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EXPLORING COLONIAL IDENTITY AND A GROWING ECOCONSCIOUSNESS

ON THE GREAT PLAINS

by

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A THESIS

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EXPLORING COLONIAL IDENTITY AND A GROWING ECOCONSCIOUSNESS
ON THE GREAT PLAINS

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University of Nebraska, 2015

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This thesis is an exploration of my journey from an unapologetic industrial agriculturalist to a more environmentally sensitive citizen. I now recognize the inescapable relationship between colonialism and environmental issues surrounding water resources on the Great Plains and how these intertwined issues affect both the planet and its inhabitants. Specifically, I look at literature as both the catalyst and sustainer of my still-growing environmental and social consciousness. From important literary works encountered as a youth to the ecocriticism and explorations of social justice of the readings I engage in today, I examine how these literary choices have led me to create a work of environmental discourse about water on the Great Plains. This attempt to highlight the ecological issues that have become important to me as a result of these literary influences also serves as the beginning of a reconciliation with identity and place.

PART I

This thesis is an exploration of my journey from an unapologetic industrial agriculturalist to a more environmentally sensitive citizen. I now recognize the inescapable relationship between colonialism and environmental issues surrounding water resources on the Great Plains and how these intertwined issues affect both the planet and its inhabitants. Specifically, I look at literature as both the catalyst and sustainer of my still-growing environmental and social consciousness. From important literary works encountered as a youth to the ecocriticism and explorations of social justice of the readings I engage in today, I examine how these literary choices have led me to create a work of environmental discourse about water on the Great Plains. This attempt to highlight the ecological issues that have become important to me as a result of these literary influences also serves as the beginning of a reconciliation with identity and place.

A Colonial Heritage

I grew up as part of a system that I would later come to know as Industrial Agriculture, a system whose mindset is firmly based on a European, Christian, cornucopian way of interacting with the world. To most people involved in Industrial Agriculture, there are only positive environmental impacts to what they do. In their minds they are reclaiming land previously being unused or used in an inefficient manner, with the goal of making it economically productive. On the Great Plains, they have made the Great American Desert – a term still used in all seriousness among these rehabilitators of

the earth – into the breadbasket of the world. This vast terraforming is justified by declaring that “We feed the world!” Who can argue with that?

It may be somewhat predictable that the Christian Bible figures so prominently in the development of my social justice and environmental consciousness, given that I grew up in a small farm community of around 1,000 people with five churches – all but one of a Mennonite denomination. Nearly everyone there is of German descent, although there are a scattering of people with Native American ancestors – although this was not known to me until several years after I had moved away after high school graduation. There was, while I lived there, also one Asian – an adopted child from South Korea – and one African American, also an adoptee, although from where I never learned. This predominantly white agricultural settlement on the Great Plains, with its token people of color, is from a distance of time and place easily seen as a manifestation of Euroamerican colonialism in action. We colonized the land, taken from Native Americans, some of whom we eventually integrated into our society – albeit as a second class of citizens, something which again I was not consciously aware of until much later in life. We also, via missionary work, extend our colonial reach to foreign countries, sometimes bringing back children from those faraway places to give them a better life. All of this is, of course, justified by Biblical passages.

Colonization occurs in the Bible as early as Genesis 4:16: “Then Cain went away from the presence of the LORD, and settled in the land of Nod^q, east of Eden” (Yancey 30). Although it is supposedly the beginning of human civilization and there are no other people for Cain to remove from the land east of Eden, it remains that he colonizes at the

very least the land. Note the term “settled.” This term is used throughout the Bible (and history) as a soft word for the theft and colonization of land and the removal of indigenous people for a “chosen” people. “Settled” also has the implication that the area is a place in need of help, of civilizing, that the land is in the midst of a wild tantrum in need of a calming hand to make it into what it was destined to be. Cain’s settlement is one of the only times in the Bible where colonization did not involve the removal or subjugation of other people, but far from the last time God’s people were colonizers. As an example, in Numbers 21:25: “Israel took all these towns, and Israel settled in all the towns of the Amorites, in Heshbon, and in all its villages” (Yancey 158).

The pattern of God’s people moving onto land not their own and conquering the inhabitants is not presented as a population-stress situation; rather, it is pushed as a divine right of the chosen people. There is pre-destination at work here. See Psalm 2:8-9: “⁸Ask of me [God], and I will make the nations your heritage, and the ends of the earth your possession. ⁹You shall break them with a rod of iron, and dash them in pieces like a potter’s vessel.” (Yancey 490 - brackets not in the original). The violence here is graphic and unambiguous, and very much in line with the temperament of the Old Testament God. Not only is this passage violent, it is dehumanizing of the existing populations of the lands to be conquered. They are to be broken “in pieces like a potter’s vessel.” The implication here is of a commodity that is imperfectly made, which should be broken as a potter would a defective pot. These passages and those like them are held up as justification for the conquest of Native Americans on the Great Plains whenever a child asks what happened to the Indians that used to live here. They were not Christian;

therefore, not really fully human in the eyes of God; they are the defective pots that must be “dashed to pieces.”

The colonization of the Great Plains thus justified, what gave my Christian ancestors the right to terraform the Plains into an agrarian monoculture territory and attempt to control the region’s natural resources? This falls under the divine decree in Genesis 1:28-30:

²⁸ God blessed them, and God said to them, “Be fruitful and multiply, and fill the earth and subdue it; and have dominion over the fish of the sea and over the birds of the air and over every living thing that moves upon the earth.” ²⁹ God said, “See, I have given you every plant yielding seed that is upon the face of all the earth, and every tree with seed in its fruit; you shall have them for food. ³⁰ And to every beast of the earth, and to every bird of the air, and to everything that creeps on the earth, everything that has the breath of life, I have given every green plant for food.” And it was so. (Yancey 27)

This is the passage most often held up whenever it is questioned why people have the right to dam a creek, kill off one species of plant or animal for the benefit of another, or to exploit natural resources such as oil, natural gas, water (and so on), even if doing so is detrimental to the environment.

All of this Old Testament justification for mankind’s superiority to nature and his right to control it may seem a bit odd; after all, Christians are supposed be primarily about the New Testament. Yet this emphasis on the Old Testament is necessary to

“properly” frame the Great Commission in terms of missionization and colonization. That passage is Matthew 28:18-20: “¹⁸ And Jesus came and said to them, ‘All authority in heaven and on earth has been given to me. ¹⁹ Go therefore and make disciples of all nations, baptizing them in the name of the Father and of the Son and of the Holy Spirit, ²⁰ and teaching them to obey everything that I have commanded you. And remember, I am with you always, to the end of the age’” (Yancey 900). Not only are Christians to convert the heathen masses, such work is a divine imperative.

For much of my youth the Bible was taught with both Old and New Testaments hand-in-hand, usually with a feel-good New Testament story that was put into “perspective” by several more from the Old Testament. This was my first experience with literary analysis (albeit a very selective type of analysis), and it taught me to look to the past for the answers that the present is built upon, that anything new must be tempered and viewed in the light of the past. Discussions of the text with religious teachers and other authorities also taught me how inventive the human mind could be in justifying nearly any behavior under the guise of progress and divine right.

Adding to all of this justification of colonization and exploitation was the reinforcement of a particular method of teaching the book of Revelation. The fundamentalist interpretation includes not only an apocalyptic end-of-days, but also the promise of a new Earth (rather than a new world, as in a paradigm shift in power and thought, as some interpretations would have it). The notion that there is a new planet, one in which all will be provided for and only those few – and it is an exclusive club, no overpopulation threatening resources there – will be allowed admittance. The new Earth

notion undermines the idea that this planet needs to be taken care of; indeed, it gives validation to the cornucopian prosperity theology taught by many in my agricultural community. It boils down to the impetus to get yours while the getting's good, but you are only allowed to do so if you are a properly devout Christian. All others need not apply. In short, I was raised as a colonist (under the guise of being a "good Christian"), to carry on that tradition, and to pass these ideas down to successive generations. One can imagine how this cultural upbringing clashed with a later interest in the injustices done to the indigenous people and the water resources of the Great Plains and caused no small hurdle to a more empathetic understanding of those issues.

A Different Point of View

The Bible was not the only literature that informed my early conception of Euroamerican relationship to the Great Plains. Unfortunately, very little of what I read strayed far from my Christian upbringing until high school. Here, by way of a teacher raised outside of small town Nebraska, I was introduced to Native American literature with the reading of John G. Neihardt's *Black Elk Speaks*.

The first time that I read *Black Elk Speaks*, it was not the edition annotated by Raymond DeMallie, and so every word was taught as those of Nicholas Black Elk. Here was presented a point of view that, while still heavily influenced by Christianity, was still culturally different enough from the Euro-centric worldview that I had been reading up until that point that my interest was captured. This first reading of *Black Elk Speaks* made two things clear to me for the first time: First of all, the indigenous people of the Americas had suffered a great deal at the hands of Euroamericans; secondly, that the reasons Euroamericans acted as they did was not primarily because of heavenly

instruction but out of a desire for the resources that were on and beneath Indian land, as well as for the land itself. The book also, to a lesser extent, reinforced the long-held idea of the eco-Indian; an almost pure, mythological being that had developed in the American zeitgeist by way of literature, popular culture, and especially out of years of Euroamerican guilt over their treatment of the environment and of the people who they had killed and removed from the land.

Subsequent readings of *Black Elk Speaks*, in particular the DeMallie-annotated edition, further forced me to conceive of the world in a different way from that of a colonist; I was pushed to try to see things from the point of view of the colonized. Especially interesting is the way in which Neihardt colonized Black Elk's story, appropriating it – however good his intentions were – to put forth his own primitivist agenda with changes to and omissions of certain aspects of the story. DeMallie's intertextual analysis of Neihardt's hand in writing *Black Elk Speaks* by way of creative editing shows how native identity is co-opted and redefined by white people (largely Americans) who are disenfranchised with their own society. The Native American culture appears appealing to these people for several reasons, among which is a feeling that “primitive” equates to “better” and “peaceful” (the primitivist/noble savage viewpoint); further, that this primitive state allows Indians to be “closer to nature” and have an innate understanding of the relationship between nature and humanity. This back-filling of Native culture is still easy to do, especially since much of Native cultures was lost to illness, genocide, and cultural erasure perpetrated upon Indian people.

While there are obvious Christian influences and overtones to *Black Elk Speaks*, part of the reason for its popularity among both Euroamericans and Native Americans may be because of its Christian overtones. Many Native Americans inspired by *Black Elk Speaks* lived through the – largely Christian – boarding school years as youths, and would therefore see a double-familiar of both the Native lore they may have learned at home – or simply learned about, but which was lost – and the Christian teachings they learned at school. Alternatively, for those Natives who for one reason or another never were exposed directly to their own cultural heritage, this melding of Christian and Native would give them just enough familiar “Christian” aspects while allowing them to claim a Native heritage. It is probable that the Christianized elements of the book are what I first identified with when reading it as well.

In considering the effects of *Black Elk Speaks* as a cultural representation of a colonized people, the end result is quite possibly more than what was intended by Neihardt. While he succeeded in promoting his primitivist agenda, it was done at the expense of appropriating and re-inventing (I would go so far as to say colonizing with the best of intentions) much of Black Elk’s – and by extension, indigenous – words and culture. Sometimes referred to as a Native American Bible, *Black Elk Speaks* served as an early counterpoint to the Euroamerican, fundamentalist Christian influence of my youth. I felt a need to explore the possibilities that this new paradigm placed in front of me offered, but before that exploration could occur I needed a frame of reference to help me understand how this shift would be relevant to me. I needed to know more about the place where I grew up and how it related to my sense of self. It did not take me long to

discover that my identity as a 4th generation resident of the Great Plains was based on a colonial view of what the landscape was. After more than three decades it was time to truly learn about the place that I called home.

Learning My Place

Nothing could have been a better introduction to the Great Plains ecosystem than Don Gayton's *The Wheatgrass Mechanism*. It is welcoming and familiar, like a ramble through a grass prairie, and as full of unexpected discoveries. Gayton manages to bring forth both scientific curiosity and the reflective, less tangible, intuitive exploration of the Northern Great Plains ecosystem. He does this in much the same way that he himself came to experience the prairie. We travel along with him from a physical, visceral encounter with the land and progress to a more scientific study of the history, current state, and possible futures of the Great Plains. Throughout we do not lose sight of Gayton's sense of wonder for the place that drives his passion for the science of how it performs as an ecosystem. Indeed, it seems as though the more that he learns about the details of how and why the prairie system acts as it does, the more wonder he uncovers.

One of the topics that Gayton comes back to over and over throughout the book is the perception of the Great Plains by most Euroamericans as a desolate, empty place worth nothing, a space devoid of life and life-sustaining abilities. Time and again Gayton disproves this, showing us how full of life the prairie is. Not only is the place full of life, but the essays in the book show that the Plains is full of some of the most efficient life on the planet, with C4 grasses that take in more carbon dioxide than other types of plants and which also manage water in a way that conservationists surely must envy. This is shown in the essays "Hugh Kortschack, Pineapples and the C4 Syndrome," and

“Watching the Grass Grow”. Gayton does not stop with the plant life, but also explores the adapted animal life of the Great Plains in the essays “The Grass and the Buffalo” and “The Hellbender at the Bottom of the Dugout.” In “Roy LaMotte’s Cows” Gayton addresses the issues surrounding the importation of European beef cattle onto land attenuated to bison, and how some of these issues might be overcome.

Time and again Gayton turns back to the signature grasses that make up the Great Plains. The amazing mixture of grasses appear to work together in the act of reclamation of sub-standard soil, as his essays “Symbiosis” and “Salt of the Earth” show. These two essays show different aspects of land reclamation. “Symbiosis” paints a picture of people who work with both the limitations and the advantages of the prairie ecosystem to carve out a life that benefits not only themselves but also the land. It is a sustainable, responsible interaction - as the title says, a symbiosis. This is a dramatic departure from a more confrontational approach, historically (and contemporaneously) taken by humankind, wherein the environment and its features are things to overcome, to be fought against, and a living wrested from this struggle - an approach which leaves both the land and people exhausted and depleted. “Salt of the Earth,” on the other hand, recognizes the unique adaptations that nature has in creating and changing the environment. Gayton, thankfully, manages to express the power and orderliness – or, the mechanism – which nature brings to this process without falling into the usual trap of “nature will heal itself of all wounds” mentality. Rather, he points out the process of constant back-and-forth struggle within the ecosystem and the adaptations that have developed to handle those struggles. For Gayton, there does not seem to be an idea of

returning the Great Plains to some mythical perfect state. Instead, he is pointing out ways in which the healthier, already adapted ecology existent in the land can give us clues to better use and manage this place that we have thrown into such disarray with our mishandling of it.

Gayton is conversational, asking us to recognize complexity, diversity, and nobility in the struggle of all life in a challenging environment, and instead of adding to that strife he proposes that we learn from it and adapt ourselves along with it so that there will be a future for both the environment and those of us who live in it. By the end of *The Wheatgrass Mechanism*, I became more convinced than ever that the issues that people have in dealing with the Great Plains are not so much a result of any deficit of the place so much as a failure on our part to understand and work within the ecosystems constraints.

Contested Ground

As informative as Gayton's book is, Theodore Binnema's *Common and Contested Ground: A Human and Environmental History of the Northwestern Plains* stands as an excellent side-by-side read to *The Wheatgrass Mechanism* by bringing both a history of the area and of the interactions between Euroamericans and the indigenous people of the region. These issues, as well as the exploitation of both people and the land and the troubling notion of the Euroamerican fur traders as a "neutral" party, are explored as part of the human experience of the Great Plains. *Common and Contested Ground* contains some impressive insights and extrapolations, given the type and quantity of material that

Binnema had to work with. I am always glad to see information that is interpreted in a thoughtful, considered manner. Binnema does so in this book.

At first I was leery that *Common and Contested Ground* would turn out to be a romanticization of the Native American interaction with Euroamericans in the early days of contact on the Great Plains. Binnema does fall into such nostalgia, and this is especially evident in his analysis of how the land and people – on both sides – were exploited. He puts down what he has found, along with his expert analysis, and allows the facts to speak for themselves. There is, for example, no doubt that the Euroamerican fur traders exploited the Native Americans to do their dirty work for them (gather furs, act as a buffer from hostile tribes). Nor is there any doubt that this exploitation and contact with Euroamericans had a profound impact on the lives of the indigenous people of the northern Great Plains; the diseases, horses, and weapons that were traded completely transformed both the people and environment of the Americas. Still, he is right to note that these changes to indigenous life did not occur within a vacuum of culture; in many respects, as Binnema notes, the existing cultural practices of the Native Americans allowed different bands to exploit other Native Americans to enhance their own wealth and prestige, and even at times let them practice a little bit of exploitation back on the Euroamericans.

This recognition of the ability of the Native Americans to be exploitative is important toward the acknowledgement of Native Americans as human beings. Too often they are portrayed as no more than spiritual, environmental stewards of the land who lived in complete harmony with nature and the Earth; or on the opposite end of the

spectrum as complete savages, full of bloodlust. Neither portrayal paints Indians as being human, and therefore makes them easier to put aside or in the past, as an extinct people and culture. Binnema recognizes in Native Americans the same tendencies and abilities as Euroamericans to take advantage of both technology and situations in order to further their own interests. We are then forced to acknowledge that the indigenous people are imperfect and human, just as the Euroamerican is (although this observation should not be taken as an apologetic statement of Euroamerican exploitation and mistreatment of other cultures).

Common and Contested is neither an apologist piece for the colonizers nor a romantic work about the indigenous, but rather a well-researched portrayal of an interaction of different groups of human beings, with all of their faults and inability to understand one another's cultures and what harm they were doing to one another and the land around them. Among other things, Binnema's analysis of the data contributed to my growth as an aware occupant of the Great Plains by pulling away whatever remnants of the "noble savage" or "eco-Indian" that had managed to linger behind after my other studies, both anthropological and literary. His handling of sources also informed the methods that I would later use to explore the water resource issues on the Plains.

A Song of Resource Exploitation

There have been fictional works in my search for knowledge of the Great Plains that have managed to put the colonialism practiced here into perspective. One especially interesting look at how resources from the Great Plains are exploited and moved by colonial powers can be found in Willa Cather's *Song of the Lark*. The novel portrays a

model that is remarkable similarity to European colonial economic practice, wherein a valuable commodity (Thea's singing talent) is extracted from the hinterlands (the American West), and goes through a series of value-adding processes until the product is consumed by the only "worthy" population (the highly urbanized, sophisticated, and most assuredly white elite of the civilized east). Not only does true development and refinement of Thea's raw talent occur in urban centers, but as she progresses in her singing career she must move further and further east (or toward civilization), finally to Europe. In an interesting twist, she must move back west, just a bit, to New York City, where her singing talent is fully and finally recognized. Thea's movement, from a far-flung frontier to the "cultural center" of the world, is a revised conception of a colonial relationship to the seat of empire, in spite of the long political separation of Europe and the United States. In this move Cather shifts the cultural apex of the world from its historically Eurocentric location to a particular part of the U.S., establishing an East Coast American exceptionalism.

Thea's story reinforces the idea that the countryside (the Great Plains) exists to provide for the bottomless hunger of the colonial Euroamerican East with raw material. The frontier is relegated to the bottom of the rung, to the pre-historic, as exemplified by the scenes in Panther Canyon. Instead of seeing the advanced culture that existed in the canyon, the ruins are presented as a product of an uncivilized other, a failed culture that, while charming and interesting to study, belongs to the past. So, while Cather reinforces Euroamerican exceptionalism and eastern imperialism, she does manage to give an accurate portrait of the machinations of colonial power paradigms and resource control.

Song of the Lark also illuminates the mindset of those who colonized the Great Plains and highlights the social hierarchy that is still in place when it comes to frontier versus high civilization; the frontier supplies, civilization consumes.

Resource Hunting

Cather's novel was hardly the first work that explored the relationship between Euroamerican elites and frontier resources. From the time of the first Spanish explorers and fur traders, Europeans have invaded the Great Plains in search of economically profitable resources. It could be argued that few resource hunters had as much impact on the Great Plains and those who lived there, as well as on the imaginations of those in the east, as those Jeffersonian explorers Lewis and Clark. The tale of their journey as seen in *The Lewis and Clark Journals: An American Epic of Discovery*, edited by Gary E. Moulton, shows the colonial aims of a young United States. This book is an interesting look at American imperialism in the early heyday of westward expansion of the United States. Without question this was a military expedition in search of exploitable resources and also a poorly disguised spy mission into an already peopled area with a view to gauging the military capacity and population of the Native Americans living there. Considering the preparations and the decisions made early on in the journey – for example, the inclusion of the air gun and mounted cannons to intimidate any Indians they encountered – it would appear that finding the fabled Northwest Passage was far from the most important agenda of the trek. Add to this constant estimates of tribal populations to discover how many warriors each tribe could muster – and the practice of identifying and marking specific chiefs within each tribe (i.e., the power brokers or the ones to be

targeted as needed), the Corps of Discovery was little more than a dressed-up recon mission.

A strong argument could be made that Lewis and Clark were truly carrying out the publicly stated goals of their mission. I wonder, however, why the U.S. government, made up of the most connected and informed people on the continent, required information that was surely known long before the trip up the Missouri. I would point to the journals themselves, which offer evidence that this journey of “discovery” was a largely unnecessary if, in fact, they were sent to explore an area of the country already familiar to Euroamericans (fur traders), find a water route to the Pacific, and to inform the Native Americans that they were now governed by the United States. As mentioned before, there are many indications that the expedition had every expectation of taking a land route across the Rockies, and the methods used and types of information gathered from Native groups is suspect. Going further, I would note the many geological observations and reports made by the group. What were they looking for? Gold, possibly, but I wonder if this metal was really a goal of the journey. I find rather scant references to gold, in fact only one which refers to a gold cord given to a Mandan chief. What about the notable instances where they identified possible lead and iron deposits? And the various sulfur springs? Iron, lead, sulfur – guns and gunpowder. While gold is important in making war, the means to make, maintain, and service munitions within a territory to be held is a far more practical consideration.

All told, I cannot help but read *The Lewis and Clark Journals* as anything other than a highly propagandized military operation that laid the groundwork for future

colonization and government policies geared toward the removal of Native American, British, and French presence from the Western portion of the continent. Even the much-vaunted (and deservedly so, in its own way) cartographical results of the expedition did as much to serve an imperialistic military campaign as they did to inform the public about the newly acquired land.

After this exploration of the Great Plains by way of these works of literature, I came across one book that brought my interest in historical and contemporary colonialism on the Great Plains and a growing concern with the degradation of the environmental resources of the region together.

Colonizing Indians and Water

Dammed Indians Revisited: The Continuing History of the Pick-Sloan Plan and the Missouri River Sioux by Michael Lawson is a work of non-fiction, and it is full of facts, data, analysis, and social commentary which makes it clear that current water resource management practices on the Great Plains have made fresh-water resources in the region far less secure. The book also makes it clear that the colonial approach to fresh water on the Plains exacts, as such things always do, a heavy toll on the indigenous population of the area. It quickly becomes clear that there are two major means of water resource exploitation happening on the Great Plains that are at the root of these negative impacts: agribusiness and energy production.

In *Dammed Indians Revisited*, Lawson touches on both of these topics as he discusses the effects that the Pick-Sloan Plan had on the Great Plains Native Americans and their communities. His focus on one group of people – Native Americans whose land

lay in the path of construction – not only raises awareness of the injustices done to Native Americans, but also serves as a cautionary tale for anyone on the Great Plains concerned about fresh water security and the often impractical and downright destructive impositions that we put on the Great Plains biome. That such an important agricultural part of North America is threatened with less water that is more and more unusable for human consumption and for growing crop plants not only threatens the food security of North America but, due to exportation of the products made here (including hydroelectric energy), the world as well.

As a work of literature, Lawson's book, with its attention to detail and narrative manner of presenting information, led me to a different method of approaching water and social injustice. He uses a scientific, well-researched method presented in a personable, accessible, readable form. Such a way of approaching a subject has many benefits, not least of which is to stimulate thought and force the reader to re-think something that, for the most part, has been taken for granted or not even thought about. As someone raised as a farmer in the industrial agricultural tradition, *Dammed Indians Revisited* helped me to re-think my approach to how water is used and how such an approach deeply affects the land and the people who had claim to it before colonization. Such is possible because of my experiences with the previously mentioned texts, and this paradigm shift in thought can best be seen in my subsequent exploration of industrial agriculture (agribusiness) and energy production in relation to the Great Plains water resource, in which I took an approach similar to that of Lawson. In many ways, the following is also my attempt to

come to terms with being a colonist in a place that I know as “home,” and my realization that this home is threatened by the very forces that allow me to think of it as such.

PART II

A Growing Awareness

I grew up surrounded by water but was unaware of this fact; instead, I would say that corn was the ubiquitous resource of my life. It was in the fields, in the grain bins, in scattered kernels around the farmyard, in the pig, chicken, and cattle feed, forever tinkling around in the clothes dryer after falling out of pockets and gloves. It even made almost daily appearances at the dinner table. If not corn itself, then corn byproducts. Certainly there were other crops; soybeans, milo, occasionally wheat, alfalfa, brome, prairie hay – but corn was king. Any crop rotations (if they were rotated at all) were based on maximum production of corn in any given year. But there is an essential ingredient in corn production: water. Lots and lots of water.

In an environment as dry as the American Great Plains, how did a crop that had been genetically engineered (mostly through intense, controlled crop breeding, and only recently by the development of genetic modification in the laboratory) to use an incredible amount of water to sustain a rapid growth to maturity come to be the most abundant plant life on the (semi)arid Great Plains? Irrigation. Supplied in many parts by pumped ground water, but just as often (and increasingly) from constructed irrigation lakes and ponds. It was taken for granted that we, as humans, had a right to use the water, to do with it as we would.

Additionally, the influx of people wanting to exploit the fertility of the Great Plains came with needs. They needed water, most easily provided by rivers and streams. Ultimately the waterways of the Plains are chaotic, often unpredictable, and “wild.” Just

as inhabitants of the land were killed or pushed onto reservations to make way for the great white tide of settlement, the rivers – most notably the Missouri – were corralled in a massive construction project. The new occupants of the land also needed electricity on the cheap, a need used as another justification for the impoundment of once free-flowing rivers, streams, and creeks throughout the Great Plains to create hydropower. Progress on the Plains equates to furthering agricultural production and the processes to garnish energy production from the region's resources.

There is a cost to such a mindset, a bill that began to accrue centuries ago with the first contact of Europeans with the inhabitants of the Great Plains. This bill is still building debt as the predominant colonial Euroamerican culture continues to exert its influence on both the indigenous people and ecosystems of the Plains. I am aware of this fact now, but it has been a long road to get here.

A History with Water

Living in the part of the Great Plains when and where I grew up, water was something that I rarely thought too hard about. Interactions with water never occurred under the assumption that it was a finite and endangered resource. It was there when the tap turned on or when the irrigation wells were fired up. The earliest memories that I have of experiencing Great Plains water not from a tap come from childhood. About a quarter mile as the crow flies from my farmyard home and into the quarter-section of cropland was a spring. Because of how wet the earth was surrounding the spring, and because the expense (at the time) of putting in enough drainage tile to make farming over

it worthwhile was too high, the only human interference with the upwelling involved mowing the grass surrounding it.

The spring lay in a gradual fold of ground, and when one stood next to it the slight slope hinted at a vast landscape just beyond the ridge. The only thing visible above the swell of the land and growing corn was a mulberry tree to the west. Because of the relatively featureless landscape offered by the mostly flat field (and also because the very productive mulberry tree became a necessary stop on the way), the walking distance to the spring was just under a half-mile. The spring did not rage, but between its hydraulic power and the lay of the land a small pool formed, about four feet deep and six feet in diameter, into which sweaty children could take turns jumping in to cool off. My brothers and I would often make the short trek on hot summer days, stopping for a bit to climb the mulberry tree and partake of its berries in their various stages of ripeness. By the time we reached our “swimming hole” we were dust-covered, with mulberry-purple stained hands and feet, and most assuredly sweaty. That ice-cold spring water washed away the grime and tricked us into burning off our youthful energy by shocking our bodies with its cooling bite. I can still smell the corn, hot dirt, and clean mud of that spot. Perhaps the most enduring memory, however, is of the cloudless blue expanse of the sky and the feeling of being in the middle of a vast, empty space. Despite the fact that nearly all of the land that I had access to at the time was cropland, that spring pool in that field was as close to (although still quite a bit far from) an untouched source of naturally flowing water that I could get. In retrospect, this is closer than many people manage to get to water untouched by human industry.

This picture of a natural spring surrounded by fields of grain is indicative of the past century's attitude toward the land and its resources. Working around what couldn't be plowed under, Euroamerican colonists terraformed all of the prairie they could into cropland. The transformation stalled with technological limits, mostly because the size of farm equipment had all it could handle. Before long, innovation made it necessary to bring even more land under the plow and technology caught up with desires for unified, easily-farmed fields. With the arrival of bigger, wider equipment, fields partitioned by drainage ditches and waterways became too inefficient. Earthmoving equipment was brought to bear on the prairie: bulldozers, earthmovers, and trackhoes. Drainage technology, first of clay and then of ABS plastic whose installation was powered by the omnipresent farm necessity, the diesel engine, allowed farmers to route seeping springs back underground, diverted through pipes into drainage ditches and bringing "problem areas" of the fields under control. In the process, what little patches of grass left in those waterways disappeared under the plow, and along with it the various species of animals that had managed to cling to those places disappeared as well. The water was something to be controlled, and so it was.

Only ten years ago, that spring that I played in as a child was "fixed" with drainage tile, so that the newly installed center pivot and 30-foot wide farm equipment would not be bogged down in it or have to cross the shallow waterway that took that icy water down to a drainage ditch. If I were to stand in that spot today, the view would be similar; there would be corn or corn stubble. Unfortunately, that is all there would be. No water would be visible, except for what might be running through the center pivot, the

installation of which was largely responsible for eliminating the waterway so its infinite circular path would be uninterrupted. The birds would be gone, as would the rabbits and occasional whitetail deer that would bed down in the grass afforded by the waterway. The mulberry tree would no longer peek out over the slight rise in the hill, having been cut down so as to gain another hundred square feet of prime farm ground. Everything neat, in rows, tidy – civilized. Progress.

I was taught by my community that the bounty of water to be found on the Great Plains is God-given, and it is our duty as stewards of the earth to use such bounty for the good of the world. That this reflects an astounding sense of entitlement is putting it mildly; that we, as human beings, are destined, chosen, and hand-picked by a creator to pull from the ground the life-giving substance in order to cultivate the land. In reality, this sense of divine right is an excuse to exploit the resource and push personal blame off onto some unseen higher power. This higher power is also used as justification for Euroamerican exceptionalism and the dehumanization of indigenous people of the Great Plains. The Euroamerican approach to indigenous people and to the environment are one in the same; exploit when you can, eliminate what does not contribute to the perceived betterment of society, and keep a small portion off to the side to assuage any guilt for completely destroying what was there before colonization. It should be no wonder then that an exploration of water resources on the Great Plains is also inevitably linked to the treatment of the native people in the region.

Agribusiness

As problematic as the Euroamerican attitude toward resource exploitation is, it is deeply ingrained in the culture of Great Plains agriculture, and there is nothing that impacts water as agriculture does – nothing comes even close. It is difficult to fault most of those who buy into this attitude, since it is reinforced by the market driving industrial agriculture on the plains. Between cornucopian beliefs and an insistence on raising crops and animals of a kind and in a manner ill-suited to the ecosystem of the Great Plains, it might seem that there is little hope for meaningful and successful turnaround in the depletion and degradation of the region's water resources.

Agribusiness on the Great Plains is a reality far removed from the mythologized family farm utopia that has long captured the imagination of early Europeans and Euroamericans. That this Jeffersonian agrarian ideal continues to hold sway in an age dominated by industrial agriculture is a testament to both successful propaganda and the integration of this myth into the American zeitgeist. While it is true that the majority of farms, to the tune of 87%, are held and operated by families, these are by and large not the small, homesteader type of operation often depicted in nostalgic literature and pop culture (EPA "Demographics"). As with most other industries, agribusiness is a highly technological process that incorporates and drives innovations in chemistry, genetics, engineering, biology, finance, and management. It is no wonder that people are often surprised to discover where the food in their grocery stores comes from. Yes, a rough-looking farmer might be the one producing it, but generally (s)he also employs several people, drives equipment that can cost up to \$500,000, and is responsible for the storage,

handling, and application of potent and dangerous but minimally regulated chemicals in the process of bringing the product to market.

The Great Plains was largely settled by people who were sold the nostalgic version of an agrarian utopia. The quest and fight for the family farm of myth still rings strong on the Plains, even though according to census data, less than 2% of people identify themselves as farmers (EPA “Demographics”). Many, like my great, great grandparents, were immigrants of European stock. Some were invited, some made their way on their own, but one thing was the same about everyone who settled on the Plains; they displaced native tribes. Some may not have known this coming in; others, like my ancestors, simply shrugged, believing that there was nothing that could be done about it and, in any case, it was God’s will that the land be turned under the plow. Many of those who managed to survive in this arid landscape were eventually rewarded for their tenacity, thus reinforcing a seemingly providential approval for their beliefs. A lucky few were rewarded beyond their wildest dreams.

Part of the reason that farming has been viable and successful on the Great Plains is the water resources to be found here. Initially irrigation was not as widespread as it is today; surface water was the best source of irrigation water, something that is necessarily limited in terms of access by a large number of people. In the late 19th century, the Ogallala Aquifer was identified; although it was not until well technology such as irrigation pumps and center pivot irrigation made huge strides after World War II that the boom in exploitation of the Ogallala Aquifer began (Hornbeck and Keskin 1). The river

was no longer blocked by landowners lucky or ruthless enough to own land along its banks; accessible water was now under everybody's feet.

The overuse of Ogallala Aquifer water has led to a great amount of concern, especially among farmers who irrigate. One US Geological Survey water loss map shows a decrease in aquifer levels of 10 to more than 40 feet between the years 1980 and 1997 (Kimball, 2010). Rainwater and winter runoff cannot hope to keep up with loss of this amount. As an example, the High Plains Underground Water Conservation District reports that "Recent studies have estimated an average recharge rate for the entire High Plains region of approximately 0.5 of an inch per year" ("Ogallala Aquifer"), hardly enough to charge even the minimal loss of 3.5" per year as indicated by the USGS. There are areas in the Southern Great Plains that were once irrigated, but because of aquifer depletion, can only be farmed using dryland agriculture. One possible solution that could have an immediate effect on the declining aquifer water levels is large-scale monitoring and charging for water use. This is not, however, a solution that farmers who irrigate are by and large willing to accept (Stephenson 767). Agencies responsible for monitoring and regulating water use have been forced to take creative measures. For example, in Nebraska in the late 1970's, well spacing regulations were put into place in an attempt to lessen usage (Stephenson 767). A more likely scenario will be one across the Great Plains that has already been carried out as aquifer depletion migrates north from the Southern Plains, where crops requiring less water and dryland agricultural practices have out of necessity replaced the former, wasteful irrigation practices (Morris).

The time period between World War I and World War II was also a critical era in the exploitation of surface water in the Missouri River Basin. As Lawson points out in *Dammed Indians Revisited*, the implementation of the Pick-Sloan Plan changed the landscape and the way that surface water was used as much as new well technology changed the scale of underground water usage for agribusiness. These massive public works and rapid conversion of native prairie to farmland scarred the land, becoming one of the largest terraforming projects in history.

Previous to the Pick-Sloan damming, the Missouri River system had a very active, strong flow which created its own ecology. The historical flood pulse system of the river, like other large rivers, contributed to this rich, local ecology that was an integral part of the Great Plains ecological matrix. Used by animal, fish, and plant species, as well as by human inhabitants, the streams and rivers of the basin were integral to the Great Plains biome (Junk et al.). The flood pulses and constantly moving water acted to create an oasis-like riverine system throughout the Great Plains in which Native American agriculturalists could farm their crops, and at which nomadic people could camp near water and wood sources. These lush riverine areas also provided dietary variety and biosystem diversity to the already diverse matrix of the grassland biome. Slowing, and in some cases nearly stopping, the flow of water in the Missouri River system brought about a massive change in ecosystem dynamics by fragmenting the Great Plains biome. Some environmental changes brought about included a decrease in biodiversity (due to extinctions, flow change, and habitat destruction), encroachment by invasive species (due

to flow and water temperature changes), and an overall decrease in water quality in the entire system (Bednarek; Galat and Lipkin; Graf; Junk et al.; Lawson).

In terms of human cost, as is common under colonial systems the indigenous population has paid the highest price. As Lawson points out in *Dammed Indians Revisited*, Native American land was picked for inundation locations over land owned by Euroamericans, even in cases where the whites' land was more suitable for building a dam and creating a reservoir. Neither were the same opportunities for asset removal given to Native Americans; often they were forced off of their land before they could pack. As for the land itself, Euroamericans consistently received higher payments for their land, while Native Americans, if they received anything at all, were put through bureaucratic nightmares that often saw what little money they did receive be eaten up by impositions and shady business practices from those in charge of the projects (Lawson). And so, communities were moved or broken up, and Native land was flooded.

As a result of dam construction the problem of decreased biodiversity along the Missouri River system has been found difficult to impossible to solve through technological means, such as turbine entrainment and fish ladders (Bednarek 808, 80). The impediment of historical flow along the Missouri is causing poor water quality. This is a result of the natural processes that occur when a flowing body of water is stopped and held in a catchment or reservoir, as occurs behind a dam. Fresh water, when forced to relative stillness, begins to absorb salt and other minerals from the ground. These substances are also absorbed and concentrated in the stored water from the sediment which deposits itself in the reservoir instead of being allowed to be carried in more

diluted form downstream and, eventually, to the Mississippi Delta. Even without the pollution caused by industrial agricultural runoff, the increased salinity of reservoir waters from this natural process has rendered much of the previously fresh water stored in dams and catchments unfit for human consumption and, just as disastrous, unusable as irrigation water (Lawson 218). This creates the paradox of having massive amounts of formerly fresh water within sight of crops that die in seasons of drought from an inability to irrigate.

Irrigating is a rite of passage for those who live and work on dirt farming operations. Farmers in the area where I grew up irrigate from both ponds – mostly created by Natural Resource District funded dams – and from underground water, which supplies the bulk of irrigation water. Center pivots make things easy; start up the motor, set the speed, come back when it's done circling. Of course, when a tire or gearbox goes bad, easy becomes a slug through crops and mud to fix the problem, but by and large a pivot is a one and done proposition. In the last two decades, center pivots have grown in number around my hometown, in part due to several years that grain prices have been high. More often than not, a pivot is put up by a younger farmer who takes over the family operation.

These younger farmers, like myself, very likely remember hot summer days of walking behind a farm tractor pulling a trailer heaped high with long sections of irrigation pipe. Not only were miles of this pipe laid out, each pipe with gated holes in their sides spaced to coincide with the rows between crops, but often they had to be moved depending on where the water was needed. Irrigating with pipe – and its close cousin, syphon irrigation – is labor intensive. The irrigator does not just turn on the irrigation

pump motor and walk away, as with a pivot. Every stretch of pipe must be walked, opening gates to insure an even distribution of water to the crops. Then, after a certain amount of time, the rows must be walked – on the opposite end of the field. The irrigator takes notes, counting rows (helped by numbered flags) and marking which rows have “come through” – where the water has made it to the other end of the field.

If the through rows match the open gates on the pipe end of the field, the irrigator must walk the pipe once more and close the gates; or, as what happened more often, just shut down the irrigation motor. The danger with not closing the gates as well is a collection of small dead animals that crawl into the gates while the water is shut off; they can damage the gates, and need to be flushed out of the end plug eventually. More often than not, however, even this is not enough work. Rows do not always come through, and an irrigator could end up walking a weaving, convoluted pattern through a field that might be a half-mile square to find where the water had stopped and undo the blockage, all the while counting rows – without the benefit of marker flags this time. Rows not going through meant the pump had to run longer, increasing the cost of an already expensive process, and the irrigator must close all of the pipe gates that had gone through. One run of irrigation to a field could consist of walking back and forth across the field six times, and depending on rainfall, this may be done multiple times at key points in the crop’s development. Given all of this, one can see why center pivots would be appealing.

Of course, growing crop plants is more than just putting in the seeds, watering, and waiting. Industrial agriculture has little patience for practices that require multiple

crop rotations to control weeds and insects, and which might renew soil nutrients in such a way that fertilization can be minimized. Intense fertilizer application, crop dusting, boom spraying, and even chemigation – the process of introducing chemicals into the water during irrigation – are also a part of agricultural life. Use of these chemicals is dangerous enough for those who handle and apply them, more so for the wildlife that encounter them without the benefit of personal protective equipment. What many farmers were long in denial about – and some that I know still are – was the effect that these chemicals have on the water they require to grow their crops.

Agricultural runoff is the single largest pollutant of both underground and stream and river water in the US (CSCOR: EPA “National Rivers and Streams Assessment” 29, 32, 100). This includes runoff from feedlot and other large animal production operations (EPA, “National Rivers and Streams Assessment” 51). Conversely, while runoff pollution is the largest man-made contributor to water-quality degradation, it is also the problem that has the most immediate and implementable solutions. Actions such as banning the use of certain chemicals in areas where the runoff could potentially reach water sources are the quickest steps toward resolving these issues. Unfortunately, political hurdles and pressure from lobbying groups (especially those hired by agrochemical companies) make such legislation difficult at best to pass. Other steps include more intelligent crop rotation to take advantage of natural processes that both increase soil fertility and decrease weed and insect issues. This solution, while logical and immediately doable, faces market hurdles above all other things. With certain key crops, namely corn, of so much higher market value than other potential products,

monocropping and lack of market value for other crops financially forces farmers to plant in an unsustainable way. It appears that awareness campaigns about proper application practices of herbicides, pesticides, and fertilizers are the extent of action being taken to mitigate this issue. No real action has been taken to make alternate rotational crops viable in the market, and politicians are loath to ask the American farmer to fall on their sword and make less money by planting them instead of cash crops.

The issue of agricultural pollution is exacerbated by the slowed flow of the Missouri. Instead of diluting the runoff in a faster-moving, larger volume flow, the construction of dams along the system has in effect allowed pollutants to concentrate. This is especially true in drought years, when discharges are typically cut to allow for water stockpiling. In time, when runoff and rainwater allow for a return to larger discharges, this concentrated pollution is shuttled downstream and, eventually, to the Mississippi River Delta and the Gulf of Mexico. This pollution is largely credited with the creation of the Dead Zone surrounding and spreading from the Delta (CSCOR).

One of the most concerning results of water flow control is the ongoing and increasingly vehement arguments over water rights from those downstream of the various dams as well as disputes between the states under which the Ogallala Aquifer resides. Agribusiness is at the forefront of this use argument, as that industry accounts for the vast majority of water usage, from 50% to more than 80% in any given area (NRCS “Cropland Irrigation Water Source, 1997”). Along with this local argument about water use is the larger global concern over the continuing pollution and loss of the world’s fresh water. Since, according to the USGS Water Science School, 60% of the world’s fresh

water is used for irrigation, agricultural users have a tremendous stake in fresh water security issues. Many who study violent conflict predict an increase in water resource related conflicts throughout the world in the very near future and include the United States in their assessments, with some predicting a looming global crisis as soon as 2050 (Judge; Solomon, “Will the Next War be Fought Over Water?”). The issue is even in the radar of the Department of Homeland Security, and not just over keeping wells and water sources safe from terrorist attacks. Availability of fresh water and the issues that water insecurity could cause are of consideration as well, as shown by links on the Homeland Security website to articles with topics such as “Energy Security – Water Resource Drivers” (HDSL).

There is also one mode of water loss that is largely attributed to agribusiness but rarely considered in terms of water security in the US, and that is water exportation, or “virtual water” (Solomon 373) due to agricultural product exportation. This occurs when agricultural products, such as grain or meat, is produced and subsequently shipped to other parts of the country or across the globe. This type of water loss is significant, as the water is taken out of the regional water cycle. Author Steven Solomon puts this into perspective far better than I could when he notes in *Water: The Epic Struggle for Wealth, Power, and Civilization*,

Growing crops is an astonishingly water intensive enterprise—about three-quarters of mankind’s water use worldwide is for farm irrigation. Indeed, food itself is mainly water. To produce a single pound of wheat requires half a ton, or nearly 250 gallons of water; a pound of rice needs between

250 and 650 gallons. Moving up the food chain to livestock for meat and milk multiplies the water intensity since the animals have to be nourished with huge quantities of grain; up to 800 gallons, or over three tons of water, for instance, are needed for the feed that produces a single portion of hamburger and some 200 gallons for a glass of cow's milk. In all, a well-nourished person consumes some 800-1,000 gallons of water each day in the food he eats. The ordinary cotton T-shirt on his back requires as much as 700 gallons to produce (373).

As Solomon points out, virtual water loss is not limited to water-intensive meat animal production; even the water used to grow and process cotton falls victim to water export.

While agribusiness is the largest current user of water, there is another major player in water use on the Great Plains that has a large impact on water quality, and therefore water security in the region. Like agribusiness, energy production in its various forms both harnesses and pollutes water simultaneously. Among energy production methods present in the Great Plains are hydroelectric power, coal and nuclear power, ethanol production, and, increasingly, natural gas extraction (a.k.a. fracking). All of these processes make use of water in one form or another and in doing so they transform the water and the ecosystems that depend on it.

Energy

Energy is a huge component of agricultural production. On the farm it is involved in everything that is done. The most obvious energy users are the vehicles – field tractors, combines, earth moving equipment, the pickups and trucks that haul workers and products. Over the years, the machines have multiplied; irrigation motors, small all-terrain vehicles, backup generators for when power goes out. The fuel that powers these engines includes natural gas, diesel fuel, gasoline, and propane.

While the engines that drive the farm certainly consume quite a bit of fossil fuel energy, there is an equally important but often overlooked consumption going on, especially on farms where production of animals in confinement is where the money is made. Electricity now runs the farmstead, allowing for the types of operations unthought-of a hundred years ago. Air exchangers running on high voltage allow for poultry and swine to be packed into a building where they are fed special feed. The feed is often custom-ground on site, a process wherein a mill run by electricity can be employed. Watering systems, heating systems, even massive power-washing systems – necessary in a confinement operation – are run by electricity.

Grain farmers use their share of power. As farms grow bigger, it becomes necessary to stagger plantings so that the crop can properly dry before it is picked. Add in technology, and suddenly timing crop harvest becomes easier, because the farmer can pick some of the crop a little bit wet and dry it at the farmyard. Drying grain takes a combination of electricity and fossil fuels: electricity to run the massive fans, and fuel to burn and create the dry, hot air that dries down the too-wet crop to the acceptable market

level of moisture. As in irrigation season, when the air almost vibrates with the hum of motors pumping thousands of gallons of water, during harvest the constant drone of dryers cuts through the crisp night air.

Having worked with all of this equipment, I can say that there is an astonishing amount of expense added to food production by these practices, and it is nearly all in the name of producing more, with an amount of consistency that borders on the obsessive. Those farmers who choose to plant strategically so that their crops dry in the field, who raise their livestock to grow on carefully tended pastures or with minimal processing of grain, are often ostracized or pushed into adopting the consumer-oriented production that is key to industrial agriculture.

All of this power, both the fossil fuel and electricity, has to come from somewhere. Long distance transmission of power is not very viable, so energy production ties hand-in-hand with the agricultural economy of the Great Plains. Energy production was a key component of the Pick-Sloan Plan. Of the dams constructed in the Pick-Sloan Plan, there are large main-stem hydroelectric dams across the Missouri River itself, requiring large and deep reservoirs. According to the United States Geological Survey,

One-third of the Missouri River has been transformed into lake environments, due to six dams built in Montana, North Dakota, South Dakota, and Nebraska (U.S. Geological Survey, 2001). Four of these dams, Fort Peck in Montana, Garrison in North Dakota, and Oahe and Fort Randall in South Dakota, are among the world's largest dams in terms of volume (The Learning Network, Inc.). The remaining dams are Big Bend

in South Dakota and Gavin's Point on the South Dakota–Nebraska border (“Dams and Reservoirs on the Upper Missouri River”).

There are also several issues which emerged following construction of these large dams. By and large, the promises made by the Pick-Sloan plan regarding cheap power and water to residents living near the dams have borne little fruit in comparison to the lofty promises made. More often than not, the power is sold at a higher price outside of the area. It is only legislation, rather than an abundance of power produced, that has kept local some benefit from hydroelectric production, and that had to be won by local pressure on legislative bodies. Part of the reason for this is that the electricity production estimates were absurdly optimistic and possibly inflated for political reasons (Lawson 214-216). Another reason for the low hydropower production is that the amount of sediment deposited in the dam reservoirs frequently necessitates a plant shutdown in order to either dredge the reservoir or to open control gates in an attempt to flush large amounts of sediment downstream. Dredging is expensive and, for larger reservoirs, impracticable, and releasing the large amount of water necessary to effect sediment removal has its own issues that generally are more concerned with optimizing turbine operations than with ecosystem management (Bednarek 807-08).

The Missouri and its tributaries also cut through the soil of the Great Plains, carving new and often unpredictable channels through the grasslands. The fast-flowing river historically carried massive amounts of this sediment from the Great Plains into the Mississippi River System. This sediment was eventually carried to the Mississippi Delta. The Delta ecosystem feeds off of the sediment and the nutrients carried by the

Missouri/Mississippi systems, making the Great Plains river systems an important input source to the Delta (Blum and Roberts). In terms of the effect of dams on sediment flow locally in the Missouri River Basin riverine systems, it has been shown that, “If the continuity of sediment transport is interrupted by dams or removal of sediment from the channel by gravel mining, the flow may become sediment-starved (hungry water) and prone to erode the channel bed and banks, producing channel incision (downcutting)” (Kondolf 533). Kondolf further states that

Dams disrupt the longitudinal continuity of the river system and interrupt the action of the conveyor belt of sediment transport. Upstream of the dam, all bedload sediment and all or part of the suspended load (depending upon the reservoir capacity relative to inflow) (Brune 1953) is deposited in the quiet water of the reservoir (reducing reservoir capacity) and upstream of the reservoir in reaches influenced by backwater (553).

It is this collection of sediment in the reservoirs of dams that decreases how much water they can hold, which in turn lessens the dam’s effectiveness in flood control. The shallowing of hydroelectric dam reservoirs also interferes with power production when sediment obstructs turbine inflow tubes (Junk et al.).

By and large there have only been attempts to mitigate the issues created by the Missouri dams using technology to make power production more efficient, such as the aforementioned dredging of the reservoirs. Some more hopeful efforts include an attempt to return a more historic flood pulse to the Missouri River through managed discharges throughout the year at more historically accurate times, rather than at the whim of a

schedule. These historically timed flood pulses allow for sediment to be washed from dam reservoirs and be efficiently carried downstream while at the same time allowing for the water levels in the reservoirs to remain at effective turbine operating levels (Junk, et al., 1989). Surprisingly there are studies that show the least expensive and most effective solution to reinvigorating the historic flow and flood pulse of the Missouri is dam removal. While this may not be practicable for every dam built – especially the hydropower dams – the research is promising (Bednarek).

Coal and nuclear power production on the Great Plains is small compared to other areas; however, the presence of coal and nuclear power plants along the Missouri River does have an effect on the riverine ecology. The most continual source of environmental effect of these plants is thermal discharge, which has been shown to produce algae blooms in rivers. Studies, notably by T. E. L. Langford, have shown for years that thermal discharge affects the biology of rivers. Although some research on power plants along the Missouri River showed negligible effects (Langford 182), later studies have shown that “Thermal pollution from industrial effluent, including power generating station cooling water, can also adversely affect aquatic resources by reducing the available area of suitable habitat. Wright et al. (1999) showed significant impacts of power plants on the Missouri River that were comparable to the predicted change due to climate change” (Caissie 1398).

There are other risks associated with coal and nuclear plants. As we have seen with the Fukushima power plant disaster in Japan, radiation pollution in the event of a natural disaster can be impossible to control. The Missouri River Basin does have

historical precedence for producing damaging earthquakes, many of which have occurred along the Missouri River itself (USGS. "Damaging Earthquakes in the US (1750 – 1996)"). There is also no reason that a man-made disaster could not do the same, be it an accident or act of sabotage, especially given the current global political climate.

Waste disposal from these power plants is also of concern to water security in the Great Plains, especially where underground water is concerned. As one environmental group puts it, "U.S. coal fired power plants annually produce more than 130 million tons of waste – composed of fly ash, bottom ash, and air emission scrubber sludge, as well as boiler cleaning wastes, waste coal, and coal pile runoff. These wastes contain a slew of toxic contaminants, including arsenic, mercury, chromium VI, lead, selenium and boron" (Pegg). These claims are backed up by research groups such as the Union of Concerned Scientists (UCS) and other groups attempting to push back against research backed by energy firms which tends to mislead and/or misinform the public about the consequences of energy generation. Nuclear waste has its issues with water security as well. Not only is water irradiated in cooling fuel rods, where to place spent fuel rods and other irradiated waste created during the operation of nuclear plants is no small issue. Nuclear plant sites themselves often serve as waste storage sites, and in the Great Plains these plants sit next to the Missouri River. Further, underground storage facilities have in the past been proposed in Lyons, NE, and Boyd County, NE, both located in the northern part of the state (Burton). Although these locations were ostensibly not above the Ogallala Aquifer, these remain largely rural areas where well water is the primary source of drinking water.

Neither of these proposals succeeded, thanks in large part to grassroots efforts to block them.

In recent years corn ethanol production had taken hold of the Great Plains. As a world leader in corn production, placing ethanol plants close to the site of corn production (Combs) makes economic sense, but not only in terms of transportation. The very same sources of water that are used to irrigate the corn are also used to process it. While the majority of ethanol production uses what is known as a “dry” process instead of a more water-intense “wet” process (USDE), the term dry is misleading, as water is still used during production. Depending on how much irrigation is required during the raising of the ethanol crop, anywhere between 5 and 2,138 liters of water are needed per liter of ethanol produced. Even if previously referenced industry numbers are used – between 263 to 784 liters of water per liter of ethanol (McKenna), water use for ethanol production far outstrips water use for one gallon of gasoline, which ranges from anywhere between 1 and 97 gallons of water per gallon, depending on the source. Most research also notes that it takes more energy to produce ethanol than it puts out (McKenna) – making ethanol production and use a net loss in terms of efficient energy production. In many cases, the cry for energy independence is cited as the reason for ethanol production; a hue and cry so politically charged that the industry is subsidized in order to make it profitable. This, along with the amount of valuable fresh water used in the production of ethanol, makes the process questionable at best.

Another energy production process that is fairly recent to the Great Plains is natural gas extraction from shale deposits, also known as fracking. While many of the

largest deposits natural gas are outside of the Great Plains, much has been identified as “recoverable” (USEIA) in the Great Plains, from the Southern and High Plains, nearly all along the western edge, and a large portion of the Northern Plains. Most notably, the North Dakota natural gas boom and the Texas natural gas boom have transformed the economies and landscapes of both states at a frightening pace, not to mention the vast amounts of pollution and environmental degradation resulting from fracking. These areas have been the scene of unprecedented drilling and exploration in the last ten years.

Among other issues, there is an increasing amount of evidence pointing to significant increases in seismic activity and strength in areas where fracking takes place, which is especially concerning where there has been no historic seismic activity and extremely worrisome where there are preexisting fault lines (Frizell; Neuman). As an example of the alarm caused by these findings, though not in the Great Plains but of an active seismic area more widely known, one of the largest shale deposits lies directly over the San Andreas Fault in California. Even Fox News acknowledges the issues posed by such a congruence of drilling in such a place. In terms of water security, the location of found deposits alone is disturbing, being close to or even contiguous with the Ogallala Aquifer. There is also the use of water in the slurry used in fracking, making the water unusable for anything in the future. Further, there are issues of leaky wells contaminating drinking water in the vicinities of fracking wells, to the point that tap water actually lights on fire from the methane concentrations resulting from leaking wells, not to mention the various chemicals used in the slurry that leach into water wells (Fox).

Let us take a look at the fracking process in order to better understand its inherent dangers to water quality. To frack for natural gas, deep wells are drilled into substrate that contains pockets of natural gas. These bore holes are then cased in steel pipes with concrete outer linings, down which a slurry of various chemicals and water are pumped under pressure. This pressurized liquid forces its way into small cracks and cavities in the substrate, enlarging – or fracturing (thus the term “fracking”) the substrate and allowing the previously sequestered natural gas to escape. The slurry is then pumped back to the surface, and newly released natural gas is then pumped to the surface. Highly problematic is the disposal of the slurry; often, it is pumped into a separate, deep well for disposal, a well that is so deep (so it is claimed) that it is harmless to drinking water, which sits well above the levels of the disposal wells. This well disposal technique is also credited with much of the seismic activity associated with fracking (EPA “Natural Gas Extraction - Hydraulic Fracturing”).

Beyond disposal of the slurry, the vast amount of polluted well water comes from well casings that leak. While the fracking industry admits that only 2% of wells potentially leak, when taken in context, this figure is staggering. By some estimates, since 2005 there have been 80,000 natural gas wells dug that use fracking. That would mean that 1,600 are expected to leak. Further complicating the issue is that the 2% number only addresses wells expected to leak *immediately*, with the number growing as wells age (Fox). Considering that many of the shale deposits and contiguous water aquifers overlap, the issue of water contamination becomes exponentially worse.

A Call to Action

Here we are, still colonists and living on the Great Plains in an agricultural paradise of our own creation. We certainly have made changes to the land; whether or not these changes are for the good is certainly arguable. After killing, subjugating, and confining the indigenous people of the region, we proceeded to colonize the land and its resources to meet our desire for more – more energy, more food, and more profit. We sustain ourselves with myths about energy independence, feeding the world, of becoming more productive than any other civilization in history. The unfortunate part of this drive, this mindset, is that it is ultimately unsustainable. We already see the loss of groundwater in the southern plains, and this phenomenon is moving quickly north. What water we do have left is becoming increasingly useless, even dangerous, for both plants and animals.

It is long past time for us to consider that it might be better to learn to live within the limits of our region, rather than try to make the place into something it is not. It may be too late to repair any damage we have done; indeed, it may cause more harm if our goal is to repair. What is needed is an acceptance of where we are at and how we came to be in a place that is on the brink of losing everything in its pursuit to support the industrial agricultural machine that dominates the region.

From this point of acceptance, we must then set as our goal as the improvement of the relationship between people and the rest of the environment. Sustainability just won't cut it – that is little more than keeping up the status quo. Repair is impossible; culturally, and possibly environmentally, too many things have changed and too much damage has been done to bring the Great Plains back to a “pristine” natural state. There are, however,

many steps that can be taken in a new direction, such as smarter crop rotations, returning farmlands to healthier grasslands, and less use of harmful chemicals in the production of our food. Perhaps the most beneficial thing that can be done is to plant crops that are better suited to the Great Plains ecosystem, and by raising livestock that are similarly adapted to the weather and plant life native to the region.

Above all, we need to treat the fresh water of the Great Plains as what it is – a valuable, finite, necessary resource that needs to be protected from the harm we have done to it up to now. This would require some considerable lifestyle changes; but rather they be voluntary now, when there is still time for adjustment, than in the future when such changes will be forced upon us through either government agencies or environmental necessity.

I can begin, in my own small way, by acknowledging where I am. I am still a colonist on the Great Plains. It is my heritage, as is the fact that in order for my ancestors to call this place home an entire group of people suffered horrors that I can only imagine, and who continue to suffer from colonial policies that attempt wipe them out completely. I have participated willingly, if in an uninformed manner, in the industrial agricultural culture. This does not mean that I need to continue the imperialist, colonial practices of those who came before me. It does not mean that I do not care for the place, nor that I am fine with bleeding the Plains dry of resources and moving on. Indeed, it seems that such a history requires that I take on more responsibility in trying to look ahead to a new paradigm in which we can all learn to live with, not just in, this place.

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