

Communicating About Water

A Collection of Student Writing about Water in Wyoming
2014 Anthology

Sponsored by:

University of Wyoming Creative Writing Program,
Wyoming Center for Environmental Hydrology and
Geophysics (WyCEHG), and
Wyoming's Experimental Program to Stimulate
Competitive Research (EPSCoR)



Through funding by the National Science Foundation
Grant ESP 1208909

All of the opinions presented in this anthology are entirely those of the authors and not those of Wyoming EPSCoR or NSF.

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*It was spring, but barely spring, and scalloped ridges
of snow still snuggled against the lee sides of hills.
The creeks were mostly still dry, deep cracks
blistering across the dun-colored plain.*

-Geoffrey O'Gara

What You See in Clear Water:

Life on the Wind River Reservation

Forward

You have heard it before, “Whiskey is for drinking, and water is for fighting.” In Wyoming, water issues have dominated politics, community relationships, agriculture, natural resources and more.

The Creative Writing MFA Program, Wyoming EPSCoR, and the new Wyoming Center for Environmental Hydrology and Geophysics (WyCEHG) invited students to participate in this ever growing conversation about water in our state through a writing contest.

I was awed by the quality and quantity of essays submitted by University of Wyoming and Wyoming community college students. From personal story to investigative journalism, the essays in the 2014 Communicating about Water Anthology are as diverse as the waters of Wyoming.

By bridging the sciences and humanities through thoughtful dialog, Wyoming EPSCoR hopes to continue to grow these conversations about water and other natural resource issues throughout the state.

We invite you to join this conversation.

*Elizabeth M. Nysson
Education, Outreach, and Diversity Coordinator
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Graduate Student Essays

Cool, Clear Water

By: Michael McNamee III

Michael McNamee III is graduate student at the University of Wyoming studying Public Administration and Environment & Natural Resources. His academic interests focus on how our traditions and values affect the decisions we collectively make for the future. In Laramie, Michael is surrounded by a loving family including a supportive wife and a strong grandfather, Michael McNamee Sr. His grandfather's life continues to serve as an inspiration and an example of how hard work and education can change the world.

This essay is a top winner in the Communicating about Water Writing Contest.

Just outside of the windswept town of Egbert, WY lies a dry plot of land nestled amongst endless plains. I clearly remember my visit there the weekend I arrived in Wyoming to start attending college. As my father, grandfather and I approached the old farm-house, I saw a slight smile on my grandfather's face. I was witnessing a reunion of sorts, as we were coming upon the place where he spent his formative years so long ago. In the middle of the land was an isolated group of buildings, iconic and typical of the farms seen all across the west. A firm line of trees surrounded the area, put in as natural guards against the ever-constant Wyoming winds. Outside of the trees, we gazed upon an ocean of pale prairie sucked dry by the August sun. This oasis was where my grandfather learned the hard truths about life, the work ethic needed for survival and the nature of the relationship every farmer and rancher has, and will continue to have, with the blessing and curse of water.

My grandfather was born into this world in May 1929 at the start of the Great Depression, a decade marked by economic hardships coupled with crippling drought. His father died when he was very young; he, his mother and brothers were left to do the best they could with the situation God dealt them.

In spite of everything, he remembers his life on the farm as a happy time where he grew up in an environment of freedom and imagination. He and his three brothers had

plenty of opportunities to “make their own fun” with the wonders of the outdoors. After he told me about the good times, I asked him if he missed his experience. After a slight pause, I could tell he was conflicted about his answer. “I do miss it, but I don’t miss the heartbreak of the life there.” The word “heartbreak” stood out to me. He said, “We could spend all season pouring hard work into the land and one hail storm could destroy everything in one day.” Such is the nature of water. A season of steady rain produces success, but one bout of hail can erase all the good works. I cannot imagine what it must have felt like to experience the toil of working the land and having it all taken away. Perhaps the most troubling thing of all, in the midst of a storm, there was nothing they could do to protect their land. As frozen pellets pounded at the crops, they were relegated to watch silently from behind the farmhouse windowpane with a sense of desperation seldom experienced today. After the storm, as renewed sunlight peeled back the clouds, the family had no other option but to salvage what they could, and move forward with the seasons of life.

Water was always on their minds, even in their free time. Some of his happiest memories were of when the family would spend evenings playing music and singing together. One of their favorites was the country ballad “Cool, Clear Water” which goes: “The shadows sway and seem to say, tonight we pray for water, cool water, and way up there he'll hear our prayer, and show us where

there's water, cool, clear, water.” They took solace in each other, praying for that sometimes elusive blessing that could quench their thirst, as well as put food on their table.

My grandfather is by all accounts a practical man. He has never been known to dwell on the forces that are outside of his control. Instead, from an early age, he put his efforts towards ways of improving the aspects of farming that he could control. He and his brothers creatively found ways to make farming easier with contraptions they built themselves. He learned the valuable skill of using technology to improve his life. “Water was almost completely outside of our control. I grew up wanting to find ways to do it better with what we were given.”

The family eventually sold the farm and he went off to serve in the Korean War. When he returned home to Wyoming, he was left to choose what to dedicate his life towards. While he had little money, he made up for it with the drive emblematic of his generation to make something of himself. With the help of the G.I. Bill, and a supportive wife and extended family, he came to the University of Wyoming to study Agriculture Mechanics. He went on to complete his bachelors and an advanced degree in Soil Science. He did all of this while working and supporting a budding family what would eventually add up to seven children. I asked him why he chose to study agriculture academically. “I grew up in that world

and knew how hard it was. I wanted to study ways to make rural life better for everyone.” This mission in life fit in well with his new job with the University of Wyoming Agricultural Extension Service, an organization responsible for a progressive movement to modernize the rural way of life.

America at the turn of the last century was faced with a significant problem. The technological advancements of the industrial revolution were concentrated mostly in urban areas and the inhabitants of rural America, especially farmers and ranchers, were continuing in much the same way as they had in the previous century. In response, a string of significant legislative achievements paved the way for the nation, and Wyoming in particular, to take advantage of its resources efficiently. First, the Morrill Act was signed by President Lincoln in 1862, establishing land grant universities with the charge of providing the “extension” of their resources to the surrounding communities. This act made way for the University of Wyoming, founded in 1886. The second achievement was the Carey Act in 1894 that allowed citizens to establish and develop much needed irrigation systems in arid states like Wyoming. Finally, the Smith-Lever Act of 1914 formally established the extension services that would implement scientific outreach, especially in rural areas. The combined effects were monumental; half the population lived in rural areas and they now had ways to capitalize on water

resources and the research of the academic community. The movement was in full swing when my grandfather studied at UW, and he loved the idea of putting his research to practical use. “What was the point of all of the agricultural research we were doing in universities if no one out in the state had access to it?”

Water conservation was at the forefront of the problems he was trying to solve at UW. His thesis was on finding ways to make irrigation ditches more productive. At the time, many farmers simply relied on dirt ditches to lead water from the stream or river to their crops. The ground was porous and they lost huge amounts water that would seep into the earth while in transit. He focused on bentonite, a type of clay found in several parts of Wyoming. The clay could simply be mixed with the natural soil in the ditches to solve the problem. It absorbed the water, expanded and formed a natural sealant allowing the water to make it to its intended destination on the farm. His researched showed that ingenuity could be used to solve some of the state’s water problems.

While at the UW Extension Service, his job was to travel all across the state consulting with farmers and ranchers about ways to make their operations more productive. This task could be particularly hard considering that

Wyoming's water laws have always been controversial. The Mead system, which governed Wyoming water rights, was based on historical claims and actual water usage. While it worked well in good years, in dry years, farmers found themselves without access to needed water because of someone else's right to have his/her needs met first. There just was not always enough to go around. Using his practical sense, my grandfather counseled the ranchers and farmers on strategic ways to make better use of what water they had. Armed with university research and real-world ingenuity, they worked together to battle the realities of drought and scarcity. "It is a harsh reality that we are limited as a state in the amount of water we have. The only thing we can control is how to make the same amount of water go farther," said my grandfather.

He worked with this agency for over three decades. Of all the accomplishments of the Extension Service, he told me that the finest was collaboration of the various disciplines within Wyoming's agricultural communities of researchers and professionals. The problems they faced often called for a multi-disciplinary solution. "We all wanted to find ways to do it better, and we knew that we were all in this together." Water conservation, especially, needed as much help as it could get. Studies of erosion, farm layout, crop rotation, fencing, dairy efficiency, stock animal habits and waste disposal were all areas that the

collaborative groups focused on that effected, or were effected by, water conservation.

When my grandfather went to these farms and ranches, he was able to communicate about water in ways that were applicable to each individual. Based on the estimated expected water for each area, the agents and producers could scientifically analyze the operation and prioritize the most effective use of the resource. In communicating and collaborating with farmers and ranchers, he also broke down barriers that had existed in the past. The Extension Service was a partnership of the U.S. Department of Agriculture, the State of Wyoming and the University of Wyoming. Representing both the government and the academic community, the Extension Service showed the rural community that their individual successes were intertwined with the broader success of the state and the country. Essentially, they weren't in this fight alone.

My grandfather has now been retired longer than I have been alive. The progress the farms and ranches have achieved since he started his career is monumental. In 1940, the average farmer fed under 20 people. Today, one feeds over 150. All of this has happened while water has become less dependable. My grandfather and I now live in a modern Wyoming that benefits from a robust and efficient ranch and farm community. Technological advancements have preserved a cultural way life, while

breaking down barriers between the rural citizen and university research. While it has been a long while since he traveled the state solving problems, he fondly remembers the friends he met and the impact he tried to make. “When it really came down to it, we could feed more people than we had before. Fewer people feel what hunger is today because everyone collaborated.”

I saw my grandfather in a new light as he walked around the farm that was the source of his life’s mission. It is one of life’s noble truths that where we come from impacts where we end up. After he finished talking with the current owner making his life on the plot, we returned to the truck to head back to Laramie. As we bounced along the dirt road, we passed one farm after another, defiantly thriving amongst the plains. I remember that as the day I was introduced to a state that truly is one big community. It is a community that shares each other’s heartbreak, faces the harsh winds of nature and embraces the thirst; the thirst for not only cool, clear water, but for the innovation needed to succeed and maintain the values that bind us to one another and the land that we love.

The River

By: Erin Jones

Erin Jones is pursuing an MFA in Creative Nonfiction and Environment and Natural Resources at the University of Wyoming, and has a BA in Geography from The University of Texas at Austin. She is mostly from Texas, but has also lived in Utah (red rock and alpine), Georgia, Pennsylvania, South Africa, Tennessee, and New Mexico. This diverse assembly of locales has resulted in deep and incongruous affairs with sweet tea, guacamole, trailer breakfast tacos, green chili, and all things spicy. Erin believes in the power and necessity of tall mountains, good swimming holes, secret waterfalls, and dry eerie canyons. She writes about people and place.

This essay is a top winner in the Communicating about Water Writing Contest.

I.

First, the warmth.

The snow curtains in the Wind Rivers suddenly release. In crashes, in trickles, the curtains tumble down Wyoming mountain slopes to pool in small dry river beds, *arroyos*, like silk. In the alchemy of the changing seasons the snow turns to water, clear and at once old and new. Then, the water flows. It follows itself downhill. It makes its easy way through crevices, under the curved space beneath roots. It sucks into the narrowest of spaces and then spreads out wantonly in wide sunny places, slows down, bathes in the warm air. Sometimes it leaves part of itself in one of these places, in a high verdant meadow, one with a water hollow left like a present by glaciers. But the rest of the water has to go, has to answer a call.

So it flows. As it flows, it finds passages, a way. When it doesn't, it cuts its own.

The dirt.

The smallest are the clays and the silts, morsels so small that when they curl up against one another you see one mass, a cool dust that coats your sweaty fingers. Deep cocoa brown, espresso with milk, gleaming cream, green

like the eyes of the boy you dated back in high school, or muscle-red. Here, though, mostly, the dirt is aged treated pine, the kind of muted brown that is invisible in plain sight. It waits in the riverbeds, in the *arroyos*, cracked and aching and patient.

There's a curious air about *arroyos*. If you stand in an *arroyo* when it is dry you feel in the way. The gulch has been waiting for something and you are not it. Go before the water comes, or you will wash with the river. When the water comes the split clay and the silt grains on the bed of the *arroyo* awaken, little comings of age. They want to know where the water is headed so urgently, so they swell with it. Their tiny canyons fill. They drink till they're sopping full and then the tiny light ones float high in the water; they spin in the refracted light, and if you look closely you can see their shadows against the heavier sliding grains at the bottom.

Those are two: water, which makes it, and dirt, which follows it. It's an awakening, every year, or a discovery, a call. The same kind of call that drops balls and spits out new velvety antlers and sprouts hairs in new places and guides the moon to pull the tide calls the river. It is, for the river, and for humans and elk and ocean, a physiological shift as well as an exploratory identity readjustment. You could say that anyone who's ever written about the river in the spring has written a bildungsroman.

Then there are rocks.

Sand is a kind of rock, people say. A clastic rock: part of something bigger than itself, fractured off, so that it is forever known by what it misses, by what it fails to complete. Sand is in the dirt, mixed in with the clay and silt. Sand goes too, down the river. It's curious about this call, about where everyone else is going. The light individual ones float up high in the liquid and the heavier ones sink into the heavier sediment river at the bottom, in with the big clays, the weighty silts. They slide together, miscegenate into a cohesive brew.

The river picks up big rocks. Or, bigger than sand. Grinds the rocks against one another and against itself until you can walk barefoot on the smooth-pebbled river bottom. That's for you, those rocks, for your bare feet in the summer, for you to pick up and flip over and wonder if there's such a thing as a magic stone. Rocks with opaquely dark mystery, rocks with subtle translucence. Crystal rocks flaky rocks shiny rocks. There are rocks that are perfect for skipping, and there are rocks that when you pick up you hold against your abdomen like a pregnant belly. There are rocks as big as you and there are rocks bigger than you.

All those rocks go, too.

The river has water, has clay, has silt, has sand, has rocks.

It has things that are alive, too; alive in a more overt way than the way that rocks and dirt are alive.

The river has tiny creatures—animals and bacteria and viruses and protozoa and fungus and amoebas, all different colors. Microbes too small to see with just your eyeball. They float, quiet in their invisibility, tiny muted semi-souls.

Fish swim in the river. They flash under ice spread like butter over winter lakes, and in fast streams.

The river has creatures that live over the water. Dragonflies and mosquitos hop over it in spurts of iridescent color, in buzzing clouds. They lay larvae in the river. The river is a womb.

All of these creatures are curious, and they follow the call of the river, for a little while or a long way.

The river has things that used to be alive, dead things, things that still look like life but blanch of animation. Branches. Whole trees. Bones—femurs and delicate vertebrae and whole or half skulls. Phalanges. Fur, attached to the swollen-up carcasses of creatures that used to run. Blood, dissipating too fast to see in the flowing water. Sometimes these dead things are dead because of the river.

So it goes.

Lately, there are other things: plastic soda can holders, choked together. The waffle metal of a buried shopping cart, or the bloated side of a refrigerator. Bovine shit and nail polish remover and pesticide. A lone leather glove, sans index finger.

Everything, eventually, makes it to the river. Once I found the whole head of a buck, disembodied, in the eddies of a shallow meadow stream. Its eyes had been eaten. Its head was hollow. Something—the river, little teeth—had sloughed off much of its fur. It smiled at me. I picked it up by the antlers and moved it tenderly to higher flat ground, in a quiet place beneath the branches of an aspen. A place where it could rest, for a while. Not forever. Everything, eventually, makes it back to the river.

There's a call.

The *arroyos* are where it all starts, where the clay and the silt and the sand and the water and the microbes all meet, in a slam of awakening need, a primal call. They head downhill together, under the roots and through the crevices. The river tugs rocks like a magnet, and more water, and then bigger rocks. Plastic and metal and fluttering pieces of disintegrating paper and battery acid and glass bottles. Fish come, and insects, and frogs. The river pauses in lakes but it doesn't linger long. It's answering a summons. It calls more water. It pulls trees,

sometimes by their roots, and carries them to the call. Branches tumble in. Elk and mice and meadowlarks and geese and rabbits and bullfrogs and humans clatter down slopes and slide or splash into the river. The bones of salamanders and bears come to the water. The river shares paths with water coming from elsewhere, from other mountains with other curtains of snow. It makes new rivers, enormous rivers.

The river is tiny trickles, through the skinniest of *arroyos*, and then it meets permanent or semi-permanent streams, bubbling down the sides of mountains with gurgling abandon, and sometimes these streams are it but usually these streams meet other streams and they all merge and all of this makes for a river that is fat in the spring with alive things and carcasses and trash and parts and dirt and rocks. And water.

There is a river that flows through the West.

It is born in the snow of Wyoming and then it follows the call through Utah, Colorado, New Mexico, Arizona, Nevada, and California. It counts as one river because a river is all of the elements just delineated. A river is the snow and the dirt and the *arroyos* and the tributaries, and everything in it. This river irrigates the crops of farmers and the throats of people who live in little windy towns that yield abruptly to the plains. It soaks up into cottonwoods and forms a thick sap that you could boil

and make into a cast for a broken bone. It sustains the pines and the plains, and the creatures that live in each, who will eventually become part of the river. It goes way south through red earth, and west through crackly grass, and then it is scooped up and sprayed onto disorientingly emerald lawns and through casino showerheads. This is the Colorado River Basin.

Much of the snow on our Wyoming peaks will eventually be spurted onto hot green Phoenix golf courses. Essentially, the entire western United States depends on Wyoming water.

II.

Does it matter where I am from? Probably. Wallace Stegner, who grappled all his life with the aesthetic differences between Easterners and Westerners, would say it does. The first time I ever became aware of a world beyond my crib was on the Wasatch Front. From the ages of two to eight, giant space and lack of water became a part of my internal structure. The West seeped in to inform my aesthetic and my outlook. I moved away, to Georgia, to West Texas, to Philadelphia and Austin and South Africa and Nashville, but I kept moving back, to the San Rafael Swell and rural New Mexico and now, Wyoming.

What follows is my educated and un-cited and reflective sketch of the history of water out here.

III.

If you grew up in the United States, when you attended elementary school you saw a map of this country. Each state was probably a different pastel color, so you could clearly distinguish its boundaries. You compared the lines around your state with the lines around others. You traced your state with your pencil. Did your hand move in quick lines and jerky angles, or did it require concentration to trace sinuous curves that meandered with what felt like frustrating abandon?

Look at a map of this country.

Many of the states in the east have borders that only an artist could draw with sufficient precision. The borders of those states curl into themselves, curve with infinite intricacy. The farther west you look, though, the larger the states get, and the straighter their borders. In my undergraduate mapmaking class, I was asked to choose a state and find its geometric center. Obviously I chose Wyoming. It's nearly a perfect square.

The borders of eastern states were drawn by people who lived there, who had walked the ground and who outlined their property based on the swells in the land and, more than anything, based on water that flowed through. How many eastern states have rivers as their boundaries?

Western state boundaries were drawn by people who had not attempted walking the land, or living on it. They looked at maps. They chunked the West into parcels that appeared, on paper, to make sense politically, and, maybe in the short term, economically. They had never been out here. The cartographers were drawing these lines in buildings surrounded by soft green saturated swells. They lived in states where liquid seemed to ooze out of stray spots of ground, where water was so ubiquitous as to be irritating. They had never seen plains on which you could trip over sagebrush for days and never find something to drink. They did not account for the lonely smallness of a town that buffers itself meagerly against vast prairie winds. They failed to grapple with the notion of dry seasons, or plants so protective of their water they needed spikes.

They had no concept for Wyoming.

White homesteaders were allowed to choose plots of land: equal squares, whether in Carlsbad or the Badlands or near-vertical Rocky Mountain slopes. There was a scramble to choose something that might yield something edible. Almost immediately, the rare plots that could be farmed were claimed, and other homesteaders were left with the detritus of the West, sweeps of land that, because of the dearth of water, could be tenable only in enormous swaths.

In 1922, representatives of the states that shared the Colorado River Basin got together in Santa Fe to talk about water. It had been a rainy last few years. The leaders were under the mistaken impression that the virility that had recently saturated the West was typical, and they made their water plans accordingly. As a result, the Upper Basin states, including Wyoming, were not to collectively deplete the water in the Colorado and its associated tributaries below 7,500,000 acre feet per year. That would, they reasoned, leave a roughly equal allotment for the states in the Lower Basin. In wet 1922, this seemed fair to everyone involved. This was the Colorado River Compact. The Compact and all of its associated laws and practices are together called the Law of the River.

Immediately after this agreement the West reverted to more typical water conditions. It became drier. Suddenly, 7.5 million acre feet per year per Basin division left the Colorado River low and sluggish. Meanwhile, people moved West. We built fountains in Las Vegas and farms in California and golf courses in Arizona.

The river is in trouble.

IV.

To write about water in Wyoming is inextricably to write about water in the West. In writing this essay, I tried to separate Wyoming's water from water elsewhere in this

region, like whites from yolk, but the yolk kept exploding into the whites. I couldn't separate them.

Water is too complicated to parcel into imaginary parallelograms.

The snow curtains trickle to the *arroyos*. The clay and the silt and the sand and the rocks mingle in the water. The river pulls microbes, insects, turtles, fish, carcasses, fertilizers, branches, bones, blood. Together they all go to answer the downstream call, but it's harder than it used to be. In some places, some years, it doesn't happen at all.

Prairie Water

By: Manasseh Franklin

Manasseh Franklin is a restless wanderer. Raised on a farm in the rolling hills of eastern Pennsylvania, she's followed her impulses across the US, Canada, Nepal, Europe and Alaska. Her writing has appeared in *Afar*, *Trail Runner*, *Rock and Ice*, *Aspen Sojourner* and *Yoga International* magazines in addition to community newspapers and websites. Over the years she's discovered that the best place for a good night's sleep is in a goose feather bag on a mountainside and that glaciers are one of the most awe-inspiring chunks of nature a person can experience.

Somewhere, there is water under the prairie. It reveals its traces on the far rocky eastern edge that presses up against the Laramie Range. Grass gives way to slabby, ridged and crusted rocks that nearly always catch the toes of my orange running shoes. I pump my arms and peer down at the rocks, not just to stop myself from tripping, but to catch glimpses of liquid in the cracks between the slabs. There's almost always some there, even if it only shows itself in moist dirt.

I wonder sometimes as I run if the pronghorn antelope I encounter look for water between those cracks, too, or if they have a secret spot their instincts repeatedly bring them back to. Sometimes, too, I think about what the world beneath those slabs looks like. I want to sheer the earth vertically, all the way down to bedrock so I can see the layers one by one and the water that seeps between them. If I did this, would the water gush and crash into me? Or could I just watch it flow softly between the earth's layers?

On first glance, it looks as though there'd be no water at all. I was fooled once, as I'm sure many others have been, by the vast, dry appearance of southeast Wyoming. Wind pours over the grasses and sagebrush, making them sway, making them appear almost like an ocean. At first, the only water one sees is the allusion of it. But of course, there's more. Like many things in

Wyoming, in order to find water in the southeast, you have to look harder than just a glance.

There's a secret the prairie holds, keeps hidden under rocks and grasses and sagebrush. Beneath its surface lies the water supply for Cheyenne and Laramie. Beneath its surface lies the vast Casper Aquifer. Thanks to the prairie, life, including humans, can inhabit some of the most arid earth in the lower 48. It almost sounds silly, but the pronghorn know it's true.

It's easy to take a thing so simple as water for granted. It pours so freely out of faucets, into toilets, onto our bodies from showerheads. Humans have made water as dispensable as the plastic bottles we buy it in, the mass quantities we pour down drains every day. Why worry about water when it's always there?

I thought that too before I migrated west. In my native east, there was water everywhere, it seemed. My family farm boasted a wide meandering creek, two ponds and several springs. The water we drank poured straight from a deep, healthy well. Sure, draughts occasionally stirred worry about the hay or corn crop but each time we worried the rain wouldn't come, it did. It would rain for days and saturate the fields and air so everything took on a sponge-like quality. Water worries never lasted long.

Here in southeast Wyoming, I think about water more than ever before simply because it's so discrete. I scan

the rolling, dry landscape for traces of it as I drive state highway 130 to the Snowies, or 230 to Colorado. I hike and run up Pole Mountain, choosing trails that cross the largest number of gently trickling streams. Or, I run on the prairie, for the peace of mind the space provides, but also for a chance of discovery.

Pole Mountain is by far my favorite place to encounter water, particularly in winter. In a state that is home to majestic 12,000 and 13,000 foot peaks, it seems more a hill than a mountain but it is filled with things to find. A trail system winds round it, threads together its aspen groves, lodgepole stands, conifer forests. And there's water there. Water that giggles in spring and early summer. Water that trickles in late summer. Water that fills with golden aspen leaves in fall. Water that freezes stone solid in winter.

When the water freezes so hard, how do moose get to it? I asked myself as I picked my way through light airy snow. I came to a stream by way of the moose tracks, but I saw no moose, only bubbles in the ice. The temperature was well below zero, the sort of cold that forms frost on dry hair. I walked alone in the woods. And I looked for moose, and I listened for water. Of course, you can't hear water in cold that deep. In fact, you can't hear much at all.

The aspen groves and lodgepole stands had taken on a peaceful silence, as though they'd resigned themselves to the deep winter freeze. The trees had nothing to say by way of leaves or birds or even branches rubbing. I followed the moose tracks to the muted stream, and I gazed down at it.

Thick, dimpled ice sheets spanned across, filled the two-foot wide space between the snow-laden banks. Some of the ice was chunky and white. Some of it clear, with dimensions of layers visible underneath. Some was filled with bubbles.

The bubbles varied in size—quarter, dime, nickel. I crouched down and looked close. It took a serious cold to make those bubbles form, it took a cold so true it stopped time. A cold so deep it froze a moment. I burrowed my chin in the collar of my down jacket.

This water, too, quenches the thirst of a town. When spring arrives and the forest floors begin to thaw, this water will follow gravity downhill and underground. It'll seep into the water tables, travel to the depths of the aquifer. It'll make the prairie bloom.

Of course, it's not always so simple as that. This all depends on snow, on winters that stay cold enough to let the snow grow. But the prairie grass is hardy; it's evolved to handle the lasting effects of big snow and low snow winters. The prairie manages dry spells far better than

those east coast hay fields that had us watching the cloudless sky with fingers crossed, everyday praying for rain that always fell on time.

It's hardy, but it needs water, too, and so do humans if they want to continue inhabiting the plains. Water in this arid environment is deceptively hard to find, but it's still here. If winters continue to grow more mild, will that be the case? If less snow falls, if spring inches in earlier each year, will the water tables stay stable?

I ask these questions as I run across the prairie in early March. In the two months since I encountered the ice bubbles and deep freeze, the plains have thawed and frozen, thawed and frozen. The temperature has climbed to 50 degrees and plummeted to -5. On the prairie, the gently rolling ground is free of snow, though moist from snowmelt. I'm wearing a short sleeve shirt, Capri pants. The gentle breeze that blows is moist and warm. Unseasonably warm, I think, but who's to say what's seasonal anymore? I reach the far eastern edge and my eyes automatically look to the cracks. I smile when I see it: there's water there. For now.

Bigger Fish:

A Wyoming Girl's Story of Fishing and Water

By: Kelli Blomberg

Kelli was born and raised in Wyoming, graduated from Kemmerer High School, went to college at the University of Wyoming and got a degree in Wildlife and Fisheries Biology and Management. She took three years off and is currently in school at UW for a joint J.D./Master's of Environment and Natural Resources. Kelli has worked technician jobs for the Wyoming Game & Fish, US Forest Service, and lab technician jobs in the Zoology Department.

Kelli enjoys spending as much time outdoors as possible. She likes hiking, fishing, gardening, backpacking, photography, pretty much anything she can do outside. She has been married since 2007 and is a dog mom.

Wyoming water to me means fishing. It always has. Some of my earliest memories are of fly fishing with my grandparents in the Greybull River next to their house at the base of the mighty Absaroka Mountains.



Realistically speaking, I may have done less fishing and more playing in the water in those early days, but the fishing was ever present. My favorite activity other than playing outside was tying large, elaborate flies with the biggest feathers I could find in my grandmother's collection. After all, bigger flies catch bigger fish, right? It was all very logical to me, and all very normal. My grandpa worked as a ranch hand on the Pitchfork Ranch and was basically a good old cowboy. My grandma was a teacher and coach, and she was simply the best. The time I spent with them was incredible, albeit, much too brief. Of course, as a small child, I didn't understand the complete gift it was to spend so much time with them in the country. Now I do understand, and I will forever treasure those days. And although my grandparents are gone, their legacy runs deep. To this day, fishing and just being in the wilderness does more for me than I think I can even recognize.

Growing up in Wyoming has innate advantages whether they are acknowledged or not. As a child I spent much of my time outside, but the teenage girl I was did not really care about much other than my high school bubble.

Maybe it isn't so much that I didn't care, but I definitely took my situation for granted. I lived most of my later childhood in the coal town of Kemmerer, but I spent my summers in farm country in the southeastern part of the state. Much of my

time, regardless of where I was, was spent in outdoor bliss. I could hike, fish, ride 4-wheelers and horses, boat,



snowboard, play, run, do whatever I wanted outside. Of course, there was usually work to be done first. It wasn't much fun to pull weeds in the beet fields, but I can look back on it now and be thankful because it taught me the value of hard work. Then the day came when my family had to sell most of the farm. Unfortunately, family farms are a dying breed thanks to a variety of factors including water issues. The ten year drought had prevented the farm from being productive like it once was. That was a reality check and my first experience with the effects of water limitations.

I was one of those strange little kids who drug home every animal bone that I found while out hiking, so I

guess it wasn't surprising when I decided to study biology in college. When I left for the University of Wyoming, I had no idea what I wanted to do specifically, but I at least knew it would be in the biological realm. It took me a while to settle on a major. In fact, it took until my 4th year. First I tried out Microbiology, but it required too much chemistry for my liking. Then I switched to science education, but I did not like the education classes. I finally found the Wildlife and Fisheries Biology and Management program. It was worth the wait. All I really had to do was look at the course list, and my mind was made. There were entire courses on the study of different animal types, and I wanted to take every single one of them. I immediately changed majors and never looked back. I knew without a doubt I was finally finding my place. My grades even improved, although the courses were tougher than anything I had ever experienced before. I was completely enamored with ichthyology, the study of fish. Limnology, the study of freshwater systems, was another favorite. Anything to do with fish and water was near and dear to me, and I devoured it all. Many of the courses in the program involved hands-on field components which naturally, I enjoyed very much. It only seemed prudent that I would continue on to a Master's program in fisheries ecology after graduation, but I decided to take a couple years off to get some work and field experience first.

Field jobs are incredible. At least, the ones I had were. I worked for the Wyoming Game & Fish Department out of the Green River office on their three-



species crew during the 2010 field season. Our crew worked in very remote places, so we camped out for eight days at a time, then took six days off. We had two main worksites: Muddy Creek, south of Rawlins, and the Big and Little Sandy rivers, between Farson and the Wind River mountains. We worked all day, camped by the river at night, and we got paid. It was like a dream come true for outdoor lovers, such as ourselves. Our work was not easy, however. I had to work hard to keep up with my all male crew, and I did. The three species project was an ongoing research project aimed at conserving three native fish species: flannelmouth sucker,



bluehead sucker,



and roundtail chub. They are currently threatened by the

white sucker and burbot, both of which are non-native species in the Green River Drainage. We used electrofishing equipment, which is exactly what it sounds like, to try and



eradicate the invasive fishes while taking data on the native ones before releasing them. The view of the Winds was spectacular. We often verbalized how lucky we felt to be working in such an amazing area. I spent many days literally up to my elbows in fish, and I loved it.



One thing that never sat right with me as we worked on Muddy Creek was that our worksite was very close to a proposed wind farm. This wasn't just any old wind farm. I am talking about the Chokecherry and Sierra Madre Energy Project. If it comes to fruition, it will be the

largest wind farm in America. Personally, I did not think wind is the answer to all our energy issues. I began to worry, while working on Muddy Creek, about the potential effects of the proposed wind farm. True, wind energy is marketed as “green”, but I have always been skeptical. For one thing, the fuel costs alone of transporting all of the materials to the worksites would be huge. The construction phase would be next. Increased traffic means erosion, poorer air and water quality. For an already threatened species, this kind of decrease in environmental quality can be devastating. The three fish species we were trying to help conserve struggled with resource competition already. With a decrease in water quality, they would potentially have an even harder time surviving. I remember after expressing these views to my crew, my boss said I should go into environmental law. I just laughed.

Although I never took what my boss said about becoming involved in environmental law seriously, my worries and questions about the future of the fisheries I worked on and grew to care for lead me to an interest in natural resource policy. I was still planning on going to graduate school for a fisheries related program, but nothing had worked out. I finished the 2011 field season at the Wyoming Game & Fish Department in Laramie determined to get accepted to graduate school that next year. However, an idea was planted in my head when I hear about a dual degree I could get at the University of

Wyoming College of Law. The College of Law offers several dual degrees, one of which is a master's degree with the Haub School of Environment and Natural Resources. At first, I thought the idea of going to law school was hilarious. I loved working outdoors and did not care for office days. I assumed all lawyers spent all of their time in offices. I continued to apply and come close to getting into fisheries master's programs, but after a few failed attempts, I decided to look deeper into the dual law program. I knew I was ready to go back to school, so I decided to go ahead and apply to law school. I was offered a place, and I accepted.

Having survived the first semester and continuing to make my way through the second, I realize that I have so much to look forward to in the following years. I am so ready to dive into natural resource law and policy. Wyoming and the Western states face many water related issues, and I want to be involved in finding solutions. It is vital that people from different states and across agencies work together on these issues. As a society, our economy, our physical and mental health, and our prosperity all hinge on the health of our natural resources.

Sometimes I feel a twinge of regret that I will never work as a fisheries biologist, but it is all okay. In a way, I will still be working in the field because the decisions I make will hopefully have positive effects on natural resources.

My experiences have definitely shaped me into a person who truly cares about what happens to the natural realm. Besides, I am a firm believer in the saying, “work hard, play hard.” I am determined to live that mantra to the fullest in the places I love.

Understanding the Far Reaches of Wyoming Water

By: Brady Flinchum

Brady Flinchum is a second year Ph.D. student studying near-surface geophysics. He is interested in using geophysical methods to understand how water is stored and moves through mountain watersheds. Brady grew up in Reno, Nevada where he obtained my B.S. degree in geophysics from the University of Nevada, Reno. Shortly after graduation Brady worked as a data processor for Multi-Phase Technologies, a small geophysical contracting company specializing in electrical resistivity tomography. Brady has been married to his wonderful wife, Melyssa Flinchum, for two years. When he is not working on his studies, Melyssa and Brady love to take their dog traveling, camping and kayaking on mountain lakes.

Life as we know it depends on access to fresh water. Unlike sea creatures that thrive in salty oceans, we need access to purified water. As it turns out, clean water is an extremely rare commodity. According to the United States Geological Survey, 96.5 percent of water on Earth resides in oceans and is considered undrinkable. Not only is the remaining 2.5 percent of water critical to our survival, but when it pools on the Earth's surface it creates unimaginable beauty. The water flow patterns during the long periods of Earth's geologic history has created dramatic landscapes that excite men and leave something to be treasured.

In Wyoming, people travel from all over the world to admire the majestic canvases painted by the Teton Range, Bighorn Mountains, Wind River Range and Medicine Bow Mountains. Millions travel to this state to admire the Yellowstone River as it falls over 300 feet before continuing its journey into the Missouri River. Many choose to actually engage nature by rafting down the tumultuous Snake River rapids that eventually end up in the Pacific Ocean.

With the arrival of spring, Wyoming's snowcapped mountains provide the vitality of fresh water essential to streams and rivers throughout the country, as well as fills reservoirs in the most beautiful places of the Continental United States. The rain that falls in the far-reaching valleys and the snowmelt from Wyoming's wondrous

peaks travel in almost every direction, providing for dependent residents season after season. Wyoming's water not only sustains life in-state, but it animates land allowing for diversity across the country. Our water travels from the scenic, elevated mountains of Wyoming in almost all directions. The water travels to the west where it meets with the Columbia River and enters the Pacific Ocean. It also travels south through Colorado and Utah meeting up with the Colorado River, and eventually the Gulf of California. Finally, our water runs east, where it departs the state through Nebraska. It contributes to the Missouri River, which eventually ends up in the Gulf of Mexico. As the nomadic water flows out of Wyoming through rivers and streams, large agricultural communities and thriving cities utilize it along the way.

In the high peaks of the Wind River Mountains stand series of lakes, which many believe are the most beautiful paintings nature herself could create. Beyond the crystal clear reflections of jagged cliffs and towers of rock over 10,000 feet high surrounding the lakes, these bodies of water flow to become the Green River. This powerful river, once snowmelt from Wyoming's peaks, tells a new story in Colorado. Its trek is delayed, dammed up to divert flow for agricultural growth and urban communities. For over millions of years this river has carved away sediment, creating the dramatic, topographic beauty that man established as Canyonlands National Park. The Green River collides with the Colorado

River at the bottom of these large sandstone cliffs. The water journeys all the way to the Gulf of California responsible for excavating the Grand Canyon and providing drinking water for the people of Las Vegas along the way.

In the other direction, the North Platte River flows through central Wyoming, where all of the tributaries from the Snowy Range and Laramie Range contribute to the river before taking a turn east and heading into Nebraska. Water usage from this river is critical to neighboring state, Nebraska, whose residents issued a lawsuit against Wyoming claiming that although the majority of water comes from Wyoming, Nebraska deserved the water rights. In *State of Nebraska v. State of Wyoming*, 1945, the Supreme Court determined that Nebraska is justified to 75 percent of the North Platte River's water rights. The court reasoned Nebraska's current farming infrastructure is more fresh water dependent from this river than Wyoming's residents. This decree is still active today. As hydrologists improve on mapping and quantifying the amount of water contributing to the river, the water rights unfortunately, have not changed. Even in 2014, the state of Wyoming is only allowed to use 25 percent of this water although Wyoming's snow peaked mountains contribute most to the North Platte River.

Due to water rights and other related issues, there is a critical demand for scientists to quantify the amount of water flowing from Wyoming's mountains to other parts of the United States. Research shows that 30 percent of fresh water is in the form of groundwater, which is not being represented in current measurements. The decree giving Nebraska water rights to 75 percent of the North Platte River was not an accurate quantification of the amount of water because it did not account for groundwater. Traditional measurements usually focus on assessing water flowing from a river or stream and not from the ground because in contrast, groundwater is difficult to quantify. In recent efforts, researchers are investigating how water moves through the mountains of Wyoming to better understand how water travels underground. It is important to quantify the amount of water that is leaving the mountains in all ways; on the surface, through rivers and streams, through subsurface flow, and also any remaining water stored in the complex rock formations of the mountains.

Traditionally the way to quantify subsurface flow is to drill holes into the ground measuring the height at which the water rises in the cavity. Drilling is an expensive process and is not ideal. In mountainous rocks such as granite, if the hole misses a fracture the entire cavity or well might appear dry despite water flowing meters away. Another limitation is when the well recharges slowly because only a few small fractures were

punctured. Drilling methods can lead to large errors in subsurface water measurement or can change the way the system operates. Current researchers believe geophysical methods can provide innovative, less intrusive ways to measure water flow without drilling holes. Scientists are pushing geophysical methods to the limit in order to quantify the amount of water where it is infiltrating the subsurface.

In order to protect and maintain Wyoming's water, as well as its pristine landscapes, it is important to understand how water moves throughout the high mountains. Studying mountain terrains will help illuminate the journey of Wyoming's water as it travels throughout the United States. Water researchers are currently trying to find new ways to protect, quantify, and preserve water resources over large spatial scales without drilling and disturbing the natural system. Pioneers will invent new tools to find and distribute fresh water to the populace around the world. This can be accomplished if we first understand the long journey of water, starting from the complex mountain terrains, to the winding rivers, where it eventually reaches a cathartic culmination.

Undergraduate Student Essays

Water in Wyoming:

Three stories over my life as a Wyomingite

By: Allison Cetak

Allison grew up in Wyoming, first in Sheridan until she was five and then in Casper until she began college at the University of Wyoming. Allison graduated from Kelly Walsh High School in 2011, and is currently studying to become an English teacher set to graduate in 2015.

This essay is a top winner in the Communicating about Water Writing Contest.

My grandpa told me once that it was never a good idea to walk on ice whose thickness you did not know. He said, it was just asking for trouble and if you were dumb enough to do it, you were just begging to fall through. At seven, this seemed like logical and sound advice, so I always pestered my dad with questions about the thickness of the ice we would be ice fishing on when I would tag along with him during the winter.

It has been an extremely cold winter, which meant that the ice fishing is great. I love ice fishing with my dad because we hang out all day, listen to his classic rock music in the truck, drink Gatorade, eat sandwiches and chips, and then get hot cocoa on the way home. I never get much junk food at home, so ice fishing with my dad is the best.

As he loads the ice auger into the truck, I pack our cooler with all the essentials and run inside to check the weather with my mom. She tells me it will be a lovely day with lots of sunshine at Boysen, so I scramble back outside and pile into the truck, ready to hit the road. We make the drive out to the lake and I listen to Queen and AC/DC from the backseat of the pickup. I even get to sing the real words to “Highway to Hell,” which makes me feel very grown up. As we pull up to the lake from, my dad talks with a Game and Fish warden to ask about the

thickness of the ice. I wait patiently in the truck as they chat, and my dad returns to the truck a few minutes later with a twelve-year-old boy grin on his face. As it turns out, the ice is four and a half feet thick which means we can drive the truck out onto the ice. I immediately protest this, fearing that we will fall through to our untimely deaths, but dad assures me of our safety and beings to drive us out onto the lake. The ice groans and pops under the weight of the truck, but it doesn't give. We park several hundred yards away from the next fishing holes and unpack the sled containing our tip ups, ice auger, and chairs.

As my dad starts the ice auger, it is apparent that it will take both of us to break through the thick ice. He drills down through the ice and I scoop the shavings out of the hole with my gloved hands, making sure the auger doesn't burn up. We go back and forth, drilling and scooping out three holes, and an hour later we have set up our tip ups and are relaxing in our chairs drinking orange Gatorade, his favorite. Just as we settle in, I notice a flag pop up, so I run over to the hole, the metal grips on my boots making a metallic noise as I run, and begin reeling in the first fish of the day. However, as I do, I yell for my dad, perplexed and mildly disgusted at the creature coming through the hole in the ice.

As it turns out, I just caught my first ling, a freshwater codfish that looks more like an eel than the bass and

trout I was accustomed to. I tell my dad that I refuse to help unhook or clean the ungodly thing, and he laughs and me, telling me to go and check on the other tip ups while he deals with the serpentine creature I just pulled from the depths of the lake. The rest of the day goes on ling free, thank goodness, and it is so nice out that I strip down to my overalls and play on the ice all day.

As the day comes to a close, we load all our gear into the truck, pack our fish in the cooler, and drive back to shore, ice groaning at our tone deafness as we sing “Bohemian Rhapsody” all the way home.

Cold. Icy. Numb. The sun is beating hot against my back, covered in a ratty t-shirt that is more grey than white, the hem of my faded jean shorts is soaked in frigid water. I am ankle deep in the north fork of the Tongue River trying to capture minnows and the longer I lie in wait, concentrating, the less sensation my feet and hands possess. Mountain stream water, especially in the Big Horns, is stingingly cold, even in the warm 80 degree July weather, but I am totally still, laser like focus calling all my attention to my task. I have nearly succeeded in luring a minnow into my waiting hand when suddenly water crashes around me. Abby, my dog, has leapt into the creek, rapidly scattering all of the minnows I had so skillfully lured into my waiting hand. My initial frustration

melts away almost instantly as I watch her tiny legs paddle around the river, sleek black head bobbing up and down as she takes in the sights and sounds of the mountains.

My dad warned me that taking her along on our exploration would be a bad idea, as her love of swimming would overpower the limited training my dad had given her in her short four months of life, and he had proven to be correct. Any hope of fly-fishing was dashed the moment she gleefully threw herself into the icy water with me, though I can't say I blame her, as that was always my first instinct when seeing a crick, river, lake, or pond too.

At ten, I have the self-control of my four-month-old puppy when it comes to water; much like my pup, I constantly need to be exploring it, swimming in it, or fishing from it at all times. I abandon my minnow hunting and paddle around with her, enjoying the contrasting sensations of icy cold river water and scorching hot sun, which always seems to feel extra warm at this high elevation. It is quiet except for the sounds of water rushing around me and the musical notes that birds add. I float along with Abby by my side, and then wade back up the river to avoid becoming tangled with my dad's fly line. She and I float and wade up and down the river for what seems like forever, exploring the stones and moss and water bugs that inhabit our chilly playground.

When it's time to go back to our campsite, my dad hauls us both out of the river, sopping wet, but content. We ride in the truck bed, a treat only afforded to me when we were driving in the back roads of the mountains, all the way back to camp where I warm up by the fire, sleepy from my watery adventures.

Dangling my feet off the end of the dock, Jens sits on my lap, his Thomas the Train figurine on his, as we watch a momma duck and her ducklings pass us by, hoping to catch a treat or two. Barrett, Hadley, and Emily are on either side of me, talking to the ducks in their best baby voices, and I quietly laugh at them. Our families are camping together in the Big Horns at Sibley Lake, my most favorite place, and I offered to walk all of the kids down to the lake so our parents could have a break. At sixteen, they seemed to trust me enough to take all the kids to play at the dock.

Emily and I are much older than Hadley, Jens, and Barrett, but they are like family to the both of us, so we love spending time with them. In true little brother fashion, Jens wants desperately for me to throw him into the lake despite the fact that I continually tell him how cold it will be. The Big Horns are lovely during the daytime, and the contrast of cold mountain lake water and sunshine feels great, but at dusk when the air

temperature drops to that of the water temperature, it is far less pleasant. We are enjoying the company of the ducks and I watch as the sun drops peacefully over the trees that surround the lake when I hear a splashing noise, like a rock being dropped into the water. A shriek emanates from the little boy on my lap and I grab him tightly as I feel him try to lunge towards the water. He kicks and screams, telling me that Thomas the Train, his most prized possession, has fallen into the lake next to the dock. I try to calm him down, as do Emily and his sisters, but he is inconsolable.

After ten minutes of crying and negotiating, he calms down and looks up at me with his sweet hazel colored eyes, pleading that I go in a rescue Thomas from the depths of the lake. I initially say no, citing the cold water and impending darkness as reasons for not going on the mission. However, the longer his sweet little expression pleads with me, lesser my resolve becomes, and soon I am stripping my sweats and coat off until I am bare foot in shorts and a t-shirt.

I stand at the lakeside and have Hadley spot from the dock for me, helping me find where Thomas was in murky lake water. She finds his blue profile and shows me where I will need to go to get him out. I wade into the water, my body protesting as the burning sensation that comes from water that is too cold slowly takes over my whole self. I wade to where Hadley indicates, feeling

with my bare feet until I can feel the small train under my step. I maneuver it between my frozen toes and attempt to pick it up and avoid getting my head wet. I am successful to a point, but the numbness takes over and I lose my grasp. Afraid that I will lose Thomas under the dock, I quickly submerge my whole torso, groping through the water to catch Thomas before he falls again. My hands clasp the train and I start to run out of the icy water. I slip into my lime green Crocs, collect my clothes, and begin sprinting back to camp, yelling for Emily to bring them all back as they follow me hastily.

As I run my whole body loses sensation from the combination of lake water and 45 degree air temperature. I scramble up the hill and down the road that leads to my camp, with the rest of my kids following shortly thereafter. I sprint into camp, running into our trailer and quickly stripping out of my soaked clothes, drying myself, and finding dry pants and a shirt to change into. After I have changed and caught my breath from my frigid mad dash, I step back outside to warm up by the fire.

As I settle into my chair, warming my feet and hands, Jens shyly walks over to me and plops into my lap. He is clutching Thomas and has a combination of guilt and gratefulness on his face. As he sits there with me, he turns around on my lap and says, "Thank you for saving Thomas. I know that water was cold, but I was so sad

without him. You're the best. I love you." Then he plants a sloppy three-year-old boy kiss on my face, and snuggles into me. I'm not sure I will ever jump into a lake to save a toy train anytime soon, but I guess that's the kind of silly things I do for family, blood or not.

To Spread the Burning Sands with Water: Lessons from Wyoming's Riverton Project

By: Annette Hein

Annette Hein is a Wyoming native. She was raised west of Casper and is interested in science and conservation. She is studying geology and enjoys writing about science to make it interesting and accessible to a lay audience. Her work has appeared in the Casper Journal and at www.wyohistory.org.

*This essay received an honorable mention in the
Communicating about Water Writing Contest.*

Don't you listen to him, Dan, he's a devil, not a man,
and he spreads the burning sands with water...
(Bob Nolan, "Cool Water")

Any story about water in Wyoming is a story about people, and some of the saddest stories are those of reclamation projects, federally funded efforts to turn arid land into productive farmland through irrigation. In the 1940s, dozens of would-be farmers came to the Third Division of Wyoming's Riverton Project, one of the least successful in the state. They hoped to live off the land, independently, but after years of effort, most of the farmers found themselves struggling and bankrupt. They were caught between the ambitions of the federal government and the realities of Wyoming soil and terrain.

This history is relevant to modern issues involving water. Water today is critical; being necessary to life and to growing food or manufacturing goods, and the planet's growing population is only increasing the demand. Wyoming's development illuminates principles we need to recognize today in dealing with the global need for water and other resources. Attempting to control nature is difficult because natural cycles are all interconnected. The story of the Riverton Project's post-World War 2 expansion shows that when such critical details are ignored, people suffer.

The Riverton Project was established in 1918, on lands ceded by the Shoshone and Arapaho tribes from the Wind River Reservation in the late nineteenth century. The Bureau of Reclamation planned to develop federal lands that had not been successfully homesteaded. Using federal funds, the Bureau built reservoirs, dug canals, and attracted settlers during the Great Depression. Settlers could earn title to federal land by developing it and growing crops. Many of the settlers on the Riverton Project were veterans of World War 1, and in this early phase, they generally succeeded in developing and keeping their lands. After the second World War, the government decided to expand the Riverton Project, opening the so-called Third Division on lands not yet developed (Autobee 15-20).

The Riverton Project's expansion reflected the attitude of the time that the natural world exists to be made useful to people. Nature was to be run like a machine or a factory; run for maximum profit and greatest efficiency. It did not matter that the flats of sagebrush in the proposed Third Division had been flats of sagebrush since the last ice age. It did not matter that the soil was infertile. It did not matter that the growing season was a scant five months (Autobee 4). Because the government of the United States thought the Rocky Mountains should be fertile agricultural country, they were to be so. The engineers and federal planners would take care of everything.

Annual rainfall on the plains was not enough to support farming, so existing water cycles in the region were modified to make irrigation possible. There was enough yearly volume of water available in the Wind River and other streams of the area, but it flowed along the river instead of precipitating directly on the soil and it came at the wrong time of year. Water accumulated in the mountains as snow over the winter, then in the spring melted away, sometimes in large floods. By summer, when water was most needed, the rivers had run dry. Preparing to reclaim arid lands meant an extensive alteration in the river's hydrologic cycle. Pilot Butte and Bull Lake Dams stored some of the water that had previously run off in spring floods, releasing it steadily to be distributed in ditches to the settlers (Autobee 1-10).

Many people were eager for the opportunity to settle on a reclamation project. The Riverton Project's Third Division, like others established after World War 2, was primarily intended to reward veterans for their service by giving them a chance to earn title to federal land. There were always more applicants than land parcels, so qualified applicants were chosen by lottery. Settlers came into the project with some experience and assets; the minimum requirements were an honorable discharge from the military, two years of farming experience, and \$2500 in assets. Applicants came from all over the country, but predominantly from the western states (Cannon 47-57). Successful applicants were taken on a

tour of the reclamation project in a vehicle dubbed "the sucker wagon" and allowed to choose a lot of 160 acres (Churchill 36).

The motives behind the 160-acre parcel size were noble, but it was inappropriate for the West. The rule was intended to make sure federal support went to small landowners and not to big agribusinesses, and in fertile farming country of the East and Midwest, a family could make a living off 160 acres of land. However, Wyoming is famous for cattle ranching because its plains are too dry, too windswept, and the growing season is too short for growing most cultivated plants. Before European settlement, large bison herds grazed the plains; today, large ranches run cattle. Rather than working with regional trends and offering irrigation to supplement cattle ranching by growing feed such as alfalfa hay, the Bureau of Reclamation wanted to encourage irrigated, Midwestern-style farming of vegetables and grain on small parcels, and brought in settlers to do so.

As with any pioneer undertaking, life on a reclamation project was not easy. The lots were undeveloped, so the first task settlers had was to shelter themselves and their families, usually in a shack but sometimes just in a tent (Cannon 107-111). Brush had to be cleared, sometimes by hand, sometimes by dragging machinery behind a jeep or tractor (Churchill, 88). Farmer Lyle Esser told historian Brian Cannon that work was continuous, "from

before sunup in the morning 'til way after sundown at night" (99). Profits were uncertain at best; Wyoming writer Beryl Churchill described the relatively successful Shoshone project during the 1920s: "One Frannie farmer's diary recorded his total income for the year at \$1,108.95. His final expenses were a couple hundred dollars more--\$1,327.90. A Garland farmer noted a little more success. In 1922 he said that he made a total of \$1679. His expenses were \$1,667.90 (Churchill, 66)."

Irrigation, of course, was one of the main jobs each farmer did, and sometimes the most difficult. The Bureau of Reclamation was responsible for building dams and major ditches to bring water to each farm, but farmers had to distribute the water and irrigate the fields themselves (Cannon 65). The method used was flood irrigation, in which water is allowed to run down the fields between the rows of plants and soak into the ground. This method was unfamiliar to settlers whose farming experience was in wetter climates (Churchill 32); one federal expert said that two years were needed to become good at irrigating (Cannon 68). Until then, ditches washed out, overflowed, or clogged. Idaho farmer Mark Sweet explained that he graveled the head of each furrow individually, working the gravel into the ground by hand: "[my] hands looked like claws and fingers were all split wide open and bleeding...it'd get so slick from all the blood that I couldn't hang onto the shovel handle (Cannon 69)."

Unfortunately, this backbreaking work often resulted in degradation rather than improvement of the land, as irrigation impacted natural geochemical cycles. Water can dissolve salts in the ground, chemical compounds like calcium carbonate, calcium sulfate, or sodium chloride. In a humid climate, where water necessary to farming falls as rain, the soil develops a structure that includes an upper zone with a high content of organic matter and very little salt. This is because rainfall washes these compounds out of the surface layer and percolates with them deeper into the soil, below plant roots. Abundant rainfall leaches most of these salts away, leaving the soil in good condition for farming. However, in an arid climate like Wyoming, the soil is much thinner and less developed. The bedrock, containing naturally high concentrations of salts, was close to the surface. Adding irrigation water to the soil mobilized these salts; then high evaporation pulled the water up through the soil, bringing the salts to the surface instead of washing them away. The result was the development of a thick white crust on the surface of the soil, often called "alkali". These salts are poisonous to plants and a severe hindrance to agriculture (Worster 319-320).

One way to remediate alkali was to flush the soil with plenty of water, but this caused another problem. The bedrock underlying the Third Division was an impermeable clay shale, so the water drained away underground much more slowly than it was applied to

the surface, resulting in seepage and soggy fields (Autobee 27). Plants could not grow in the waterlogged soil. This problem could be addressed by installing underground drains, but the drains did not always work properly and drove up the cost of the project (Cannon 133-135). Riverton Project settler Van Sorensen recalled this frustrating time: "[A]ll at once it started to get swampy. You'd go out there at night and that alkali on everything, you'd swear it had snowed. Absolutely pure white....There was not one living thing out there except for some cattails (Cannon 135)."

In the end, everyone concerned with the Riverton Project's expansion was a loser. In 1960, settlers had a gross income of some \$30 per acre, and at this rate, repaying the government for the irrigation infrastructure was projected to take centuries. In 1964, the government bought most of the Riverton Project Third Division units back from the settlers rather than continue to fight intractable alkali and drainage problems. The settlers were left without the farms they had labored for and dreamed of, and the government was left with a total bill that exceeded 25 million dollars. The land remained in poor condition. Eventually, in the 1970s, the former project lands were sold to farmers in the Riverton area (Cannon 144-149).

Overconfidence in our technical capability to control nature must have been one of the factors behind

deciding to expand the Riverton Project. The Bureau of Reclamation clearly did not feel that the clay bedrock or the high concentrations of salt posed significant obstacles to project settlement; otherwise, it would not have opened the Third Division lands. With several decades of irrigation experience across the West, it is hard to understand how the Bureau could have failed to check for and recognize these problems in advance. They must have assumed that productive farms could be established in spite of these issues; one can only conclude that such details as clay shale and alkali were regarded as insignificant compared with the abilities of Reclamation engineers. What actually happened was that the one desired change, bringing water to crops, affected natural cycles and caused further changes the farmers found harmful--severe drainage and alkali problems. Turning the arid flats into fertile farms was nowhere near so easy as it seemed. The settlers, the government, and the taxpayers paid the price of this simplistic approach.

The history of the Riverton Project illuminates different philosophical approaches to dealing with water and other natural resources. One view, taken in this case by the Bureau of Reclamation, is that nature can and should be run like a machine and controlled for our benefit. The opposite view, taken by hard-line environmental groups today, is that any human alteration of the natural environment is undesirable. A more moderate view is

that it is acceptable to manipulate the natural environment to some extent to provide resources that people need. Every organism on the planet alters conditions for its benefit, such as antelope scraping away snow or birds building nests. However, in trying to control water or other aspects of nature, the history of the Riverton Project tells us we need to be aware that the natural world is not a machine. We must understand water's natural processes and work with them as much as possible, rather than always trying to overrule nature and impose our own plans. Failure to take natural conditions into account has more than an environmental cost. It has a direct and painful human cost.

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Under the Surface: Water in Wyoming

By: Nicholas Robinson

Nestled under the Wind River Mountains in Lander, Wyoming is where Nicholas Robinson was born and raised. Nicholas is studying Communication and Environment and Natural Resources at the University of Wyoming. After graduation in May of 2015 he wants to pursue a career writing about nature and the environment: fusing both of my passions. During the warm months in you'll most likely find Nicholas on a body of water somewhere in Wyoming, enjoying the moment.

Paddles sliced through the still water. Stars scattered the night sky as wisps of smoke dissipated into the air from nearby campfires. My friends and I kayaked across the lake with picturesque mountain silhouettes surrounding every direction. Our location: The Wind River Mountains in Wyoming. In, around, and on top of Wyoming's bodies of water is where I often am in the summer months. Whether it is whitewater kayaking, hiking into a back-country lake, or sliding off the Popo Agie Falls, water plays an integral role in my life.

Lander, Wyoming and the Wind River Mountains will always be home. From the Popo Agie with its cascading whitewater, or pristine alpine lakes, amazing water surrounds Lander from every direction. Through these bodies of water I am better able to identify with nature. Ever since my close friend and kayaking mentor David Schmitt passed away in 2011, spending time out on Wyoming's water brings a comforting solace – a connection with my friend. Water in Wyoming is a medium to connect with nature. On a personal level, it is a way to communicate with a lost friend. The well that is water in Wyoming penetrates much deeper than one man's spiritual connection with nature. More is under the surface than just one person's interpretation. To fully define "water in Wyoming" I needed to cross the border.

A few miles away from Lander lies the Wind River Reservation. While I am graced with idyllic and seemingly

perfect examples of water, I've always wondered what the water on the reservation is like. During the summer of 2013, I spent 40 hours a week working at the Shoshone Rose Casino. My coworkers I bonded and became friends. Their lineage derives from either the Shoshone Tribe or the Northern Arapaho Tribe or a mix between the two.

While waiting for customers in the restaurant all of us talked about weekend plans and hobbies. Near the Fourth of July, my supervisor Sinaed, a member of the Shoshone Tribe, ecstatically told me about her plans to bring her children and boyfriend up to Moccasin Lake on the Reservation for a camping trip. I can recall her saying: "I'm ready for a break" as she went out to seat a table.

On another occasion my friend Rhonda, an enrolled Arapaho member, and I made small talk. She inquired about my studies at the University of Wyoming. I nonchalantly replied with Communication and Environment and Natural Resources. She began laughing and after that my nickname was "hippie." Later we talked about the environment and conditions on the reservation: "One day all of the water will be gone, and there will be none for us to drink," Rhonda said and guzzled down a glass of ice water, telling me how that thought made her thirsty.

Although our cultures diverge from one another, we share numerous commonalities. Whether we venture out to lakes for recreation, or drink it to survive, each and every person is connected with water. This connection transcends borders and cultures. Making the current state of water in Wyoming a concern for all of us.

During Christmas break, I went back home and met with Rhonda to talk specifically about water on the reservation. The statement she made prior in the paper about the water being gone one day piqued my interest, and after a semester of thought I wanted to revisit it. She provided some interesting insights. The core of the problem is a disconnect “between the natives and white people,” Rhonda said. Instead of working together, each group opposes the other. A lack of communication and compromise leads to disputes between both sides. Just the other day there was a fight in the conference room in the middle of the water board meeting, “things escalated between the two sides and two women even got into an heated argument,” Rhonda said. Regarding water table variations and drought, she shared speculation of neglect: “The lakes are drying up there Nick,” Rhonda pointed out the window to the mountains, “they will be gone and no one will know, or care.”

Uranium and other pollutants litter The Wind River Reservation. In mid-1970’s the Environmental Protection Agency (EPA) investigated the inactive uranium mill on

the Reservation. Their conclusion: contamination was present, but the levels did not exceed the guidelines set by the EPA or Surgeon General (Douglas, pg. 21, 1997). Since that survey in 1977, the number of Native Americans dying by various forms of cancer is rising (Ahtone, 2012). Is the former uranium mill responsible for this spike in deaths? It appears so. Tailings of the mill were left uncapped for years, leaving to inevitable uranium contamination of the water table (Ahtone, 2012). Contamination and pollution exists, however there is a discrepancy between where and how much. Reservations are sadly common pollution dumping grounds. In his article, Tristan Ahtone states that contamination sites like the one on the Wind River, mostly happen on tribal land (Ahtone, 2012). It is disheartening that we blatantly subjugate another group of people to pollution that is not even theirs. We are all people. Our cultures, backgrounds and histories may differ, but we all drink the same water.

Fixing the pollution problem on the Wind River Reservation is daunting. As Rhonda stated, the battle between the groups is the core. Wyoming Governor Matt Mead is fighting against the EPA. He does not want the EPA to monitor air pollution levels on the Reservation because it could change the Reservation's boundaries and make Riverton apart of the Wind River Reservation (Zhorov, 2014). This discussion about borders spun out of control among residents in Fremont County. While back

home I overheard crazy rumors of people getting ready to “defend” their homes, while tossing around racist and derogatory terms without batting an eye. It was terrible to overhear. Sadly not many people knew why the borders might change: to monitor air quality on the Wind River Reservation.

Here we are today. In a political gridlock while pollution worsens. Discussions are happening, but they are not the right ones. Current conversations consist of two distant groups in constant disagreement. Each one so solidified it will not hear the other out. It is time to merge together, not pull apart. A solution is possible. It requires cooperation. Let’s start working together; it is pertinent to all of us, no matter which side of the border. This is not a suggestion. It is a plea.

For four days during the Sun Dance, Rhonda fasts from food and water. This religious ceremony helps her connect spiritually with nature and the environment. Ironically, being further away from water brings you closer.

My first attempt of defining water in Wyoming was simplistic. A way for us to connect to nature; spiritually, physically, and emotionally. I could tell stories of my first time kayaking the Platte River in Casper; spending all day on the water, finding myself. I tried and the result felt superficial. It was a boy rambling on about how he was

enlightened because he found a way to connect with nature. I was not special. We all have a connection with water. But in a way I am special. My connection with water is not in jeopardy. On the other side of the border for Rhonda and thousands of others it is a drastically different story. So instead of sharing my own personal story of how scenic rivers are scenic, I sought out the often untold story. Like a child at a lake for the first time, I ran off the dock and into the dark water. And when I came up for air, I had my answer.

Water in Wyoming defines who we are.

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Pavement Rainbows

By: Camille Garcia

Camille Garcia is currently a freshman at the University of Wyoming with majoring in Anthropology and minoring in Creative Writing. She is originally from Cheyenne, Wyoming. She is a singer/songwriter and frequently writes in many genres of writing.

We all stood crammed underneath my teal umbrella outside the café, talking as if it weren't so late at night and as if it weren't pouring rain. I was mostly outside the protection of the umbrella, feeling the cold rain drip down my bare arms and soak my hair. But I didn't mind, because I knew that this moment could never be replaced, especially in a place where water scarcely preferred to fall from the clouds. Though my friends complained about the chilly air and the wet rain, they must have appreciated that moment too, and knew that it couldn't have been the same under any other weather condition.

We were caught up in the magic of that July night—it was something about this freshly fallen rain streaking the windows while we were inside sipping caffeine and absorbing the lyrics and guitar slides our friend had been playing for hours. Full, bright energy was swimming through the dimly-lit café and through our hearts, making us feel bold and healthy as another friend snapped pictures of us, capturing those exuberant moments. Months later, we would look back on those pictures and remember how the rain had made us feel, and why that cool humid atmosphere was so extraordinary.

Now, the scent of purity filled the night air and we inhaled it carelessly. Historic downtown, Cheyenne, Wyoming had become our home that summer. We knew

its streets like the ridges of our own thumbnails but it looked so much different on a rainy night. The brick buildings looked newer, the cracks in the sidewalk were less noticeable, the paved streets were shiny and black. Water has that anti-aging effect on everything, I realized. It makes us see the underlying beauty in everything. During the daylight, those changes are obvious: the grass becomes greener, flowers become more vivid, tree bark becomes more prominent, the hidden colors of rocks become visible. In the sky, cleared of clouds, a rainbow appears.

However, I didn't realize until that night that even in the dark, beauty becomes more distinct. The downtown shops were closed and the city was asleep, but there were still lights to welcome any life that might still be awake at this time. Green, yellow, and red stoplights reflected off the streets and blended with the fluorescent yellowish white streetlights like paint. It was as if this night rain carried with it serenity, blurring all of our worries before our eyes, creating rainbows on the pavement instead of in the sky.

It was the same water that cleansed our feet in the summertime as we dipped our toes into streams that ran through the city. It was the same water that our grandparents praised for watering their crops when food or water wasn't so easily accessible. It was part of the cycle that had been nourishing the earth since the

beginning of time—of course rain carried serenity with it, along with hope and happiness that I could feel through the pores of my skin as I stood outside of the umbrella on that July night.

Acknowledgements

Thank you to Anne Sylvester, Wyoming EPSCoR Project Director, and Beth Loffreda, Creative Writing MFA Director, for your time and contributions to this contest.

We want to especially recognize our judges who took time to carefully read essays and thoughtfully select awardees. In the Graduate Category, thank you to Carlos Martinez Del Rio, Director of the Biodiversity Institute; and to Emilene Ostlind, Editor and Communications Coordinator at the Haub School of Environment and Natural Resources. In the Undergraduate Category, thank you to Stephanie Joyce, the Energy and Natural Resources Reporter at Wyoming Public Media; and to Manasseh Franklin, a Master's of Fine Arts Candidate in the Creative Writing Program and Wyoming EPSCoR's 2014-2015 Graduate Assistant.

And, thank you to all the students who submitted writing—your time and effort is sincerely appreciated, and we are very glad for the opportunity to showcase your work.

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