning the states

of Wyoming, Colorado and Nebraska, and the Teton and South Leigh Creeks, which were decided by the Wyoming District Court concerning Wyoming and Idaho.²³ Interstate compacts and one international compact govern allocation of water from the rest of the streams and rivers in the state. These compacted rivers include the Bear, Belle Fourche, Niobrara, Snake and Yellowstone rivers and Wyoming's three tributaries of the Colorado River, the Green, Little Snake, and Henry's Fork.²⁴ Of the previously mentioned 18.2 million acre-feet of surface water supply in Wyoming, 15.4 million of that flows out of the state, 3.6 million acre-feet of the water that flows out of the state's borders is compacted.²⁵

While the primary doctrine of water rights in the state is prior appropriation, surface water rights may be transferred using the appropriate procedures, but only to the four "preferred uses." The four preferred uses that are recognized in Wyoming water law are: "(1) water for drinking purposes for both humans and livestock, (2) water for municipal purposes, (3) water for steam engines and general railway use; culinary laundry, bathing, refrigerating uses; steam and hot water heating plants, steam power plants, and (4) water for industrial use."²⁶

Water Use in Wyoming: Primary Stakeholders

The State of Wyoming cites three primary areas of water use: agriculture, domestic, and industrial.²⁷ As of 1995, the largest user of water in Wyoming was agriculture, according to J.J. Jacobs and D.J. Brosz, with the Wyoming Water Resources Center (WWRC) at the University of Wyoming. They cite 2.3 million acre-feet of surface water use and 300,000 acre-feet of groundwater use each year to irrigate Wyoming's crops.²⁸ Most recently, the Wyoming Water Development Office (WWDO) confirmed agriculture as the largest user of water in their Wyoming Water Facts page.²⁹ The numbers for water usage that are provided in the facts

¹⁵ Ashley, Jeffery S. and Zachary Smith. Groundwater Management in the West.

¹⁶ Ashley, Jeffery S. and Zachary Smith. Groundwater Management in the West.

¹⁷ Wyoming. Wyoming State Constitution. Article 8, Section 4. Water Divisions. and Jacobs, J.J. and D.J. Brosz. 1993.

¹⁸ Jacobs, J.J. and D.J. Brosz. 1993.

¹⁹ Jacobs, J.J. and D.J. Brosz. 1993.

²⁰ Jacobs, J.J. and D.J. Brosz. 1993.

²¹ Jacobs, J.J. and D.J. Brosz. 1993.

²² Wyoming. Wyoming State Constitution. Article 8, Section 2. Board of Control. and D.J. Brosz. 1993.

²³ Jacobs, J.J. and D.J. Brosz. 1993.

²⁴ Jacobs, J.J. and D.J. Brosz. 1993.

²⁵ Wyoming State Engineer's Office. Interstate Streams Division. "Wyoming's Compacts, Treaties and Court Decrees." 2006. see also, Jacobs, J.J. and D.J. Brosz. 1993.

²⁶ Jacobs, J.J. and D.J. Brosz. 1993.

²⁷ Wyoming Water Development Office. Wyoming Water Facts. <http://waterplan.state.wy.us/waterfacts.html>

²⁸ Jacobs, J.J. and D.J. Brosz. 1993.

²⁹ Wyoming Water Development Office. Wyoming Water Facts.

page include the “typical quantities of agricultural, domestic, and industrial water use.”

Next after agriculture, another major user is industry. In Wyoming, this consists primarily of oil and gas development, coal mining and processing, and electricity generation through coal fired power plants. Interestingly enough, while the WWDO and the Wyoming State Engineer’s office do not readily disclose numbers pertaining to water use within oil and gas development, the industry has boomed in a very large way since 1995 and is a growing user of water today.

Aside from coal and electricity generation uses, the industrial section of the WWDO’s Wyoming Water Facts Page only includes “petroleum refining.”³⁰ According to Gary Watts’ paper written in 2000 and published on the WWDO website, while oil and gas is an important user of groundwater in the Green River Basin (southwest Wyoming), the amounts the industry uses are “small.”³¹ The same document also notes, however, that “future needs have not been projected [for groundwater uses by natural gas operations].”³² From this statement and the fact that the industry has expanded greatly statewide since this information was published in 2000, suggest the data in the Watts document and published by the WWDO are outdated and more recent information is needed. Another testament to the importance and need for more up-to-date data is found in a statement by the State Engineer’s office. The statement reads, “...there will be a large demand for water supplies for oil and gas-related activities and/or other temporary activities in southeast Wyoming – many of which will occur within Ground Water Control Areas.”³³ Particularly because these water extractions will be occurring in groundwater-scarce areas of the state, the publishing of more updated numbers on the exact amounts expected for these activities is important for state water planning purposes. Also important to note are concerns just south of these Groundwater Control Areas around Greeley, CO. Here, the concern about the increasing use of hydraulic fracturing and its effects this will have” in a region that has battled drought on and off for decades, and where state officials predict there

won’t be enough water to sustain expected population and agriculture levels in the not-too-distant future...”³⁴

Domestic water use is the final major stakeholder named by the Wyoming Water Development Office. According to Jacobs and Brosz, 30 percent of domestic water uses in the state come from surface water, 25 percent from groundwater and 45 percent use a combination of both groundwater and surface water.³⁵ According to the Wyoming State Water Plan, current domestic (including municipal and stock) uses from surface water amount to 63,200 ac-ft/yr, domestic uses in Wyoming are projected to increase in the next thirty years to range anywhere from 101,000 to 138,800 ac-ft/yr by 2040.³⁶

Water Quality Regulations in Wyoming

Given the high use and release of water by agriculture and the oil and gas industry, water quality can become an issue; either from chemical pesticide use in agriculture or chemical use in oil and gas recovery. In the face of challenges posed by drought and higher demand for water in the West, the pollution of viable sources of water cannot be tolerated, which is why I include this section on current water quality regulations in the state of Wyoming.

Let us begin with the federal environmental and water quality legislation that applies to the waters within Wyoming. You may notice that some policies explained in the following paragraphs seem to be unrelated to water quality. Due to the potential of some activities that can affect water quality, to in turn affect something else, such as wildlife, some federal policies can come into play in the regulation of water quality that may not seem applicable at first.

The Clean Water Act (CWA) is a federal environmental policy that was passed in 1972. Among other things, the Act requires the State of Wyoming to prepare a 305(b) report that details water quality across the state. It also requires the state to compile a 303(d) list of impaired streams that also include specifications of Total Maximum Daily Loads (TMDL) for certain pollutants.³⁷ The Clean Water Act Amendment, otherwise known as

³⁰ Wyoming Water Development Office. Wyoming Water Facts.

³¹ Watts, Gary. “Industrial Water Needs Projections,” Technical Memorandum. 2000. Watts and Associates, Inc. Green River Basin Water Plan.

³² Watts, Gary. “Industrial Water Needs Projections,” Technical Memorandum. 2000.

³³ Wyoming State Engineer’s Office. Web. 8 Dec. 2011. <http://seo.state.wy.us/>

³⁴ Eichenseher, Tasha. “In Drilling Country, Water Rights Stir Fracking Questions.” E&E Publishing. 9 Feb. 2012.

³⁵ Jacobs, J.J. and D.J. Brosz. 1993.

³⁶ Wyoming Water Development Office. State Framework Plan Updated Data Tables. Web. 6 Dec. 2011. <http://waterplan.state.wy.us/plan/statewide/tables/tables.html>

³⁷ Clean Water Act of 1972, 33 U.S.C. §1251 et seq. (1972) Retrieved from <http://epw.senate.gov/water.pdf>. and Gibbens, Gerald A. “Wind/Bighorn Basin Water Plan Final Report.” May 2010. Wyoming Water Development Commission.

the Federal Water Pollution Act Amendment of 1972 authorizes the state of Wyoming to plan and manage its own water quality.³⁸ Despite that allowance however, Wyoming has not assumed primacy in the enforcement of the drinking water quality program of the Clean Water Act so the U.S. EPA takes charge in the regulation of Wyoming's drinking water quality.³⁹

The Safe Drinking Water Act (SDWA) was passed in 1974 to protect tap water in the U.S. It authorizes the EPA to develop water quality standards using "detailed risk and cost assessment, and best available peer-reviewed science."⁴⁰ Under SDWA, operators and owners of public water systems are required to adhere to these standards established by the EPA. SDWA provides the option for states to apply to enforce SDWA (as opposed to federal enforcement) and the ability to establish their own set of standards secondary to those of the EPA.

In 2005, under the George W. Bush Administration and the influence of oil and gas corporations, Congress passed the Energy Policy Act Amendment to SDWA, also popularly known as the Halliburton Loophole. Under this amendment, oil and gas companies' process of hydraulic fracturing is exempt from adhering to the drinking water standards under SDWA.⁴¹ Hydraulic fracturing is the process of pumping large volumes of chemical infused water into geologic formations to fracture rock that encases natural gas, which allows the gas to seep out to the surface. This policy has major significance in states like Wyoming, where oil and gas development and the use of hydraulic fracturing are prevalent and growing.

The CWA, SDWA and the Energy Policy act are three of the primary pieces of federal legislation that have jurisdiction over water quality in Wyoming, but there are other federal laws that also have jurisdiction over the state's water quality, although indirectly. Laws like the Endangered Species Act (ESA), the Resource Conservation and Recovery Act (RCRA), and the National Environmental Policy Act (NEPA) can indirectly

dictate water quality in the pursuit of another goal. For instance, streams that contain an endangered species of fish must be kept at a certain level of water quality so as not to endanger the survival of the endangered species under the ESA. Hazardous waste must be disposed of properly under RCRA and failing to do so might result in water contamination, which would be a violation of RCRA. During a NEPA review process for putting in a pipeline, one of the discoveries might be that water quality of a stream or aquifer would be in danger of oil contamination, hence the chosen alternative might need to reflect the protection of that water source.⁴²

Wyoming also has several water quality policies on the state level. The Wyoming Environmental Quality Act, passed in 1973, has water quality provisions that are enforced by the Water Quality Division (WQD) of the Wyoming Department of Environmental Quality (WDEQ).⁴³ This law was created to address public concern that pollution "will imperil public health and welfare, create public and private nuisances, be harmful to wildlife, fish, and aquatic life, and impair domestic, agricultural, industrial, recreational, and other beneficial uses."⁴⁴ Wyoming's Environmental Quality Act addresses these concerns by authorizing the state "to prevent, reduce and eliminate pollution, to preserve and enhance the water...of Wyoming, to plan development, use, reclamation, preservation and enhancement of the... water resources of the state."⁴⁵

Just as the WQD within the WDEQ is charged with enforcing the Environmental Quality Act, it also deals with any operations performed by or under the supervision of the BLM, Forest Service, EPA, or the Wyoming Oil and Gas Conservation Commission (WOGC) that could potentially contaminate groundwater.⁴⁶ The WDEQ has also developed two individual sets of water quality standards for both surface and groundwater. These requirements can be found in Chapters 1 and 8 respectively of the WDEQ's "Water Quality Rules

³⁸ Clean Water Act of 1972, 33 U.S.C. §1251 et seq. (1972) and Taucher, Paul and Scott Quillinan. "2011 Wind/Bighorn River Basin Groundwater Memorandum DRAFT." Web. 7 Dec. 2011.

³⁹ Gibbens, Gerald A. "Wind/Bighorn Basin Water Plan Final Report." May 2010. Wyoming Water Development Commission.

⁴⁰ Safe Drinking Water Act of 1974, 42 U.S.C. §300f et seq. (1974) Retrieved from <http://epw.senate.gov/sdwa.pdf>.

⁴¹ Energy Policy Act of 2005, 42 USC §13201 et seq. (2005) Retrieved from http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=109_cong_bills&docid=f:h6enr.txt.pdf.

⁴² Endangered Species Act of 1973, 16 U.S.C. §1531 et seq. (1973) Retrieved from <http://epw.senate.gov/esa73.pdf>. and National Environmental Policy Act of 1969, 42 U.S.C. §4321 et seq. (1969) Retrieved from <http://epw.senate.gov/nepa69.pdf>. and Resource Conservation and Recovery Act of 1976, 42 U.S.C. §6901 et seq. (1976) Retrieved from <http://epw.senate.gov/rcra.pdf>.

⁴³ Jacobs, J.J. and D.J. Brosz. 1993. and WY. Wyoming State Statutes. Title 35, Chapter 11, Article 1. "Environmental Quality Act."

⁴⁴ Gibbens, Gerald A. "Wind/Bighorn Basin Water Plan Final Report." May 2010. Wyoming Water Development Commission. Web. 8 Dec. 2011. <http://waterplan.state.wy.us/plan/bighorn/2010/finalrept/finalrept.html>. and WY. Wyoming State Statutes. Title 35, Chapter 11, Article 1. "Environmental Quality Act."

⁴⁵ WY. Wyoming State Statutes. Title 35, Chapter 11, Article 1. "Environmental Quality Act."

⁴⁶ Taucher, Paul and Scott Quillinan. "2011 Wind/Bighorn River Basin Groundwater Memorandum DRAFT."

and Regulations.”⁴⁷ The baseline for these standards consists of surface and ground water being classified in one of a variety of classifications, which determine the standards of quality they must be held to. There are four classifications pertaining to surface water: 1. Outstanding waters, 2. Fisheries and Drinking Water, 3. Aquatic Life other than Fish, and 4. Agriculture, Industry, Recreation and Wildlife.⁴⁸ Groundwater has a total of six classifications that determine the quality standards any given source is held to, these classifications are found on page 30 of Chapter 8 in the “Water Quality Rules and Regulations” document.⁴⁹

Now that we have an understanding of the quantities and availability of ground and surface water within the state of Wyoming, the stakeholders who rely on that water, and policies that govern its use and quality, we can begin to ask the next question. This question concerns the future of water supplies in Wyoming as rising temperatures and drought brought by climate change begin to take their toll on the already limited water supplies in the West. The next section of this paper is dedicated to providing a brief presentation of research concerning climate and hydraulic fracturing in relation to water resources in Wyoming. These are the issues that policy-makers in Wyoming and the West in general must seriously and honestly consider if regulatory policies have any chance of adapting Wyoming and the West to a future with less water.

WYOMING WATER CHALLENGES

Climate Change and Water Shortage

No matter how we look at it, temperature changes and drought from climate change are going to have a significant impact upon Wyoming’s water resources.⁵⁰ In the context of population growth, both in Wyoming and in downstream states to which Wyoming has certain water delivery obligations, the increases in water demands from municipalities, industry, and agriculture significantly diminish the resilience of Wyoming’s water resources to climate change. As a headwater state, Wyoming has

the pressure of its own growth, of course, but also the growth of the states that demand water downstream and are legally entitled to it. When drought is added into the mix as a result of increased temperature, altered precipitation and river flow patterns, and depletion of glacial and snowmelt, this increase in demand threatens to become Velcro against an already stretched balloon for Wyoming’s water resources.⁵¹ Another factor that makes Wyoming’s surface and groundwater at particular risk in the face of climate change lies in its very status as a headwater state. Steve Gray and Chamois Andersen, water experts at the University of Wyoming elaborate on this point:

...[W]ater users farther downstream are somewhat buffered from the types of drought we see in the historical record; dryness in one upstream area will often be offset by average to wet conditions in another part of the basin. Downstream states may also benefit from a relatively large amount of storage on the river above them. But in Wyoming the water that falls as snow in nearby mountains is often the only local source of surface water for the entire year... (Gray and Andersen, 2009)

It is because of these vulnerabilities⁵² that policy and decision makers in the West, and especially in Wyoming need to be aware of climate change and actively consider its effects in their work. We must examine our current water policies in an attempt to adapt them to our changing environment. Without such consideration, water management policies will not be able to adequately address all of the factors necessary to produce an effective and useful decision for Western society. Gray and Andersen explain well what is at risk even for non-environmentalists when they write, “given rapidly increasing demand and often conflicting interests, any reduction in water supplies could have major consequences for natural resources, industry, energy production, and people throughout the region.”⁵³

⁴⁷ Wyoming Department of Environmental Quality. “Water Quality Rules and Regulations.” Feb. 2007. Web. 8 Dec. 2011. <http://deq.state.wy.us/wqd/wqdrules/>.

⁴⁸ Gibbens, Gerald A. “Wind/Bighorn Basin Water Plan Final Report.” May 2010. Wyoming Water Development Commission.

⁴⁹ Gibbens, Gerald A. “Wind/Bighorn Basin Water Plan Final Report.” May 2010. Wyoming Water Development Commission. and Ashley, Jeffery S. and Zachary Smith. Groundwater Management in the West.

⁵⁰ Gray, S. C. Andersen. 2009. Assessing the Future of Wyoming’s Water Resources: Adding Climate Change to the Equation. William D. Ruckelshaus Institute of Environment and Natural Resources. University of Wyoming, Laramie, WY. 28 pp. Web. 2 Dec. 2011. http://www.uwyo.edu/enr/_files/docs/uofw-water_climate_final_comp.pdf

⁵¹ Gray, S. C. Andersen. 2009. Assessing the Future of Wyoming’s Water Resources: Adding Climate Change to the Equation.

⁵² Gray and Andersen, 2009. Assessing the Future of Wyoming’s Water Resources: Adding Climate Change to the Equation

⁵³ Gray and Andersen, 2009. Assessing the Future of Wyoming’s Water Resources: Adding Climate Change to the Equation. p 5

Hydraulic Fracturing: Compounding the Problem of Water Shortage

The practice of hydraulic fracturing, also known as “fracking,” involves pumping large volumes of chemical laced water at high pressure into a geologic formation to fracture or “frack” the rock, allowing oil or gas that is trapped within the geologic formation to seep to the surface for collection by the energy production company. Each fracturing treatment requires around 5 million gallons of water per well that is drilled.⁵⁴ Production companies also prefer to use fresh, clean water so that they can use one standard “recipe” of chemical cocktail, rather than fidget with chemical adjustments to account for salinity or other factors that may come with using varying degrees of non-potable water.⁵⁵ This creates a cause for concern and an obvious compounding factor in the realm of water shortages in the near future.

With the oil and gas industry expanding throughout Wyoming, both water quality and quantity protections are garnering increased relevancy for the future. Hydraulic fracturing has long been suspected of creating water contamination in drinking water wells of many who live near these operations. Vital questions about this possibility were answered in a December 8th, 2011 draft report from the U.S. EPA concerning groundwater contamination issues in Pavillion, Wyoming. In its report, the EPA implicates oil and gas operations for the contamination of groundwater sources in central Wyoming. The agency concludes, following an explanation of their methodology and results that, “...inorganic and organic constituents associated with hydraulic fracturing have contaminated ground water at and below the depth used for domestic water supply.”⁵⁶

Despite growing public concerns and the results from the EPA’s study, industry in Wyoming continues to deny responsibility in the creation of water quality problems. Hence, this is another growing area of water policy concern. Given the policy background compiled within this essay, particularly with the existence of the 2005 Energy Policy Act and the limited regulations, except within GCAs, on water use by industry, it is hard to say how strong of a legal defense of water quality or quantity could be made in Wyoming when it is pitted against the interests of industry.

Conclusions: Wyoming’s Water Future in the Current Policy Environment

In this essay, I have provided a baseline understanding for the quantities, availability, use and allocation of ground and surface water in Wyoming; I have given an overview of Wyoming’s primary water stakeholders and outlined water quality laws in the state. The purpose for presenting this baseline was to provide a foundation for examining our current policy environment in order to evaluate its current ability to address climate change. The final section of the paper was a brief introduction to the reality of environmental problems that face Wyoming and its water supply in the near future.

Climate change is undeniable and its effects will most certainly be felt in Wyoming and the West, but how badly the challenges affect us will depend on our willingness to examine the baseline now and move forward in our decisions in an educated and holistic manner. In the case of water contamination from hydraulic fracturing practices, as climate change increases the scarcity and value of water, carelessness about water quality protection cannot be taken lightly.

The sheer volume of water used by hydraulic fracturing operations (5 million + gallons per well) is also an important factor when preparing for water scarcity and calculating risk.⁵⁷ By forming an understanding of the problem and the current policies that do [or in many instances, do not] address the problem, we can begin to work in an effective way toward protecting the quality of Wyoming’s increasingly valuable water supplies for the future.

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⁵⁴ Eichenseher, Tasha. “In Drilling Country, Water Rights Stir Fracking Questions.” E&E Publishing. 9 Feb. 2012.

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⁵⁷ Eichenseher, Tasha. “In Drilling Country, Water Rights Stir Fracking Questions.” E&E Publishing. 9 Feb. 2012.

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