2016

THE CUYUNA IRON RANGE: LEGACY OF A 20TH CENTURY INDUSTRIAL COMMUNITY

Frederick Sutherland
Michigan Technological University, fesuther@mtu.edu

THE CUYUNA IRON RANGE: LEGACY OF A 20TH CENTURY INDUSTRIAL COMMUNITY

By

Frederick E. Sutherland

A DISSERTATION

Submitted in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

In Industrial Heritage and Archaeology

MICHIGAN TECHNOLOGICAL UNIVERSITY

2016

This dissertation has been approved in partial fulfillment of the requirements for the Degree of DOCTOR OF PHILOSOPHY in Industrial Heritage and Archaeology.

Department of Social Sciences

Dissertation Advisor:	*Professor Timothy Scarlett*
Committee Member:	*Professor Susan Martin*
Committee Member:	*Professor Carol MacLennan*
Committee Member:	*Doctor Timothy Tumberg*
Department Chair:	*Professor Hugh Gorman*

A Dedication To:

My father Fred J. Sutherland and my grandfather Bill Christiana. Both men saw me begin this academic journey. Unfortunately, neither lived to see me complete it.

Contents

List of Figures

List of Figures Continued

List of Tables

Acknowledgements For:

Laura Ukura-Leir for requesting that the Social Sciences department of Michigan Technological University explore her industrial community. I would like to acknowledge the help and assistance of my dissertation committee chair Professor Timothy Scarlett and committee members Professor Susan Martin and Professor Carol MacLennan for providing guidance and support throughout the research process. I would like to thank Professor Fred Quivik for his valuable instruction while I was a student in his *Documenting Historic Structures* class.

I am very grateful to the volunteer surveyors that documented their communities with me in 2012. They gave a lot of their time, patience, and knowledge to make this project succeed. These volunteers include: Pat Chase, Jay and Jody Idzoric, Kathy Jasperson, Joe Lusk, Jack McAllister, Kathy Novak, Paula and Bonnie Robinson, Laura Ukura-Leir, and Leif Underdahl. Sadly two of these volunteers, Kathy Jasperson and Joe Lusk, passed away within a year of survey's completion. The work of these scholars, leaders, and community volunteers will live on through the stories and places of mining heritage they have shared with the world.

Abstract:

The Cuyuna Range is a former North American iron mining district about 90 miles(145 kilometers) west of Duluth in central Minnesota. The district was the furthest south and west of the three Minnesota iron ranges (Vermilion, Mesabi, and Cuyuna). In 2011, Students and staff from Michigan Technological University's Department of Social Sciences were asked to identify and promote features of the Cuyuna Range's mining heritage. Methods and approaches of mulitsited archaeology were used to unify the diverse places and themes into a more cohesive narrative. Their investigations focused on sites of technological innovation, social conflict, and important people. One collaborative project involved training a team of local volunteers to survey seven iron mining communities to identify sites with historic importance. In total, 876 sites were documented. The data generated from this effort can be used to develop plans for cultural tourism focused on the iron mining heritage of the Cuyuna Iron Range. It was found that using multiple themes from multisited archaeology strengthened the region’s narrative better than simply focusing on sites from a single thematic viewpoint.

Introduction:
The Cuyuna Range as a 20th-century industrial community

Minnesota's Cuyuna Iron Range went through a life-cycle of birth, prosperity, and decline during the tumultuous 20th-century. The histories of innovations, conflicts, and peoples on the smallest of the state's three iron ranges was reflected in the growth and development of its industrial communities (Figure 1). Authors of Great Lakes mining history portray the Cuyuna Range as an oddity that developed in the early 20th-century well after the establishment of the two other iron ranges within the state. This historical treatment comes from the fact that the development of the Cuyuna Iron Range cannot easily fit into the common narratives used by most mining historians. Most authors describe iron mining districts like the Mesabi and Vermillion ranges through the lens of mineral pioneering or rapidly growing iron and steel production in the late 19th and 20th-century under the authority of a major corporation such as United States Steel (De Kruif 1929, Lamppa 2004, Hatcher 1950, Walker 1979).

These two common narrative lenses do not reflect the contributions of small-scale local and regional mining companies that operated most of the Cuyuna Range's mines. The residents and companies of the Cuyuna Range engaged with the constantly changing national and global trends of iron mining in the 20th century. Exploring the evidence from multiple sites reflecting the of the Cuyuna Range provides better potential for telling this industrial community's important story. Shared themes of innovations, conflicts, and dynamic peo-

ples are found across multiple community sites. These themes can be uncovered by exploring the important mining structures, community architecture, oral histories, primary source documents, and archeological remains regarding Cuyuna's heritage.

The area was a crossroads of American Indian and European American cultures that traveled, traded, and fought across the territory. By 1840, the global trade in animal furs from North America had collapsed. The livelihoods of peoples across the Northern United States had depended upon trading furs for European goods, including alcohol, which caused further social upheaval within communities in central Minnesota. Following that economic collapse a phase of land deals between the Ojibwe Nation and the United States Government opened the way for railroads, lumber companies, and homesteaders to transform the landscape. Mining speculators in the late 19th and early 20th centuries struggled to persuade investors to support developing iron mines. The region's geography obscured any surface evidence of iron ore. Proving the ore existed in marketable amounts was a difficult challenge. A patchwork of commercial and private landowners already controlled most of Crow Wing and Aitkin Counties by the time iron ore was confirmed at the turn of the 20th-century. Without the arrival of Longyear's diamond core drill or a similar technology, the Cuyuna Iron Range would have remained hidden beneath a layer of glacial soils. A skilled and persistent real-estate developer named Cuyler Adams was able to consolidate enough properties, systematically drill test, and then attract in-

vestors to develop those lands. Once proven, the manganese present within the iron ore bodies attracted inventors seeking to develop the unusual and useful geologic combination of iron and manganese.

Early 20th-century inventors like John T. Jones hoped the manganese rich iron produced from the furnaces he designed would be economically successful with Cuyuna's iron ore. Other investors focused on developing communities with a better standard of living for workers than the many hastily built boom towns on the Mesabi Range. These community developers also sought to improve the moral standard of their fledging mining towns by banning the sale of alcohol. A strong debate over the role of liquor sales would set business leaders in the region against one another. That conflict would eventually create a culture of small-scale bootlegging across the Cuyuna Range.

Political leaders within the mining communities shaped the independent character of the region. One leader even gained national notoriety. While the towns were not strictly "company towns" controlled by a single mining corporation, several communities like the City of Crosby, Minnesota were developed under a paternalistic mindset by mining businessmen George and Matt Crosby. Their vision for a well organized, sanitary, and temperate community collided with the expectations of the Finnish, Southern European, and other immigrant laborers that populated their planned community. The laboring peoples in these communities demonstrated their independence by holding strikes in 1913 and 1917 organized through local ethnic worker's halls with minimal input from the

larger national labor organizations of the early 20th-century. Cuyuna's laboring population demonstrated their independent streak again when they elected the first communist mayor in the United States, Karl Emil Nygard in 1932. Shortly after the Second World War, some working families began to successfully climb the social ladder into the local business elite. Business leaders such as those from the Zontelli family demonstrated through a combination of hard work and business savvy that members of the Cuyuna Range working community could transcend class boundaries created a generation before.

Cuyler Adams' son Robert Adams was a business leader that sought to gain a financial edge in a competitive iron ore market during the 20th-century by using sintering technology to raise the grade of marginal iron ores. The Cuyuna Range did not have the first or only application of sintering at a mine location. The sintering plant constructed by the Evergreen Mining Company in the Cuyuna Range did become the largest sintering facility at a mine location in the United States. This site operated for over 40 years and was critical to processing ores from across the Cuyuna Iron Range. Sintering was critical to making the region's ores competitive with iron ores coming from other regions.

The United States government contracted with the Manganese Chemical Company during the Second World War and the Korean War in order to develop domestic manganese resources needed in the war effort. The Cuyuna Range contains the largest known domestic supply of Manganese in the United

States. The company's research developed new processes to refine manganese from the Cuyuna Range as a strategic national resource.

The geography of the region hid dangers as well as valuable minerals. The Milford Mine Disaster occurred in the Cuyuna Range in 1924 and was one of the largest mining tragedies to occur in the Midwestern United States. Poor safety measures along with the poorly understood geology of the region at that time caused catastrophic flooding in the underground mine, killing 41 miners in a matter of minutes.

By the early 1960s several public-private partnerships arose between Cuyuna's mine companies, state, and federal agencies. Simply improving the grade of iron ores was not enough to make them competitive. These partnerships proposed solutions to change the declining fortunes of iron mining across the region. Despite the wide-ranging solutions attempted, including international partnerships with German companies, most mines would close before the mid-1970s. As the last mines closed, mining communities began efforts at placemaking by celebrating the mining heritage which brought them into being.

Several sites such as the Croft Mine, the Cuyuna Country State Recreation Area, and the Milford Mine Memorial Park have had varying levels of success in portraying the region's legacy of mining. In 2012, students and staff of Michigan Technological University worked with members from the communities associated with the Cuyuna Iron Range to expand industrial heritage and placemaking efforts. This collaboration identified key challenges related to min-

ing heritage and how it could be applied. Interactions between members of industrial communities and scholars in the early phases of the project demonstrated that more than one academic approach would be needed to understand this mining district.

Industrial communities are a relatively recent arrangement in human history. The academic sources that define or explain these communities has not always been interested in how history and heritage interact for these societies. Before exploring the shared narrative themes found within the industrial communities of the Cuyuna Range an overview of academic studies with relevant tools to analyze these communities must be conducted.

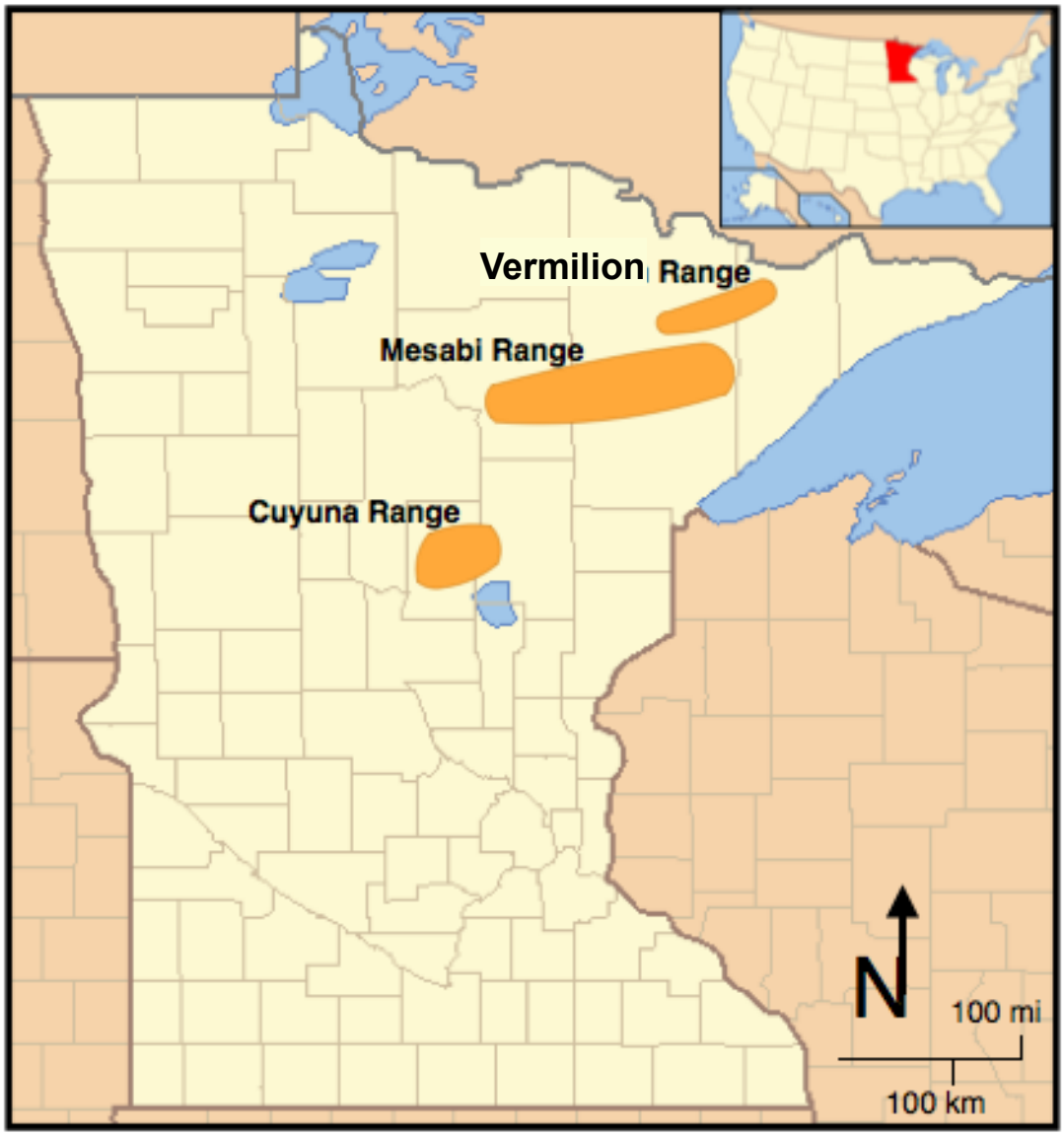


Figure 1. A map of the three major iron mining ranges in Minnesota. Adapted from Lamppa 2004, iv.

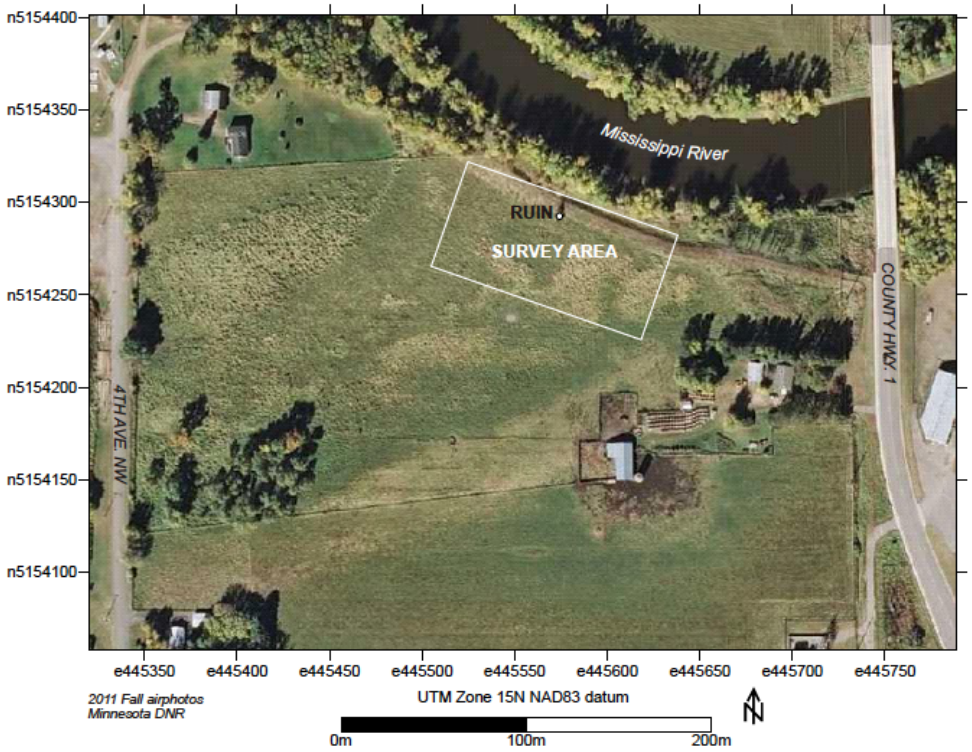


Figure 2. General view of Jones Furnace Ruin north of Aitkin, MN. From "A Geophysical Investigation of the Jones Iron Furnace Site". Archaeo-Physics LLC. Report number 210. Minneapolis, Minnesota. http://www.archaeophysics.com/files/fred/jones_furnace.zip. Accessed October 7, 2015.

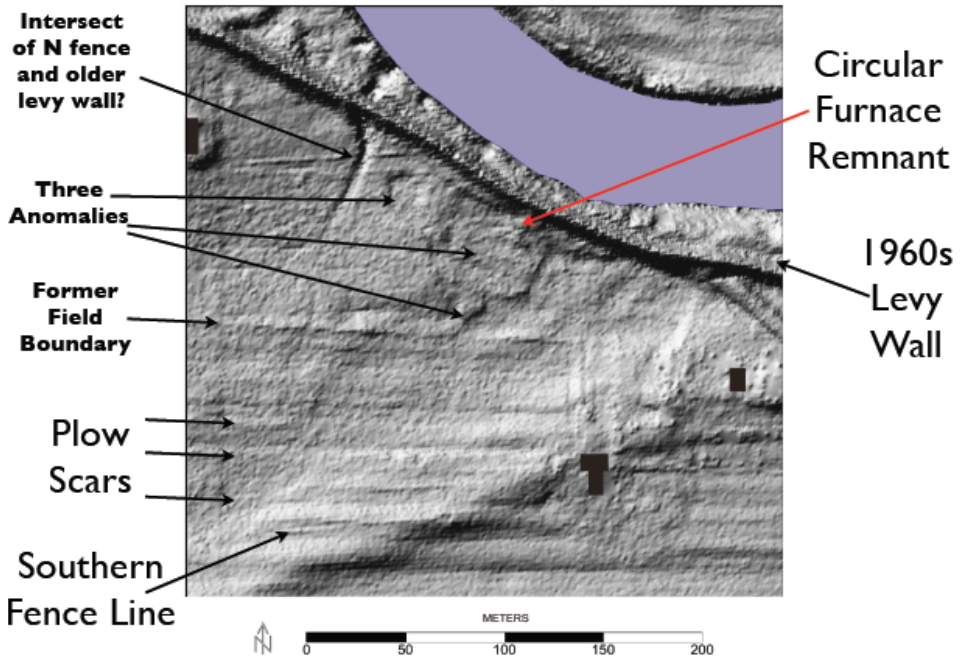


Figure 3. Line Scanning Radar image of same field as figure 19. Image care of Archaeo-Physics, 2014. Text and arrows created by Author.

Figure 4. Detailed image of furnace ruins at surface. Photo by Author.

Figure 5. A section of broken rail and spike located using magnetometry in the field south of the furnace ruin. Photo by Author.

Defining Industrial Communities:

Industrial communities, like those which formed in the Cuyuna Iron Range during the 20th-century, are an integral part of the transformations wrought by industrialization on human societies across the world in recent centuries. The industrial communities studied by historians, anthropologists, and archaeologists contain unique social and physical arrangements that make them distinctive from other types of human populations. Each discipline brings unique insights and reinforces the general body of knowledge provided by the others. Industrial-scale production and extraction often required concentrations of labor and capital beyond the levels sustained by small agrarian settlements. Industrialists in North America and Europe frequently had to develop communities for housing and supporting a working population for their industrial operations when there were no nearby urban centers. The limitations of transportation available for working populations in North America and Europe prior to the wide availability of personal automobiles in the 1950s further compounded the challenges of housing and supporting a workforce close to the center of an industrial enterprise. These circumstances are typical of places undergoing industrialization. They create communities that are often highly dependent upon a single industrial process. These communities are dense populations of laboring people often representing various ethnicities, genders, and classes. Lastly, these communities may also include the support network of a worker's family.

Despite knowing these basic traits that industrial communities share, some features are not well known or understood about them. The Cuyuna Range was truly a 20th-century industrial community focused around the extraction of iron ore. The range had diverse populations of laborers, both immigrant and native born. The intent of those who founded communities, such as the Crosby brothers, was to house and support a mining workforce. An industrial community building effort was necessary because only one town, Deerwood, was near the richest beds of iron ore prior to the opening of the Cuyuna Range. By exploring the development of industrial communities on the Cuyuna Iron Range with methods and theories drawn from several disciplines it is possible to understand how these places operated and changed through time.

Investigating the overlapping narratives of the region's people, their conflicts, and their ideas as they occurred over the district's life-cycle can reveal things that focusing on one feature or site cannot portray. Multiple sites where innovations, conflicts, and people shaped the region's industrial life-cycle were identified through researching the history of the Cuyuna Range. Ethnographers and archaeologists have demonstrated how these themes can be used to better understand how communities, like those in the Cuyuna Range, develop.

Multi-Sited Analysis

One recently published archaeological method has significant potential to unify the diverse stories and perspectives across the Cuyuna Iron Range.

Ryzewski (2012) provided a useful approach to studying multiple industrial remains across an entire region spanning many decades. Multi-sited archaeology, borrowed from multi-sited ethnography, can help compare the innovative sites of the Cuyuna Range by identifying and then exploring certain unifying themes that interconnected them. Ryzewski based her approach upon the work of the ethnographer G. E. Marcus who developed the original framework of multi-sited ethnography in 1995. She quoted from Marcus that the main ways to tie multiple sites together is to "follow the people, follow the thing, follow the metaphor, follow the story, follow the life/biography, or follow the conflict" in order to compare and evaluate the connections revealed between each site (Ryzewski, 252 citing Marcus 1995). Ryzewski used multi-sited archaeology of three colonial-era iron working sites in Rhode Island to understand the involvement of a particular family and their influence over many generations upon the "production, innovation, and the role of industries in the developing Northeastern American colonies" (Ibid, 254). She stated that each of the three sites are so fragmentary that each site on its own contributes little information. When, for example, the data collected informs each of the other sites into the decisions and developments by the Greene family, the fragmentary contexts enhance her understanding of the larger regional and global contexts of Rhode Island's colonial industry (Ibid, 254-256).

A multi-sited approach to the study of human culture does have some potent critics. While few articles present a critique of multi-sited archaeology,

ethnographers have debated multi-sited studies since the time Marcus defined the term in 1995. Some critics have only displayed reservations about the possibilities of multi-sited studies while offering very limited alternatives to address some of the wider connections and possibilities multi-sited methods provide (Cook et al. 2009). Candea (2007) offered a different critique that advanced the debate between the traditional ‘bounded’ site and the multi-site approach with it's seemingly limitless connectivity and ambiguity. For Candea, the alternative she offered about a constructed bounded site “is premised on the realization that any local context is always intrinsically multi-sited” (2007, 175). She acknowledged the forces of globalization and interconnection that inspired scholars like Marcus to develop multi-sited ethnography required a new approach rather than the continued embrace of the site concept rooted in the 19th century (Candea 2007,169). She stated that a cultural site,

“as an arbitrary location, one with no overarching 'meaning' or 'consistency' is to remember that all these heterogeneous people, things, and processes are 'thrown' together, and to question, in the evidence of their uneasy overlap in one geographical space, the completeness of the 'cultural formations' to which one might be tempted to think they 'belong'. Crucetta [a cultural site studied by Candea] in this sense is not an object to be explained, but a contingent window into complexity.” (Candea 2007, 179).

Candea concluded her observations by suggesting ethnographers should adopt approaches from other disciplines, such as archaeology done in advance of road construction. Her definition of an archaeologically informed site,

“is delimited by concerns which are totally arbitrary from a research point of view (the future layout of a motorway or parking-lot, for instance). The site in developer-funded archaeology is perhaps the most obvious metaphor for what I have called an arbitrary location: devoid of its own intrinsic meaning from an archaeological point of view (although of course not from the developer's), such a site can only ever be a window into complexity, and never a holistic entity to be explained.” (parentheses in original, Candea 2007, 181).

This conclusion from Candea (2007) provided support for adopting a type of multi-sited perspective to regional sites, such as those in an industrial district like the Cuyuna Range. Her approach did not impose connections or introduce ambiguities between places. Instead, it reflected the constraints imposed by the archaeological record and the questions being investigated. Industrial sites are inherently interconnected through economic, geologic, social, and infrastructural systems. To explore every avenue that intersects with a particular place or region would be to fall into the trap that Candea warns scholars to avoid. Indeed, the analysis in this dissertation has only looked through the ‘window’ of sites that provided context to the formation, development, and decline of iron mining in a small region of Minnesota. However, as Candea (2007)

pointed out, they are joined “in ways that are intrinsically multi-sited” on a global scale (175).

Exploring a region through the influences of regional and global forces, like Cobb and DePratter (2012) did is valuable to the study of a district like the Cuyuna Range. Their study investigated the production of ceramic vessels known as Colonoware in a time and region that was at the intersection of various colonial, indigenous, and enslaved cultural influences in the Savanna Valley of Georgia. Using a multi-sited approach, by “following the thing” (in this case the ceramics), Cobb and DePratter (2012) “reconcile the subjectivities of agents and communities with the broader currents of colonialism and globalization over the past five centuries” (449). They concluded that Colonoware, which has influences from European, African, and Native American vessels is not only about determining a “fixed identity” for the makers and users of the ceramic, but about locating the “shared histories” and complex relationships of the region in the colonial era (Cobb and DePratter 2012, 456). Studying the housing of Cuyuna’s industrial communities with an approach like Cobb and DePratter (2012) did with ceramics can reveal the shared histories of the diverse ethnicities and social forces that were at work in the Cuyuna Range during the 20th century. These shared histories can then be linked to the development, production, decline, and closing of the iron ore industry. Connecting the district to the world system of the 20th century can be accomplished without subordinating the individual site’s role or significance as it might be in other types of analysis.

These connections can be important for giving the life cycle of an industrial community a global context. Wood (2000), an ethnographer, explained that multi-sited studies are rooted in an understanding of Wallerstein's World Systems Theory of global commodity chains between sites of production and consumption. However, he stated that multi-sited studies are "grounded less in the relations of production upon which world-systems theory focuses and more in the symbolic and political creation of historically particular and culturally specific realities through the exercise of various forms of power" (Wood 2000, 144). While this fact would seem to make adopting multisited archaeology to a mining district challenging, it emphasized the intersections of people and ideas in a place like the Cuyuna Range which can augment the already dense historical literature on the production of iron ore for the region.

A 'Life-Cycle' of industrial Communities by Historians

The Cuyuna Iron Range in the 20th-century displayed many complex economic, social, and political arrangements. Authors across several disciplines have focused upon different stages of an industrial community's development. It is clear that each author places emphasis on either the establishment, development, decline, or the post-industrial phases of an industrial community. Many share scholarly interest in the concepts of space, power, identity, and the impacts of industry upon the health and environment of industrial communities.

Each source offers valuable insights about industrial communities which strengthens and deepens our understanding of them.

Groups of immigrant workers formed identities by developing institutions like worker's halls and ethnic associations in the industrial communities of the Cuyuna Range from 1910 to 1932. Many scholars have carefully explored identity formation within industrial communities. Historians were the first scholars to closely study industrial communities. These scholars have investigated the records, populations, and landscapes associated with communities that lived in and around industrial sites. These studies can help explain how the different immigrant communities in the Cuyuna Range were able to become politically organized for changing their working conditions within three years of the iron district's formation.

Prior to the 1960s very few scholars investigated the industry and community of a particular region with equal attention. One of the first works to accomplish this balance was historian E.P. Thompson's *The Making of the English Working Class* (1963). Thompson focused on the transformation of agrarian and crafting societies in Northern England into a more modern industrial workforce organized around the concept of class. In particular, Thomson investigated the forces leading to the political formation of a self-conscious working class that could articulate its grievances collectively. In North America, historians Dawley (1976) and Dublin (1979) undertook similar explorations of class or group formation among the shoemakers of Lynn and the renowned "mill girls" of

Lowell, Massachusetts. A similar progression of political organization appears to have occurred with immigrants that had rural backgrounds in the early history of the Cuyuna Range.

North American historians began investigating how industrial communities sustained themselves physically and economically by the 1970s and 1980s. While the approach used at that time has some features of a life-cycle approach, it often lacked discussion of the interactions within the industrial community. These studies from the 1970s and 1980s can provide comparisons to how the communities of the Cuyuna Range developed over time. Anthony Wallace, an anthropologist writing in the style of a historian, examined letters and financial records from a Pennsylvania coal mining community in *St. Claire* (1987) and of those from a textile community in *Rockdale* (2005). His approach emphasized how these communities sustained themselves economically and socially. Other similar historic studies include Buder's railcar manufacturing company town in *Pullman* (1970) and Gaventa's coal mining communities in *Power and Powerlessness* (1980). All three authors included a more detailed investigation of management's role in shaping how industrial communities develop. Wallace investigated company records to understand how industrial communities supported themselves on limited wages, how community members were able to cope with frequent (and sometimes fatal) accidents, and what were the managerial policies that allowed these accidents to happen. Buder explored how the company town of Pullman, Illinois was ultimately unable to

meet the idealistic visions its creators had for creating a healthy and content working population. Lastly, Gaventa revealed how managerial policy permeated the society that Appalachian coal miners lived in. These policies framed the ways miners could and could not resist company control. In the Cuyuna Range tragic mine accidents, paternalistic control, debates over morality and health occurred and are worth comparing to these other historic accounts.

Most scholars that published before Herbert Gutman only explored one or two dimensions of the things that define an industrial community. Industrial communities like the Cuyuna Range are complex and developed through negotiation and debate within the different towns and neighborhoods. Gutman's *Work, Culture, and Society in Industrializing America* (1976) greatly influenced how modern scholars investigated the life-cycles of industrial communities. Gutman drew inspiration from the field of anthropology which was beginning to explore social questions of racial identity and gender interactions within industrialized societies around the time he first published this influential work. Gutman's research did not attempt to study an industrial community as economic or labor historians had done; instead, he focused upon how segments of an industrial community interacted with one another based on cultural traditions and customs carried over from where these working people originated.

Since the 1980s, historians inspired directly, or indirectly, by the pioneering work of Gutman have written about industrial communities with a greater appreciation for the interactions that ethnicity, gender, and class have within an

industrial community. Examples of this work include Shiflett (1991), Arnesen (1993), and Kelly (2001). Shiflett's *Coal Towns* showed how constructed communities and company policies in the coal mining districts of Appalachia did not destroy or remove the ability of workers to shape their own identity. Arnesen and Kelly both portrayed the factors of race in working communities in the southeastern United States. Arnesen explored the formation of biracial labor coalitions which are able to briefly overcome strong racial divisions within Post-Bellum New Orleans. He demonstrated how managers carefully orchestrated radicalized attitudes between white and black workers in order to divide and defeat efforts to unionize their workforce.

Three other relevant historians that have published works related to the establishment or development of industrial communities in the last 20 years include Crawford (1995), Lankton (1997), and Alanen (2007). While these authors are not inspired directly by the works of Herbert Gutman they certainly have taken a more sophisticated view of how industrial communities develop than many scholars prior to the 1980s. Crawford's *Building a Workingman's Paradise* investigated how company towns and company policies changed how this type of industrial community was established between the 1890s to the 1940s. He provides equal emphasis to the influence of managers and workers in shaping how these closely controlled industrial communities operated. Lankton's *Beyond the Boundaries* (1997) shared some connections to earlier scholars like Wallace in its broad analysis of an entire industrial society and its de-

velopment gradually over time. He enriched his study of mining communities with sections that focused on the distinctive ethnic practices of the pioneering copper mine settlements of the Keweenaw Peninsula in Michigan and how a snowy winter climate challenged and changed the ways that this industrial community sustained itself. Alanen's *Morgan Park* (2007) contributed to modern scholarship on industrial communities in the way it investigated how that company town articulated with the larger neighboring urban centers of Duluth, Minnesota and Superior, Wisconsin both socially and economically through the 20th-century.

The environmental and social impacts of mining in the American Midwest during the late 19th and early 20th-century are significant and ongoing. These forces have certainly left their mark on the landscape of the Cuyuna Range. Robert Gordon's *A Landscape Transformed* (2001) explored an iron mining and smelting district in Northeastern Connecticut. His approach demonstrated how people living in the region adjusted the ways they engaged with their landscape as the production of iron waxed and waned from the 18th to the 20th centuries. He focused on the effects that logging, mining, and controlling waterways had upon how people lived in the landscape. After the 1850s most ironmaking industries in the region avoided competition for mass quantities of iron and steel. This choice led to a gradual decline in iron production to the point where forests were allowed to regrow, mine pits were turned into recreational lakes, and land where piles of mine tailings existed were redeveloped

for domestic housing (115-116). Many of these effects have occurred or are occurring on the former iron mining landscape of the Cuyuna Range. Using Gordon's approach to landscapes through the lens of industrial ecology can help uncover the relationship people had with their mine environment. Major accidents such as mine collapses and the ways the former mining landscape has been transformed into a 'natural' attraction occurred in the Cuyuna Range also.

The Cuyuna Range was propelled into the headlines of papers across the Midwest when an accident at the Milford Mine claimed the lives of 41 miners in 1924. This accident fits with a pattern of rapid industrial development described by other scholars of industrial communities. Anthony Wallace's detailed study of the community, mining, and disasters in his book *St. Clair* contains features that inform the social and environmental issues that led to the Milford Mine Disaster on the Cuyuna Range. *St. Claire* followed the rise of a coal mining district through the perspectives of the mine owners and the communities that supported the operations. Wallace skillfully portrayed business and laborer's viewpoints on the mining practices and how they were lived-out by those in the coal district.

One of Wallace's conclusions about the mentality of the coal mine operators in 19th century Pennsylvania is particularly revealing. Wallace stated that these owners felt they had to "choose between a sure loss, on the one hand, and, on the other, the substantial probability of a larger loss combined with a small probability of no loss at all, they tended to choose the risky

alternative....They avoided the sure financial loss attendant upon taking all recommended safety precautions and opted for the more risky and ultimately more costly, alternative of neglecting safety and gambling they could 'get away with it'" (Wallace 1987, 449-450). The owners of the Milford Mine, a generation later and a thousands of miles way from St. Claire, Pennsylvania, were in haste to bring their iron ore to market. They may have also been making a similar wager with their miners, as the owners of the coal mines of St. Claire had made in order to maximize their short-term profits.

Other historians can provide a model of a mining district to compare with the Cuyuna Range. Lankton's *Beyond the Boundaries,* in addition to exploring ethnic practices of the pioneering mine settlements also looked at technological change and social unrest among the communities in the Keweenaw Peninsula of Michigan. He deftly ties the development of the one-man-drill for underground copper mining to significant social unrest in the region. In Minnesota's Cuyuna Iron Range no specific technology change can be traced to a rise in labor unrest. However, there were developments in mining practices after 1920 towards greater output in open pit mines using ever larger excavating machines that needed fewer laborers. This likely helped to increase the population of unemployed miners that were the political base for the election of Karl Emil Nygard, the communist mayor of Crosby. This town was the largest community in the Cuyuna Range at the height of the Great Depression in 1932. Like Michigan's Copper Country, there were significant populations of first and second

generation immigrants from Italy and Finland in the Cuyuna Range. These politically well-organized immigrants joined with Balkan immigrants in effectively resisting the policies of mining companies by striking in 1913 and at the ballot-box in 1932.

Both the Copper Country of Michigan and Cuyuna Range of Minnesota share very cold, and sometimes harsh, winters. However, the most important environmental factors limiting the development in the Cuyuna Range was the obscured nature of the Cuyuna's iron deposits coupled with the large amount of privately held land. Until the arrival of Longyear's diamond-core drill technology in the early 20th-century, the Cuyuna Range would remain hidden beneath hundreds of feet of glacial soils. After the Cuyuna Range had been producing iron ore for 17 years, events like the Milford Mine Disaster in 1924 revealed that regardless of who or what was at fault, that the underlaying geology of the district was still not well understood. Much like the Copper Country of Michigan, as the highest grade and most easily exploitable deposits were removed in the Cuyuna Range it faced increasing challenges to remain competitive with other mining districts.

A 'Life-Cycle' of industrial Communities by Anthropologists

Anthropology has become interested in societies that became industrialized or have been rapidly industrializing over the last 40 years. This is, in part, due to the fact that many areas that were once almost exclusively agricultural

or pastoral are increasingly being transformed by the process of expanding global markets driven by industrialized nation-states. As the region that became the Cuyuna Range industrialized in the early 20th century, similar cultural shifts to those explored by modern anthropologists occurred. Anthropologists are able to record and study industrial communities directly by asking community members questions and testing hypotheses of past behaviors against those recorded in the present. In particular, they provide a deeper understanding of the social impacts upon the industrial communities undergoing decline or emerging as post-industrial communities. Robinson (1986), Nash (1993), Finn (1998), and Modell (1998) provide examples of anthropological scholarship on industrial communities across the globe.

Land and financial dealings were important for mining to begin in the Cuyuna Range. In Robinson's *Stepchildren of Progress* (1986) she investigated an Indonesian mining community where control and values associated with owning land had changed over a generation of mining. In Nash's *We Eat the Mines and the Mines Eat Us* (1993) she investigated the industrial community around a Bolivian tin mine. She carefully documented the hierarchy of the miners from managers, engineers, carpenters, drillers, and cart workers. Such hierarchies appeared on the Cuyuna Range just before the strikes over contract mining in 1913. Nash's study observed how each type of worker spoke about the others in the mine, both in and not in the presence of managers. Her studies revealed how the workers compensated for the discomfort of the work envi-

ronment by using coca (1986, 198). While both examples from her study displayed behaviors that are specific to that region and community, they represent an important window on the challenges an industrial community could face and how a working class culture could deal with those challenges.

Modell and Brodsky (1998) investigated aspects of industrial communities in the United States experiencing de-industrialization. Her *A Town Without Steel* explored the physical and social transformations of Homestead, Pennsylvania during a time of rapid de-industrialization. She documented the transformation of bonds and beliefs between generations of working class families and those between the industrial community and the steel companies as the painful reality set in that the steel industry or any other industry would never come back.

Frequently, industrial communities are so deeply tied to a single productive or extractive industry that when this particular industry declines or closes suddenly, most of a community's working age residents scatter in search of work and better opportunities. This process is shown in extensive detail by visual anthropologists Modell and Brodsky (1998). They reported on the physical and social transformations of Homestead, Pennsylvania during a time of rapid de-industrialization from the 1980s to the early 2000s. In addition to the riveting photographs of industrial decay, the authors documented the transformation of bonds and beliefs between generations of working class families and those between the industrial community and the steel companies as the painful reality

sets in that the steel industry, or any other industry, would never come back in their lifetime.

No single source records these de-industrialization processes with complete detail in the Cuyuna Range as Modell and Brodsky (1998) did for Homestead. The third volume of *Cuyuna Country* comes the closest to presenting all of the social and economic impacts on the working population of the region in the late 1960s to early 1970s from the decline in mining. There are pieces of that story that are present in the local newspapers from the era, audio recordings of long-time residents made by local historical groups such as the Cuyuna Range Heritage Network, and lastly from the data that can be gathered from the landscape of former company homes that supported the mining industry of the area.

The visual remains that are often left behind in these cases of rapid de-industrialization are fragments of the former industrial processes on the landscape and a portion of the worker housing along with other community structures. These features such as abandoned or neglected structures and the economic difficulties that often accompany the areas around these structures are common in former industrial communities. However, in places like the Cuyuna Iron Range they might not be obvious to an untrained eye.

A 'Life-Cycle' of industrial Communities by Archaeologists

Archaeology is another academic discipline which brings unique insights into the study of industrial communities. Archaeology of industrial communities has often focused upon households and the goods consumed by those living in them. From this perspective, historical archaeologists have attempted to understand the choices and behaviors within industrial communities in ways that were not documented or communicated openly with outside observers. Mrozowski and Beaudry's *Interdisciplinary Investigations of the Boot Mills: Lowell, Massachusetts* (1989) investigated a boardinghouse belonging to the same "mill girl" industrial community studied by Dublin (1979). Mrozowski and Beaudry revealed evidence of the worker's diet, sanitation, and illicit activities such as drinking and smoking. Their artifactual evidence augmented the surviving company records which speak about the difficulties managers had enforcing a policy of keeping the worker's boarding houses clean and presentable through the 19th century. Their investigations also showed a significant decline in sanitation standards once the mill girl population was replaced by Irish immigrant labor (1989, 279-292). Palus and Shakel's *They Worked Regular* (2006) studied an industrial community on Virginius Island, West Virginia. The authors compared the differences in materials recovered from the houses of managers and laborers and noted how these differences between the two types of households (both in the cost of goods and the amount) increased over time as the

workforce transitions from a highly skilled gunsmiths towards semi and unskilled machine-tenders.

The arrangements and groupings of housing, especially in communities like Crosby in the Cuyuna Range can reveal the beliefs and policies of those who developed the landscape. Pappas (2004) investigated housing for a logging company using archaeology. He noted that, “in order to address industrial communities adequately, an open model of community creation based on personal interaction is required” (Pappas 2004, 160). His study revealed how the placement of housing for single and married loggers at a remote logging camp in California reflected paternalistic notions of observation and privileges based on the workers marital status. The arrangement of space, based on authority, status, and the levels of interactions between segments of the workforce informed his study. He reported that single loggers in the camp had less amenities and were forced to live closer to manager’s housing and central offices than the married loggers (Pappas 172-174).

Boarding houses were an important feature of particular neighborhoods in the Cuyuna Range. In many industrial communities the women maintained these homes while the men worked elsewhere. Archaeologists have explored boarding house remains to better understand how they functioned in industrial communities. Wood (2004) studied the use of tin cans in waste middens near an early 20th-century coal mining community in Berwind, Colorado. By comparing the age and frequency of the tin cans in the deposits with historic records

she successfully made the case that the purchasing of costlier caned food was part of a strategy that allowed women in the community to feed and board single miners in their family's homes in order to contribute to the financial stability of the household.

Making connections between the struggles of different generations that lived within an industrial community can give an archaeological project greater depth and meaning. One of the objectives in researching the Cuyuna Range was to engage current residents with the legacies of their industrial heritage. Another archaeological project that has done this was McGuire and Reckner's *Building a Working Class Archaeology* (2005). Their work does not only attempt to understand a dynamic event in the past, but it also tried to connect with and engage two types of distinct "descendants" from former working communities around Ludlow, Colorado. This study has significant implications for those interacting with communities of working people after an industrial community has transitioned towards decline or emerged as a post-industrial community. The authors reached out to the biological descendants of the coal miners, both to gain further insights from them and to raise awareness of the violent clash between miners and management. The second group of modern descendants the authors approached are those they defined as the "descendant community" of working people in Ludlow that, while not biologically related, shared similar conflicts and struggles with managers that the historic coal miners of Ludlow had fought about almost 100 years earlier (2005, 235-236). The authors hoped that

archaeology of the conflict site could allow biological descendants greater influence over the former industrial community's legacy and that the project could help inspire the descendant community of present-day workers through the examples of those that struggled before them.

Frequently, industrial communities are so deeply tied to a single productive or extractive industry that when that particular industry declines or closes suddenly, most of the community scatters in search of new work and better opportunities. This process is portrayed in extensive detail by Modell (1998). What is often left behind in these cases are fragments of the industrial processes on the landscape along with a portion of the worker housing and other community structures.

While not strictly an archaeologist, Francaviglia's *Hard Places* (1991), studied former mining districts across the United States as archaeologist studies a type of artifact. He carefully detailed how to observe and identify the major physical features that distinguish these former industrial communities, such as the clusters of nearly identical company homes or the piles of tailings created from separating ore from waste rock. Francaviglia's last chapter "Perceiving the Landscape" is informative because he discussed how several former mining communities in North America survive through marketing their heritage to tourists after their primary industry declines (1991, 169). These heritage activities included taking tours through abandoned mines, sometimes with a former miner as a guide or looking at a landscape that was "frozen in time" not on pur-

pose, but because development and construction was halted so suddenly when the industry went into decline.

Shared Themes About Industrial Community 'Life-Cycle'

Across these three disciplines there are some common themes that appear to be shared by many of these works. The organization of spaces within an industrial community to serve the purposes of a single productive or extractive industry is one such theme. Works by scholars such as Crawford (1995), Robinson (1986), and Pappas (2004) exemplify those interests by historians, anthropologists, and archaeologists respectively.

Scholars across all three disciplines have explored the transformation of communities caused when the main economy of a region shifts into a post-industrial life-cycle as it has in the Cuyuna Range for the last 40 years. Modell and Brodsky (1998) observed steel workers perceptions of their community changed as their places of employment gradually transformed from hopeful sites of future work, to work that would not return, and even become entirely new places (like an upper middle-class water park) they could neither afford nor want to be associated with. Francaviglia's investigation of how former mining communities changed once their days as extractive centers was over shows how the history of these places is often mobilized in the present to bring meaningful employment to the remaining residents. The examples from these authors demonstrated that community choices can determine the values and pur-

poses connected to former industrial sites. This process can help integrate or further alienate residents from connecting with the legacies of a former industry.

Many other authors have explored industrial landscape transformation and identified trends that are similar to what occurred to the Cuyuna Iron Range in the 20th-century. Finn's (1998) *Tracing the Veins* balanced a mostly historical study of the copper mining community of Butte, Montana with a modern anthropological study of a copper mining community in Chuquicamata, Chile. While she did not define her work as multisited, it does share some commonalities with the approach demonstrated by Marcus (1995). Both copper mines were owned and operated by the Anaconda Mining company in the mid-20th-century. Her comparisons of both communities reveal the ties both communities shared through managerial policies, and cycles of economic prosperity and eventual decline as newer mines gradually eclipsed both mining locations.

Historians extensive study of industrial communities has formed the basis of how industrial communities are studied into the present. Anthropology is able to obtain primary information through ethnographic engagement with living communities, both industrial or industrializing. Archaeology, with its strong attention to housing and consumption, provides evidence about the frequently undocumented lives of industrial communities from inside and outside of the workplace.

Besides the shared components of what makes an industrial community, the scholarship also agrees upon some of the relationships and sequence of developments that industrial communities appear to share. Tensions and conflicts frequently occur within industrial communities as diverse populations in the community attempt to negotiate the sudden changes wrought by new technologies and fluctuating economic conditions that industrialization brings in its wake. As circumstances lead towards the eventual decline and closing of the industry that once defined an industrial community, many of its members may scatter to become a part of other industrial communities. Those left must then decide if they will also leave or try to develop a new economy, often based on celebrating the history and heritage of their former industrial past.

Various sources have illustrated some of the different factors which shaped the development of the industrial communities in the Cuyuna Range. These authors clarify what was influencing the choices each group made to create this distinctively 20th-century mining landscape that survives into the present. Understanding the myriad of local, regional, and global connections which fostered innovations and developments not seen in other iron mining districts can redefine the existing narrative about the Cuyuna Range.

2012 Community project overview

Leaders of a Cuyuna Range heritage group, the Serbian Sisters, requested the assistance of scholars to document their region's industrial culture and history. In 2012, the Social Sciences department of Michigan Technological University responded to that request in order to bring the region's history to a wider audience beyond the borders of the mining district. The group requested that we use the department's expertise in industrial heritage to help stakeholders develop plans to improve the local economy while celebrating the region's rich past. We were not told which places should be given the most attention, but we were encouraged to develop our own questions and research design to identify significant sites.

Focusing upon a community-based approach for cultural renewal and economic revitalization can serve as an example for heritage management and tourism development. This strategy is a variation on the process that urban planners Lynda Schneekloth and Robert Shibley call *placemaking* (1995). They define this practice as the "daily acts of renovating, maintaining, and representing the places that sustain us" with equal emphasis on the inputs from trained professionals and community members (Ibid, 1-2). The collaboration between professional scholars and community members to develop new representations of these former Minnesota iron mining communities is an act of placemaking.

As documented by Modell and Brodsky (1998) in Homestead, Pennsylvania, the process of de-industrialization across a region can literally strip away

the identity working communities had with their landscape. The process of placemaking can be a way those woking communities reforge connections between themselves and the physical legacies of their industrial community. One of the key research questions that arose from community discussions, both public and private, was to find the places and spaces with the most potential to highlight that working heritage on the Cuyuna Range.

Discussions with community members led to a plan for systematically recording historic structures from the era of active mining in the district (1910-1960). This record would become a tool for researchers and community collaborators to decide which sites and regions of the Cuyuna Range needed further attention. Soon after the recording plan was drafted, I gave a series of short history presentations about seven former industrial communities in the region. These presentations were advertised in the local newspapers including the *Crosby-Ironton Courier* and *Brainerd Dispatch*. Further notice was provided through fliers on local community bulletin boards and the town halls of each community. Each public talk ended with a request for help documenting communities. Eleven volunteers agreed to participate in training at the Heartwood Center in Crosby. The training emphasized documenting the exteriors of structures based on the standards set by the National Register of Historic Places and the Minnesota State Historic Preservation Office.

The team of volunteers recorded a total of 876 standing structures on field forms and took 1676 digital images. The sites ranged in age from homes

dating around 1960 to a log structure that possibly predated 1910. The data sheets and digital photographs were placed into a database of regional historic structures using Filemaker-Pro 12 software in the months after the survey. Digitizing the locational information has allowed internet-based repositories to connect to the database in significant ways, including the United States Federal Census files on ancestry.com. These files were linked with the addresses of the historic structures that were documented. This additional linking to the Federal Census allowed public access to information on who lived in various community dwellings, their employment, resident's cultural affiliation.

In the 2013 the Hallett Memorial Library in Crosby requested a printed version of the database as a resource to local residents. The digitized files were printed into three volumes, with the Crosby volume divided into two parts, that are available for public reference at the Hallett Memorial Library in Crosby, Minnesota. While these reference copies are not intended for the public to write in or modify, future plans include offering a printed copy at the Cuyuna Range Heritage Network work members to add notes into and for a version of the digital database to be available online where people may wish to contribute comments.

An archaeological site relating to the Cuyuna Range was identified by researching historic newspapers. This research and fieldwork helped to determine the site's potential to be added onto the National Register of Historic Places. The research also provided meaningful data about the some of the ear-

ly aspirations and challenges faced by entrepreneurs when mining on the Cuyuna Range began.

Archaeological Field Work at the Jones Furnace Ruins, Aitkin

Sometimes small historical leads can bring unexpected turns in research. The headline of the July, 5th 1913 edition of the *Crosby Crucible* boldly proclaimed, “The Ardis Furnace: Story of the work that lead to success. Its possibilities on the Cuyuna Range”. The discovery of this tantalizing clue triggered more systematic searching of other papers from around this time to learn more about the proposed iron smelting furnace. Additional articles from the region indicated that the town of Aitkin had been selected as the final site for the iron smelting furnace (*Crosby Crucible, August 16, 1913*). Microfilm copies of the *Aitkin Age* and *Aitkin Republican* newspapers at the Aitkin Historical Society’s collection revealed further details. The Aitkin newspaper articles provided enough details to roughly determine the parcel of land provided to build the Ardis Furnace. At the Aitkin County Courthouse, the likely parcel of land was determined by identifying the parcels that must have been adjacent to the one mentioned in various articles of the Aitkin newspapers from 1913.

The Tibbitts family owns the property just north of Aitkin where the former furnace was located. Mr. Tibbitts stated that his father, who had bought the land after the industrial site was abandoned, believed the builders of the furnace had tried to swindle investors of their money and never really intended the

facility to operate. Not far away from his house, a distinctive concrete feature could be seen jutting out of the cow pasture.

No known surveys of historic or other archaeological sites in this vicinity of Aitkin, Minnesota mention this particular ruin. All of the historic sources that survive do not provide details of the furnace design, statements about the site's completion, its operation (if ever), or when the site was abandoned. After conversations with the landowner and officials with Minnesota's State Historic Preservation Office, there was agreement that a geophysical survey would be a good first phase to study the site in order to determine the feasibility of preserving and interpreting the ruins before human development or natural processes like erosion damage the site's integrity. Geoff Jones, a member of the contract firm, Archaeo-Physics, was consulted on how to document the ruins using remote sensing techniques (Figures 2-5).

A geophysical and pedestrian survey found the bounds of the site, identified features with potential to understand the design and operation of the furnace, and determined that the furnace probably did not operate. The geophysical survey did not contribute meaningfully towards uncovering the exact iron furnace design John T. Jones intended to use at this site. Despite these limited findings there is potential to nominate the Jones Furnace ruin to the National Register of Historic Places under criterions A and C since enough of the concrete ruin and potential out-buildings survive and could be excavated to learn if and how the furnace design contributed to later developments in furnace tech-

nology. It also reflects the original designs patented by Jones at the turn of the 20th-century. Besides this site's own National Register potential, it may also work as a contributing element to a National Register district nomination of waterfront lumber mill ruins, docks, and sunken riverboats along this section of the Mississippi River.

Archival Research and Informal Interviews Conducted

Archival research was conducted in order to locate documents and records related to the industrial communities of the Cuyuna Iron Range. The Cuyuna Range Heritage Network included the photographic and oral history audio recordings held at their center in Crosby, Minnesota. These records helped to gain a sense of the general history and disposition of each community. Company records and maps held at the Minnesota Discovery Center, formerly known as 'Iron World', in Chisholm, Minnesota revealed some information about different companies that operated in the Cuyuna Range. Another repository that yielded interesting leads, but did not yield documents with significant research value were the blueprints and files held at the Croft Mine Historic Park in Crosby, Minnesota.

The Minnesota State Historic Preservation Office, located in the basement of the Minnesota History Center in St. Paul was one early source of general information about previous cultural heritage research in the region. Their files provided a handful of useful records, most collected around the time

Joseph Stipanovich did his architectural surveys of the Cuyuna Region in 1979. Various stories about the region's history with sintering and the role of it's founding developer, Cuyler Adams led me to explore the Adam's Family mining company records at the Minnesota History Center in St. Paul. Those records also revealed a close relationship between several early companies and the Mines Research Station at the University of Minnesota in Minneapolis. The University of Minnesota's Elmer L. Andersen Library held the records and correspondences of the professors at the Mines Research Station. The records gave additional perspective on what state politicians, mine engineers, and businesspeople thought about the Cuyuna Range at different times. Online copies of patent records and 20th-century mining journals gave insights on the significance of innovations that shaped the history of the Cuyuna Range. The best primary sources for understanding daily life, major local events, and local opinions on different issues was in the collection of local newspapers held at the *Crosby-Ironton Courier* in Crosby, Minnesota. The Aitkin Historical Society held the most useful newspapers, documents, and other resources for understanding places and events occurring within Aitkin County.

Two informal interviews occurred as better relationships were established between Michigan Technological University Scholars and the modern communities that composed the Cuyuna Range. Both instances involved local residents that came forward to share important historic documents they had collected. Gary and Karen Woehler arranged a meeting in the fall of 2013 for

the purpose of turning over documents related to the region's history. As we talked, they also shared stories about their efforts to save the Croft Mine site from demolition. Permission to share their account was acquired afterward in order to strengthen research on the region during the 1970s. The second informal interview came from Dave Zontelli as he generously shared the details of his family's history he had been compiling. He supplemented the written content he had with personal stories and reflections of growing up around his father while the Zontelli mining company was at the height of its operations.

The evidence collected here demonstrates the Cuyuna Iron Range is a nationally and globally important mining district. The multisited archaeological approach in this dissertation will weave together three central themes of ideas (innovations), conflicts, and dynamic people. In order to begin this process of weaving together important themes about this 20th-century mining district a history of the communities and landscapes that existed before iron mining began is necessary.

Part 1: Emerging Onto the World Stage

A portage trail traversed Cuyuna Country during both the [Dakota] Sioux and Ojibwe occupation on the land. On this trail Cuyuna Country was the central area for trade and cultural interaction between native indigenous peoples.

-Paula Lekatz Robinson

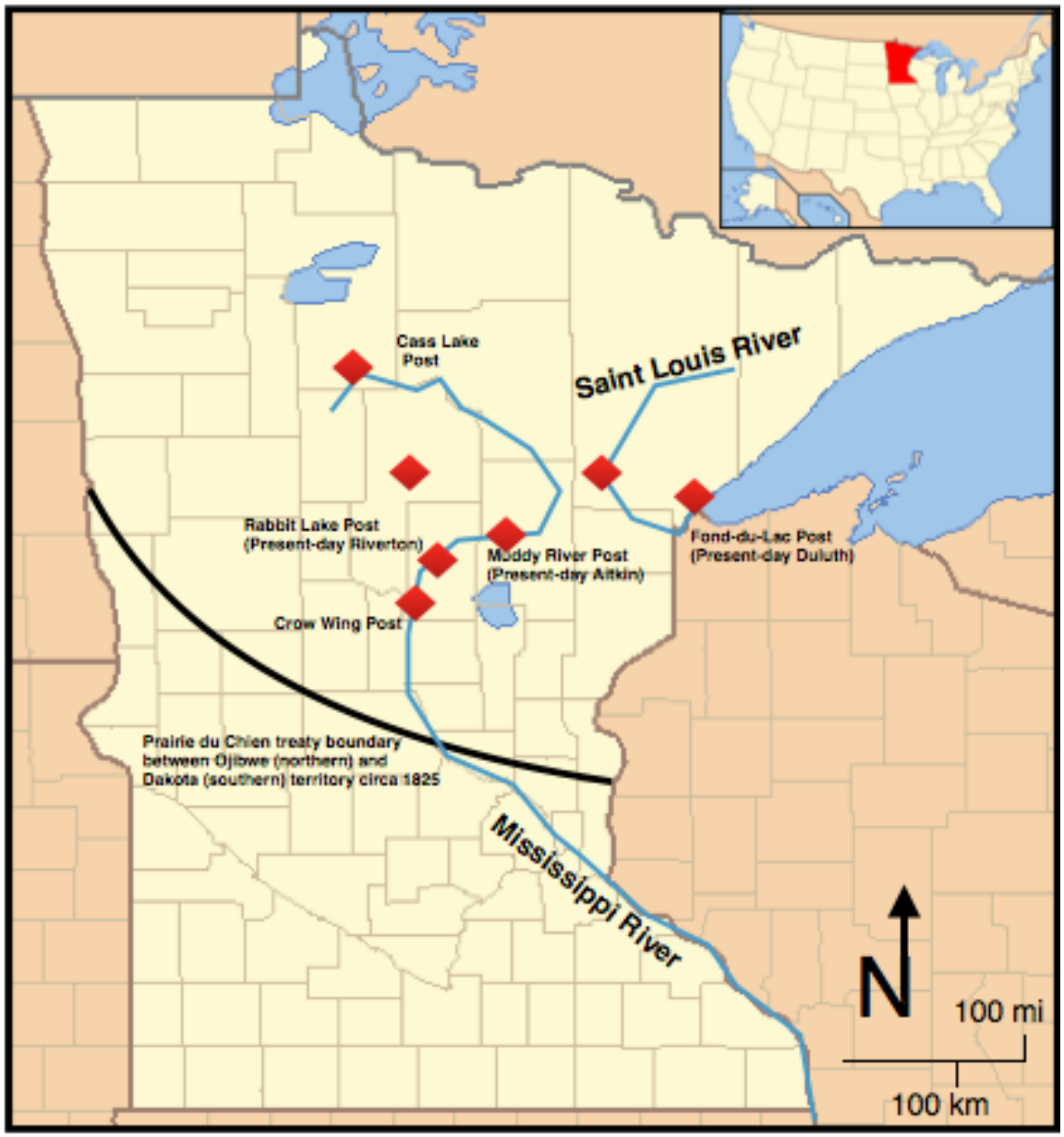


Figure 6. Map of selected early 19th-century fur trade posts in Central Minnesota, major waterways, and American Indian territorial boundaries. Adapted from *Cuyuna Country Volume 1* page 26, *Assassination of Hole in the Day* page 11.

Chapter 1: Pre-1870:
Land, Peoples, and Economy before Mining

Table 1: Population estimates from 11,000 BCE to 1870 in three regions of Minnesota that would develop iron mining communities. ancestry.com: US Federal Census Collection. Accessed December 7, 2015. *Crow Wing Population prior to 1860 are estimates from Gibbon 2012. 1860-1870 US Federal Census did not record American Indian population.

Table of Population Change					
Population By County	**11,000 to 3,000 BCE**	**3000 BCE to 500 CE**	**500 to 1500 CE***	**1860**	**1870**
Crow Wing [Cuyuna Range]	10-25*	25-100*	1000s*	269*	200*
St. Louis [Vermilion and Mesabi Range]				406	4,561
Itasca [Mesabi Range]				51	96

The iron and manganese minerals of the Cuyuna Iron Range were likely formed during the middle of the Precambrian Era (approximately 2 billion years ago) as the oldest surviving portions of the North American continent were being created (Lamppa 2004, 2-3). Over the next billion years, these minerals were eroded, dissolved, and redeposited into concentrated lenses of ore. These bedrock deposits were then completely covered by glacial gravels, sands, and silts from the retreat glaciers during the end of the Pleistocene Era approximately 13,000 years ago (Beltrame et al. 1981, 1-3). The post-glacial landscape had become a terrain of gently rolling hills and marshy basins that

were interposed with many lakes, streams, and a portion of the Mississippi River Valley.

Weather records from the closest major city, Brainerd, show that the current annual temperates of the region can vary from an average low of 6 degrees Fahrenheit (-4 Celsius) in January to an average high of 69 degrees (21 Celsius) in July (Ross 2000). The region has an average of just over 27 inches (685 milliliters) of precipitation annually with 60 percent of it falling as snow. The average growing season is considered to be short, lasting only 92 to 115 days from late April to early August (Ecological Classification System 2014).

According to the Minnesota Department of Natural Resources, this portion of Central Minnesota is called the “Tamarack Lowlands” (Ecological Classification System 2014). Before the landscape was altered by logging, modern agriculture, and mining activity the region had stands of conifers including black spruce, tamarack and white cedar mixed with meadows or marshy lowlands near bodies of open water (Ibid). Only small stands of the red and white pines existed on higher terrain (Ibid).

Peoples Prior to Iron Mining

American Indian populations have lived in and around the territory that became the Cuyuna Iron Range for many thousands of years. The earliest physical evidence of human activity appears in the form of fluted stone projectile points from around 13,000 years ago (11,000 BCE) (Gibbon 2012, 6,

48-49). These artifacts were left behind shortly after the retreat of glaciers from the region when the landscape resembled an open tundra rather than the more recent environment of marshes, woods, and meadows (Gibbon 2012, 47). Starting around 5000 years ago (3000 BCE) until approximately 400 years ago archaeological evidence has shown a steady change in how people of the region subsisted. Indigenous peoples transitioned towards building more permanent settlements supported by agriculture and gathering wild rice near the shores of many local lakes (Lamppa 2004, 4-11). Gibbon notes that while this shift occurs "in conjunction with [but probably not dependent upon] the establishment of modern climate and vegetation patterns" (2012, 88). Along with more intensive uses of agriculture and rice gathering, the archaeological record notes more intensive use of "aquatic resources" such as fish to sustain larger and more densely settled populations (Ibid).

When Europeans first contacted peoples living in Great Lakes region in the mid-to-late 1600s, three distinct populations of American Indians were vying for control of the lands in what would become the Cuyuna Range. Members of the Arapaho nation living along the western shores of the Great Lakes in what would become Minnesota and Wisconsin were quickly being displaced by members of the Dakota and Ojibwe nations (Robinson 2011, 8). This was the beginning of an era defined by American Indians adapting their already sophisticated regional trade networks for the extraction and exchange of animal pelts into a global interchange of goods with European merchants. When the global

demand for animal pelts finally reached the borders of the Arapaho, Dakota, and Ojibwe peoples it placed new economic pressures on the local landscape to supply furs for this global trade. Ojibwe historian Anton Treuer provides an eloquent description of the Ojibwe nation's perspective on the North American fur trade. He states,

"The French expanded their domain and economic empire in North America with the good graces and political, economic, and military might of the Ojibwe. Through their interactions with the French during the fur-trade era, the Ojibwe increased their standard of living, grew in population (which had been devastated by terrible disease pandemics), expanded their political power, and multiplied their territorial holdings by a factor of twenty" (Treuer 2010a, 12-13). These territorial expansions placed the Ojibwe into direct conflict with neighboring peoples for control of valuable hunting grounds for fur-bearing animals.

During the early to middle 1700s The Dakota and Ojibwe nations had succeeded in displacing the Arapaho and began fighting each other for control of territory for hunting grounds, water transportation, fertile lands for settlement, and access to European trading posts (Robinson 2011, 6) (Figure 6). After frequent conflicts between the Dakota and Ojibwe in the middle of the 1700s, the Ojibwe nation had gained undisputed control of the region which would become the Cuyuna Range, pushing the Dakota further south and west (Ibid). Settlements of Ojibwe peoples were founded on many of the larger lakes across the area including Mille Lacs Lake, Bay Lake, Rabbit Lake, and Gull Lake (Ibid).

One portion of the Upper Mississippi River near the present day community of Riverton, Minnesota was the site of a fur trade post, an Ojibwe community, and portage location called “Rabbit Lake Post” in the early 1800s (Robinson 2011, 8 &18, *Cuyuna Country* Vol. 1, 26). This site was a vital link connected to Northwest Fur Company’s main hub at Fond du Lac (near present-day Duluth, Minnesota). Rabbit Lake Post connected Fond du Lac with posts further north and south of Rabbit Lake such as Leech Lake Post and Crow Wing Post (*Cuyuna Country* Vol. 1, 26). The Rabbit Lake Post and the many other posts like it in what would become Northern Minnesota were suppliers to a global economy based on the exchange of animal furs and manufactured goods between Europe and North America. This fur post likely went out of use by the late 1830s as the fur trade economy declined rapidly in North America, never to recover.

A combination of shifting European fashions from furs to silk and competition from inexpensive nutria pelts from South America flooding the global market caused fur prices to drop quickly in the early 1830s (Dolin 2010, 280-281). Dolin, a historian writing on the decline of the North American fur trade notes that, “by January 1833 the price paid in New York for beaver from the Rockies dropped 33 percent to four dollars per pound, and the less desirable beaver [from areas such as Northern Minnesota] couldn’t be sold for any price” (2010, 281). Leaders of the Ojibwe nation, seeking to continue purchasing manufactured goods, settle debts with fur trade posts, and protect rights to hunt and fish

on local lands began signing treaties with the United States that would soon lead to a dramatic transformation of the region's landscape.

The time period of treaties between the Ojibwe and the United States, lasted from 1826 to 1867. The leaders of the Ojibwe in Minnesota secured promises of hunting and fishing rights while granting permission for European-Americans to build new settlements in the region through these treaties (Robinson 2011, 35-36, 42). For a brief time, between 1855 and 1867, there were treaty arrangements between the Ojibwe and the United States to have an American Indian reservation located around Rabbit Lake near what would become the Cuyuna Range community of Riverton, Minnesota (Treuer 2011, 151-152). One of the most influential of the Ojibwe leaders at this time was Hole in the Day [Also referred to as Bagone-giizhig the younger]. He was a chief of the Mississippi Band of Ojibwe in Minnesota which included those Ojibwe living between Mille Lacs to the south, Gull Lake to the west, and Sandy Lake to the east. This area of the Mississippi River roughly encompasses what would become the Cuyuna Iron Range in the 20th-century. According to one biographical account, Hole in the Day "negotiated almost every Ojibwe treaty with the U.S. government in Minnesota …[he] used both diplomacy and force with a skill that baffled Americans and other Ojibwe leaders alike" (Treuer et al. 2010b, 22*).*

In the 1855 treaty between the Ojibwe and the U.S. government signed by Hole in the Day a clause was added to hopefully change a tragic reality at the time. In addition, this legal agreement would play another role when it was

enforced upon residents of central Minnesota 60 years later. The seventh article in the 1855 treaty stated that the government must "prohibit the introduction, manufacture, use of, and traffic in, ardent spirits, wines, or other liquors, in the Indian Country, [which] shall continue to be in force, within the boundaries of the entire country herein ceded to the United States [which included what would become the Cuyuna Range], until otherwise provided by Congress" (Robinson, 2011, 85). The effects of alcohol poisoning and alcoholism were factors in the deaths of Hole in the day's father and uncle (Treuer 2010b, 79). Treuer noted that businesspeople "and even government officials deliberately began weaving alcohol use and abuse into the fabric of Indian communities…With the decline of the fur trade and increased pressure on Indians to sell land for trade goods, money, and food, many Indian people despaired and turned to the poison offered by unscrupulous traders" (Ibid). In light of those emotional wounds caused by the trade in alcohol it is not difficult to understand why such an article was inserted into the treaty negotiated by Hole in the Day.

The choices Hole in the Day made in setting the terms for treaties, like the one he signed in 1855, and the manner in how he represented Minnesota's Ojibwe population alienated him from local Ojibwe leaders. His negotiations also angered many local business-people. Before he could finish renegotiating a treaty requiring many of the Mississippi Band of Ojibwe to resettle further west onto the White Earth reservation he was assassinated on June 27, 1868 (Treuer 2011, 3-5). This event left a power vacuum in Ojibwe leadership which

would eventually be filled by business-people mostly interested in enriching themselves on the White Earth reservation (Treuer 2011, 184-185). Between 1855 and 1868, most Ojibwe living in and around what would become the Cuyuna Range agreed to or were coerced to resettle onto the reservation at White Earth or reservations around Mille Lacs and Sandy Lakes (Robinson 2011, 36 & 42, Treuer 2011, 189).

A few stories of individuals of Ojibwe heritage interacting or living around communities of European-Americans in the Cuyuna Range have been passed-down through local legends recorded in the first volume of the *Cuyuna Country* series. One individual is “Indian Jack” who was a refugee from a Dakota attack on his home village that killed all his immediate family (*Cuyuna Country* Vol. 1, 38-39). He was well known to early European-Americans such as the Wolford Family who even helped bury “Indian Jack” when he passed away in 1895 (Ibid). The Wolford Family also notes that other members of the Ojibwe nation visited them to purchase goods from their small store in exchange for blueberries, moccasins, beadwork, and other clothing items (*Cuyuna Country* Vol. 1, 39). Hank, another person of Ojibwe heritage was adopted by a family of European-Americans homesteading along Bay Lake. He was “well educated...subscribed to magazine[s] and kept himself well informed on current affairs”. While Hank may have been raised by European-Americans as a child he later chose to live apart from both Ojibwe and European-American settlements in his own traditional Ojibwe shelter (*Cuyuna Country* Vol. 1, 40).

Further accounts from early European American settlers in the region portray individual Ojibwe as violent or “savage”, but do not contain any primary accounts or evidence from witnesses to support these claims. Documented violence against those with Ojibwe heritage by European-Americans does exist. The most noteworthy of these conflicts was an event in 1872 that became known as the “Blueberry War”. Two Ojibwe men were jailed in Brainerd and later hung by a mob after being accused of killing a European-American woman. The men were killed before a trial could be held, and no hard evidence was ever gathered to prove the accusations. Shortly after the hangings, European-American leaders fearing reprisal attacks by the Ojibwe called for state militia to protect communities in Crow Wing County. The account of the “war” notes that when the militia did arrive that they found communities of Ojibwe “all peacefully at work, picking blueberries on high river ground” (*Cuyuna Country* Vol.1 42-44).

Not long after the first waves of homesteaders arrived in the Crow Wing County region, logging surveys were conducted in the middle-1860s. These surveys confirmed that the forests of the region contained a mixture of conifers and places with “no suitable tree” likely indicating marshy or scrub-brush terrain (*Cuyuna Country* Vol. 1, 49). Logging companies entered the region in the late 1860s and would continue logging marketable stands of timber through the early 1900s. The lack of sizable stands of the prized white pine in Crow Wing County likely delayed the large scale cutting of timber in the region and made it

more attractive for smaller regional lumber companies to operate supplying local demand for building materials.

Regional Economy and Land Use Before Iron Mining

Lands acquired by the lumber and railroad industries were quickly sold to families for homesteads once the logging of marketable timber was complete. Many of the remaining trees were then cut down by homesteaders to build their dwellings and clear land for farming (*Cuyuna Country* Vol. 1, 49-51). Transportation of cut logs by logging companies was limited to hauling by sleds in winter to the region's first lumber mills in Brainerd or Deerwood/Withington during the 1870s. Most of the local waterways were too shallow to float logs onto the nearest branch of the Mississippi River. The finished lumber from Brainerd or Deerwood/Withington was used to supply local construction and the remainder was sent by rails further south to supply markets in Minneapolis and Saint Paul (*Cuyuna Country* Vol. 1, 53-56). It is unlikely that much of the trees or lumber from Crow Wing County was shipped outside the state to other lumber markets along the Mississippi River in Iowa and Missouri which desired white pine lumber. Only a brief mention of the region is made in texts on the lumber history of Minnesota. Historian Agnes Larsen states that, "in the development of Minnesota these forests counted for little...It was the rich soil in which the [forests] grew that was attractive to the settler" (1949, 6).

From the early 1600s into the early nineteenth-century the American fur trade had made all of lands of the northern Great Lakes region an important supplier for a global economy based around animal furs and manufactured goods. When that economy changed in the 1830s and 1840s, local Ojibwe peoples looked for ways to settle debts with fur traders and secure promises of hunting and fishing rights from the United States government. These treaties allowed European Americans to settle, farm, and log the landscape. Shortly before the start of efforts to locate and mine iron ore in Crow Wing County, around the third quarter of the nineteenth-century, most of the land was controlled by timber companies, railroads, or homesteaders. The timber and agricultural economy of the region was only significant within the state of Minnesota in the late 1800s. When businessmen from Minnesota and Wisconsin, some with experience from other Great Lakes iron mining districts, realized the potential of iron mining in the Cuyuna Range, then the region would once again become a factor in national and global markets.

Chapter 2: 1870 - 1906
Envisioning an iron mining landscape

Table 2: US Federal Census of population and change from 1870 to 1900 in three regions of Minnesota that developed iron mining communities. ancestry.com: US Federal Census Collection. Accessed December 7, 2015.

Table of Population Change						
Population By County	**1880**	1870-80 % change	**1890**	1880-90 % change	**1900**	1890-1900 % change
Crow Wing [Cuyuna Range]	**2,319**	+1060%	**8,852**	+282%	**14,250**	+61%
St. Louis [Vermilion and Mesabi Range]	**4,504**	-1.26%	**44,862**	+996%	**82,932**	+85%
Itasca [Mesabi Range]	**124**	+29%	**743**	+499%	**4,573**	+515%

The Cuyuna Iron Mining Range is located in Crow Wing County which is about 90 miles (145 kilometers) west of Duluth in central Minnesota (Figure 7). Since the middle 1800s, the historic iron ranges of Northern Minnesota have supported populations of European immigrants and their descendants that include Scandinavians, Southern European, and Slavic peoples. Prior to 1900, Crow Wing County's Euorpean-American settlements and economy revolved around logging and small-scale farming. In 1870, the Northern Pacific Railroad line became an important transportation link between the area and larger urban centers further south such as Minneapolis and Saint Paul.

The hub of activity and European-American settlement in the region that would become the Cuyuna Range was centered around the Northern Pacific

Railroad station in Withington, built in 1871 (*Cuyuna Country* Vol. 1 2004, 70). At the same time that station was built a 19-year-old land examiner working with the Northern Pacific Railroad named Cuyler Adams first came through Crow Wing County (Clark 1922, 88). He continued working with the Northern Pacific Railroad company as it expanded westward into North Dakota in the 1870s, but would return to Withington approximately 10 years later and became a driving force in the development of this region as an iron mining district.

Many letters, ledgers, and other documents from Cuyler Adams became part of the Adams Family Mine Company Collection at the Minnesota History Center in Saint Paul, Minnesota. These documents include records from Cuyler Adam's ventures in North Dakota where he frequently bought and sold land from the Northern Pacific Railway company. The railroad was given tracts of land by the federal government as incentive for the Northern Pacific railroad to continue expanding westward. The ledgers and maps kept by Adams from the 1870s reflect his skill at surveying and negotiating land deals with large companies and small-scale landholders. He would also partner with other businessmen to form local railroad companies and other businesses in order to enhance the value of land he controlled (145.i.1.12F Box1).

As far back as the 1870s these records show Adams was a sophisticated real estate investor who kept careful financial records, maps, and notations on every property he bought and sold along with the reasons motivating his actions. These early records also reveal Adams spread his financial risks for

speculating in real estate by forming multiple business partnerships and companies where he acted as their main representative in land deals. All of these skills developed by Adams in North Dakota would later be put to use when he sought to develop the Cuyuna Iron Range in the early 1900s.

Following the People: The Oldest Community in the Cuyuna Range

Withington, the community Cuyler Adams first passed through around 1870, was renamed Deerwood in 1882 in order to reduce confusion in shipments with the community of Worthington, Minnesota (Cuyuna Country Vol. 1 2004, 70). Early settlers in Withington/Deerwood included German, Irish, Swedish, and Norwegian families seeking to acquire federal lands for homesteads (*Cuyuna Country* Vol. 1 2004, 70-89). Of the historic structures surveyed in Deerwood, thirteen buildings clearly appear to have existed from before mining explorations began in the Cuyuna Range at the start of the 20th-century. Each house reflects architectural trends seen in many Late Victorian homes including gambrel roofs, enclosed soffits, and asymmetrical forms common to Queen Anne style dwellings. All of these dwellings were one and a half to two stories tall. One of the thirteen pre-twentieth-century dwellings documented was a Methodist Church when it was constructed in 1898. The structure was converted into a residence during the middle of the twentieth-century. The former church retains features of its original gothic architecture, including the steep rooflines. A fourteenth residence not surveyed in Deerwood was an ornate Queen Anne style dwelling that belonged to a businessman named Beriah

Magoffin. While permission to document this home was denied by the home-owner, a visual inspection of the residence allowed the surveyor to place this home in the same category of other Late Victorian homes in Deerwood. The locations of these older dwellings were all within several hundred meters of the railroad line that runs across the southern edge of Deerwood.

Marvin Lamppa noted in his history of Minnesota's iron mining that homesteaders, logging interests, and railroad companies were concentrated around Deerwood and Brainerd by the middle of the nineteenth century. They controlled much of the land in Crow Wing County at the time organized iron exploration efforts began (2004, 195). Unlike the early histories of iron mining districts in the Vermilion and Mesabi, the Cuyuna Range had very little land available for sale or lease by the time large iron ore deposits were discovered (Lamppa 2004, 195). These challenging circumstances for iron mining in the early 1900s meant "every investment in a mine was preceded by extensive drilling and every purchase of land was an enormous gamble" (Ibid).

Compared to the patchwork of entrenched owners who were controlling the land and mineral rights in the Cuyuna Range, mining interests had a far easier time acquiring large tracts of mineral lands in the Vermilion and Mesabi ranges. Much of the lands that became part of the Vermilion Iron Range were acquired by wealthy investors around 1880 by using frontmen to survey and purchase federal "public domain" lands before news of mineral deposits were made public (Lamppa 2004, 54). A similar story played out in the acquisition of

the richest iron ore lands of the Mesabi Range by logging companies. Soon after the land was logged, large tracts were resold as “cutover land” at low cost for prospective mining investors to acquire in the early 1890s (Lamppa 2004, 104). It would take a far more sophistication and patience for someone to acquire enough mineral lands in the Cuyuna Range to develop into the first successful mine. While some attempted to prospect and develop iron mining in the Cuyuna Range from 1880 to 1906, it would eventually take the real estate savvy of Cuyler Adams to succeed in piecing together ownership of proven mineral lands where others fell short.

Early Efforts of Mineral Prospecting in Crow Wing County

Many historic accounts about the early years of prospecting for iron ore near what would become Cuyuna Range have a “highly narrative quality” detailing heroic individuals seeking to bring the mining district into being (Cuy-Una. 1976, 5). The first individual described in these narratives is Henry Pajari who in 1882 noticed magnetic deflections in his compass similar to those he had seen while he worked with iron mining companies in Michigan and Wisconsin. After carefully mapping the strongest magnetic anomalies using a device called a dip needle, he attempted to dig several test pits, but was frustrated by seeping water and unmarketable deposits (Cuy-Una. 1976, 4-5). The deposits in other ranges like the Mesabi or the Vermilion tended to be drier and closer to the surface than those in the Cuyuna. These challenges to reaching the iron

ore of the Cuyuna would eventually be addressed over the 20th-century by several technological developments in ore prospecting and benefaction, but until then it remained a challenge to many early mine operations to locate ore and prevent flooding in their mines.

In the same year as Pajari tried and failed to demonstrate the presence of iron ore in Crow Wing County, a significantly wealthier and more experienced railroad land examiner named Cuyler Adams returned to Central Minnesota. He noticed similar magnetic anomalies to those that Pajari had discovered while surveying property with his trusted St. Bernard, Una. Over the next 25 years, from 1882 to 1907 Cuyler organized investors, formed rail and mining companies, conducted systematic drill core tests for ore, and made real-estate deals in order to develop a new iron range (Cuy-Una 1976, 5-6).

A further challenge that delayed the start of the Cuyuna Range as an iron mining district was the fact that all of the iron ore deposits were buried by glacial sediments. Therefore, no outcrops of iron ore were present at the surface, unlike the Vermilion and Mesabi Iron Ranges further north. In May 1890, Edmund J. Longyear introduced diamond core drill prospecting to Minnesota. Within five years this revolutionary technology quickly replaced older methods of exploring with shallow test pits dug by pick and shovel (Lamppa 2004, 122-124).

Drill core testing would eventually allow Cuyler Adams to confirm the presence of marketable iron ore below the depths easily reached by older test

pit methods on properties he surveyed. Drill core prospecting was not just useful for finding ore, it was also a valuable tool used on the Cuyuna range to confirm the absence of ore. This drilling technology allowed regional businessmen, like George Crosby from Duluth, to locate and develop land for working communities by identifying land that was near, but not on top of, rich iron ore deposits. Drill core testing influenced the town he founded in 1908 that would bear his name, Crosby. George Crosby and his fellow land investors would carefully select the lots for townsites without the costly and socially contentious risk of forced relocation of homes and businesses which were built on top of valuable iron deposits. Mesabi Range communities founded in the late nineteenth-century without prior drill core testing would face these costly relocations. These include the relocations of buildings in Eveleth in 1896 and significant portions of Hibbing in 1918 (Lamppa 2004, 162-165, 195-196).

In 1893 the first mining company in Crow Wing County was established by P. G. Fogelstrom and Dr. Werner Hemstead of Brainerd, Minnesota. Unfortunately their joint gamble on iron mining in Crow Wing County would not pay out. Mr Fogelstrom was a well driller and Dr. Hemstead a local physician. These Brainerd businessmen attempted to sink an iron mine shaft near some promising deposits “on the north side of Oak Street in Brainerd, Minnesota” where several locals believed “there was a valuable layer of ore underground” (Himrod 1940, 8-9). The businessmen’s mining venture ended abruptly when their well drill struck solid rock about 50 feet below the surface

with no trace of iron ore (Himrod 1940, 10). It would take greater technological sophistication and financial stamina than the two Brainerd businessmen alone could muster to exploit the mineral wealth of the Cuyuna Range.

Following the Person: Cuyler Adam's Establishes the Cuyuna Range

Between 1902 and 1904 there was much doubt among those living in the two largest regional centers of Brainerd and Duluth that any marketable iron ore existed in Crow Wing County. The locally based effort by Brainerd businessmen P. G. Fogelstrom and Dr. Werner Hemstead had ended in disappointment, further discouraging investors from supporting the ventures by Cuyler Adams and his associates. At this time at the dawn of the 20th-century Adams is described by historians in *Cuyuna Country* as having "no money of his own, nor did he have any connections with people whom he could obtain such speculative funds" (*Cuyuna Country* Vol. 2. 2002, 11). On the other hand Lamppa reports that Adams had made money as a land speculator during the Bonanza Farm boom in North Dakota during the late 1870s and early 1880s. Adams used some of those profits to buy a home in Deerwood, Minnesota in the early 1880s (Lamppa 2004, 190). An account that likely portrays Cuyler Adam's true financial standing comes from a biographical article on his life stating that around 1900, "He had made money, but a good deal of it was tied up in land elsewhere. And his four years of investigation [on the Cuyuna Range] had prevented him from adding much to his income. Therefore his supply of ready

money was limited, and he had hard work getting more." (Clark 1922, 92). Even if he had sold all of his real estate it was likely that those funds alone would not be sufficient to launch his vision of systematically locating and developing the profitable bodies of iron ore he suspected lay in Crow Wing County.

By the time that Adams began to survey and plan how to develop what would become the Cuyuna Iron Range he had made small fortune as a real estate speculator. The surviving historic records and letters from the beginning of the 20th-century reveal he was also clever enough to not stake his entire fortune on developing iron mining in central Minnesota. Cuyler Adams had a close friend and business partner named William C. White. Mr. White was a lawyer "well connected in Duluth and had a great many friends who relied upon him for advice and to whom he could present a venture of this sort with some hope of success" (*Cuyuna Country* Vol. 2. 2002, 11). Adams spent close to 20 years between 1882 and 1902 carefully mapping magnetic anomalies across Crow Wing County and organizing the infrastructure needed to support a mining district. Cuyler Adams started by developing railroad connections between Crow Wing County and the ore docks in Duluth.

According to local legend, though no surviving primary evidence has been located, Adams tried to secure interest in a new railroad line from the Great Northern Railroad's "Empire Builder" James J. Hill. Unfortunately, Adams and Hill could not agree on an acceptable rate to ship iron ore along the proposed railroad (Cuy-Una 1976, 6). Next, Adams incorporated his own railway

company named the Duluth and Iron Range Railroad and secured properties in Duluth for an ore dock and terminals in Crow Wing County (Ibid). The oldest surviving ledgers from Cuyler Adam's archived business files do not indicate he owned any ore dock facilities in 1911. If he did own and develop properties for an iron ore dock in the Duluth area, he must have sold them off between 1903 and 1911. Once he secured a route and dock facilities, Adams then enticed the Canadian Pacific Railroad to build track connecting both properties with the promise of delivering "10 million tons of [iron] ore at 65 cents a ton" (Cuy-Una 1976, 6).

On March 3, 1903, Adams consolidated the railroad company's assets with his newly founded Orelands Mining Company by persuading eight Duluth investors to contribute a thousand dollars each to begin systematic drill core explorations for iron ore. In spite of these successes in laying the groundwork for a mining district and fostering close ties to Duluth investors, few additional investors were willing to purchase stock in the Orelands Mining Company. The sentiment of most potential investors seemed to be "a person would have to be crazy to buy stock in a company trying to find ore where no one had seen any" (Lamppa 2004, 191).

It was at this time that Cuyler Adams and his partners with the Orelands Mining Company had two fortunate events occur. These events changed the impression local investors had about iron mining in the region. A prominent geologist H. B. Ayers entered the region around the time Cuyler Adams began ex-

ploring for iron ore. Mr. Ayers purchased a home “on Dam Lake, Kimberly Township, Aitkin...not only because of the wonderful stand of pine which he found there, but also because of the rock outcrops that he felt indicated the presence of [nearby] iron ore” (*Cuyuna Country* Vol. 2. 2002, 10). Adams persuaded Mr. Ayers to promote geological exploration in the region and to bolster the legitimacy of the Orelands Mining Company’s venture with his formal support.

The second fortunate event for the Orelands Mining Company happened in April 1904 when the Oliver Mining Company, a branch of United States Steel, began exploring south of the existing Mesabi Range into Aitkin and Crow Wing County. Lamppa notes that while their drill crews left the region after conducting only “12 oreless drill holes”, it provided the fundamental shift in many people’s perceptions that helped Adams’ potential investors believe iron ore could really exist beneath the surface (2004, 191). The Duluth investors that Adams and his colleagues desperately sought backing from now concluded that “if United States Steel was interested in the region, there must be ore. Oreland’s mining stock now sold quickly” (Lamppa 2004, 191).

The sudden surge in investment for Orelands stock allowed Adams and his investors to purchase their own drilling equipment from those already in use in the Mesabi Range and transporting them to Deerwood (*Cuyuna Country* Vol. 2 2002, 12). This allowed their company to conduct more concentrated testing in the areas that had been broadly surveyed earlier. Over the summer of 1904,

the Orelands Mining Company had success striking deposits of high grade iron ore where the Oliver Mining Company had failed in their search earlier that year. According to one of the original members belonging to a three-person survey crew working for the Orelands company, “not much of the original money was left in the treasury when [the Orelands crew struck] a large boulder...it became necessary to abandon the original location of this hole and move 50 to 100 feet over...the new hole, being off maximum [magnetic indication of ore, thus unlikely to yield iron ore] was exactly in the right situation and encountered excellent grade ore which subsequently became a part of the Kennedy Mine (*Cuyuna Country* Vol. 2 2002, 14-15).

Over the next two years the Orelands Mining Company focused on acquiring land, further drill testing, and enticing investors into leasing mineral lands from them. Shortly after the spring of 1905, Duluth-based mining companies began exploring and purchasing land in Crow Wing and Aitkin Counties (Lamppa 2004, 191). Charles Leith, a visiting geologist from the Mesabi Range, met with Cuyler Adams and asked him what he thought the new iron range should be called. This was during a brief time of intense mineral exploration and new possibilities. According to local legend, “Adams’ wife, Virginia suggested a combination of the first syllable of Cuyler’s name Cuy [a name he was often called by in letters from his close friends and family] along with the name of his favorite dog Una [Cuyler’s faithful companion on surveys] Cuy-una.

Professor Leith approved and from that time the name was used in all official publications" (Lamppa 2004, 191).

Within two years, by June 1907, Cuyler Adams and his business partners enticed S. A. Kennedy of the Rogers-Brown Ore company of Buffalo, New York to lease and develop the property which became known as the Kennedy Mine, the first active iron mine on the Cuyuna Range (Himrod 1940, 32). According to letters from the Adams Family Mine Company Collection, by early 1908 Adams was again negotiating with businessmen he knew at the Northern Pacific Railroad to expand the amount of rail capacity used to bring Cuyuna Range ores to market. It appears Adams was able to negotiate a shipping rate lower than what the Northern Pacific charged for mines in the Mesabi range. He achieved this in part because the railroad company was unsure if the ore would be marketable at a higher rate. He was also able to achieve this favorable price because he had a long history of business dealings dating back to his time working for the Northern Pacific in North Dakota in the 1870s and 1880s (Adams Family Mines Collection).

Over 20 years, from the 1880s to 1900s, suspicions of iron ore deposits eventually attracted the right combination of investment, planning, exploration, and development in a new iron mining range. Cuyuler Adams is rightfully in the center of the early history of the Cuyuna Range, but credit must also be given to developments like the introduction of Longyear's diamond core drill technology and the explorations of U.S. Steel's Oliver Mining Company to the region.

The next 15 years after the start of the Kennedy Mine brought booming growth to local mines and the communities surrounding them. Those communities, on average, would develop in a more organized manner than had occurred on the Vermilion and Mesabi Iron Ranges. The working families and businesspeople that would populate these new communities were different from those that had arrived in the region before the discovery of iron ore. Even before these newcomers were fully established in these industrial communities they would quickly challenge the careful plans of businessmen like Cuyler Adams and George Crosby. These ‘growing-pains’ of industrial community formation would leave lasting effects on the region.

Part 2: Development and Disaster

"What people lack, at any time, is not opportunities — there are always plenty of those — but the knack of opening the door in their minds, if you can call it that, which gives them the courage to decide on something and to see it through."

-Cuyler Adams

"I knew if we lost a minute it was too late.…I just run, and fall down, and run some more. I get to the ladder. I reach for it. I miss it. I grab it and start up. I am all in. But I am damned if I stop."

-Matt Kangas recounting how he survived the Milford Mine Disaster of February 5th, 1924

Figure 7. Map Crow Wing and western Aitkin Counties showing the county seats, major iron ore bodies, mining communities, and flow of the Mississippi River in the Cuyuna Iron Range circa 1920. Adapted from “Production of High-Grade Manganese Products From Cuyuna R-N Tailing” Washington D.C: United States Department of Commerce. 1965, Page 3.

Figure 8. A circa 1911 view of the town of Cuyuna, the first purpose-built industrial community in the area. Note the one and a half story miner's houses on the far right and the two story tall boarding house on the far left of the image. Most of this housing and the first story of the boarding house remains today. Image Care of Cuyuna Country Heritage Network.

Figure 9. A 1913 Image of recently built Honeymoon Row housing in Crosby. Most houses remain today, but their porches are enclosed. Image Care of Cuyuna Country Heritage Network.

Figure 10. A Row of miner's homes in Riverton circa 1913. Note the distinctive slightly hipped gables on the one and a half story homes. Several of these homes remain, but now include one story homes from the former town of Manganese. Image Care of Cuyuna Country Heritage Network.

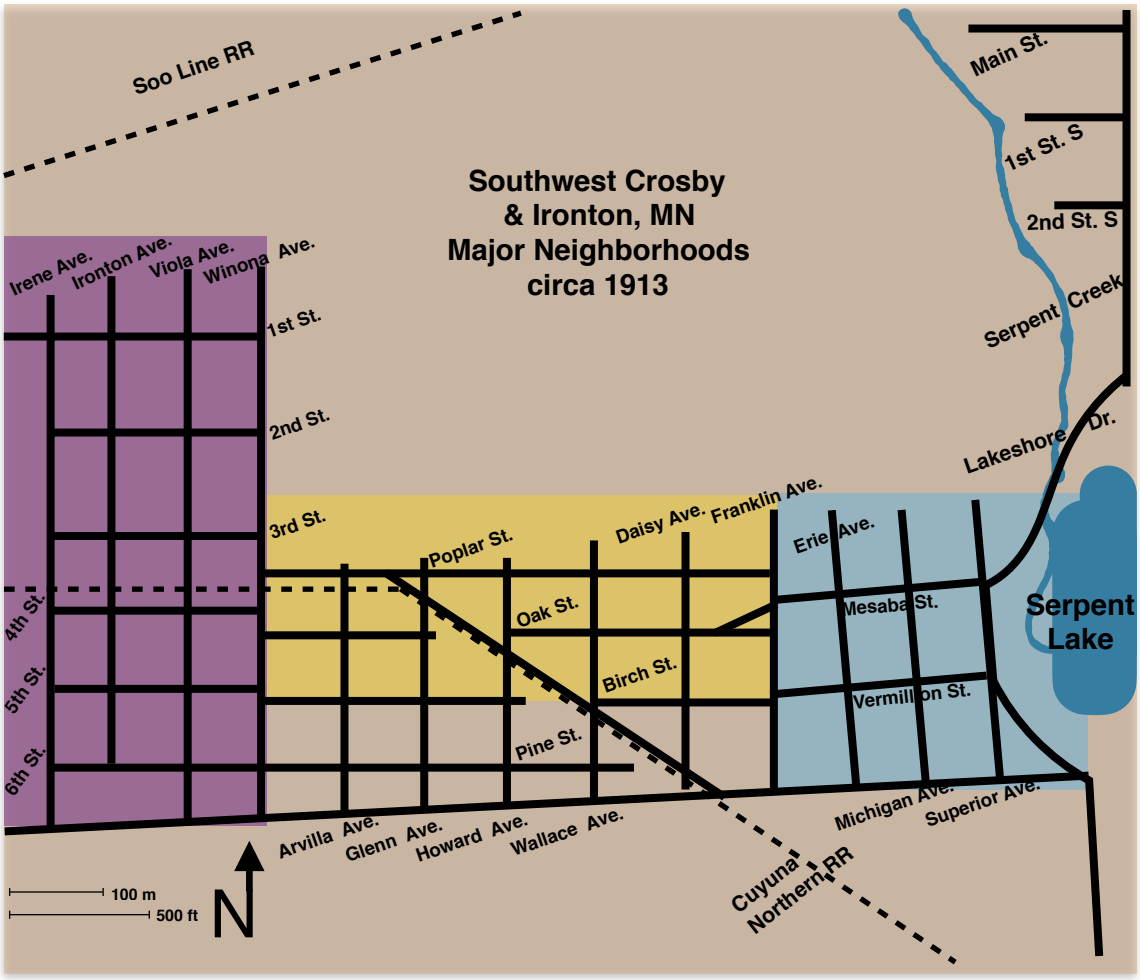


Figure 11a. A color coded map of Crosby's western platted neighborhoods and the neighboring town of Ironton to the west of Crosby. Blue: Lakeview, Yellow: Balkan Street, Purple: Ironton. Original image by author with information from: 1913 *Standard Atlas of Crow Wing County, Minnesota*. Chicago: George A. Ogle and Company. University of Minnesota Borchert Map Collection. Call Number G1428.C8 G42x 1913. http://geo.lib.umn.edu/collections/digitizedplatbooks/crowwing_1913_index.htm. accessed October 7, 2015.

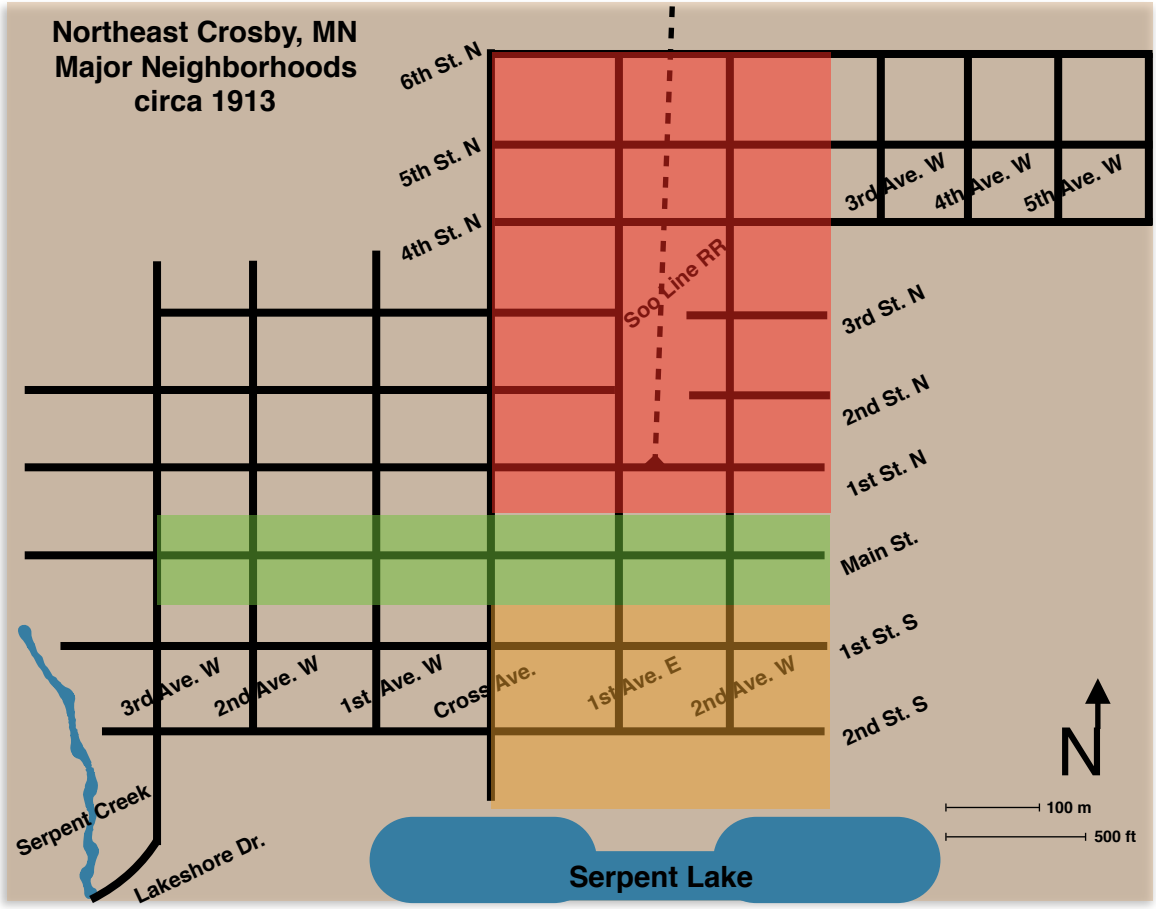


Figure 11b. A color coded map of Crosby's northern and eastern neighborhoods. Red: Honeymoon Row, Green: Main Street Commercial District, Orange: Gold Coast. Original image by author with information from: 1913 *Standard Atlas of Crow Wing County, Minnesota*. Chicago: George A. Ogle and Company. University of Minnesota Borchert Map Collection. Call Number G1428.C8 G42x 1913. http://geo.lib.umn.edu/collections/digitizedplatbooks/crowwing_1913_index.htm. accessed October 7, 2015.

Figure 12. A photograph of miners on strike along Main Street of Crosby in 1913. Image care of the Cuyuna Range Heritage Network.

Chapter 3: 1907 - 1913
Bursts of Opportunity

Table 3: US Federal Census of population and change from 1900 to 1910 in three regions of Minnesota that developed iron mining communities. ancestry.com: US Federal Census Collection. Accessed December 7, 2015.

Table of Population Change		
Population By County	**1910**	1900-10 % Change
Crow Wing [Cuyuna Range]	**16,861**	+18%
St. Louis [Vermilion and Mesabi Range]	**163,274**	+97%
Itasca [Mesabi Range]	**17,208**	+276%

The apparent success of the Kennedy Mine in 1907 helped to inspire the formation of new communities near the mine location. The area around the mine quickly developed supporting structures and became the first industrial community on the Cuyuna Iron Range. Historic accounts of the Kennedy Mine mention that by the end of December 1907 the new mine had “a shaft down 60 feet, an engine house, a blacksmith shop, and other buildings” already constructed (Cuy-Una 1976, 19).

In 1908 the town of Cuyuna developed near the Kennedy Mine and had become the first permanent settlement spurred by the iron mining boom in the region (Figure 8). Twelve of the seventeen historic structures surveyed in Cuyuna date from this period of rapid development from 1908 to 1918 approxi-

mately. The oldest is a log-frame building that may have been constructed before roads and rails could easily bring materials for building structures. Other homes built soon after roads were established come in two main varieties. Nine residences are of the first type and were built during the start of Cuyuna's growth. These homes are one-and-a-half stories tall, end gabled, and designed to hold a single family. All of these structures originally had open front porches facing the street. Many of these dwellings now have enclosed this porch area to give the homes additional all-season living space. This is a trend that reoccurs with many of the other documented early 20th-century homes in other Cuyuna Range communities such as Honeymoon Row in Crosby. The second type of early 20th-century dwellings in Cuyuna are the three surviving one story end gabled structures with a very narrow floor plan, giving them the appearance of a "shotgun-style cabin". The location of these dwellings between the larger single family dwellings or on the edges of residential blocks suggests they might have been built near the peak of the boom in Cuyuna's growth when some lots were divided to pack extra housing into the already built-up center of the community.

Throughout 1908 the Kennedy mine stockpiled ore at a rate which pleased its investors. Unfortunately, the mine still lacked a direct railroad connection, making it difficult and costly to ship materials into and out of the mine property (Himrod 1940, 36). Before a six mile railroad spur from Deerwood to the Kennedy Mine was established, supplies were moved "by wagon or sled

from Deerwood up and down the hills to the mine site. It is reported that it cost as much to get coal to the mine from Deerwood as it did [to bring coal] all the way from Pittsburgh to Deerwood in the first place" (*Cuy-Una* 1976, 19).

Cuyler Adams coordinated agreements from property owners along the Cuyuna Range to commit a certain tonnage of iron ore by 1910 and for the Soo Railroad to build 100 miles of track between Duluth and the Cuyuna Range along with charging a rate of only 65 cents per ton of ore shipped. A *St. Paul Dispatch* report from 1909 mentioned in *Cuyuna Country* states, "the construction of this railroad might break the steel trust monopoly, as it would enable independent furnace operators to get [more affordable ore] in competition with the steel trust, which owned the Mesabi Range railroads and had set the price of hauling ore at 80 cents per ton" (2002, 23). These deals led to the Soo Line Railroad building the required track and ore dock facilities just north of Duluth in Superior, Wisconsin by 1911. The first shipment received on this new line was nine carloads of coal to the Kennedy mine by January 1910, the first shipment of ore out of the Cuyuna range came from the Kennedy Mine, 42 carloads worth, on April 11, 1911 (*Cuyuna Country* 2002, 25-27).

At last Cuyler Adam's persistence and toil to help foster the Cuyuna Iron Range into being was returning profits. The oldest surviving tax return for Cuyler Adams reported that he earned an estimated $33,000 (1914 Tax Return, Adams Family Mines Collection). That amount is approximately $500,000 to

$750,000 in 2015 dollars. Over two-thirds of this income was reported to be "royalties from mines" which were located on the Cuyuna Range.

Following the Person: George Crosby and Cuyuna's Largest Community

Along with the rise of the first mine, the founding of what would be the largest and best organized city in the region, Crosby, was accomplished with more planning and coordination between merchants, real estate brokers, and financiers than many other mining communities in Minnesota. Like the other mining communities about to develop in the Cuyuna Range, the City of Crosby was independently started by private businesspeople with intent to make money on developing real-estate near, but not over the richest iron deposits. Duluth businessman George H. Crosby, the city's founder, had his first financial successes in the 1890s by surveying properties for iron ore on the Mesabi Range. First he surveyed, then purchased, and later resold his Mesabi Range properties to iron mining companies. Later, he would expand his mining interests to "Utah, a number of claims in Arizona, and other operations in Montana, Washington, and New Mexico" (*Cuyuna Country* 2002, 74).

From this wealth of personal experience with mine operations George "was determined to avoid the mistakes and excesses of earlier Mesabi mining towns" (Lamppa 2004, 195-196). Mr. Crosby conducted diamond drill core testing shortly before he acquired land for the community in 1908. When no ore was found, the streets were surveyed. Lastly, George Crosby ensured the latest amenities were available to residents including "graded streets, eight wells for

drinking water, sewer lines, sidewalks with cement curbs, lots for buildings, community park, public beach, children's playground, baseball field, a band-stand, and 100 low rent miners' cottages" (Lamppa 2004, 196). These features were advertised through promotional brochures in order to attract enough laborers to work in the newly developed mine locations close to the community of Crosby. One of the key selling points over other mining settlements in the area was the promise that "Every deed to a lot in the original plats of Crosby is without mineral reservation. There will be no removals, no tearing down. There are no uncertainties in the way of substantial improvements" meaning the miners living in Crosby would have guaranteed housing and community amenities regardless of the changing conditions around the nearby mine locations (Cuyuna 1976, 28).

George Crosby is most often given credit for financing, founding, and promoting settlement in the city of Crosby. However, his younger brother Matt Crosby was the city of Crosby's first mayor. From approximately 1908 onward Matt Crosby spent his life living in and directly managing the early development of the city. He first acted as the treasurer for the town's organizing committee and appears to have been elected by that committee to act as mayor once the community was established around 1910 (*Cuyuna Country Vol. 2*, 2002, 75). Matt lived and worked close to the community of Crosby for the rest of his life. Matt was responsible for overseeing the survey work on their community, and reported to his brother about the progress of construction. George Crosby

would live most of his life in Duluth, close to his business associates and financial interests located there (*Cuyuna Country Vol 2.* 2002, 74-76).

Wealthy investors, mostly based in Duluth, controlled the major banks supplying the mortgages for lots that were sold. Many of the business owners that could afford to move into the brick and plate-glass walled store fronts of Main Street were frequently successful business owners from Duluth, Brainerd, or Hibbing (*Cuyuna Country* Vol. 2 2002, 163-169, 275-294). The local political scene was also dominated by leaders from this business class with Matt Crosby as the mayor and figurehead of this community establishment. So while no single mining company or business entity controlled Crosby or any other mining community of the Cuyuna Range, there were clear social and physical divisions between those that were invested in mines or large businesses and those who were laboring in mines and supporting themselves with small neighborhood business.

The commercial center of Crosby in 2012 retained many of the historic facades dating from 100 to 85 years ago. The main change to many of them has been to their first story plate glass windows. Many have been replaced with walls and smaller, more energy efficient windows. Most stores are still operating, but are now antique shops and novelty stores. Some stores are not open or are underutilized.

The population of Crosby grew quickly in the early 20th century after lots became available for development. The earliest reported population for Crosby

was only 300 in 1910, but grew to 1000 by 1911 and doubled to 2000 by 1912 (*Cuyuna Country* Vol. 2 2002, 140). Many of these new Crosby residents were recent immigrants from Scandinavia and Southern Europe and were not familiar with the type of industrial community being developed in Crosby.

Margaret Crawford quotes contemporary sources on mining company town design from around the time mining company towns like Crosby, Minnesota were being built in the first decade of the 20th-century. Her sources state that managers of that time were calling it “new era for company towns” focused upon “scientific treatment” of the landscape to foster better worker loyalty with more amenities and standardization of living conditions (Crawford 1995, 129). This was being done by managers of mining interests to counter labor union claims of low quality living conditions or conditions that favored certain classes of workers over others (Ibid). In Crawford’s summary of these “new” company towns built from approximately 1909 to 1929 she notes, “virtually all had been designed as complete communities, including housing, shops and services, public spaces, and recreational facilities. In addition, nearly all were physically and conceptually separate from their industrial purpose -the factory or mine” (Crawford 1995, 200). All of these “complete” features for a new-style company town were present at the founding of Crosby, Minnesota.

A central focus of John Byczynski’s thesis, *Claiming the Mines*, is the formation of Crosby and the ways its founders structured class and power relationships into the landscape. Brycznski accomplished this analysis by exploring

historic maps and census records rather than studying the physical structures of the neighborhoods. The community of Crosby is situated between Serpent Lake to the south and what was the largest deposit of iron ore to be developed in the district just to the north of the city. Crosby is carefully gridded with an east-west running main street working as a central axis separating most of the earliest worker housing to the north, closer to the former mines from the more luxurious lakeside dwellings built south of main street (Figure 11a). Byczynski noted that the early Crosby building ordinances required expensive brick structures be built on main street. This ordinance helped to enforce social divisions between wealthier local merchants that could afford to be located along Main Street from those wishing to establish small businesses in their own neighborhoods.

At present, two-thirds of the surviving historic brick commercial buildings on the Cuyuna Range (26 of 36 sites) are from Crosby. 19 of those Crosby sites are two stories tall with large plate glass windows along their fronts facing Main Street. Some of these large windows have been replaced with walls and smaller windows which may help hold in heat more effectively in the winter months. Nine of the remaining brick commercial buildings which generally share similar traits in style and age to Crosby, belong to Ironton's main commercial district along 4th street. The majority of non-brick commercial buildings in Crosby and Ironton were situated between the residential neighborhoods

along Oak and 3rd Avenue SW and were often the local grocery or other dry goods store for that ethnic neighborhood.

The way that the Crosby brothers positioned Main Street in Crosby also demarcated the separation of the “Gold Coast” neighborhood with housing for mine managers, engineers, and wealthy merchants from the other neighborhoods occupied by miners and their families. (2011, 29). The local ordinance policies also helped to clearly divide class boundaries between businesspeople and laborers by making it harder for smaller shopkeepers to afford a space in the commercial center of Crosby (Ibid). Byczynski’s map of early settlement in Crosby clearly shows the most dense concentrations of laborers is north of main street in what became known as “Honeymoon Row” (2011, 24) (Figure 9). The homes and surrounding lots in this area are likely the ones George Crosby had advertised as the “100 low rent miners’ cottages” (Lamppa 2004, 196).

When this neighborhood was surveyed in 2012 many of the homes built nearly 100 years earlier remained, but most had enclosed their front porches to increase the amount of all-season living space. Another dense concentration of housing for mine laborers was due east of Serpent Lake in the marshy “Lakeview” neighborhood. This neighborhood had many multi-story homes and boardinghouses. In 2012 the survey of this neighborhood showed clusters of historic buildings mixed with more recent dwellings. Some of the roads along the western edge of this neighborhood have been closed and changed. A scenic strip of land along the northern shore of Serpent Lake became the ex-

clusive “Gold Coast” neighborhood of wealthy businesspeople and mine managers. The area in 2012 remained similar in affluence and appearance to the way it did when first platted, but some additional houses have been added onto the larger lots. Many of the homes closest to the lake have additional privacy fences and foliage making it difficult to assess the condition of these historic homes from the public roadways. The homes of the mine managers and business elite in the early 20th century were located between the two largest concentrations of mine workers, but somewhat separated by narrow strips of commercial development on Main Street to the north and 3rd Avenue to the south and west.

Pappas (2004) noted the centrality of managers in his own study of industrial communities among the logging camps in California during the early 20th-century. The dwellings of the superintendent and assistant superintendent in his study were located close to the “central dwelling area” of single loggers, but still separated by a steep slope. This arrangement of space allowed managers to display their elevated status, through separation by residing on the slope of hill and their interest in controlling the working population by ensuring their dwellings could be seen by the densest concentrations of worker dwellings (Pappas 2004, 164).

The dwellings of the Cuyuna Range were not like the “uniform style” of cabin described in Pappas’ central dwelling area. It seems that in Crosby at least, the intent was to develop and sell lots that looked more like the married

residences that Pappas described with variations in their exteriors. The text from one of the early Crosby promotional brochures has been reproduced in the *Cuy-Una* text. This text notes the dwellings, “varying in design and color to avoid the horror of monotony” (1976, 29). Early photographs of these dwellings show they were clearly designed for single-family occupancy, and their appearances did not vary nearly as much as advertisements would suggest. Pappas discusses that the renters of “Family” cabins in the logging camps he studied were given the freedom to personalize and modify their dwellings which varied slightly from a standardized format (2004, 165). Federal Census records from the 1920s and 1930s indicate many of the single miners in the Cuyuna Range during the first decades of booming growth in the Cuyuna Range stayed in boarding houses that were mostly located in the “Lakeview” and “Balkan Street” neighborhoods, those miners living with their families were more likely to be the occupants in cabins for rent along “Honeymoon Row”. This social division by marital status and employment as laborers or management in Crosby thus has similar features to the logging camps studied by Pappas (2004).

One piece of historical evidence demonstrates the arrangement of married and un-married laborers had a ‘moralistic’ component. This debate was illustrated in a local Crosby Crucible cartoon from the first years of Crosby’s development, prior to the passing of the 18th amendment in 1919 prohibiting the sale of alcohol nationwide. The cartoon represents the neighboring town of Ironton as a magnet with saloons drawing laborers and other residents

away from Crosby while business leaders and 'boosters' look on with dismay. The text below this image states "Which Shall it be? — The Licensed Saloon or the 'blind pig?'/ With Ironton's saloon but 15 minutes from Main Street does a dry Crosby pay?/ You can vote the town dry, but not the people" ("Which Shall it be?" 1915, 5).

The "Lakeview" and "Balkan Street" neighborhoods contained many of the boarding houses for single miners in Crosby. Those neighborhoods are even closer to Ironton than the 15 minute walk from Crosby's main street mentioned in the cartoon. While it may have been in George Crosby and other founder's vision to have a temperate and family oriented community in Crosby, there is no record suggesting that the City of Crosby actually passed laws banning saloons. Despite this fact, Ironton was always known for its nightlife of saloons, theaters, and other forms of entertainment compared to Crosby (*Cuyuna Country* Vol. 2, 170-171). This dynamic of a temperate, well ordered industrial community adjacent to a community with a bawdier nightlife mirrors the social arrangement found between the industrial community of Morgan Park, Minnesota and neighboring areas such as Superior, Wisconsin described in Alanen's *Morgan Park (*2007, 156 & 211).

The new residents in Crosby, as for much of the Cuyuna Range, came from different regions than the previous generation of European-American settlers before them. Immigrants from Finland and Finnish-Americans, some of whom had been in the United States for many years or even a generation came

to settle in the marshy Lakeview district along the southern and western edges of Crosby. Other Scandinavians from Norway and Sweden settled in the northeastern portion of Crosby near “Honeymoon Row” (*Cuyuna Country* 2002, 141). Many of the newest immigrants to the Cuyuna Range, and to the United States in general, came from portions what was Austria-Hungary. Many of them settled west of the “Lakeview” neighborhood in the appropriately named “Balkan Street” neighborhood (Figure 11b). Other immigrants from Italy and Germany also settled into distinct ethnic enclaves within Crosby (Ibid).

Of the 94 documented houses located in the northeastern portion of Crosby, 69 were reported to be built from the earliest years of Crosby’s founding. Of those 69 early residences there are 41 nearly identical floor plan, one story hip roofed, single family homes frequently referred to by local residents as “Honeymoon Row” houses. These 41 dwellings are particularly concentrated along 2nd and 3rd Streets NE. Like the miner’s homes in Cuyuna, these homes originally had a small front porch facing the street, but most have now been enclosed or removed. The other 28 documented 1910 to 1920 era dwellings typically are one and a half story single family residences. A few 1940 Federal Census records tied to these larger residences in the Honeymoon Row neighborhood show their owners were often teachers, clerks, and small business owners. These 28 homes tend to be along the edges of the other workers housing on 1st street (one block north from Main Street) or along 7th and 8th streets NE.

Several dwellings recorded in the Lakeview district served as boarding houses according to Federal Census records from the 1920s. These boarding houses tended to be slightly larger than most single family dwellings of the era at one and a half or two stories in height. Wood (2004) effectively demonstrated in her archaeological study of boarding miners within worker's homes that this practice was an important source of income supported by the women maintaining the household for their families and their boarders.

Only a few dwellings of the former "Balkan Street" neighborhood survive and have been moved to communities like Ironton. In the 1970s a new high school was built over much of this neighborhood. The few surviving houses are one story single family dwellings that are very representative of other homes from that era.

Federal Census data from 1920 shows that a large proportion of the workers living in Crosby, Ironton, Manganese, and Riverton identified themselves as "Yugoslavian", "Serbian", "Croatian", or "Austrian". These immigrants had left the social and political upheaval present in the Austro-Hungarian Empire as it experienced rapid industrialization over the late 19th to the early 20th centuries prior to the First World War. Many of these immigrants had come from rural-agricultural contexts and could be described in the same way Thompson notes the displaced agricultural laborers were when England's working class began to form at the start of the 19th century (1963, 215). The large numbers of immigrants from Southern Europe that came to the Cuyuna Range were not

accustomed to the constraints of time (both seasonally and daily) or to the unique difficulties of underground mining. These laborers sought the means to reassert more control over their working lives.

Following the Conflict: Sites of Ethnic, Social, and Political Identity

A portion of the Finnish immigrants that came to the Cuyuna Iron Range came from other mining districts in the Great Lakes region that had large immigrant communities of Finnish laborers. However, Brunfelt a historian with a focus on local ethnic populations, reported that many were recent immigrants from Finland and were more likely to be politically "radicalized" than earlier communities of Finnish-Americans. These 20th-century Finnish immigrants had witnessed the social upheavals that would culminate in Finland's independence from Russia by 1917 (2000, 30). This population quickly established social and political structures within the growing working community of Crosby. While Finnish immigrants supplied the political coordination for laborers in the early years of the Cuyuna Range, the only way for them to have their grievances heard by mining companies was to gain the backing from the larger population of Southern European immigrants.

The focal-point of these social and political efforts became the building of the Finnish Worker's Hall at the corner of 1st Street South and 2nd Avenue South, just off of the southwestern corner of the commercial center of Crosby. Brunfelt reported that the cooperative company founded to construct the work-

ers hall declared the facility would be open to any “Society, societies, body or bodies of work-men, wage earners, or socialists” in the community (2000, 31). Thompson notes that political and cultural forces are as much a factor in shaping a cohesive working class as economic factors can be (1963, 164). The fact that this Finnish Worker’s Hall would serve as a an early hub of political rallies and cultural performances in the Cuyuna Range should come then as no surprise.

Even while the Finn Hall was incomplete on April 12th, 1913 it still served as a center for miners of many different ethnicities to meet and organize the first strike in the Cuyuna Range (Brunfelt 2000, 32). The short-lived strike was not organized by either the Western Federation of Mines or the International Workers of the World, but by a regional chapter of the Finnish Socialist Party based in Duluth (Ibid). Brunfelt reports that this choice to hold a strike without wider support from a national labor organization reflects the competing factions within Finnish socialist movement which had “differing views of Marxist philosophy and over affiliation with the Industrial Workers of the World [IWW]” (2000, 31). Therefore, in order to unify the most politically active Finns in the Cuyuna Range, almost no outside help was sought. The local efforts to encourage miners to strike caused about one thousand striking mine laborers from four of the largest active mines at the time (Kennedy, Armour #1 & #2, and Thompson) to walk out. This body of striking miners amounted to almost half the local population of the time. They demanded three major concessions in-

cluding an end to contracts, certainty in the length of their workday at 8 hours, and set minimums for pay underground at three dollars (“Miner’s Strike” 1913, 1). Interestingly, no demands to recognize a union or to promote further labor organizations across the region were made. Local representatives from the Socialist Party and International Workers of the World arrived to the Cuyuna Range well after the start of the strike because as John Byczynski noted these groups “sensed if they would not show sympathy with the [Cuyuna Range] miners, they would lose credibility amongst the workers” (2011, 43). The IWW representative sent to the Cuyuna Range recounted that when he arrived to attend a critical meeting between strikers and management he was “escorted to a Finnish boarding house for supper. After supper I tried to gain admittance to the meeting [already in progress without his knowledge], but found the door locked so that I could not gain admittance.” (Fenton 1913, 7). It appears likely that the Socialist Party and IWW were caught off-guard by the Cuyuna Range strike of 1913 and were never fully able to bring their resources to bear by the time the strike ended a few weeks later. This lack of input from larger labor organizations meant the Cuyuna miner’s demands were narrowly focused on the issues they most wanted to change. However, it also meant the workers did not have the logistical resources that a national labor organization would normally provide to sustain a lengthy strike.

An era of labor conflict over contract mining in Minnesota’s iron mines had begun with a very contentious strike organized by the Western Federation

of Mines in the Mesabi Range during 1907 where “hatred festered” for years afterward (Lamppa 2004, 210). The era ended with a federally negotiated settlement to a particularly violent and chaotic strike organized by the IWW on the Mesabi range in 1916 (Lamppa, 2004, 215). In Lamppa’s account of this period of labor unrest he claimed that the 1913 strike on the Cuyuna was “put down in the usual manner” in the same way conflicts had been settled in the Mesabi Range, meaning with armed guards, blacklists, and hiring scab laborers to replace those on strike (Lamppa 2004, 210). In reality, the Cuyuna Range’s first experience with labor unrest was quite different from others in the region. Between those two disruptive, partisan, lengthy, and unsuccessful labor outbursts managed by national labor organizations on the Mesabi Range in 1907 and 1916 stands the comparatively peaceful, candid, relatively brief, and locally organized Cuyuna Iron Range strike of 1913 (Figure 12).

Contract labor mining in Minnesota, according to Brunfelt and Lamppa, was viewed by many miners as inherently unfair. Most miners of the time worked in teams of two or four under the direction of a mine captain. Contracts were negotiated by the mine captain with mine owners and rates were paid based on the value and amount of ore mined. This left miner’s pay to be set by the fluctuating market price of ore, the unknown variations of the iron ore vein, and the biases of their mine captain who might require a bribe to allow a team to work an easier or more profitable part of the mine. (Brunfelt 2000, 26-28, Lamppa 2004 69, 89).

In 1913 the striking miners and mine company representatives on the Cuyuna Range began their debate by listing their positions openly through the local newspaper. The worker's provided numbered "demands" and the mining companies published a point-for-point rebuttal titled "the ultimatum" listed on page one in the April 11th and 12th, 1913 editions of the *Crosby Crucible*. The parties meeting at the Finn Hall included delegations from the business community, mine companies, and striking workers who discussed terms for two weeks. The strike committee was composed of a diverse ethnic cross-section of the mining population. Members "included an Italian, Joe Guitto; a Swede, Theodore Sjerblom; a 'Scandinavian' Theodore Parson; two Austrians, George Biondich and John Barkich; a Montenegrin, Emil Martin; a Serbian, F. Kovevich; and a Finn, Otto Berklund." (Brunfelt 2000, 33).

According to the *Crosby Crucible* newspaper, a settlement was announced on April 26th. The settlement did give the workers greater certainties about the length of workdays, pay, and obligated mine companies to supply tools along with compensation for blasting supplies in mining contracts ("Strike Settled" 1913. 1). The laborers did not gain everything they had wished for when the strike began. In particular, the contract system remained a factor in determining the pay rate for miners in most Cuyuna Mines for decades to come. Especially after witnessing the turbulence of the 1916 Mesabi Range strike, iron mine operators in Minnesota gradually set more generous rates in their contracts. Also, as the United States prepared to enter the First World War

the market for iron ore was “at an all time high, with the labor pool at an all time low, the mines of the Iron Country wanted *-and needed-* a contented workforce.” (emphasis in original, Lamppa 2004, 216).

Not only the workers claimed the conclusion of the 1913 strike as a ‘victory’. Real estate developers sized upon the publicity that the strike had brought to the region to highlight its relatively friendly business and labor relations compared to neighboring mining districts. A flier from the “Almira Land Company” stated,

A month ago people would have doubted the idea that were 1000 or 1200 miners working in the vicinity of Crosby. Now they are sure of it. Crosby was the storm center of the struggle which lasted nearly two weeks, and its staunch business men lent every aid in the adjustment of differences. Many business deals were pending when trouble broke out which naturally were deferred while the fight was on, but the word was no sooner passed that an agreement had been reached when business began to hum once more. The real estate market particularly reflected the good tidings and a dozen more sales were reported in Crosby the first day work was resumed at the mines, indicating the strong faith business men have in this town, that has been the leader in the Cuyuna Range (Reproduced in *Cuyuna Country* Vol. 2 2002, 43).

In addition to the victory being claimed by the business community, the labor settlement reached on the Cuyuna Range in 1913 demonstrated the power of social organizations and the early importance of the Finn Hall as a

place for establishing the political voice for immigrant laborers in the region. By December of 1913 the Finn Hall held its first social event, a holiday concert, in time for Christmas (“Hall is Dedicated” 1913, 1). In this formative period for working communities in the Cuyuna Range, and Crosby in particular, other ethnic groups also met at the Finnish Worker’s Hall until they could organize and raise funds for their own community centers. Through the next four decades the Finn Hall would continue to serve as a social and political epicenter for the Cuyuna Range through elections, strikes, mine disasters, as well as concerts, parties, and other celebrations.

With the risk of labor unrest over, for the moment, the Cuyuna Range was poised for booming growth. Twenty-nine new iron mines would open across the entire Cuyuna Range in the next decade. This era would attract inventors, innovators, and many more miners seeking to make their own fortunes. The booming communities would also attract a fair share of those wanting to profit on the demand for liquor and vice as well, sparking a region-wide “Saloon Debate” about how to regulate or outlaw liquor. As the First World War concluded a second rush commenced to find ways to keep the boom times going, however this haste contributed to one of the deadliest tragedies in the entire history of iron mining in the Lake Superior region.

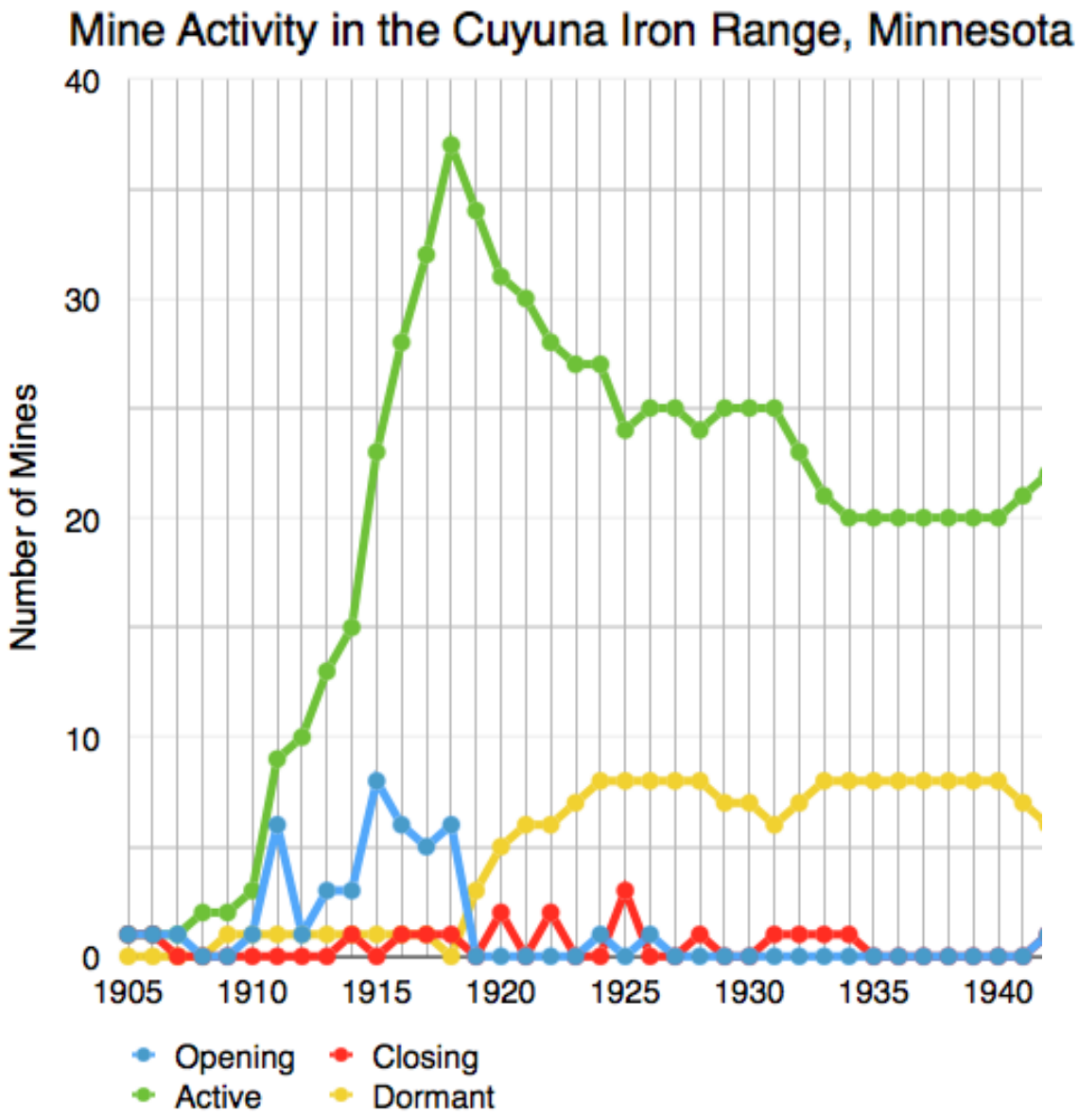


Figure 13a. Chart showing the 1905-1940 year-by-year numbers of mines opening for the first time (blue), mines permanently closing (red), actively mining iron ore (green), and those dormant (yellow). Those mines in yellow will eventually be actively mined again, but the only activity happening on them that year is that existing stockpiles of ore are being sold, but no new ore is being mined. Data source: *Cuyuna Country Volume 2,* 2002, 96-102 and "Mines in Crow Wing County through 1984" *U.S. Bureau of Mines.*

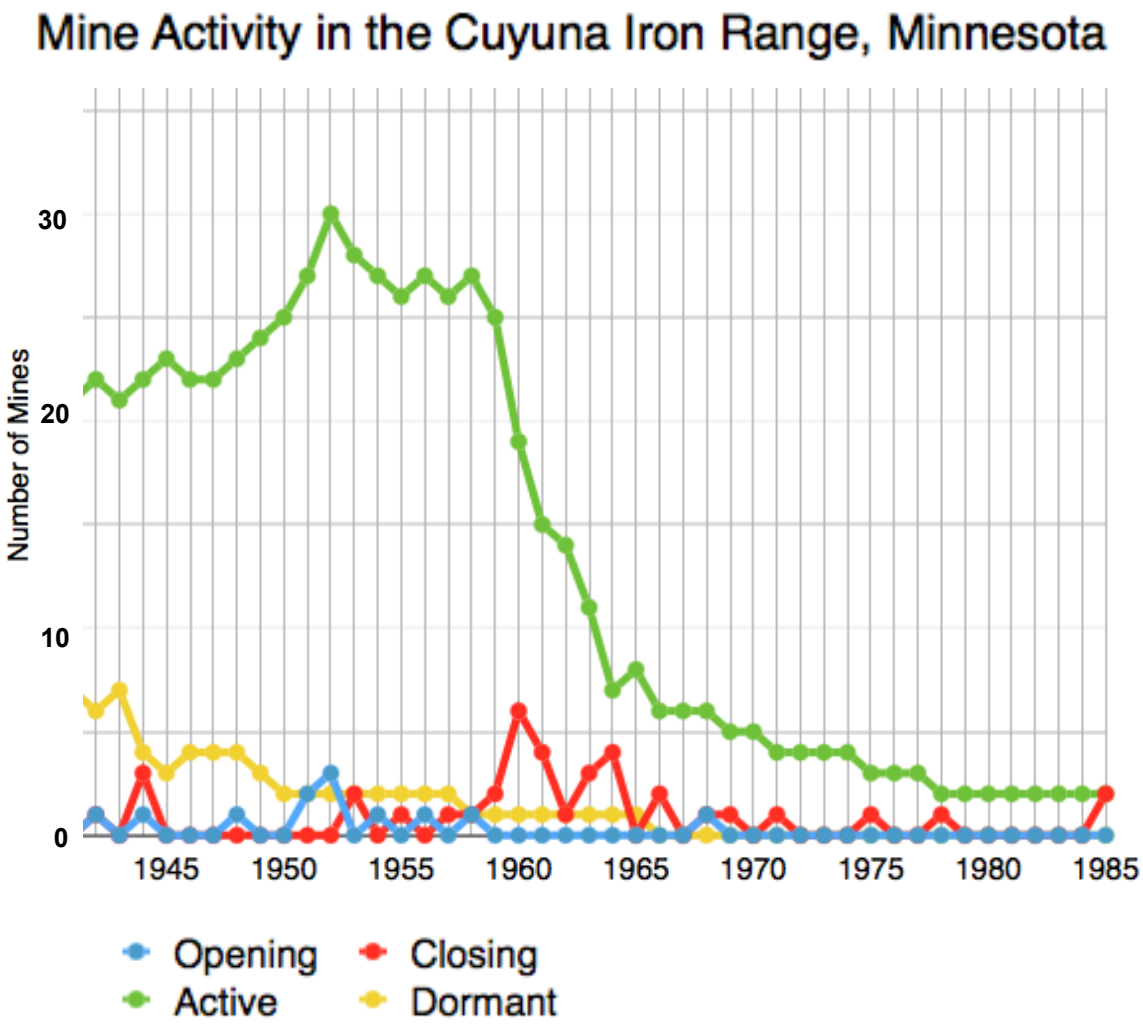


Figure 13b. Chart showing the 1941-1985 year-by-year numbers of mines opening for the first time (blue), mines permanently closing (red), actively mining iron ore (green), and those dormant (yellow). Those mines in yellow will eventually be actively mined again, but the only activity happening on them that year is that existing stockpiles of ore are being sold, but no new ore is being mined. Data source: *Cuyuna Country Volume 2,* 2002, 96-102 and "Mines in Crow Wing County through 1984" *U.S. Bureau of Mines.*

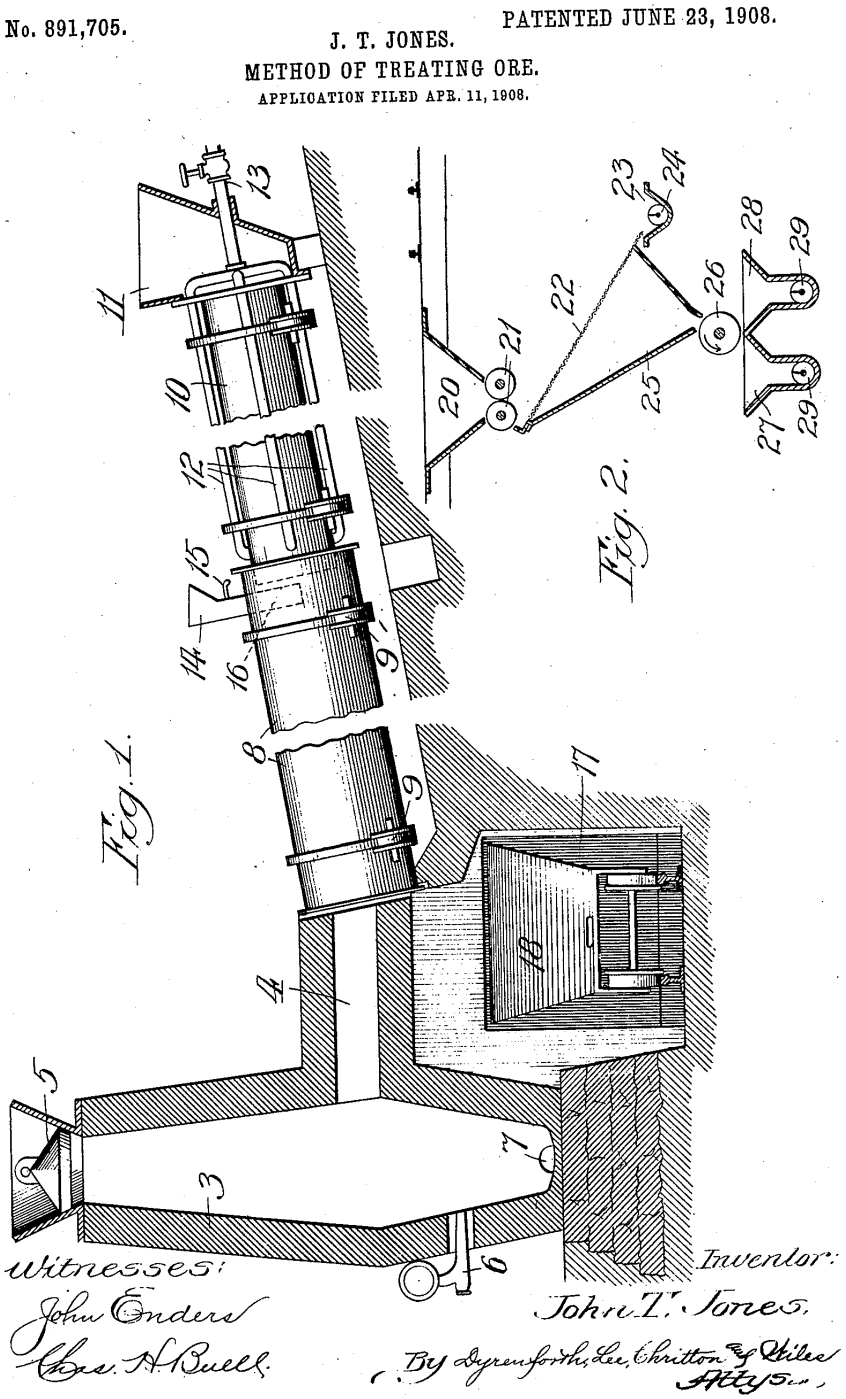
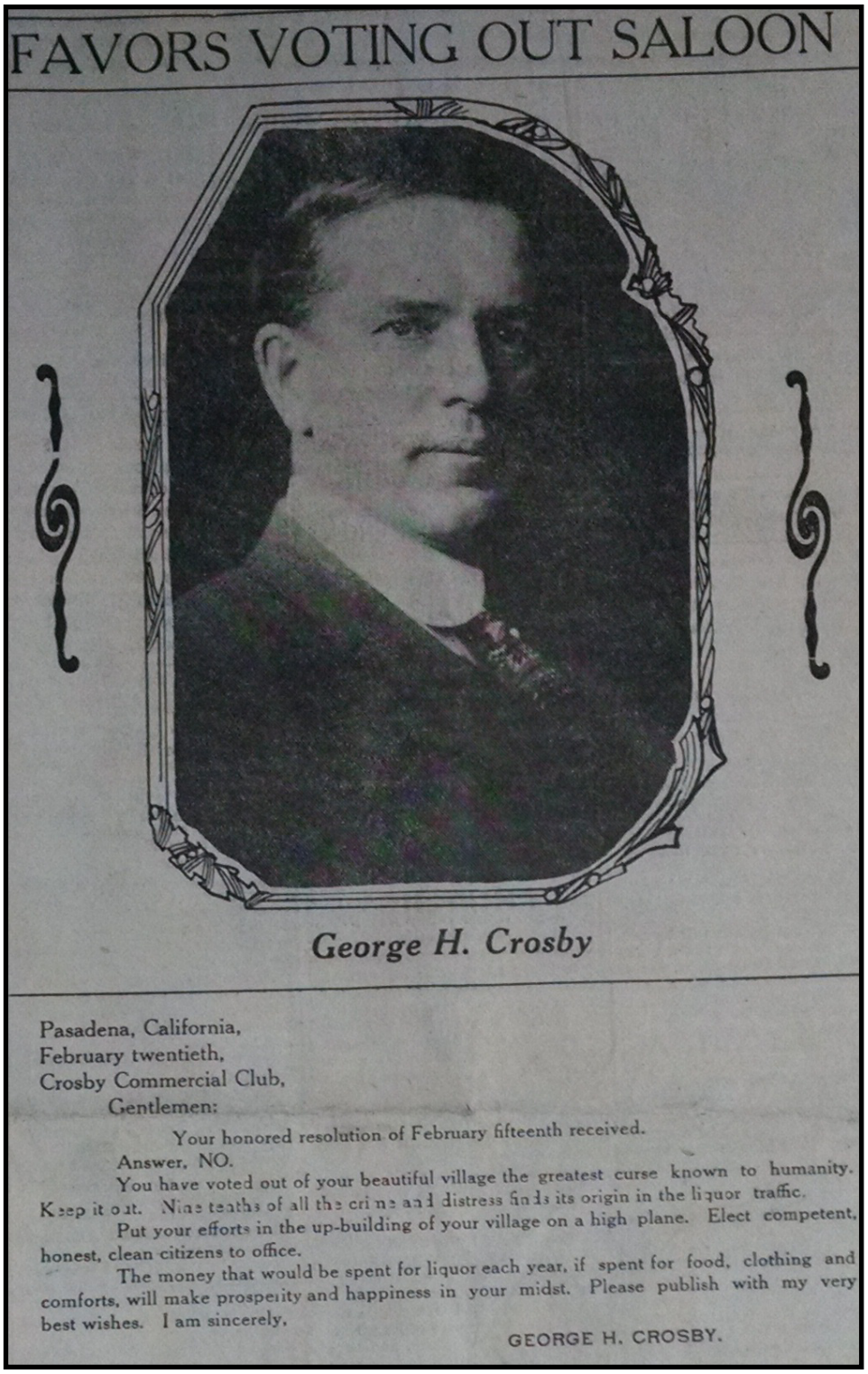


Figure 14. Patent Drawing for John T. Jones 'Ardis Furnace' for smelting low-grade iron ore. This may have been the design for the furnace he planed build in the Cuyuna Range after testing it in Iron Mountain, Michigan. Google Patents. U.S. # 891,705. https://www.google.com/patents/US891705?dq=891705&hl=en&sa=X&ved=0CCMQ6AEwAWoVChMIiv3Ztt-wyAIVzFY-Ch1ArA8H. accessed October 7, 2015.

Figure 15. Image of the Rowe Mine's iron ore concentration plant under construction circa 1914. From Minnesota History Center's Gale Family Research Library's Sound and Visual Collection call number II.20, image #2.



FAVORS VOTING OUT SALOON

George H. Crosby

Pasadena, California,
February twentieth,
Crosby Commercial Club,
Gentlemen:

Your honored resolution of February fifteenth received.

Answer, NO.

You have voted out of your beautiful village the greatest curse known to humanity. Keep it out. Nine tenths of all the crime and distress finds its origin in the liquor traffic.

Put your efforts in the up-building of your village on a high plane. Elect competent, honest, clean citizens to office.

The money that would be spent for liquor each year, if spent for food, clothing and comforts, will make prosperity and happiness in your midst. Please publish with my very best wishes. I am sincerely,

GEORGE H. CROSBY.

Figure 16. George Crosby's telegraphed response to debate on sale of liquor in the town named for him. Featured in February 27th, 1915 edition of the *Crosby Crucible*. Page 1. From archives of Crosby-Ironton Courier, 1915 Folio collection.

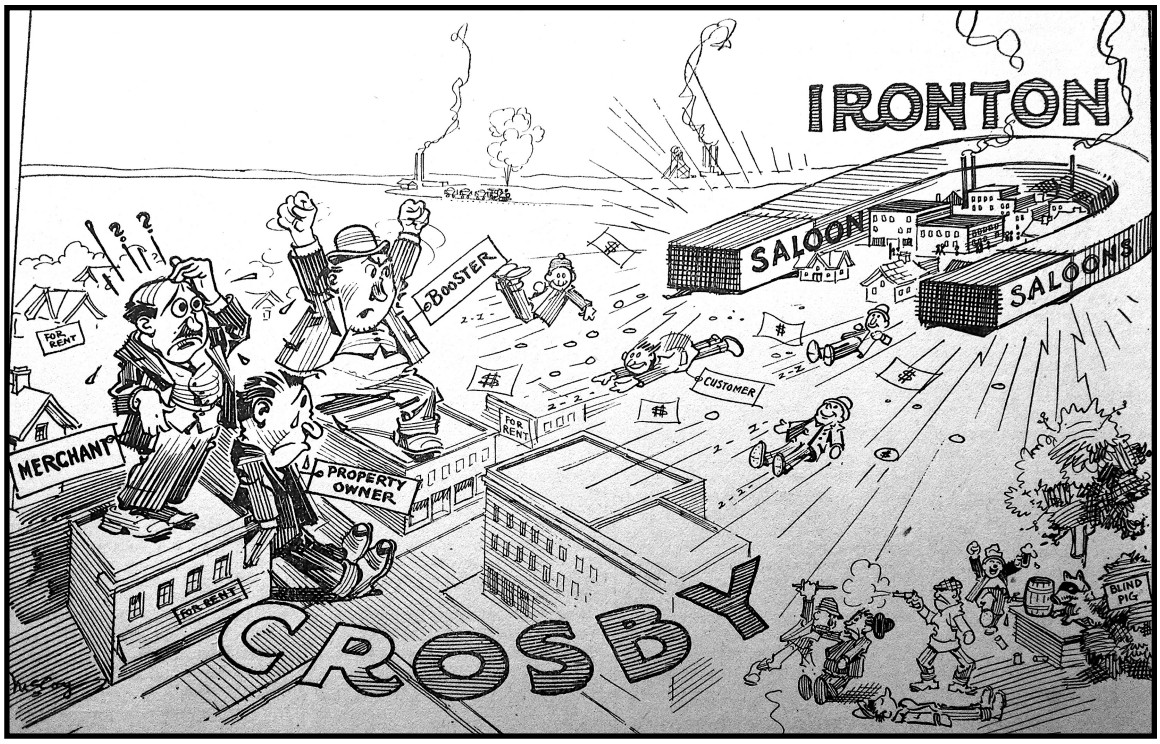


Figure 17. Early political cartoon featured in the *Crosby Courier.* Below the cartoon a statement read “Which Shall It Be? —The Licensed, Saloon or ‘Blind Pig?’, With Ironton’s Saloon but 15 Minutes’ Walk, From Main Street Does a Dry, Crosby Pay?, You Can Vote the Town Dry, But Not the People in It!” Note in the bottom right corner of the cartoon the group of criminals and a “blind pig” operator waiting on the borders of Crosby. Meanwhile Ironton’s magnetic saloon and nightlife scene draws customers and dollars away from the concerned boosters, merchants, and other property owners in Crosby. From: “Which Shall it Be?” *Crosby Courier*. March 19th, 1915. Page 1. From archive at Crosby-Ironton Courier, 1915 folio collection.

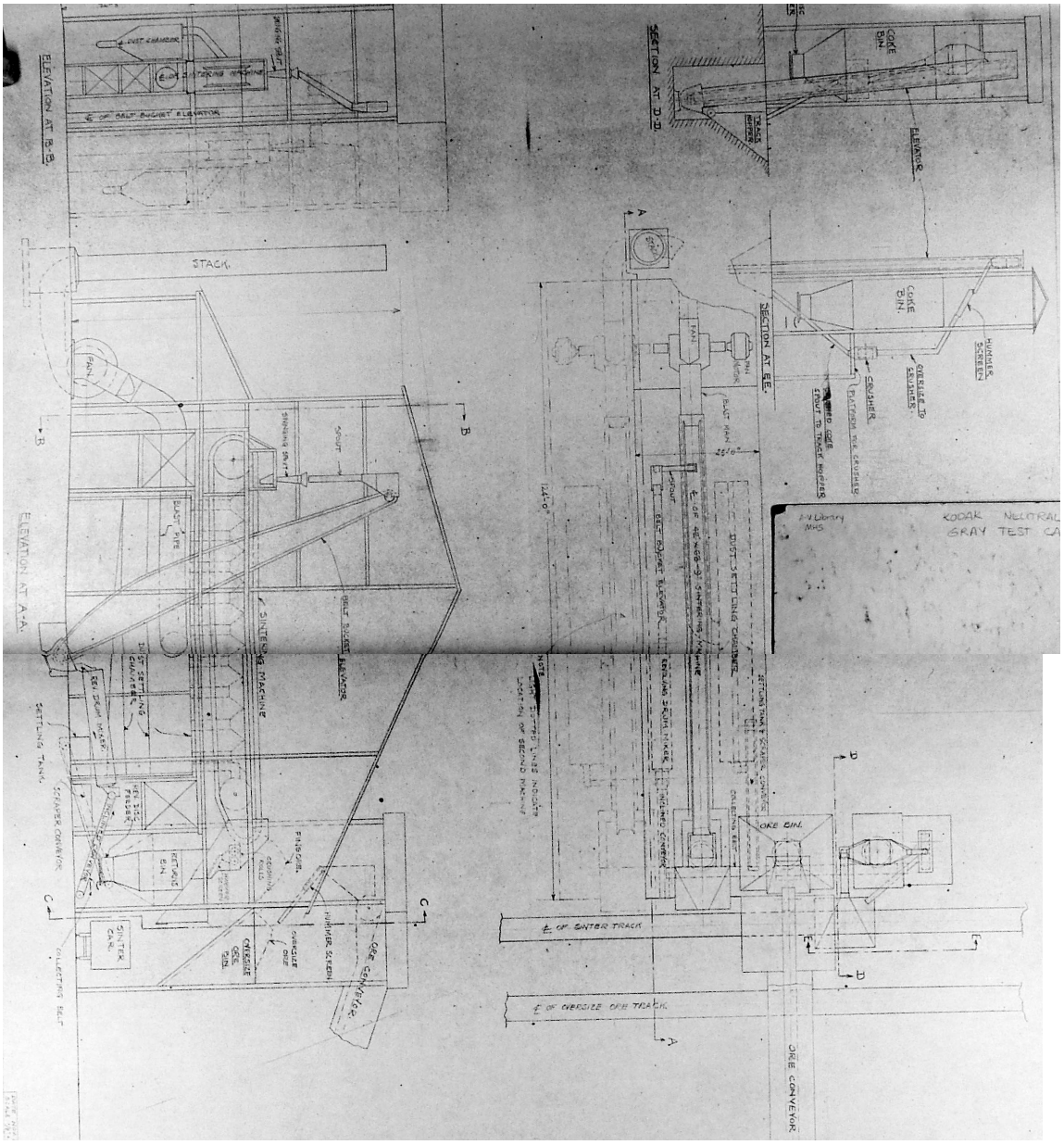


Figure 18. Initial plans for the Evergreen Sintering Plant drawn by the American Ore Reclamation Company for Robert Adams in 1922. Part of the Adams Family Mine Collection. Saint Paul Minnesota: Minnesota History Center. Accession number 145.i.6.9b Box 79.

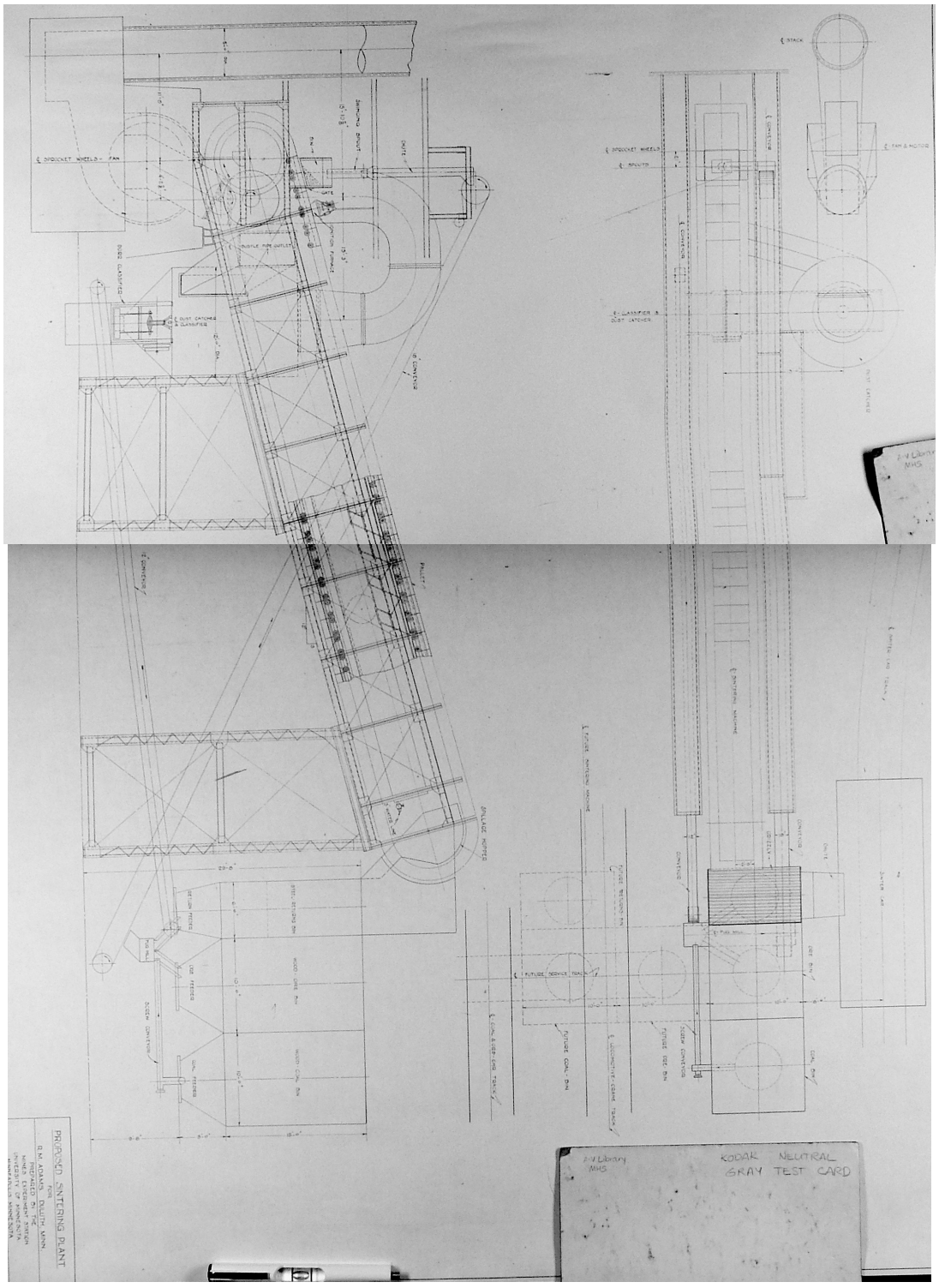


Figure 19. A later version of the plans for the Evergreen Sintering Plant detailing the main conveyor mechanism. Drawn in 1924 by the Mines Research Station at the University of Minnesota. Part of the Adams Family Mine Collection. Saint Paul Minnesota: Minnesota History Center. Accession number 145.i.6.9b

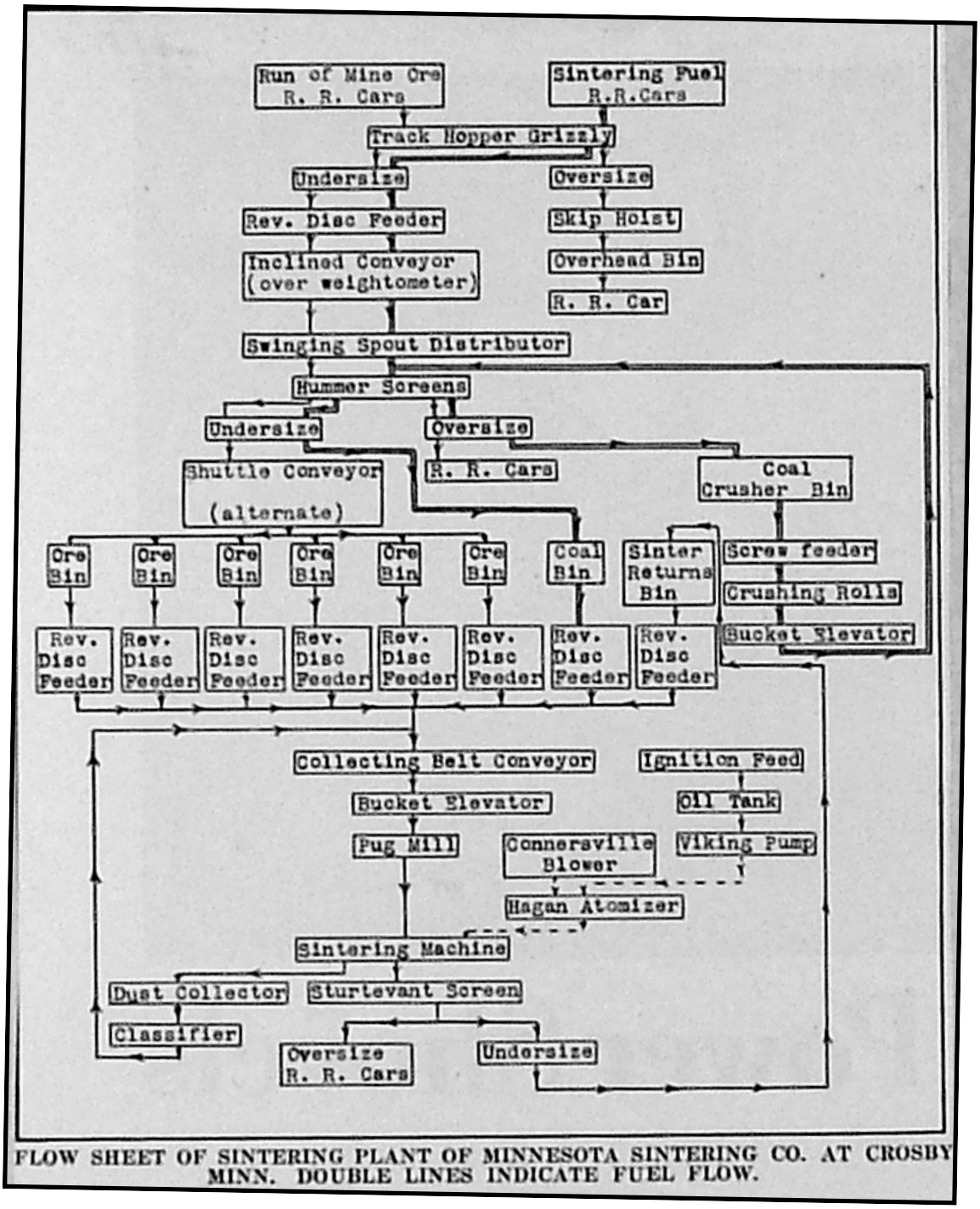


Figure 20. Image of work flow at the Evergreen Sintering Plant circa 1925. Note, unlike work flows of other sintering facilities, this diagram lacks a stage of adding moisture to the process since most Cuyuna ores already contained adequate moisture. Image from the Adams Family Mine Collection. Saint Paul Minnesota: Minnesota History Center. Accession number 145.i.6.9b Box 79.

Chapter 4: 1914 - 1924
Rushing to Raise the Grade

Table 4: US Federal Census of population and change from 1910 to 1920 in three regions of Minnesota that developed iron mining communities. ancestry.com: US Federal Census Collection. Accessed December 7, 2015.

Table of Population Change		
Population By County	**1920**	1910-20 % Change
Crow Wing [Cuyuna Range]	**24,566**	+46%
St. Louis [Vermilion and Mesabi Range]	**206,391**	+26%
Itasca [Mesabi Range]	**23,876**	39%

After the veil of overburden soils had been pierced by Longyear drills and Cuyler Adams persuaded investors to develop iron mine operations, further challenges remained. Inventor-entrepreneur John T. Jones was attracted by the potential to use the Cuyuna's unusual manganese enriched iron ore for his unique Ardis furnace design to make iron and steel. Despite early enthusiasm Jones and his investors were unable to overcome financial and logistical obstacles on the newly discovered iron range. Meanwhile, a new social debate over the role of liquor on the Cuyuna Range would pit idealistic businessmen like George Crosby against local residents seeking to regulate and profit from the saloon trade. The results of the "Saloon Debate" as it would come to be known would establish the roles of virtue and vice in communities of the Cuyuna Range over the next decade.

Following the Idea: Iron Benefaction in the Cuyuna Range

Very soon after the end of the First World War many economic and social changes came to the Cuyuna Range. This included a national prohibition of alcohol and a challenge to mine owners who sought to manage the vast quantity of unprofitable low grade iron ore on their properties. One such mine owner was Cuyler Adam's son Robert. He sought technological solutions developed with the collaboration of public and private researchers. This effort led to the construction on the Cuyuna Range of the largest ore processing facility of its kind in the nation. Unfortunately, not every geologic challenge was discovered at this time. The poorly-understood geology coupled with the haste to develop profitable mining operations would lead to a tragedy that grabbed the attention of people across the Great Lakes Iron Mining District.

From the start of efforts to develop the Cuyuna Range into a profitable mining range the national and global markets for iron and steel would shape this district's destiny. A letter from Cuyler Adams to the vice president of the Northern Pacific Railroad, J. M. Hannaford revealed that as early as 1906 mine owners keenly knew how challenging it would be to bring Cuyuna's iron ore to market. This was because the quality of Cuyuna's ore was considered by iron and steel manufacturers to be "of good character but of a low grade, and must come into competition with similar ores" already on the market (Adams 1906).

At that time, ore that was at or just below fifty percent iron by weight was considered to be “low grade”.

Following the Person: John T. Jones and the Ardis Furnace

One of the first and most novel efforts to turn the low grade iron ore on the Cuyuna Range into profitable iron and steel products was attempted by inventor John T. Jones. He proposed to reduce the transportation and production costs of iron by smelting it locally using readily available fuel and transportation resources. Jones had grown up working with his father around the iron smelting furnaces of Central Pennsylvania in the middle of the 19th-century where local supplies of iron and coal had made the region into a center of iron and steel-making (Sawyer 1911, 1505). Jones planned to turn the midwestern United States into the next iron-making district at the start of the 20th-century. Before arriving in the Cuyuna Range he already had some success at building and operating a furnace he had designed, called an Ardis Furnace, to process low grade iron ores of the Menominee Iron Range in Michigan (Ibid, Figure 14). The noteworthy feature of his design was that it could operate by burning coal or wood by-products and had a nearly horizontal rotating chamber used to smelt the ore into iron, looking a bit like a modern cement mixer (Jones 1908, 1-2). The next location Jones selected to build an iron smelting furnace for low grade ore would be on the emerging Cuyuna Iron Range.

Early in the spring of 1913 newspapers from the communities of Crosby and Aitkin were buzzing with excitement about the opening of a new industry in the region. John T. Jones announced that he was looking for a site to build another experimental blast furnace to make iron and steel using the ore coming from recently opened mines of the Cuyuna Range. The earliest mentions of Mr. Jones' searching for a building site seemed to suggest that Crosby would be ideal because it would place the facility on the doorstep of the emerging iron mines on the Cuyuna Range. On the cover of the July 5th, 1913 edition of the *Crosby Crucible* the editor clearly states Mr. Jones "is ready to establish his furnace at Crosby, if the people of Crosby want it". Further, in the editorial section on page four the editor states,

"The furnace will be erected on the range, to be sure, and we are mighty proud of the fact -because what is good for the range is good for all of us -but what is should have its first home at Crosby which is the commercial and industrial center of the range, its metropolis, and it will always be the hub of the Cuyuna. An Ardis Furnace would not only give Crosby further distinction, but greater wealth".

On the same day as the article that ran in the *Crosby Crucible,* a smaller article ran on the cover of the *Aitkin Independent* newspaper headline stating "Crosby to get Blast Furnace" though it states in the article that "It has not yet been decided just where the plant is to be located". The community of Aitkin, Minnesota is located about 10 miles (3.5 Kilometers) east of Crosby along the

shores of the Mississippi River. They had well-established rail and water transportation networks supporting nearby logging and agricultural production.

The final decision on where to place the furnace was announced on the front page of the August 14th, 1913 edition of the *Aitkin Republican* newspaper which states, “The Jones furnace will be located at Aitkin, which is the biggest bit of industrial news that was ever let loose in this bailiwick”. The final decision to site the new facility in Aitkin appears to have been centered on the better transportation systems to support iron production in Aitkin compared to other sites. The August 14th article continues by stating “The company has had other sites on the range under consideration, but in selecting Aitkin it was no doubt influenced by the fact that in addition to our two railroads, we had the Mississippi River. Naturally it will take a large supply of wood to supply the furnace and the company wished a river site, so that it might be in touch with the great supply of wood which is tributary to the river and which can be brought down in rafts or by boat”.

It was clear to people in Aitkin that having an iron furnace in their community could greatly change their economy. The papers claimed the furnace might “employ from 50 to 2000 men as capacity increased by the addition of units” with even more jobs created in other businesses to support the furnace’s operation. The excitement continued through August of 1913 with papers regularly reporting the progress of construction along the shores of the Mississippi River, “Teams of men were promptly employed, the excavation made, and by

last Wednesday evening [August 20, 1913] the concrete foundation for the tube was in -ten feet in depth and sixteen feet in diameter".

By the fall of 1913, the local papers reported there was some anxiety among the residents of Aitkin about when the furnace would open. The newspaper reports attempted to address the worries of Aitkin's residents by issuing statements from one of the managers, "we have been meeting with considerable delays from a number of quarters, especially the money line, but the tension is about to be relieved...the furnace will be up and making metal by Thanksgiving Day". However, even by May 1914 the situation had not changed with the papers reporting "before the steelwork was ready the company ran out of funds". By the end of the summer in 1914 the Jones furnace was no longer talked about in the papers, it had been replaced by news of war beginning to rage across Europe.

Current Conditions of the Jones Furnace Ruins:

The partially completed remains of Jones' iron furnace can still be seen along the shores of the Mississippi just north of Aitkin. Recent archaeological surveys of the site indicate that it was highly unlikely that the site ever operated (Jones 2014, 6). The results of this report further suggest the furnace never got past the first stages of construction mentioned in papers over the summer of 1913. A 4.8 meter (16 foot) diameter poured concrete ring protrudes approximately 1 to 1.5 meters (3 to 5 feet) out of the surface of a field used as a cow

pasture for the last 65 to 70 years. The wall of this concrete ring is approximately 30 centimeters (1 foot) thick. Six ferrous pins with threaded tops protrude from the upper surface of the concrete ring and are spaced symmetrically, about 2.4 meters (8 feet) from each other (Figure 4). This bolts may have been used to mount machinery or some other supporting structure to the concrete ring. The concrete ring is currently filled with cobblestones picked out of pasture and an adjacent levee wall to prevent harm to the grazing cattle. Almost abutting the northern side of the exposed circular ruin is a levee wall built in the 1960s to prevent flooding from the nearby Mississippi River.

The last remarkable feature of this concrete ring are the etchings in the top surface of the wall found along the eastern half of the structure. The etchings are faint, but appear to have been made while the concrete was still wet from the time this structure was built. The southern-most etching is a signature of a “Carl Jameson”. Further north is a set of three initials or an acronym “JAR.” The third etching is very difficult to read, but may be another name, possibly “___ Ray(mond)”? The northernmost visible etching is the most significant since it includes a date. The full etching reads “George ____ August 20 1913”. This date coincides with historic newspaper accounts that stated foundations for the iron furnace were being laid down, “Teams of men were promptly employed, the excavation made, and by last Wednesday evening [August 20, 1913] the concrete foundation for the tube was in -*ten feet in depth and sixteen*

feet in diameter" [emphasis in original] as stated on the front page of the August 23rd edition of the *Aitkin Independent*.

A LiDAR image of the field associated with the furnace ruin provided by Archaeo-Physics suggests there may be intact foundation features near the subsurface surrounding this circular furnace remnant (Figure 3). These features appear as linear and rectangular anomalies around the circular ruin. The potential area where these subsurface anomalies is present is within a 2 acre radius from the circular concrete ruins. Some narrow reflections in the radar image spanning the property from east to west are likely the former rail lines that ran along this section of the Mississippi River and are depicted in Sunburn Fire insurance maps of Aitkin from 1914, though this furnace site is not represented in these maps. South of the current fence line dividing the pasture from other properties in Aitkin appear to be more faint narrow lines that are likely plow-scars from past use as an agricultural field.

On the 11th and 12th of August 2014 Geoff Jones, his son Oliver Jones, and Fred Sutherland collected geophysical data across the land surrounding the poured concrete ruins of the Jones furnace site. The geophysical survey area consisted of a contiguous series of "grids", squares, or rectangles marked on the ground with wood or plastic stakes that would not interfere with the geophysical equipment. The preferred dimensions of the survey grids was 30-x-30m. The total area covered by the survey was an area 120 x 60 meters just south of the concrete ruins. The survey grid system was referenced to perma-

nent datum monuments including nearby fence posts, building corners, and electrical transmission poles.

The use of multiple methods increased the likelihood that features would be detected, and can greatly enhance interpretability. Because each geophysical method responds to different properties, multiple data sets are complementary rather than redundant. Geoff Jones of the firm Archaeo-Physics wrote his report on the methods and findings of the survey. He states, “Magnetic survey was the primary method used across the entire 120 x 60 meter survey area, followed by coverage of selected areas of interest around the furnace ruin spanning a 60 x 60 meter square with electrical resistance survey.” (Jones 2014, 2-3)

Magnetic field gradient survey responds to local variations in the earth’s magnetic field that are created by subsurface materials. Materials likely to create strong magnetic anomalies include brick, igneous rock, and ferrous metal. The instrument can also detect more subtle anomalies caused by thermally altered, organically enriched, disturbed, or compacted soils. A wide variety of archaeological features are thus detectable. It is very rapid and capable of high resolution. The fact that subtle anomalies are often obscured by highly magnetic materials such as brick, metal, and slag can be a limitation, but these materials are expected to be an integral part of the archaeological records at the Aitkin Iron Furnace Ruins, thus making the method particularly suitable.

Jones described the equipment as a “Geoscan Research FM 256 flux-gate gradiometer at a transect interval of one meter or less, and a data sample density of at least 8 readings per square meter. Results of the magnetic survey were examined to provide guidance for selective coverage with resistance survey. At a sample density of 16 samples per square meter, collected at a transect spacing of 0.5 meters, approximately 2 acres can be surveyed per day under favorable conditions.” (2014, 2-3).

For the Electrical resistance survey Jones stated that equipment responds to differences in the electrical resistivity of subsurface materials. The instrument responds to differences in grain size, organic content, moisture content, and chemistry. Many types of features are detectable if sufficient contrast exists between the feature and the surrounding matrix. Features may be detectable because of intrusive materials such as stone architecture or fill within pit features, or because of organically enriched, compacted, or disturbed soils. According to Jones he used, “a Geoscan Research RM15 resistance meter would be used to perform the resistance survey. With a slower rate of survey, the total coverage was less than that of the magnetic survey. Instrument configuration and sample density would be determined in the field based on site conditions and insights gained through preliminary survey results. The instrument may be used in either square-array or twin-probe configurations.” (2014, 3-4). The probe spacing was optimized for depth of investigation and resolution.

The sample density collected was two samples per square meter collected at 1 meter transect intervals.

Several anomalies found in the surveys are suspected to relate with topographic features of the local landscape. Several potential linear architectural or road features were detected. These could be remnants of associated with developments of the site around the time the Jones furnace was contracted. There is equal possibility that these features were generated after the furnace site was abandoned and the field had its topsoil stripped during the 1930s before being turned into its current use as a pasture.

Some ground-truthing of anomalies detected by the electrical resistivity and magnetometer surveys was conducted in the field. Anomalies were confirmed with a pin flag making contact with a solid object then topsoil was peeled back to reveal the features in-situ. The thin soils of the pasture area and the fact that some ruins of the furnace are on the surface made this a useful supplement to confirm the magnetic and electrical resistance anomalies identified in the survey. Three features uncovered may relate to historic events around the furnace ruin (Figure 5). These confirmed anomalies near the furnace ruins included a concentration of roughly made brick, a pile of cobblestones, and a segment of railroad track with an iron spike not *in situ*, but still in an approximate location and orientation to the rail lines depicted on the 1914 Sanborn map. Other anomalies uncovered were likely from the middle-20th-century and

included heavy gauge iron wire used in fences and buried portions of the levee wall just to the north of the furnace ruin.

The most important conclusion made by Geoff Jones in his geophysical report was to determine if the Jones furnace had ever been put into blast. He noted that a, “Strong magnetic signal is associated with the ruin. Sources for this signal are apparent in the ferrous metal components of the structure and in the igneous rock in and around it. There is no diagnostic indication that this structure has been subjected to very high temperatures.” (Jones 2014, 6). If the structure had been heated to the temperatures needed to turn iron ore into iron or steel it would have made a significant magnetic anomaly surrounding the ruin as slag and other furnace wastes from the process would have altered the magnetic properties of the surrounding site. This evidence strongly suggests that the reported troubles related to funding construction in late 1913 and early 1914 were what likely ended the venture to operate this iron furnace before it was completed.

The dream of producing iron and steel on the Cuyuna Range did not die with the failure of the Jones Iron furnace venture. No less than Cuyler Adams, the booster and namesake of the Cuyuna Range stated in a biographical article on his life that he believed,

‘Iron smelted with charcoal,’ he [Adams] pointed out, ‘is better than iron smelted with coke. It contains less sulphur, and sells for about fifty cents a ton more. The forests of northern Minnesota contain vast quantities of timber. Much

of it is of little or no value for lumber. Yet it is suited for making excellent charcoal. The ore is here. If we made charcoal locally, why not smelt the ore here? Why ship the ore by rail to Duluth, and by steamer to Cleveland, and by barge to Youngstown or Pittsburgh, when it might be shipped as pig iron smelted at the mine mouth?' (Clark 1922, 93).

No evidence of a further attempt to make iron or steel locally appears in documentary or in physical evidence beyond this quote from Adams. The price per ton of iron and steel declined rapidly during much of the early 20th-century, going far lower than those prices which Adams had thought would make smelting Cuyuna's ore locally a viable operation (U.S. Geological Survey 2014, 1). Thus, as the 20th-century progressed the dream of turning the Cuyuna Range into an iron or steel-making hub faded away.

If the dream of making the Cuyuna Range an iron-making hub was over by 1913, the more modest dream of raising the grade of iron ore through benefaction technology was just beginning. Benefaction processes seek to increase the iron content of the products shipped out to iron and steel makers. These processes can either mechanically separate out the non-iron rich portions of the mined material or chemically change the ore in order to concentrate the desired iron minerals into a product called sinter. The first benefaction efforts focused on the mechanical methods of raising the grade of iron ore from the Cuyuna Range.

By the end of 1914, at the start of First World War, fifteen mines were in operation on the Cuyuna Range. There was a strong incentive to open new mines and expand mine communities because North American iron and steel makers had lost access to Russian manganese ores used in specific types of hard steels vital to the military and heavy machinery sectors of the U.S. economy (Lamppa 2004, 193). This suddenly thrust the Cuyuna Range onto the national stage as the largest accessible source of iron ore with manganese, called manganiferous iron ore. Raising the grade of the iron and manganese content of the Cuyuna's ore now took on additional importance with the sudden growth in demand starting in 1914.

Following the Idea: Iron Benefaction Prior to World War One

An account of iron "Benefaction Plants" from Anna Himrod's historical account of industry of the Cuyuna Range notes that just north of Riverton "The first benefaction plant on the [Cuyuna] range was erected at the Rowe Mine. The contract for the plant was let in July 1913 to the American Concentrating Company of Philadelphia. P. H. Nelson, who was responsible for having the mine stripped hydraulically [of overburden], was also in charge of building this concentrator." (Himrod 1940, 88). An article from page four of the August 2nd, 1913 edition of the *Crosby Crucible* provides further details about the concentration plant in Riverton, explaining that "Mr. Nelson recently shipped a number of cars of ore from the Riverton mine to an American Concentrating plant in

Joplin, Missouri and there treated [it]. The result was most gratifying. Ores running forty percent iron came back from the concentrator carrying sixty per cent iron with only three per cent of moisture". The article went on to explain more about the facility, saying that it

"will differ from those on Coleraine and Nashwauk, on the Mesaba range, in that jigs and not tables will be used" (ibid). Lastly, the article notes some interesting about Mr. Nelson's efforts, "Mr. Nelson, who has made a special study of methods for treating or reducing these ores. He spent considerable time looking over the various concentrating plants about the country. The erection of the concentrator, the first on the Cuyuna Range, will mean a world to mining in this section. Mr. Nelson, who first introduced the hydraulic method of stripping on this range and proved its success in face of adverse criticism has been working on this proposed concentrating system and has solved it" (Himrod 1940, 88). Photographic evidence in the collections of the Gale Family Research Center suggest the Rowe Mine used hydraulic methods extensively to strip glacial overburden from the buried iron ore deposits.

Himrod noted the work on the Rowe Mine Concentrator was not completed until late in 1914 because the construction crews were focused on efforts to build a trestle bridge across a nearby lake. The facility is described as "a washing, crushing, screening, and jigging plant at first, but the jigging opera-

tions were soon abandoned" (Himrod 1940, 89). No details are given as to what equipment was used or for how long the benefaction plant operated.

A remarkable photographic collection of the Rowe Mine's Concentrator facility exists at the Minnesota History Center's Gale Family Research Library's Sound and Visual Collection (#II.20). The images include many depictions of the hydraulic stripping process mentioned in the August 2, 1913 *Crosby Crucible* article. One series of these images appear to show the early phases of the benefaction plant's construction in 1914 on bluffs above the nearby Rabbit Lake beside a water tower under construction at the same time (Figure 15). The nearly complete concrete facility appears to be approximately two stories tall and nearly twenty feet wide. A sketch map from a 1991 archaeological survey conducted of the former Rowe Mine property notes at least one concrete foundation that fits this general description, but the map lacks a notation for scale (Harrison 1991: 58-59). The report also contained an account from a "local informant" named Al Eberly who stated the concentration plant operated until 1919, primarily as an ore washing facility for the Rowe and Sagamore Mines (Harrison 1991: 56). While the approximate location of the Rowe Concentrator's ruins have been identified, the private lakeside property owners did not return any reply to requests to visit the site to observe the current site conditions.

Following the Conflict: The 'Saloon Debate'

As mining began to boom in the Cuyuna Range, another issue was also growing on the minds of civic leaders regarding the sale of alcohol. Local leaders like Matt and George Crosby had seen firsthand the types of Mesabi Range mining communities later described by historian Marvin Lamppa. These iron mining communities "consisted mostly of men. Gambling, heavy drinking, prostitution, and fighting were the order of the day. Saloon licenses often paid the expenses of these [Mesabi Range] village governments" (Lamppa 2004, 157). The Crosby Brothers and their supporters wanted to create safe, sanitary, and well organized mining communities. One way the Crosby brothers and their local supporters attempted to create this type of community was to prevent saloons from dominating the social life of the region. The "saloon" debate began first in the City of Crosby, but then spilled over into the rest of Crow Wing County's mining communities. Ballot measures were put forward to outlaw saloons and the sale of alcohol, declaring the City of Crosby as "dry". The earliest account of this debate begins with an editorial from the *Crosby Crucible* in February 1915 explaining the editor's stance to fight against saloons by supporting cause of "dry" politicians in the March 1914 local elections (Atkinson, 4. 1915). These politicians, once they were elected, quickly shut down the single saloon that operated in Crosby. While the editors of the *Crosby Crucible* were clearly coming out against the sale of alcohol the editors stated that "The *Crucible*, too, will be pleased to have submitted to it the best arguments in favor of the sa-

loon, and those arguments will be printed" (ibid). Despite this invitation for opposing views, few if any statements against the cause of temperance were found in their pages. A few weeks after their temperance editorial, the *Crucible* would feature George Crosby's telegraph in support of the saloon ban (Figure 16). Opposing viewpoints to shuttering saloons and banning the sale of alcohol did exist and were published in the rival local newspaper *The Crosby Courier.* This periodical led with a large political cartoon on the cover of their March 5, 1915 edition portraying the economic and social costs of outlawing the sale of alcohol in Crosby (Figure 16). It also announced that the editor of the *Courier*, Mr. H. L. Nicholson would be running for town clerk on the "Village Caucus Ticket" which favored a limited license system for saloons to control their location and hours of operation. His position on the "saloon debate" as it was soon known was pragmatic rather than absolute:

"No sooner is the licensed saloon driven out of a community than the 'blindpig' moves in and takes its place. This has been plainly seen the past year in Crosby since the town has become dry. Some $1500 [just over $32,000 in 2015 dollars] of tax payers money has been spent in detecting blind pigs. Under the license system the traffic bears a share of the burdens of the taxpayer. The 'blind pigs' pay neither license or taxes. Under the license system the trafic [sic] is above ground and in the day light and under the surveillance of the officers of the law, while the 'blind pig' hides away in the cellar, wood shed, garret or kitchen" (Nicholson 1915, 1).

Nicholson's comments foreshadow the exact problems and issues that would arise in the United States when a total prohibition on the sale of alcohol was enforced nationwide in 1920. Unfortunately for Nicholson and the other leaders that supported the ballot question for licensed saloons in Crosby lost the election by only 24 votes. This outcome was smugly-worded in the headlines of the March 6th, 1915 edition of Nicholson's rival paper, *The Crosby Crucible.* Its declaration read: "Extra!! Victory for the Drys -*And they said it couldn't be done*- Saloon can't come back, the People Decide, Majority of 24 on License question -Against License 188, For License 164 -*Pardon Our Smile*". [emphasis in original]

The victory celebrations were short lived for the cause of "drys" in the rest of the Cuyuna Range when a similar vote to ban saloons across Crow Wing County failed in early July 1915, losing by less than four percent of the overall vote -1840 to 1973 ('County Goes Wet' 1915, 1). An interview with John F. Cunnen, one of the Minneapolis-based organizers for the temperance cause in Crow Wing County, claimed the conditions in the 'dry' communities like Brainerd or Crosby were to blame for other communities' decision to vote down a county-wide ban. He said, "blind pigs run openly [in Brainerd] with no attempt to close them and one has a sign right in a street window, 'business is good. Ishka Bibble.' Naturally this condition of things produced a change in sentiment [across the region]." While piecemeal ordinances had closed saloons in two of

the largest population centers in Crow Wing County, the surrounding mining communities of the Cuyuna Range resisted following their example.

An investigation of Crow Wing County Court criminal accusation or 'indictment' records from the early 20th-century appears to show a doubling in the number of charges made for "selling liquor without a license" after 1913. Between 1910 and 1914, the average annual number of indictment charges for liquor violations in all Cuyuna Range communities was six (Indictment Record). In 1914 the number of indictments climbed to seventeen and would remain in the double digits for over a decade (Ibid). While some of this increase may reflect a rise in the population of Cuyuna Range communities between 1910 and 1914 it may also reflect a shift in how some residents chose to consume alcohol. After 1914 almost all charges for "sale of liquor without a license" were for amounts "under 5 gallons of beer or under one pint of distilled sprits". This evidence suggests that many were arrested for distributing amounts that could have easily been made in a home for use among a few friends or family members rather than a large bootlegging or "blind-pig" operations that the *Crosby Courier* had feared would come with the closing of local saloons.

Despite the setback in forcing Crow Wing County to abolish alcohol sales, the county-wide temperance movement had one last legal 'ace to play' in order to achieve their goals. Reformers appealed to federal courts to enforce a previously overlooked article of the 1855 treaty with the Ojibwe which declared that the government must "prohibit the introduction, manufacture, use of, and

traffic in, ardent spirits, wines, or other liquors, in the Indian Country, [which] shall continue to be in force, within the boundaries of the entire country herein ceded to the United States [which included what would become the Cuyuna Range], until otherwise provided by Congress." (Robinson, 2011, 85). To the shock of hotel, saloon, drugstore, and other commercial sellers of alcohol in the Cuyuna Range on October 9th, 1915 agents from the Bureau of Indian Affairs from the Department of the Interior served notices to end the sale of alcohol in their businesses. *The Crosby Crucible* reported that the general sentiment before that moment had been that such an action would never happen "because there are no Indians around here" ('Range Saloons' 1915, 1). This ruling affected not just the towns on the Cuyuna Range, but also several Mesabi Iron Range communities including Chisholm, Hibbing, Coleraine, and Grand Rapids (Lamppa 2004, 175). One of the last holdouts against the ruling was Peter Spina, owner of the Spina Hotel in Ironton. He appealed the federal decision with help of the Minnesota Attorney General. His case appeared to have been dropped by the state attorney soon after the enforcement of the Bureau's notices went into effect during the fall of 1915 ('Range Saloons' 1915, 1).

While this region of Minnesota achieved prohibition of legal alcohol nearly five years ahead of the constitutional ban on alcohol it had also clearly set a significant fraction of the population against the policy. In the Mesabi Range those communities that were just outside the bounds of the 1855 treaty's liquor clause, like Buhl, saw a boom in saloon traffic by people living on the western

half of the Mesabi Range (Lamppa 2004, 176). In Crow Wing County, where there were no nearby towns outside of the liquor ban, this ruling seems to have fostered the growth of a well-established network of small-scale bootlegging.

The small-scale production and sale of alcohol occurred in every Cuyuna Range Community according to county court indictment records from 1910 to 1928. These records give impressions of what local law enforcement was focused upon in the early 20th century and also a window into some of the tactics used to find criminal activity. While these records can give a quick overview of types of crimes being prosecuted along with the names and locations those accused, it does not give a clear picture of convictions or the reactions of those accused of these crimes. Most of the charges listed do not include more specific location information beyond listing the home town of the accused. The distribution and sale of alcohol on a large scale, above “5 gallons of beer or one pint of distilled spirits” was uncommon in the indictment records of this time. Only ten of the thirty-five liquor related charges from 1912-1917 were in this larger amount (Indictment Record Volume 2).

Among those ten, two were for “un-licensed drinking places” in Crosby and Cuyuna. Those accused of selling larger quantities of alcohol in the remaining eight indictments were also charged with “keeping a disorderly house” or “running a house of ill-fame” for prostitution (Indictment Record Volume 2). These indictments provided clues to help to identify specific neighborhoods where reports of significant illegal liquor sales and other vices occurred. All but

one of the “houses of ill-fame” or similarly worded indictments came from the City of Crosby. One of the Crosby indictments from 1916 specified the location of the “disorderly house” as “in lot 25, block 8 of Smith’s addition to the City of Crosby”. This lot was near the intersections of Birch Street and Franklin Avenue (Indictment Record Volume 2. Case #865). That intersection placed the reported house of prostitution near the border of the Lakeview and Balkan Street immigrant laborer neighborhoods. The location was also relatively close to Crosby’s border with Ironton, meaning foot traffic could easily reach their doorstep from either community.

These same qualities may have been what attracted the individuals with the most charges of keeping a house of prostitution to Birch Street in Crosby as early as 1912. Fred Powell and his wife Evelyn shared a total of six out of the eight total prostitution indictments (all with additional liquor charges) listed from 1912 to 1917. Evelyn would be indicted again on the same charges in 1922. The census for 1920 shows that Fred [65] and Evelyn [36] were residing on Birch Street in Crosby. Both do not list any form of employment (U.S. Census of Population-1920). The Fred and Evelyn Powell may not have been operating their “house of ill fame” out of their primary residence since no other boarders are listed, but they may have been managing such a place nearby.

Ten years earlier in the 1910 census, Fred Powell was listed as residing in the Mesabi Iron Range town of Stuntz, which was later merged with the town of Hibbing. He was listed as a “hotel manager” with 16 female “boarders” aged

between 22-35 (U.S. Census of Population-1910). Besides Fred and the female boarders only one other male clerk is listed as a resident in the “hotel”. All of the female boarders reported their form of employment as “hotel” related (Ibid). Soon after 1910 Fred Powell appeared to have moved his prostitution and liquor business to the Cuyuna Iron Range because he is first charged in Crosby during the winter of 1912 (Indictment Record Volume 2. Case #660). This evidence suggests that there was at least one informal vice district that operated along Birch Street on the edges of the mostly immigrant boarding house neighborhoods bustling with single working men that lived near the borders of Crosby and Ironton. In 2015 the boarding houses and other structures reported to have been used as “houses of ill fame” are no longer standing. One site has become a church parking lot. Another reported site, in the town of Cuyuna, has had the upper story removed. That was the boardinghouse portion of the structure and would have been the only likely space where prostitution might have occurred in that building.

Lookout Island, a place about two miles south of the intersection of Birch Street and Franklin Avenue in Crosby was reported to be the site of a large moonshine operation. The *Deerwood Enterprise* claimed that on August 12, 1921 Mike Tolen was caught on the island with “fifty-two gallons of moonshine ‘likker’ [sic] and two hundred of mash” in preparation to become liquor (‘Beautiful Island’ 1921, 56). The isolated location on Lookout Lake had made the operation harder to detect than a moonshine operation hidden on land, yet the site

was still only a short distance away from some of the main boardinghouse neighborhoods in the Cuyuna Range. Shortly after a flurry of 42 alcohol related indictments in November 1926 no other county court indictments for crimes related to alcohol sales are reported. It is very unlikely that people across the region suddenly stopped producing and selling alcohol. It is more likely that new leadership within the county sheriff department left the enforcement of alcohol prohibition to federal agents until the constitutional amendment was repealed in 1933.

Following the Idea: Sintering as a solution to Iron Benefaction Challenges

While the activity in illegal alcohol and prostitution was increasing, the economic boom from demand to support industry in the First World War ended abruptly. Just after reaching a historic peak of 37 operating mines in 1918 the markets for Cuyuna's manganiferous iron ore changed rapidly. The end of the First World War and the reestablishment of international supplies of manganese ore caused a shift in demand from North American iron and steel furnaces. Many smaller independent mines were feeling intense financial pressures to keep their operations profitable. A trend of halting excavations and only drawing upon existing stockpiles of ore to sell would begin at this time and continue up to the start of the Second World War (Figures 13a and 13b).

Another significant threat to the sustainability of the Cuyuna Range in the 1920s was what experts considered as the exhaustion of remaining high

grade iron ore deposits, those ores containing above fifty percent iron. A reporter for the *Iron Trade Review* recorded a speech given by "C. W. Potts, of Deerwood Minn, operator of manganiferous ore properties in Minnesota" in which he stated "Merchantable grades of iron ore from the mines in Minnesota [including the Cuyuna, Mesabi, and Vermilion ranges] will be practically exhausted by 1936 and the present known reserves, based upon the growing demands of the steel industry will be gone by 1941" ('Forcasts Ore Reserve Depletion' 1921, 758).

In the 1920s, during a time of prolonged economic stress and the existential threat of exhausting the remaining marketable ore in the Cuyuna Range, a more intensive method to raise the grade of ores was needed as soon as possible. Some mining companies in partnership with researchers began adapting a process called sintering to the iron ores in the Cuyuna Range. The technological origins of sintering iron can be traced back to the earliest human efforts to make iron through the bloomery process. Both processes expose fine grains of iron ore and fuel to temperatures between 2100-2300 degrees Fahrenheit (1,150-1250 degrees Celsius), below the melting point of iron, but hot enough to cause iron grains to fuse together in order produce an iron-rich spongy mass (German 2014, 17). In the bloomery process this mass was then heated and hammered to produce wrought iron. In sintering, the same process was done to fuse fine grains of iron ore into a larger mass suitable for shipping

to an iron furnace where it could be heated to over 2800 degrees Fahrenheit (1538 degrees Celsius) to produce molten iron (German 2014, 23).

In the first half of the 20th-century, industrial-scale sintering had only recently emerged as a process to enhance iron ore. According to German, “The major products of sintering had their origins in empirical discoveries and grew into widespread use without a fundamental understanding” of the science behind the process (2014, 36). This led to a trial-and-error system of testing each type of iron ore in order to discover if it had the right properties to turn it into a marketable sintered product.

Fine grains of iron ore had a tendency to sink to the bottom of the blast furnaces commonly in use during the early 20th-century and thus did not smelt properly. Sintering helped to turn these small grains of iron ore into suitable material for smelting that ranged between about 1/4 to 1/2 inch (5 to 12 millimeters) in size once processed. From the start of the 20th-century iron mines and iron manufacturers saw this process as a way to utilize ore and iron rich dusts that had been considered waste beforehand. This established a debate in the iron trade about whether it was better to sinter iron ore at the mines or to process that ore and any iron rich wastes at the site of the furnace itself. Starting in 1922, a chain of events and collaborations led to the Cuyuna Range’s Evergreen Mine building of the largest iron ore sintering plant of its kind in the United States (Himrod 1940, 90). Sintering became one the means to sustain the Cuyuna Range through the difficult period it faced in the 1920s

and 1930s. Himrod described the sintering process that was ultimately adapted for use on the Cuyuna Range. She states that it bonds “fine [iron ore] particles that are difficult to use [in iron furnaces]. This fine ore is thoroughly mixed with coal dust and then run under a furnace. The heat generated by the burning coal dust fuses the iron ore into large chunks” that are more suitable for steel and iron furnaces (Himrod 1940, 88).

Robert Adams, son of Cuyler Adams, documents his interest in bringing iron sintering technology to the Cuyuna Range through a series of memos dated from September 1922 to February 1923 (Adams Family Mine Collection Box 79). In these early documents he and his fellow managers were working out the costs and benefits of building a sintering plant on their Evergreen Mine property north of Ironton. Even in this early planning document Adams envisions the potential for a “two unit plant” that would be larger than any other in the country (Ibid). His initial cost estimates of the sintering plant and supporting facilities totals $131,903 for a single unit and $206,690 for a two unit plant. This is cost is approximately $2,000,000 to $2,500,000 in 2015 dollars. Robert Adams saw three key advantages to building an iron sintering plant in the region that would allow him to “ 1. Buy cheap unsalable ore [to sinter into a salable product], 2. Doing merchant business for existing mines, 3. Preferential business with the Evergreen [mine]” (Adams Family Mine Collection Box 79).

Near the end of this memo Robert poses the question, “What would be the point at which he [or another regional mine owner] would be willing to give the

plant the ore at a scrap heap price [cost for unmarketable low-grade ore] and what would be the point where he would ask a rate of merchant business [of high grade ores]?" (My clarification added in brackets. Adams Family Mine Collection Box 79). His question might have been posed to others in the Adams Mining Company, but it may have also been directed towards the faculty at the University of Minnesota's Mines Research Station. Shortly after this memo was typed Robert Adams would seek their advice on sintering.

Correspondences between Robert Adams and E. W. Davis of the Minnesota School of Mines Research Station begin in September 1922. The tone of these letters indicated that both men had a close relationship where Adams frequently confided to Davis his uneasiness about obtaining tests and estimates from established iron sintering operations east of the Mississippi River. Adams felt these sintering plants had greater interests in selling rights to copy their patented machinery than to applying the technology to the specific needs of a mine owner in the Cuyuna Range. Adams relied upon the testing Davis and his colleagues at the Mines Research Station conducted to validate the claims of sintering companies.

One example of this tension is reflected in the letters between Adams and a sintering machine designer from the American Ore Reclamation Company named Bethune G. Klugh. Klugh was a recognized leader in developing sintering machinery during the first half of the 20th-century. His patented sintering furnaces were designed to run primarily on waste gases from an adjoining iron

furnace. These sintering machines could reprocess iron rich slags, flue dust, and fine grained ore into sinter for use in the iron furnace (Klugh 1913, 1, Yost and Klugh 1916, 1). While he had worked on and developed sintering machines at mines used in Birdsboro, Pennsylvania his patents and published research from approximately 1910 onward were focused on reprocessing materials at iron furnaces rather than mine locations. Therefore, Klugh was an unusual choice for Robert Adams pursue for adapting the sintering process at his Evergreen Mine. It may also explain the awkward and tense relationship these two reflect in their letters to each other.

Adams included copies of his letters regarding Mr. Klugh to E. W. Davis of the Mines Research Station in hopes that Davis could provide a second opinion. One letter to Davis from Adams dated October 24th, 1922 states:
"When I get Mr. Klugh's figures of proposed cost of sintering and cost of plant, I am going to take them up with you to have you go over them because I can see about $50,000 difference in cost of the plant between what Mr. Klugh talks about and what you talk, and can also see a big difference in cost of operation." (UMN Archives, Mines Exp. Station Files. Adbar Dev. Co. Box 2 of 28).
By December 18th, 1922 Mr. Davis stated he has completed tests to make ten pounds of sinter using various grades of Cuyuna Range iron ore with another hundred pounds planned to be completed "before long". At the start of 1923, Robert Adams pushes Klugh and Davis to have a full-scale commercial test done at a sintering plant using Cuyuna Range Ore. According to Adams, Mr.

Klugh states on Dec. 7th that he was not interested in testing such a large amount of ore at his Cleveland sintering plant. Almost two months later on January 30, 1923 Mr. Adams noted that Mr. Klugh seemed to be changing the terms of their preliminary deal to have Klugh guarantee a certain quality of sinter in return for Adam's guarantee of delivering ore to the plant. Adams had feared that Mr. Klugh was "expecting us in the end to take all of the risk in that he would not guarantee that his plant would function properly." Adams' mistrust ran further when he later states in the same letter that Klugh may be, "playing us against some other possible builder of a plant on the Range". Near the end of the four page Jan. 30th 1923 letter to Davis, Mr. Adams restated his desire to do a full-scale commercial test in order to bring some certainty to developing a Cuyuna Range sintering plant, "no similar commercial sintering of [Cuyuna] hematite ore has been done." Subsequent exchanges between Davis and Adams in early 1923 indicate they both agreed a full-scale test would be compelling evidence for investors to support building the sintering plant, perhaps without Klugh's input.

In February 3, 1923 Klugh expressed his unhappiness about the proposed system of guarantees for quality and profitability of a sintering plant. Klugh worried his interests were assuming all the risk in building and running the facility during the most vulnerable early phases when operations would be the most inefficient. Once the first months of costly inefficiencies were addressed the contract would leave Klugh to only profit on the royalties for the sin-

tering technologies that the plant used and Adams would reap the greater profits of a fully operational plant. Klugh suggested jointly funding and operating the sintering plant with Adams in return for a share of the profits from Adam's Evergreen Mine adjacent to the site of the proposed plant (UMN Archives, Mines Exp. Station Files. Adbar Dev. Co. Box 2 of 28). Adams was not interested in Klugh edging into his mining business. About two weeks later on February 16th, 1923 Adams confided to Davis in a letter that during a recent meeting a new agreement between himself and Klugh established control of the sintering company between the sintering plant builders as "owning one-half interest and our people owning the other half, and the Evergreen [mine] being a preferential customer." This arrangement appears to have been the system that would carry Adams and Klugh through the process of building the sintering plant, but it did not end their disagreements.

The friction between Mr. Adams and Mr. Klugh continued after the basic financial arrangements for the sintering company were settled. By March 8th, 1923 Adams informed Mr. Davis that Klugh was "the prize killer of time" while alluding that other mine companies could overtake their efforts and build a sintering plant ahead of them. The main cause for these delays appears to have been in finding existing stockpiles of suitable ores to be tested in an existing sintering plant. Interestingly, Mr. Davis of the Minnesota School of Mines states on March 29th, 1923 that he will be supplying Mr. Adams with plans for the sintering facility, with Adam's replying the following day that based on the experi-

ences of dealing with outside companies up until now “I think in the final analysis we will be doing most of this ourselves.”

Several delays were caused by attempts at locating a suitable sintering plant and supply of Cuyuna iron ore to test. Eventually, the first sintering test of Adams’ Evergreen mine ore was conducted at the H&G Brooke sintering plant in Birdsboro, Pennsylvania from June 11th to the 15th, 1923. A thorough report on the tests was written by the Birdsboro plant operators. The summary states that 1000 tons of Cuyuna iron ore was delivered, that the ore’s initial quality was low due to the high ratio of fine grained material, and that in its initial state this ore was unsuitable for most iron and steel furnaces, but could be a candidate for sintering (Pearsall, Klugh, and Davis 1923, 1). The report’s findings continue by stating that the plant operators had determined ratio of coal to fine ore to make acceptable sinter at the rate of 500 tons of sinter per day per 64 foot long sintering machine. While it was noted that the high moisture was a concern, the testers felt the ore’s structure lent itself to be easily sintered compared to iron ores from Mesabi Range in Minnesota and Southern New York mines. The report concludes that only a few limited adjustments to the “standard” machinery would be needed to make sintering Cuyuna iron ore profitable (Pearsall, Klugh, and Davis 1923, 1).

A notation in the 1923-1924 annual reports of the University of Minnesota to the board of regents summarizes the school’s role in developing a sintering plant in the Cuyuna Range,

“For the last two years considerable interest has been centered in the low silica manganiferous iron ore on the Cuyuna Range. Experimental work at the Experiment Station has indicated that sintering is all that is required in order to make this kind of ore suitable for blast furnace use. Attempts were made to interest several different concerns in this process and finally the R. M. Adam’s company at Ironton, Minnesota, became sufficiently interested to pay for some experiments on a larger scale. Accordingly, arrangements were made to carry on experimental work in a commercial sintering plant at Birdsboro, Pennsylvania. The results checked the small scale experimental results which were secured in our laboratory, and after receiving our report Mr. Adams decided to construct a similar plant on the Cuyuna Range. It will make available a large quantity of low grade ore, and the successful operation of this plant will undoubtedly mean the construction of several similar plants by other mining operations (University of Minnesota 1924, 113).”

Construction of the Evergreen Sintering Plant would begin soon after the tests at Birdsboro were completed. Using the knowledge from those experiments shaped how the facility first operated by the joint Klugh and Adams sintering company partnership. In just over a year from the tests in June 1923, the Evergreen Sintering Plant began operations in August 1924. As later reports from the plant manager show, there were still several work-flow issues to resolve that the testing at the Mines Research Station and in Birdsboro had not revealed.

Two sets of blueprints for the Evergreen Sintering Plant exist in the archives of the Adams Family Mine collection (Figures 18 and 19). One early draft is dated November 1922 from the American Ore Reclamation Company and appears to be similar to the facility in Birdsboro, Pennsylvania. The machinery closely matches the patented Dwight-Lloyd sintering process and the Yost-Klugh ignition furnace designs held by the American Ore Reclamation Company (Dwight 1912, Yost and Klugh 1916). The second set of blueprints dated May 1923 were drafted by staff at the Mines Experiment Station at the University of Minnesota in Minneapolis. Comparisons between the 1922 and 1923 plans show there is a notable difference in terms of the orientation of the conveyor system feeding fuel and ore into sintering plant. The 1923 plans use gravity-feeds and angled conveyor systems that appear to be more efficient than in the earlier 1922 design.

Internal reports to the Adam's Mining Company dating from the end of August 1924 describe some of the early set-backs faced by the sintering operation. On the first day of production the manager notes "The track hopper feeder could not be started by the motor and they were not even able to start it by hand so it [the fuel and ore mixture] was shoveled from the feeder opening onto the belt" (August 1924 Report: 1). Reports about the next several days show further slow-downs due to issues with controlling the flow of materials in the sintering plant. The final assessment of production lists only 240 tons of sinter produced over the "experimental" first month of operation, though the report

notes better progress securing supplies of ore, fuel, and transportation of materials with all of the outside companies needed to support the facility (August 1924 Report: 2-3).

Within the Adams Family Mine Collection there are two press statements about the Evergreen Sintering Plant shortly after it's opening in August of 1924. An undated press release titled "New Sintering Plant At Ironton: To Save Huge Ore Waste In State" explains that the Mines Experiment Station of the University of Minnesota worked with plant owners for 2 years on "technical tangles" required to prove process was cost-effective (Adam's Family Mine Collection Box 79). The article continues by noting that the then current 500 tons daily capacity could be doubled in the future with a second machine(Ibid). The article concludes with a statement from Dean Appleby and Wade Davis of the Mines Experiment Station about the way they see this sintering plant as the second part of a three part solution to finding uses for lower grade MN ores. The three processes they mention are magnetation for eastern Mesabi, sinter for Cuyuna fines, and the remaining problem of western Mesabi low grade ore "will be solved eventually" anticipating the role that taconite would play in the decades ahead. (Ibid).

The second press statement likely came from a mining trade publication from published in early 1925 based on the contents of the article. The "Minnesota Sintering Co. Plant: Present Capacity 500 Tons Per Day" article notes the plant screens large ore pieces for direct shipment and processes fines into

salable sinter fragments. It further details the sintering process using a flow chart (Adam's Family Mine Collection 145.I.6.9b/Box 79) (Figure 20). It concludes by describing the bed of material to be sintered is about 10 inches (25 centimeters) thick when fed into sintering machine and that the screen capacity can support two sintering machines running when a second machine is acquired (Ibid). This foretells when a second machine would be added in the next decade. With expansions and modifications over the next several years this sintering plant would become, for a time, what sources claim to be either the largest sintering plant of its kind in the United States (Himrod 1940, 90) or the world (Lamppa 2004, 195). The facility would employ up to 130 people once its operations reached their full potential by 1940 with two sintering machines processing ore from multiple mines across the Cuyuna region (Leach 1944, 33).

Following the Conflict: Changing Mines and the Milford Mine Disaster

All through the 1920s, even before the Great Depression, the number active mines had dwindled to less than half the number open in 1918 (*Cuyuna Country* Vol. 2 2004, 52). Those mines which investors had rushed to open during the First World War were facing strong economic challenges from ranges like the Mesabi that produced more ore and of a higher grade. In addition to these local economic pressures, as the Russia's political situation stabilized it began increasing supplies of manganese were of higher grade and in a greater volume than that from the Cuyuna Range.

The type of mining dominating production on the Cuyuna Range was also changing in the 1920s. Up to 1918 the majority of mines in the Cuyuna Range were underground operations that followed the body of iron ore as it plunged deeper into the earth. After 1920 most new mines were open pits or were soon turned into open pit operations. For example the Evergreen Mine (which also had the sintering plant) and the Alstead were open pit operations beginning in the early-to-middle 1920s that would eventually expand to absorb six earlier Cuyuna Range mines between them, most of which had been underground mine operations (Figures 22a and 22b).

Technologies to remove the overburden of glacial gravels, sands, and silts using high pressure water hoses (like those first used at the Rowe Mine) or more often with use of large steam shovels were replacing more labor intensive methods of framing mine shafts and hauling ore to the surface. With these competitive pressures set against most small underground operations, some chose to sell their operations and others sought to get their ore onto the market as soon as possible before economic conditions made things more difficult for these mines to return a profit.

One underground mine that could represent the common pressures felt by all of the remaining underground operations was the Milford Mine. The mine location, first named the Ida Mae and later the Milford Mine, was being developed from 1917 through 1923 as it passed from various owners until George Crosby acquired the lease to the property in 1922 (Aulie 1994, 23, citing McE-

wan, 1924). As a result of the declining markets for manganiferous iron ore after the First World War, the Milford Mine was the last underground operation producing manganiferous ores when it opened in 1923 (Aulie 1994, 21).

The Whitmarsh Mining company's investors, George Crosby chief among them, felt pressured to make every effort to sink a shaft into the moist glacial deposits to reach the main ore body at the Milford Mine as quickly as possible. Anthony's Wallace's observations about mine managers on marginal coal fields in Rockdale, Pennsylvania show that if offered the choice "between a sure loss, on the one hand, and, on the other, the substantial probability of a larger loss combined with a small probability of no loss at all, they tended to choose the risky alternative…." (Wallace 1987, 449-450). In this case with the Milford Mine, the Whitmarsh company knew it was likely to face losses and more difficult market conditions if progress on opening the Milford Mine were delayed.

The unfortunate and unforeseen consequences of this haste at the Milford Mine which even Aulie termed "an almost frenzied desire to produce as much ore as possible in the shortest time" culminated in tragedy on February 5, 1924 around 3:45 pm when water, mud, and other debris rushed into the mine from an adjacent lake killing 41 miners almost instantly (Aulie 1994, 25, 156, citing McEwen 1924).

This disaster sent emotional shockwaves through the entire mining district and even reverberated in historic accounts from scholars mostly focused

on other Great Lakes mining districts (Hatcher 1950, 245-246, Lamppa 2004, 193-194). An agonizingly slow recovery process of pumping water and removing muck from the shafts took eight months and one day to find all 41 miners lost in the tragedy (Aulie 1994, 95). The effort to investigate the causes behind the disaster operated in parallel with the recovery effort with a final report filed in November 1924 by a governor-appointed committee led by Minnesota's (then) former labor commissioner W. E. McEwen. His committee consisted of several local and regional mining engineers and a county mine inspector (Aulie 1994, 147). After interviews of the seven survivors, former workers, mine engineers, managers, and extensive research into the company's records the committee concluded that "the accident at the Milford Mine was not the result of negligence on the part of the Whitmarsh Mining Company; that it was not foreseen" (Aulie 1994, 166, citing McEwen 1924).

This official investigation did not remove lingering questions or doubts among by members of the local working community. Aulie includes source material from the 1924-era labor newspapers discussing the causes and effects of the disaster. One of these papers provided testimony from an unspecified miner at Milford stating that many of the braces and supports were not adequate to hold back the pressure of the wet sand and glacial soils around the mine shaft, causing them to bulge and crack (Aulie 1994, 132). Other problems listed by this miner included poor means of moving between levels in the mine either using ladders with broken rungs or lifts without protected sides (Ibid).

Aulie did not answer the lingering question of “were safety factors overlooked?”, rather he provided information that “will help the reader draw his own conclusions” (1994, 25). His tactful negotiation between different perspectives on the event reflects the biases of working and business class segments of the Cuyuna Iron Range society. It is worth noting that the testimony of the Milford Mine Disaster survivors may have been influenced by the same factors that led June Nash to observe that her accounts from Bolivian miners about working conditions changed depending on if mine managers were present to hear them (1993, 182-187). It would be difficult, if not impossible to obtain testimony from an event such as this without some potential for influence from outside interests such as unions or mine managers. A labor newspaper noted that two of the miners that gave official testimonies in the investigation appeared to have changed their stories on the mine’s condition between the time of the accident and the investigation (Aulie 1994, 141). The Milford Mine would eventually reopen in 1928 and operate for another 9 years when it permanently closed in 1933 (Aulie 1994, 25). The disaster at the Milford Mine lingers in the hearts and minds of residents to the present day. The site of the disaster is being developed into a memorial park by the Crow Wing County Commissioners.

Soon after the disaster at Milford, no new mines would open in the district for another 15 years (Figures 22a and 22b). Many small Cuyuna mine companies would sell out to several mining companies with a presence on the Mesabi Range like Hanna and Inland Steel who were unaffiliated with U.S. Steel. Mine

laborers were increasingly displaced by mechanical means of removing ore, leading to rising unemployment well before the onset of the Great Depression of 1929-1930. The region was ripe for political, economic, and social change in the years to come.

Figure 21. Image of the former Finnish Worker's Hall of Crosby in 2012 when it was about to be sold by the Masons to a private owner. In the early 20th century the site served as a political epicenter for the candidate who would become the first elected communist party mayor in the United States in 1932. Photo by Author.

Mine Name	Location	Started	Ended	Changeover Years	Company	Notes	Open Pit or Underground	Iron or Manganese Or
Sigma	SE of Deerwood	1905	1905		Pickands-Mather	Flooded, abanndoned	Underground	Iron
Oliver	E of Cuyuna	1906	1906		Oliver Mine Co.	Flooded, abanndoned	Underground	Iron
Kennedy	E of Cuyuna	1907	1925		Rogers-Brown Co.	Added to Roger's Mine 1959	Underground	Iron
Adams/Chesquitawney	E of Cuyuna	1908	1918	1918	Rogers-Brown Co., Biwango	Added to Portsmouth Mine, inactive 1909-1917	Underground	Iron
Meacham/Croft	E of Cuyuna	1910	1928		Rogers-Brown Co.	Merged with Croft 1914, Portsmouth Mine 1928	Underground	Iron
Armor#2	N of Ironton	1911	1968	1915	Rogers-Brown/Inland Steel	Exhausted, Inactive 1933-1949	Underground	Iron and Manganese
Barrows	SW of Brainerd	1911	1914		Hanna		Underground	Iron
Cuyuna-Mille Lacs	S of Trommald	1911	1985?	1924, 1928, 1946, 1956	Cuyuna-Mille Lacs, Manganiferous Iron Co, Butler Bros., Hanna, Pittsburgh Pacific	Inactive 1946-1948		
Iron Mountain	W of Trommald	1911	1985?	1965	Iron Mountain, Algoma, Hanna, Pittsburgh-Pacific	Innactive 1920-1965		
Tompson	N of Ironton	1911	1944	1928	Inland Steel	Added to Evergreen Mine 1928	Underground	Iron
Williams-Carlson/Rowe	N of Riverton	1911	1957	1951	Pickands-Mather/Hanna	1st open pit and benefaction site Hanna acquired 1951	Open Pit	Iron
Cuyuna-Duluth/Ironton	N of Ironton	1912	1932	1923	Cuyuna-Duluth, Inland Steel	Inland owned	Underground	Iron
Duluth-Brainerd/Ferro	N of Trommald	1913	1944	1942	Locker Donahue, Onahman, Butler Brothers	Innactive 1919-1942.	Underground	Manganese
Pennington	N of Ironton	1913	1960	1940, 1945	Pennington, Evergreen, Rhude&Fryberger	Innactive 1923, Evergreen takeover 1940, Rhude 1945-60	Open Pit	Iron
Sagamore	S of Riverton	1913	1969	1918, 1927, 1960	Savage, Pickands-Mather, Pittsburgh-Pacific		Open Pit	Iron and Manganese
Brainerd-Cuyuna	S of Brainerd	1914	1918		Brainerd-Cuyuna	aka 6th street mine		
Cuyuna-Sultana	SE of Trommald	1914	1955	1928, 1942	Onida, Pickands-Mather, Mahnomen, Evergreen			
Wilcox	E of Brainerd	1914	1920	1917	Canadian-Cuyuna, Omaha			
Adbar/Maroco	S of Trommald	1915	1959	1926, 1928	Adbar, Marquette, Hanna	Exhausted		
Croft	N of Crosby	1915	1934	1928	Rogers-Brown Co., Youngstown Mines		Underground	Iron
Hillcrest	W of Ironton	1915	1964	1937, 1945	Hills, Evergreen, Hanna	Exhausted	Open Pit	Iron and Manganese
Hopkins	E of Trommald	1915	1971	Takeovers 1924, 25, 28, 31, 55, and 64.	Hopkins, Fay, United, Pickands-Mather, Evergreen, P.M. Co, Pittsburgh Pacific		Open Pit	Iron
Mahnomen	NW Ironton, SE Trommald	1915	1963	1928, 1961	Mahnomen, Pickands-Mather, Hanna		Underground	Iron and Manganese
Mangan #1	SE of Trommald	1915	1975	Takeovers 1928, 49, 53, 57	Manganiferous, Hanna, Zontelli, Pittsburgh-Pacific		Open Pit	Manganese
Rowley	E of Brainerd	1915	1917		Barrows	Experimental shafting failed due to water issues		
Talbert	E of Brainerd	1915	1916		Adbar	abandonned		
Donahue/McKenzie/Gloria	S of Manganese	1916	1931	1918	Locker-Donahue, Gloria		Underground	Manganese
Feigh	W of Ironton	1916	1961	1945	NW Improve Co., Hanna	Inactive 1936-1945	Open Pit	Iron
Joan#1 & #2	N of Ironton	1916	1963	1949, 1953, 1957	Joan, Hanna, Zontelli, Pittsburgh-Pacific	Inactive 1919-1949	Open Pit	Iron and Manganese
Mangan #2	NW Ironton, SE Trommald	1916	1963	1918, 1928, 1961	Mahnomen, Pickands-Mather, Hanna	Absorbed Mahnomen Mine	Underground	Iron
Merritt #1 & #2	N of Trommald	1916	1961	1928, 1938, 1951, 1957	Merritt, Manganiferous, Butler, Zontelli, Pittsburgh Pacific	Inactive 1921-28, 1943-57	Underground	Iron and Manganese
State Pit/Wearne	N of Crosby	1916	1960	1925, 1936	Inland Steel, Evergreen, Hanna	Exhausted	Open Pit	Iron
Bessemer	N of Riverton	1917	1922		Little Rabbit Iron			
Ida Mae/Milford	SE of Wolford	1917	1933	1922, 1925	Cuyuna-Minneapolis, Whitmarsh, Amherst	Site of major accident 1924	Underground	Manganese
Joan #4	W of Trommald	1917	1944	1943	Joan, Butler Brothers	Innactive 1920-1930, 32-43	Open Pit	Manganese
Little Rabbit	N of Riverton	1917	1922		Little Rabbit Iron			
Martin	SW of Ironton	1917	1960	1944, 1949, 1953	Whitmarsh, Evergreen, Hanna, Zontelli		Open Pit	Iron
Arco	NW Ironton, SE Trommald	1918	1964	1937, 1945	Arco, Evergreen, Hanna		Open Pit	Manganese
Clark/Pontiac	E of Trommald	1918	1925	1921	Onida, Chappaquidick		Underground	Manganese
Huntington	W of Ironton	1918	1961	1941, 47	Whitmarsh, Evergreen, Hanna	Inactive 1924-1941	Open Pit	Iron
Liberty/Bonnie Belle	W of Ironton	1918	1925	1925	Liberty		Underground	Iron
Northland	E of Wolford	1918	1942	1941	Northern Minnesota Ore, Butler	Inactive 1919-1941	Underground	Manganese
Portsmouth	N of Crosby	1918	1960	1930	Gordon, Hanna		Open Pit	Iron and Manganese
Preston	E of Manganese	1918	1920		Coats & Tweed		Underground	Iron and Manganese

Figure 22a. List of the 45 mines of the Cuyuna Range that opened before 1918. Blank areas are unknown details. Note many “Open Pit” operations may have started as underground and if operating after 1940 were likely to become open pits. Table generated from *Cuyuna Country Volume 2,* 2002, 96-102 and “Mines in Crow Wing County through 1984” *U.S. Bureau of Mines.*

Mine Name	Location	Started	Ended	Changeover Years	Company	Notes	Open Pit or Underground	Iron or Manganese Ore
Evergreen	N of Crosby	1924	1960	1945	Evergreen, Hanna	Absorbed Thompson, Portsmouth, Warne and Meacham mines (big open pit).	Open Pit	Iron
Alstead	W of Ironton	1926	1964	1936, 1945	Adbar, Evergreen, Pittsburgh-Pacific	Absorbed Hillcrest and Arco in 1930s	Open Pit	Iron and Manganese
Trojan	W of Ironton	1942	1966	1948	Evergreen, Pittsburgh-Pacific	Exhausted	Open Pit	Iron
Snowshoe	S of Riverton	1944	1964	1952	Rhude-Fryberger, Hanna	Exhausted	Open Pit	Iron
Virginia	N of Ironton	1948	1966	1957	Zontelli, Pittsburgh-Pacific	Exhausted	Open Pit	Iron and Manganese
Gorman	E of Brainerd	1951	1953	1952	Pacific Isle, Zontelli	Exhausted		
Section 6	S of Crosby	1951	1958		Hanna	Exhausted	Open Pit	Iron
Mallon	E of Riverton	1952	1953		Hanna			
Manuel	N of Ironton	1952	1962	1957	Zontelli, Pittsburgh-Pacific	Exhausted	Open Pit	Iron and Manganese
Rabbit Lake	NE of Cuyuna	1952	1978	1966	Pickands-Mather, Hanna	Stockpile shipments '66-78	Open Pit	Iron and Manganese
North Yawkey	N of Ironton	1954	1960		Pittsburgh-Pacific	Exhausted	Open Pit	Iron
Carlson-Nelson	E of Riverton	1956	1959		Rhude-Fryberger		Open Pit	Iron
Musser	W of Trommald	1958	1961		Hanna	Exhausted	Open Pit	Iron
Zeno	S of Manganese	1968	1985?	1976	Hanna, Pittsburgh-Pacific		Open Pit	Manganese

Figure 22b. List of the 14 mines of the Cuyuna Range that opened after 1918. Blank areas are unknown details. Note many “Open Pit” operations may have started as underground and if operating after 1940 were likely to become open pits. From *Cuyuna Country Volume 2,* 2002, 96-102 and “Mines in Crow Wing County through 1984” *U.S. Bureau of Mines.*

5: 1925 - 1940
Mining Turmoil and Social Unrest

Table 5: US Federal Census of population and change from 1920 to 1940 in three regions of Minnesota that developed iron mining communities. ancestry.com: US Federal Census Collection. Accessed December 7, 2015.

Table of Population Change				
Population By County	**1930**	1920-30 % Change	**1940**	1930-40 % Change
Crow Wing [Cuyuna Range]	**25,627**	+4%	**30,226**	+18%
St. Louis [Vermilion and Mesabi Range]	**204,596**	-0.8%	**206,917**	+1.1%
Itasca [Mesabi Range]	**27,224**	+14%	**32,996**	+21%

In the 1930s a new generation of Cuyuna Range Miners began a process of dissolving the social boundaries formed by different ethnic neighborhoods and enforced by policies from mine managers and local businesspeople. This generation had grown up in the same schools and shared events in some of the same social spaces such as the Finn Hall which helped to organize various political campaigns (Figure 21). The new generation of voters had grown increasingly frustrated by declining economic conditions in the 1920s. These conditions only became worse when the Great Depression began in 1929. A charismatic young mayoral candidate from Crosby proposed actions to ease the economic hardships faced by the working community in the depths of the Great Depression. The fact that this candidate, Karl Nygard, belonged to

the Communist Party was a secondary issue. While some of the laboring immigrant population might have been ineligible to vote when they came to the Cuyuna Range in 1910, their children who were born in America were old enough by 1930 to vote and reshape their community in the process.

The mid-1920s saw many mines sell their operations to a handful of larger companies. The three companies acquiring most of these mines were the M. A. Hanna company of Cleveland, Ohio, the Pickands-Mather company also based in Cleveland, and the Inland Steel company of Chicago, Illinois. While these companies continued to operate a few of the most profitable operations, many others were purchased and used only for shipping their existing stockpiles of iron ore that had been built up during the booming years before 1919.

The workforce of miners in the Cuyuna Range faced a difficult situation in the 1920s and 1930s. There where fewer mines were open than a decade ago and most of the remaining mines were open-pit operations that required fewer workers than the older underground operations needed. When the Great Depression arrived on the Cuyuna Range in 1930 it made a difficult situation even worse for these industrial communities.

John Byczynski's Master's thesis on the early labor history of the Cuyuna Range called "*Claiming the Mines*" gave some impressions of this era. His description of these communities relies on statistics and data collected from the Federal Census and Bureau of Mines. Other primary sources such as radical

newspapers were also explored, but mainly to supplement the author's labor-history interpretations. In particular, he did not explore the divisions and tensions within ethnic and laboring groups of the Cuyuna Range in the way that Brunfelt had done. Byczynski does provide a startling chart about the worsening labor conditions in this period. He showed in an eight year span from 1926 to 1934 ore shipments from the Cuyuna Range declined from over 2,000,000 tons to only a little over 500,000 with an equally devastating drop in regional mine employment from just over 1,300 workers to only 312 (Byczynski 2011, 93).

George Crosby attempted to help the families of displaced workers by creating a community garden for those that had little or no money to purchase food (Byczynski 2011, 96). Most miners were unemployed or underemployed and increasingly unable to settle debts. Unlike George Crosby, local political leaders, faced their own shortfalls in taxes and fees to run their community's services. They responded harshly to those residents that were struggling financially. Byczynski recounts how one policy in Crosby was to deny a license plate for vehicles of those on community poor aid that had not yet paid their license fee (2011, 99). Policies such as these increased the feelings of frustration and anger at local politicians drawn from the ranks of the business elite.

Following the Person: Karl Emil Nygard

These economic tensions helped to foment support for socialist and communist party activity in the region, culminating with the election of Karl Emil Nygard, the first communist mayor in the United States at Crosby in 1932 (*Cuyuna Country* Vol. 2 2004, 159-160). Nygard was also the first of his generation, raised for most of his life in the Cuyuna Range, to rise to a position of mayor. Nygard had been born "while his father was working in the iron belt of Northern Wisconsin on August 25, 1906. He came to Crosby with his parents in 1910. He was graduated from Crosby-Ironton High School in 1923" (*Cuyuna Country* 2002, 160). Though Nygard had worked in the mines for a year to save money for college, he had to quit his studies in chemistry for lack of funds to complete his education. Returning to Crosby without money or prospect for work, Nygard ran for mayor of Crosby and won a surprising victory 521 to 379 (Ibid). The social/political groups that held meetings within the Finn Hall were crucial to his victory.

Byczynski attributes Nygard's election to several factors converging in 1932 to make his unlikely victory possible. He notes that voting patterns before 1932 and lack of strikes for over 15 years revealed the region was not an active hotbed for labor radicals in spite of the efforts of political groups associated with the Finnish Hall in Crosby (Bycznski 2011, 86). However, the lack of strikes doesn't mean there was no organization to represent the interests of local laborers. As demonstrated in the strike of 1913, the region had never been a

stronghold of labor radicals from national parties. Over that period between strikes on the Cuyuna Range the Finn Hall continued to exert influence on the regional political environment. Karl Emil Nygard's election was due mostly in part to his family's reputation the deep economic anxieties in the community, and the political organization of the Finn Halld:

Nygard's "father had worked in the mines, thus miners were familiar with him. Furthermore, Nygard took action on behalf of unemployed miners in the early stages of the Great Depression, which no doubt endeared him to those citizens struggling through the declining economic fortunes of the Cuyuna Iron Range. The Great Depression itself, which spared no one in Crosby, certainly made residents more willing to listen to alternative solutions from non-typical municipal candidates. In addition, a scandal involving the misuse of funds by municipal officeholders, and Nygard's own somewhat disingenuous representation of his politics, factored into his election" (Byczynski 2011, 87).

According to Byczynski, Nygard was the first elected mine laborer to "any office in the village council" which had been dominated by mine managers and local businesspeople (2011, 93). In some interviews taken later in his life Nygard admitted that his communist political affiliation was not stated on the 1932 ballot, but many voters likely knew about it before the election, "because in a small town you can't hide under a bushel basket. So the election came off, and I was elected, as mayor. Not as a Communist, as an individual" (Nygard 1973).

Nygard's policies as mayor placed emphasis on aid for the jobless and seeking reforms in Crosby's finances. Some Crosby residents accused the previous town council of being corrupt, going so far as to petition the county auditor to investigate the situation (Byczynski 2011, 102-103). The focus of that investigation was against the town clerk, Pauline Sheets for embezzlement of town funds (Bycznski 2011 101). Many of Nygard's proposed reforms were blocked by the other members of the Town Council. Though he had won the election by a clear margin, he had to work with council members, including Pauline Sheets. Others, like the Town Trustee and lumber yard manager Ed Burns would block motions from Nygard that might put Crosby into debt while it attempted to support needy residents (Ibid). Like any political figurehead facing a disagreeable governing-body, Nygard gave public speeches, held rallies, and organized marches in the street for the policies and ideals he championed. Many of these events were held at or organized within the Finnish Worker's Hall (Byczynski 2011, 107).

During his time in office, Karl Nygard did not limit himself to speeches at the local level. In the fall of 1933 he left Crosby as an invited speaker for Socialist and Communist events along a national tour which included a large event at Webster Hall in New York City (Ibid). Some of Nygard's claims during that particular speech were exaggerated and others were fabrications. For instance, while he claimed to force the local bank to release city funds for public aid, the reality was that his request was blocked by the town council and nothing was

done (Byczynski 2011, 108). News of this speech spread quickly in local papers on the Cuyuna Range. These misrepresentations and the short list of actual political accomplishments, besides some relief work for the unemployed, doomed his reelection bid in December 1933. Nygard ran again in 1934 and lost by an even wider margin, getting less than one quarter of the total votes (Byczynski 2011, 109).

President Franklin Roosevelt's social policies stole much of Nygard's thunder in terms of banking reforms, employment, and economic aid by the middle 1930s. (Brunfelt 2000, 215-216). Even Nygard, later in life, admitted that Roosevelt "was the savior of America" from "riots and anarchy" if the policies of Hoover had been continued into Roosevelt's administration. These policy changes also signaled a shift in the need for and purpose of ethnicity-based aid organizations such as those provided from the Finnish Worker's Hall and other organizations like it. In spite of Nygard's short political career, the political leadership fostered by those affiliated with the Finnish Worker's Hall had once again served to challenge the interests of the mine management and local businesspeople. Rather than organizing a strike, that would be tenuous at best during hard economic times, their organization helped to rally a new generation of voters and political leaders to challenge the established political order from within. Once in office, Nygard used the hall as a place to foster support his policies and as a springboard towards a national stage.

After 1932, the Finnish Worker's Hall became less vital to the political life of the miners in the community. While Cuyuna Range communities like Crosby had been designed much like a company town, most of the commercial developments like grocery stores were controlled by individuals, not a corporation. Some of these stores were owned and specifically catered to members of their ethnic neighborhood. After the early 1930s, more individuals from the generation born and raised in the Cuyuna Range were elected to local political offices. This new cohort of politicians included more people with closer connections the local ethnic mining neighborhoods than the business centers in Duluth or Brainerd than had the first generation of civic leaders such as Matt Crosby. Byczynski (2011) notes that in the same election won by Karl Nygard a new 'workers' slate of candidates ran for office. These candidates included miners Frank Plut, Wallace Mattson, and Richard Johnson along with a sintering plant laborer named Clarence Montpas (Byczynski 2011, 104).

The working population of the Cuyuna Range acquired their political power first through unions and ethnic associations, but gradually developed their own economic, cultural, and political power from within the community. E. P. Thompson noted that in England, "the making of the working class is a fact of political and cultural, as much as of economic, history…the working class made itself as much as it was made." (1966, 194).

The relative prosperity of mine managers compared to those they managed was reflected in the neighborhoods that saw new construction during this

time. Of all the 876 historic structures surveyed, only a little over 15 percent (157) were built during the 1920s. Of these, only 15 were likely used by miners or blue collar workers in the communities of Riverton, Cuyuna, or Deerwood based on their size and location within their community. The vast majority of 1925-1940s era structures were built in Ironton (52) and Crosby (90). Most of these structures have distinctive Craftsman-style trim, stuccoed walls, and lower rooflines than earlier structures. The homes in Ironton and Crosby are a mix of one, one and a half, and two story structures. The five largest residences in Crosby, in terms of height and square feet, were built in the Gold Coast Neighborhood in the 1920s. These homes and the many others built in the vicinity of the Gold Coast Neighborhood of Crosby reflect the relative prosperity of middle-managers and business elites compared to workers struggling to support their families living in homes in surrounding neighborhoods dating from before 1918.

Tensions between mine managers and laborers would continue throughout the history of the Cuyuna Iron Range in the 20th-century. However, the clear social and political divisions that had defined the social relations of the mining region in the early 20th-century were blurring after the 1930s. The Workers Hall would eventually be sold to the Cuyuna Range Masons in May of 1952. They would continue to hold their gatherings at the hall for another 60 years (“Masons Buy Workers Hall” 1952, 1).

After the attack on Pearl Harbor on December 7th, 1941 plunged the United States into the Second World War, the sudden need to supply North American industry with iron and steel revived the fortunes of mines across the Cuyuna Range. Unlike the rapid boom-bust and lingering economic stagnation that occurred on the Cuyuna Range after the First World War, vigorous mining activity in the Cuyuna Range would continue for over a decade after the conclusion of the Second World War in 1945. Some immigrant families which had previously been miners or laborers, like the Zontellis, would seize opportunities to become mine owners and important local business owners around the Cuyuna Range in the late 1940s and 1950s. The possibility of developing the region's manganese resources would lead to the Manganese Chemicals Corporation to build and develop new technologies on the Cuyuna Range that have continued to be referenced by modern companies. This era of prosperity would be the time when the region made its mark upon the history of the 20th-century.

Part 3: Making their Mark

Almost everything is a dull rusty red. This is the color of the railroad ties, of the soil, of the stockpiles, and even the buildings at the mines.

-George F. Brightman describing the mining landscape near Crosby in 1942

They both knew with their hard work, expertise, modern equipment, and excellent workforce they could compete with anyone. Zontelli Brothers could actually do this work cheaper than the [other] mining companies.

-Dave Zontelli referring to his father (Henry, a.k.a Jack) and uncle (Emil) the founders of the Zontelli Mining company

Figure 23. The Portsmouth (former Evergreen) Sintering Plant at the height of its production circa 1945. From Minnesota Historical Society: Photographic collection. Negative #5172-A. Use Copy #HD3.17 r13. http://collections.mnhs.org/cms/largerimage.php?irn=10190195&catirn=10815044. accessed October 7, 2015.

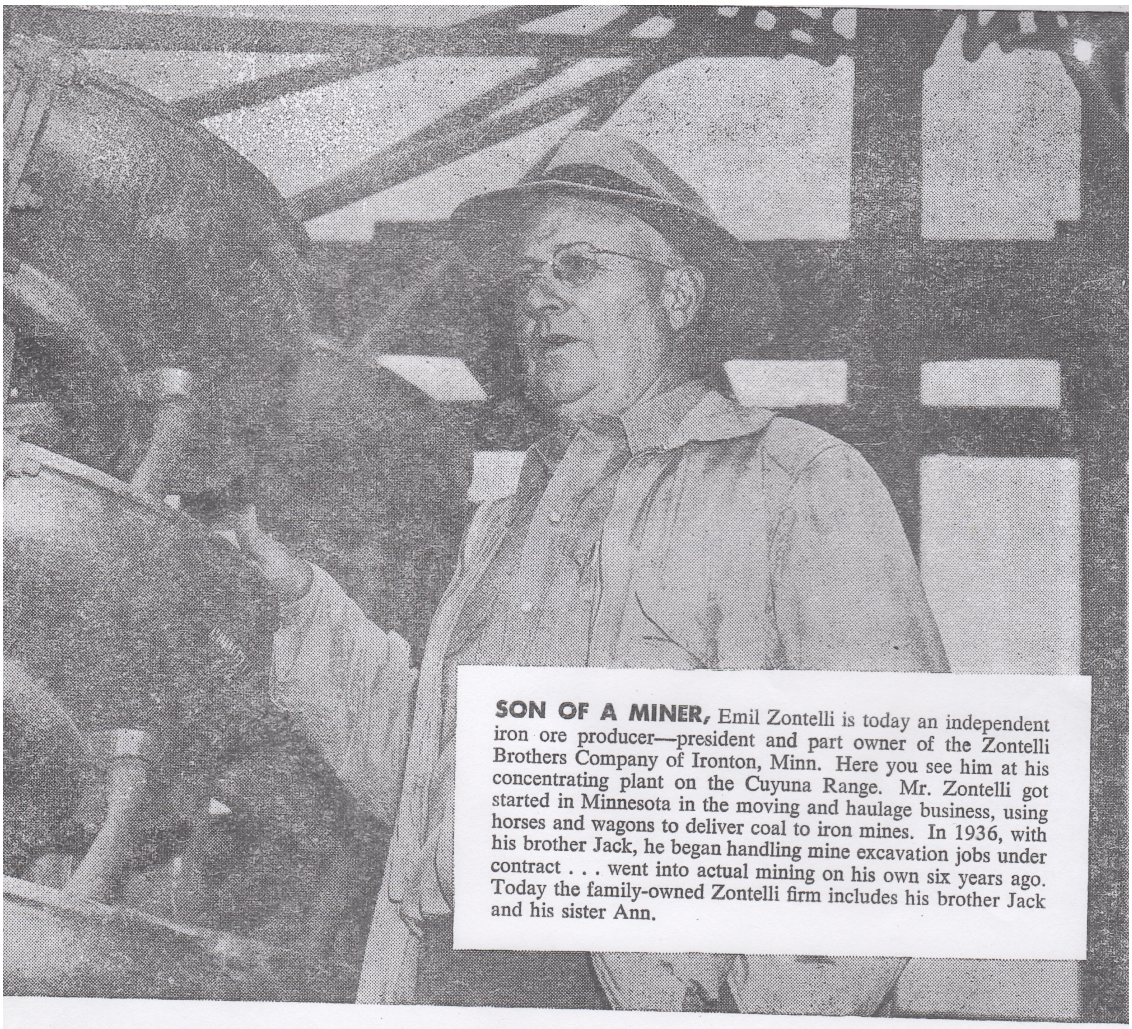


Figure 24: Portion of a promotional advertisement featuring Emil Zontelli. *Crosby-Ironton Courier.* November 15, 1951, page 6. From archives at the Crosby-Ironton Courier, 1951 Folio.

Chapter 6: 1941 - 1960
A Second Wind

Table 6: US Federal Census of population and change from 1940 to 1960 in three regions of Minnesota that developed iron mining communities. ancestry.com: US Federal Census Collection. Accessed December 7, 2015.

Table of Population Change				
Population By County	**1950**	1940-50 % Change	**1960**	1950-60 % Change
Crow Wing [Cuyuna Range]	**30,875**	+2%	**32,134**	+4%
St. Louis [Vermilion and Mesabi Range]	**206,062**	-0.4%	**231,588**	+12%
Itasca [Mesabi Range]	**32,321**	-2%	**38,006**	+17.5%

Production rose again sharply at the start of the Second World War in December 1941 and continued to remain strong throughout the Korean War that ended in 1953. With this surge in demand the mining operations of the Cuyuna Range sought to expand operations and improve their efficiency. Those mine operators that could convert dormant underground sites into open pits and adapt technologies like trucking ore out of mine pits would find the greatest success in this era. The increasing extraction of low grade iron ores caused benefaction plants like the Evergreen Sintering Plant to expand to their greatest extent. New attention by federal and state agencies was also being given to the manganese resources of the Cuyuna Range in this era. This interest would eventually manifest itself into a research facility which would create

many new and important developments in the processing of manganese for commercial use.

The annual rate of ore shipments from 1940 onward continued to rise until 1953 with a peak of 3,714,634 tons (*Cuyuna Country* Vol. 3 2004, 16). By comparison, the Mesabi range averaged nearly 28,200,000 tons per year near its peak in production of high grade ores during the Second World War (Lamppa 2004, 222-224). The Cuyuna Range was never meant to out-produce its neighbors, even in the best of economic times, but the demand for its manganiferous ore drove its production growth to new heights.

As had been the case in the First World War, the international trade in manganese was disrupted and steel producers became more reliant upon the manganiferous iron ores of the Cuyuna Range. After the Second World War ended, the rise in production of automobiles and the chilling of relations between the United States and Russia kept demand for Cuyuna Range iron ores at a high level. The increased production in iron ore at this time reflects the interconnections between the interests of iron and steel makers in the eastern United States.

Following the Idea: Refining Manganese from Cuyuna Ores

Early in 1942, interest in constructing a plant for extracting manganese from the manganiferous ores of the Cuyuna Range was proposed to meet the wartime needs of North American industry the Second World War. The pro-

posed facility, using either an ammonium sulfate or sulfuric acid process “to be built near Crosby will be a ‘war baby,’ certain to close down when cheaper manganese sources in Russia, India, and Africa are open again” according to Donald Nelson, the president war production board” (Manganese Plant is Ruled a ‘War Baby’ 1942, 1). The report did accurately foretell what economic forces would end the operations of manganese processing on the Cuyuna Range. Before then in the 1950s, tensions in the Cold War between Russia and the United States worsened. This situation created a window of time when Cuyuna’s manganese ore was developed into a strategic national reserve.

While Mr. Nelson’s final report apparently halted plans to develop manganese ore processing during the Second World War, the general demand for manganiferous ores for the iron and steel industry did expand. The question of having a manganese processing plant would resurface within a decade of Nelson’s decision. By the summer of 1942, mining companies reported to local papers that they were having record levels of production and increased efficiency compared to the levels observed during the recent Great Depression. The *Crosby Courier* reported, “a 40 percent increase over the ore movement off the range in 1941” had been achieved with a doubling of the efficiency of returning ore cars from the ore docks in Superior, Wisconsin from 8-10 days in 1941 to only 4 or 5 days by the summer of 1942 (“Cuyuna Iron Range Geared” 1942, 1). Another unspecified fraction of the ore leaving the Cuyuna Range in 1942 is termed as ‘rail ore’ bound for “Granite City, Illinois” (Ibid). The report continued

to describe the operations of the Evergreen Sintering plant working “at capacity averaging about 50 railroad cars of sinter daily” (Ibid).

Following the Idea: Cuyuna’s Sintering Zenith and Decline

By 1942, the concentrating of iron ores near Riverton had changed since the days of the Rowe Mine Concentrator. The newer facility, based at the Sagamore Mine “is steadily shipping dried ore from the mine plant. It is the only drying plant of its kind in operation in the state. The ore passes thru (sic) two large revolving kilns in the presence of heat to reduce the moisture content of the ore (Ibid). A short summary of this roasting kiln is mentioned in an article for *Crosby-Ironton Courier* as a “Cook Stove For Iron Ore” where “this revolving kiln in which wet ore from a mine near Crosby, Minn., is cooked to remove excess water. This cuts down the ore’s weight for shipping and increases its iron content” (“Cook Stove” 1953, 7).

Since the rocky start in 1924, the Evergreen Sintering Plant had steadily improved and expanded its operations through the 1930s. The original one unit 42 inch wide by 64 foot long sintering machine would be lengthened and paired with a second larger sintering machine. According to Hanna Mining Company’s regional superintendent G. B. Hunner, “In 1929 a new 72 inch by 76 foot [sintering] machine was installed … and in 1930 the [sintering] machine was lengthened to 127 feet which are the dimensions of the present unit. This last change required the installation of a second fan and the wind-boxes were

divided" (1950, 471). Hunner explained the significance of this increased fan capacity and lengthening of the sintering machines, "sintering is merely the function of time, to the same volume of air that can be drawn through the sintering charge to burn the carbon" (1950, 472). These changes allowed them to extend the amount of time that heated air came into contact with the fuel and fine iron ore particles ensuring more of it became sinter without having to use more fuel mixed with the iron ore.

Anna Himrod's 1940 account of the sintering plant revealed details on how the flow of materials was handled at that time. She notes, "the plant has been rebuilt and enlarged until it now contains the largest sintering machine in the United States" (Himrod 1940, 90). She was impressed that, "The flow sheet of the plant is extremely flexible" because the plant configuration allows for crushing, screening, washing, and sintering of ore with the possibility of separating out marketable ore at each stage of the process, leaving only material that needs further treatment to move on to the next process (Ibid). Himrod concludes, "this wide flexibility [in levels of treatment] makes possible the benefaction of widely varying types of ore" (1940, 91). Leach noted in his report that the Evergreen Sintering Plant processed a large amount of the iron ore before it even reached the sintering machine by means of an ore washing plant that was added in 1931. This wash plant further improved the grade of ore before entering the sinter plant, thus allowing even leaner ores to be sintered (Leach 1944, 33). These improvements and modifications clearly show that the owners of the

Evergreen Sintering Plant sought ores of various qualities from around the Cuyuna Range. The scale and processing flexibility reflect those wide-reaching interests compared to a facility that only specialized in the qualities of ore coming from the local Evergreen Mine.

Leach's 1944 account of the Evergreen Sintering Plant echoes much of Anna Himrod's 1940 account. However, in that short four-year span of time additional improvements had been made to the sintering plant. Leach describes it as "a Sinter Plant, the first of its kind designed to treat soft limonite iron ore" (1944, 29). One reason for the plant's unique configuration is the wide range of ores available in the region, the "Cuyuna Range ore probably shows a greater variety of texture, composition, and color than ore from any other iron mining district. Mixture of hematite and limonite present" (Leach 1944, 30). He reports that "the first sinter machine was of the Dwight-Lloyd type 36 in wide by 65 ft. long and its best production was about 400 tons of sintered product per day" (1944, 33). According to Leach, since it was first built the sintering plant had been remodeled twice with the 1944 version being 72 in wide by 126 ft long, nearly tripling its initial capacity at a total of 1,150 tons sintered daily (Ibid). Leach concludes by stating "this is the largest sintering machine in this country and the plant is the only one of its kind treating hematite ore in the Lake Superior District." (Ibid).

After the Second World War the sintering operations at the Evergreen Mine continued to increase production according to G. B. Hunner. He was the

district superintendent for the Hanna Iron Ore Company which bought the Evergreen Mine along with the sintering operation and renamed it the Portsmouth Sintering Plant (1950, 471. Figure 23). Hunner notes that further improvements in production since Leach's 1944 account had raised the daily tonnage "from 1123 tons in 1945 to 1658 tons in 1949" (Ibid). Even though improvements were still being made, there were also short-term setbacks. He reports that "in 1945, a few days after the ore season had started a disastrous fire of unknown origin swept through the screening plant and ore storage building and destroyed this unit for all practical purposes" (Hunner 1950, 472). New facilities were quickly built to replace the old ones, with a primary and secondary crushing plant with conveyor feed systems that directly moved crushed material into the sinter plant or into rail cars (ibid) This rebuilt conveyor system appears to have been more efficient than the earlier "collector belt and table feeders driven by a flat belt from a line shaft" that had been prior to when the fire occurred. (Hunner 1950, 471).

The main reason for the significant boost to the production of sinter after 1945-46 appears to have been the replacement of the two earlier furnaces (gas and coal) with a new "Morgan type" oil furnace which was more fuel efficient and lost less time to mechanical problems (Hunner 1950, 472). Further modifications were made by the Hanna Iron Ore Company which improved how heat was directed to the iron ore, how materials were moved through the sintering machine, and reduced the need for unscheduled repairs (Hunner 1950, 473).

Hunner concludes that the output of sinter puts their plant in line with “most modern twelve box machines today” Based on the details listed in Hunner (1950), Leach (1944), and Himrod (1940) The Evergreen/Portsmouth sintering plant had 18 wind boxes, seven on the side taking in iron ore and eleven more on the side discharging the finished sinter product. This comparison to the output of smaller sintering machines may indicate that despite the improvements and modifications made by the Hanna Iron Ore Company that the Portsmouth Sintering Plant was simply not as as efficient at producing sinter relative to the scale of smaller and more up-to-date sintering plants, many of which were now becoming a feature of steel manufacturing in the middle twentieth century.

A revealing note about the way the Portsmouth Sintering Plant was quickly becoming an outlier to common practices in the iron industry can be found in the September 1951 report from Skillings’ Mining Review. It states that the

“Portsmouth Sintering Plant is operating at a high rate and is steadily sending out loaded railroad cars to the ore docks. The plant is a lone operation of its kind and favors sintering ore at the source instead of sintering at the point of consumption -a controversy held in abeyance for years. Portsmouth Sinter is a well known trade name noted for its excellent structure, high iron content, and low moisture. Its crunchy appearance might lead to its being called the ‘cracker jack man-made ore’ of the Cuyuna Range.” (Use All Known Ore 1951, 1)

The mention of ‘controversy’ about sintering away from steel mills reveals that the debate between sintering at mines or steel mills appears to have been nearly settled, with the Portsmouth plant as a lone relic to an earlier philosophy of iron ore processing. As the 20th-century progressed beyond the 1950s iron sintering machinery would become a common feature attached to iron and steel mills to reclaim iron from clinker and other furnace by-products.

Following the Idea: Changing Ore transportation Methods

Mining Journals in the middle of the 20th century reported on the technological changes occurring on the Cuyuna Range. These sources have been a useful window into how other scholars and mine engineers viewed the Cuyuna Range while it was in operation. For example, the methods used to haul iron ore across a mine location were changing from locomotive and conveyor systems towards roadways and trucks by the middle of the 20th-century. (Lamppa 2004, 153), Leach (1944), and Burton (1950). With demands for Cuyuna’s ore reaching record levels there were strong incentives to find new ways to reach ores that were not accessable using the standard rail car methods of moving ore. The Cuyuna Range became a leader in adopting and adapting new technologies during this era of high demand for domestic iron ore. All three sources report the advantages of using trucks in an open-pit iron mine is their ability to reach small pockets of high grade ore that could not be accessed economically with using trackways, especially if the grade of the slope was too steep for lo-

comotives. The earliest note of trucks hauling ore from mines in the Mesabi Range dates back to 1933, but would only see limited use there until the middle of the 1940s when larger trucks with more powerful engines were developed (Burton 1950, 1&4). On the Cuyuna Range, where the grades of iron ore were more variable, trucks for hauling ore were embraced sooner, as early as 1937 in the case of the Evergreen Mining Company (Leach 1944, 31).

Leach reports the advantages of trucks in the Evergreen mine, the home mine where the Evergreen Sintering Plant was located, in his 1944 account. Leach notes that trucks gave better access to some parts of the open pit that tracks couldn't easily approach, including some grades as steep as 22% which were impossible for locomotives to climb (1944, 32). The foremen for the Evergreen Mine saw trucks as a useful tool allowing them to cover a wide area of the mine operation rapidly, making it easier to be at critical places of the mine operation at the right moment (Leach 1944, 30). The report also claims that the waste material collected by using trucks is reduced since less waste material had to be cleared to gain access to ore than with machinery fixed on tracks (Leach 1944, 32). The report does note two drawbacks of using trucks. They occured when roads were impacted by soaking rain causing impassable muddy sections or by extremely dry conditions creating dusty clouds making the roads difficult for drivers to see (Ibid). Until 1943 the Evergreen mine tried to address mine road conditions by using a mix of oil and mine tailings. However, rationing

during World War Two forced the mine to only use tailings to pack down roadbeds (Ibid).

Following the People: The Zontelli Family

Homes built during this period of relative prosperity for the Cuyuna Range between 1940 and 1960 were mostly built in Crosby which had 51 of the 70 recorded structures. Ironton had most of the remainder (9) of these houses. These dwellings shared the trend of lower rooflines that 1920s and 1930s homes shared, but the structures tend to be one story and have a rectangular in floor plan. Several of these homes are in the common “midcentury modern” design of split level or ranch style dwellings. Others, show details of a streamlined colonial revival style in their trim. Many of these homes have a large plate window or windows facing the street. Most of these mid-century homes were located in a middle class residential area east of the Gold Coast neighborhood. It is difficult to know how many homes were in this neighborhood because they are now slowly being acquired and demolished by the local Cuyuna Range Medical Center. A few property owners in this neighborhood informed the surveyors that they had agreements with the hospital to grant the owner the opportunity to live in their homes for the rest of their lives, but after passing their land will be acquired by the medical center as it continues expanding. This pattern in housing suggests that Crosby’s role as a central hub of the Cuyuna Iron Range only increased in the middle of the 20th-century as access to automobiles

made it less necessary for workers and managers to live within walking distance from their workplace.

The story of one local family that demonstrates the potential for upward social mobility in the Cuyuna Range in the early to middle 20th century is that of the Zontellis. Their mining operations found success in places where other companies had abandoned operations. By the late 1940s, the Italian-American Zontelli family had built a successful mining business in the Cuyuna Range that focused on the acquisition and refinement of ores that had been deemed by experts to be 'marginal'. These "lean" ores were composed of between 30 to 49% iron. The Zontellis were skilled at processing lean ores or combining them with higher grade ores to meet the market standards of the time. In addition to their business savvy and work ethic, the Zontelli family used technology to make marginal ores from their mines meet the thresholds for marketable ore.

The first member of the Zontelli family to arrive in the United States was Emanuel Zontelli. According to family history, in 1886 Emanuel escaped the social and political turmoils in Northern Italy along with many other young men of his village by finding work at the Montreal Mine in Pence, Wisconsin (Zontelli 2014, 7-8). In 1888 Emanuel married a young widow, Virginia Pretis, an immigrant from Northern Italy who had lost her husband to a mine explosion in the Leadville Mining District of Colorado and had then moved to Wisconsin, via a short return visit to Italy, to live with her brothers in Pence (Zontelli 2014, 8-10). Virginia did not want her family working underground in mines so she exerted

her strong influence over her husband Emanuel and sons, Emil and Henry, to find other sources of employment. By early 1912 Emanuel was a successful local supplier of timber to the mines in Pence, Wisconsin. On July 7th, 1912 Emanuel died from injuries related to an accident he had while managing his timber supply. Emil, Henry, and their sister Anna held a family meeting with their mother Virginia. They decided to seek-out new opportunities on the recently opened Cuyuna Range in Minnesota.

After arriving in Ironton, Minnesota in July 1913, Emil and Henry began diversifying the types of work they performed around the Cuyuna Range, as long as it did not involve working underground in the mines, thus following their mother's wishes. Their first occupations included road building, hauling coal, and moving structures for local mining companies (Zontelli 2014, 15). About ten years later the two brothers expanded into heavy earth moving equipment for large construction projects across the region including building several of major roadways and power line corridors. When construction opportunities declined during the Great Depression the Zontelli Brothers shifted to helping the remaining active mines strip overburden soils from their open pit locations (Ibid).
By 1949 a third member of the Zontelli family was accepted as a full partner in the business. Annie Zontelli Stang, the sister of Emil and Jack had become the bookkeeper for her brothers shortly after graduating school in 1936 (Zontelli 2014, 17-18). The partnership is described by Dave Zontelli as "a gift from Emil and Jack because Annie was so valuable, trusted, and honest" clearly showing

her work was being recognized as vital to the success of the entire company (Zontelli, 2014, 18).

By the late 1940s several mining operations across the Cuyuna Range chose to sell their mines after wartime iron and steel production transitioned towards consumer demands. The Zontellis seized this opportunity to acquire mines and use their accumulated experience towards making their mine operations fit the shifting iron market conditions of the 1950s. A short description of the Zontelli Family's success in the middle of the 20th-century is provided from a Crosby-Ironton newspaper feature sponsored by a lobbying group called "The Iron Mining Industry of Minnesota". The text and tone of the article suggests it was part of a series of features in a public-relations campaign that was published in many newspapers across Minnesota during 1951 (Figure 24). This article includes an eye-catching photograph of Emil Zontelli standing alongside his iron ore processing facility near Crosby. The caption to the photograph reads: "Here you see him at his concentrating plant on the Cuyuna Range. Mr. Zontelli got started in Minnesota in the moving and haulage business, using horses and wagons to deliver coal to iron mines. In 1936, with his brother Jack, he began handling mine excavation jobs under contract [and later] went into actual mining on his own six years ago [1945]" (Iron Mining Industry 1951, 6).

The main article further described the Zontelli Brother's contributions to the mining industry. The highlights include, "The Minnesota concentrating plant he runs turns low-grade ore, once considered worthless because of the low iron

content, into first-rate ore urgently needed by the nation. By making use of it, Mr. Zontelli is practicing real conservation -helping to lengthen the life of better ores" (Ibid). The stated national 'urgency' in this article is likely a reference to the demands placed on North America's iron industry during the height of the Korean War (1950-1953). The article concludes its mention of Emil Zontelli with "It is good to know that Minnesota's Ranges have other 'Zontellis'- other men who, starting from scratch, today own and operate impressive processing plants that 'manufacture' iron ore" (Iron Mining Industry 1951, 6).

A report from *Skilling's Mining Review* reprinted in the September 6th edition of the *Crosby-Ironton Courier* described Emil and Jack Zontelli's operations in late 1951. The "Zontelli Bros., Inc. are producing iron ore from the Virginia mine on the Cuyuna range. The Virginia mine is worked by open-pit methods and made it s first shipment in 1948. Three Woods jigs have been added to the Virginia mine concentrator to retreat low grade classifier product." (Use All Known Ore 1951, 5).

Dave Zontelli outlines some of the ore processing systems that he believes to have been the keys to his family's success at iron mining in the Cuyuna Range in the mid-20th-century. He reports, "Zontelli Brothers had the best, most efficient treatment plants on the range. They had a very large plant located at the Virginia mine on the west side of the range. This plant had a Heavy Media Separation Process that no other plant had on the range. The Virginia plant could treat low grade ore, that other plants could not and make the ore

marketable" (Zontelli 2014, 19). As part of the strategy of turning marginal ores into marketable ones, Dave Zontelli continues with his description of their mining strategy compared to other companies in the region. He states,

"It was more profitable to mix the low grade ore in the pits with the high grade ore and come up with a Bessemer ore of 52% iron than to just mine the high grade ore. Most other mining companies were using pure high grade ore to get a better price for the ore. This meant that they were only high grading the pits; that is, they were mining the highest grade ore and leaving the low grade ore in the pits. It did not take long for the property owners to learn that the Zontellis would be shipping more ore from a property than any other mining company" (Zontelli 2014, 19).

This combination of ore processing and mixing of grades proved to be a very successful strategy. Another unique feature of the company compared to other mining organizations was in their labor force. Dave Zontelli states, "Zontelli Brothers was the only non-union company in the mining industry in Minnesota, Michigan, and Wisconsin. The union desperately wanted to organize Zontelli Brothers" (Ibid). Part of this desperation can be seen in the effect the Zontelli mines had in disrupting the coordinated iron mining and steel workers strike during the spring of 1952 that was focused upon pressuring U.S. Steel in particular. Since the end of the Second World War most wages for iron mine employees had stagnated while costs of living were rising (Lamppa 2004, 225). The strike was part of a national effort to raise unionized workers' wages and

improve benefits. Most active mine operations on the Cuyuna Range, besides the Zontelli Brothers, were still operated by larger regional mining companies with mines spread across the Mesabi Range and other Great Lakes mining districts. Due to that large scale, most mining companies had workforces tied to unions with a national scope such as the AFL or CIO (American Federation of Labor or Congress of Industrial Organizations).

Local newspaper accounts show that while all other Cuyuna Range mines closed rapidly when the national strike of 1952 was called, the Zontelli Brothers' mines were the last to close. Their mines continued operating weeks after the strike began and were the quickest to open again, nearly 55 days later, when both sides were nearing a settlement granting workers a raise in wages ("Strike Notice Monday" 1952, 1 and "Ore Shipments Start" 1952, 1). The pressures to unionize would continue to follow the Zontelli Brothers company through the 1950s. The Zontelli family's business ventures be would continue to develop, grow, and innovate for several more decades in the Cuyuna Range.

Following the Idea: The Manganese Chemical Corporation

For a third and final time in the Cuyuna mining district's history a war raised demand for steel in the United States while also restricting its access to manganese from Russia. As the Cold War continued, the three main alternatives to Russian manganese (India, Africa, and South America) would continue to increase their output of manganese ore. Steel production in the United

States would also gradually plateau, then decline under fierce competition from more modern iron and steel mills in Europe and Japan. For the time being in 1951 however, demand for manganiferous ores from the Cuyuna Range remained very strong.

A surge in demand for raw materials to support United States military during the Korean War sparked new interest in extracting manganese from the Cuyuna Range. An August 1951 article posted in the *Crosby-Ironton Courier* reports that, "major metallurgical research problems [are] now being tackled under an expanded defense program by Bureau of Mines metallurgists in Minneapolis. Because of this intensified research, the staff of the Bureau's North Central Experiment Station on the University of Minnesota campus has been increased from seven to twelve persons since the start of 1951" (1951, 1). The article continues with a specific statement about the importance of the manganese present in the Cuyuna Range. It notes that the United States Bureau of Mines believes it is "no less vital to the nation's economy [is] research to recover manganese from manganese-bearing formations on Minnesota's Cuyuna Iron Range. Every ton of steel takes about thirteen pounds of manganese" (1951, 1&4). The article concludes that while the United States can acquire some manganese ore from India, Africa, and South America "manganese shipments from the Soviet Union, probably the world's largest producer, have practically stopped" (Bureau of Mines 1951, 4).

In 1951 another government sponsored and state research driven collaboration with local businesses fostered important innovations with implications for the Cuyuna Range and for the rest of the nation. The pressures from a limited domestic supply of manganese in 1951 drove this new public-private collaboration just as it had in the crisis of declining high grade iron ore in the 1920s. The Manganese Chemical Corporation of Minneapolis, Minnesota worked closely with state funded researchers on ways to develop new methods that produced manganese with ore from the Cuyuna Range. The first mention of the company in the Cuyuna Range is in an article in the *Crosby-Ironton Courier* from August 9th, 1951. The article leads with a description of the company's struggles to sell an existing manganese processing plant in Aurora, Minnesota. The article then implies this delayed sale was the reason why "plans for a new manganese extraction plant on the Cuyuna Range were apparently delayed" (Reject Bids 1951[2012], 5). The short notice ends on a hopeful note by reporting that "rumors [are] circulating in the local area [that] an option has been taken on land near [the town of] Manganese as the site of the plant and that the plant will come to this area regardless of the outcome of the sale of the Aurora plant (Ibid).

By the spring of 1952, renewed interest in building the manganese plant deemed a 'war baby' ten years previously was gaining political and financial support. The relocation of the Manganese Chemical Company to a newly built facility in Riverton, Minnesota starting in the fall of 1951 was facilitated with the

help of a “tax amortization amounting to $1,110,956.25” from the Defense Production Administration (“Riverton Plant Gets Tax Certificate” 1952, 1).

By August 14th, 1952 the company was awarded an additional loan of “up to $1.5 million to construct the plant” from the U.S. defense materials procurement agency ($2 Million Manganese Plant” 1952, 1). Construction at the Riverton site had been halted since the fall of 1951 when it was determined that “the building as planned would not be large enough to carry the operation” (Ibid). In addition to the influx of loans for construction and tax incentives the defense materials procurement agency also guaranteed a favorable price of “$2.35 per unit of 22.4 pounds” of “concentrates containing not less than 60 percent manganese” for the first six months of production along with a government contract extending for approximately four additional years of production at market prices (Ibid). The anticipated annual capacity of the plant in 1952 was stated to be “456,000 long-tons or 10,214,000 pounds” (Ibid).

The plant neared completion by April 1953 when the first tests were conducted at the facility (“Manganese Plant to Start” 1953, 1). The report states the main facility “is 234 feet by 117 feet and the tallest part of the structure is 47 feet high” and that “about 55 men, including the necessary technicians will be employed when the plant enters production” (Ibid). The process of refining the manganese ore in the Cuyuna Range used large amounts of water. The facility needed state permits for drawing, treating, and returning water from the Mississippi River at the rate of 2,800,000 gallons per year (Ibid). In a yearly summary

for 1954, the facility was described as fully operational. The plant made “several shipments of high grade manganese product. This manganese is forwarded in heavy stock paper bags. The plant uses the ammonia carbonate process and is rated to take in 200 tons of manganiferous ore (“New Plant” 1954, 1). The stated concentrating process is different from the two proposed processes mentioned in the failed 1942 proposed plant. Later accounts of the facility, around the time of its closing in 1962, state that the plant was focused on producing “a large quantity of battery-grade manganese dioxide for the U.S. Army’s Signal Corps and to experiment with the recovery of manganese from low grade manganiferous ores on the Cuyuna range for commercial use (“Riverton Plant to be Moved” 1962, 1).

Patent records show new processes and innovations were being developed by employees working for the Manganese Chemical Company while it operated in Riverton (Welsh 1960). The patent for a new manganese dioxide production process was granted on October 18, 1960 to a chemist Jay Y. Welsh, resident of Brainerd, employee of the Manganese Chemicals Corporation of Minneapolis, Minnesota. In his patent, he claims to have uncovered a more efficient way to create “battery-grade manganese dioxide” for commercial use. This statement shows a shift in the general purpose of mineral extraction on the Cuyuna Range away from iron or manganiferrous iron towards manganese as a valuable product in its own right (Welsh 1960). The content included with this patent provides details that this innovation has been utilized and

cited in at least 43 other patents, with the most recent being in 2011. The list of corporations in these citations includes Dow Chemical, Duracell, and Gillette with each citing the relevance of this process towards their own battery technologies (Ibid).

Following the Thing: Declining Communities and Moving Houses

Even though mining output for the Cuyuna Range reached its peak in this era, some places were already in deep decline. Though the larger communities such as Crosby and Ironton were as prosperous as ever, only one of the smaller communities, Riverton, had active mines (the Sagamore open pit) and processing centers (like the Manganese Chemical Company's plant) supporting them. Other satellite communities had lost the last active mines around them with the end of the Second World War. The town of Manganese was a community located near four active mining operations when it was founded in 1913, but it had declined greatly since it's population peaked near the end of the First World War. The U.S. Federal Census recorded the community's peak population at 183 shortly after that war ended (U.S. Census, 1920, 238).

Testimony from former Manganese residents in the 1930s noted the population had declined to "approximately 60 to 65 people" by that time (Foote 2004, 195). George Brightman, an economic geographer, gave a vivid description of the state of communities across the Cuyuna Range at the end of the Great Depression. He noted that in 1942, while Crosby and Ironton were reviv-

ing by recent wartime demand. Peripheral towns that had boomed in the First World War such as “Trommald (population 166) and Manganese (population 62)…are reduced to ghost towns” due to the closed underground mines that once supported their communities (Brightman 1942, 284). By 1954, less than 35 years after its heyday the town of Manganese was being labeled a ‘ghost town’ by local observers as well. The size of the community in Manganese had declined to the point that less than six homes were being occupied when Mrs. L. L. Foote reported to the local paper in 1954 (Foote 1954, 1). Mrs. Foote notes that “Families began to move away following the closing of the Algoma, Merritt, Joan, and Gloria operations during the 1920s and 1930s. Some houses were moved or were torn down by order of the Fire Marshal or merely used as firewood” (Foote 1954, 1). Within a year, 1955, the last homes in Manganese would be abandoned (Foote 2002, 195).

The fate of the homes that were moved from the former town of Manganese are visible today in communities like Riverton where the once uniform rows of one-and-a-half-story former company houses are now interrupted with one story dwellings reported by residents in the 2012 historic structures survey to have been moved there from Manganese some time during the mid-20th-century (Figure 11). More small-scale mining operations and their satellite communities such as Trommald would go into steep decline soon after the last mining surge of the 1950s was over. The next decade would include serious challenges to sustaining mining efforts around even the largest industrial com-

munities in the Cuyuna Range. The early 1960s to 1970s was defined by efforts to sustain mining or develop new industries to support the local mining communities before changing market conditions made even these efforts falter.

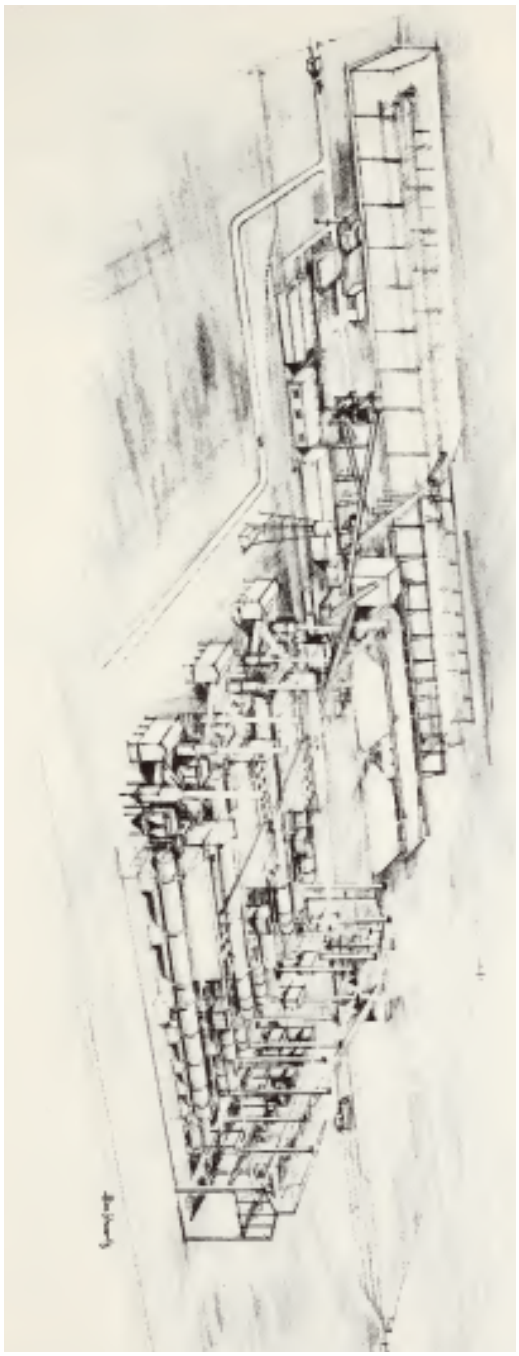


Figure 25. Image of a proposed three kiln Krupp-Renn iron processing facility. With potential space to expand (to the left) into a six kiln plant. The Cuyuna Range Community of Trommald was one site under consideration to have this facility built. Digital scan at highest resolution available. Pennsylvania State University: Americana Collection. From: U.S. Chamber of Commerce. Feasibility of the Krupp-Renn Process for treating the lean ores of the Mesabi Range. 1964, page 8. Available from: archive.org; https://archive.org/details/feasibility-ofkru00sout. accessed October 7, 2015.

GOING . . . GOING . . . and then it stopped in the position pictured above. In the process of wrecking the old Armour No. 2 shaft just north of Ironton, workmen miscalculated a bit in cutting braces on the headframe and instead of tipping over completely, it stopped part way. All it took was a little more torch cutting to complete the job, however. Work has also started on dismantling the new Armour No. 2 shaft.

Figure 26. Image from a series featured on the headline of the November 1st, 1967 edition of the *Crosby-Ironton Courier.* These images show the closing and scrapping of the Armor #2 Mine located near Ironton, the last underground mining operation in Minnesota at that time. From archives at the Crosby-Ironton Courier, 1967 folio.

Chapter 7: 1961-1975
Iron Innovation and Amendment

Table 7: US Federal Census of population and change from 1960 to 1970 in three regions of Minnesota that developed iron mining communities. ancestry.com: US Federal Census Collection. Accessed December 7, 2015.

Table of Population Change		
Population By County	**1970**	1960-70 % Change
Crow Wing [Cuyuna Range]	**34,826**	+8.3%
St. Louis [Vermilion and Mesabi Range]	**220,693**	-4.7%
Itasca [Mesabi Range]	**35,530**	-6.5%

Production in the Cuyuna Range declined sharply after peaking in the 1950s. Only 1,600,000 tons shipped in 1966 and trending down further to 308,000 tons shipped by 1972 a decline of almost eighty percent (*Cuyuna Country* Vol. 3 2004, 28-29). This era saw a large number of mines close, nearly twenty in a little over a decade. Seventeen of the twenty mines that closed in that time did so by 1965 (Figure 13b). High-grade iron mines across the state had to invest more in technology, equipment, or workforces in order to counteract the diminishing output of marketable ore from their mines. C. W. Potts' 1921 prediction of declining marketable iron ore reserves was coming true. The decline was delayed for a few decades by factors such as an economic recession, processes like sintering, and new mining techniques like those practiced by the Zontelli family ("Forcasts Ore Reserve Depletion" 1921, 758). This downward

trend in production reflected the changing markets and technologies, such as taconite production of this era, that lowered demand for high-grade iron ores from the Cuyuna Range. As the common practices of marketing Cuyuna's iron and manganese resources became unsustainable, various economic, political, and social groups attempted to find new processes to sustain mining and to identify new sources of economic growth.

Following the People: The End of Zontelli Brothers Mining Company

The Zontelli Brothers had sold their mining interests to Pittsburgh Pacific on August 1st, 1957 and made the deal publicly known with an announcement on August 7th ("Zontelli Bros Merge" 1957, 1). This sale occurred within a year of the vote by their employees to unionize the mining workforce (Zontelli 2014, 21). According to Dave Zontelli,

"I believe that at this time there was a lot of pressure on the employees from the slowdown in the mining industry. When the employees voted to be represented by the union, Jack was personally hurt. He felt that he had lost his company and the employees had voted him out. Looking back, it seems that the company voting to go union was a blessing to Jack. Although he was personally hurt, the vote released him from the responsibility of keeping everyone working in a time when the demand for iron ore was slowing down." (2014, 21).

This statement revealed that Jack Zontelli held some paternalistic feelings towards his employees. As the Zontellis' business ventures expanded through the 1950s with multiple mines in multiple states, it must have become

difficult to maintain an intimate “family” relationship with every employee while at the same time working against unionization efforts. The late 1950s saw economic conditions gradually worsen for everyone connected to Cuyuna’s mining industry. In the end it seemed the temptation for workers to gain greater job security with unionization on mining sites near the end of their operational lives was too great. The Zontelli business model of blending and refining unmarketable iron and manganese ores was becoming difficult to sustain. High grade iron ore’s share of the iron and steel market shrank against the rising popularity of taconite ore suppled from the Mesabi Range after the middle 20th-century. While these events ended Zontellis’ management of active mines, they continued their businesses in construction and in iron ore processing for other Cuyuna Range Mines. Their company would soon play a vital role in the events to sustain mining in the Cuyuna Range through the 1960s.

Following the Idea: Manganese Markets Shift, Closing of Riverton Plant

Early in 1962 the Manganese Chemical Corporation announced it would move it's processing facility and headquarters to Baltimore, Maryland (“Riverton Manganese Plant Will be Moved” 1962, 1). A statement from the Riverton plant’s superintendent, D. W. Peterson explained the company’s reasons for relocating. He stated this move:

“has been under consideration for over a year, is necessary to improve the company’s competitive position by locating the processing facilities closer to its raw materials and markets...As mining operations declined in the area, it be-

came more and more uneconomical to obtain suitable ore locally for the processes and products being developed. This forced the company to turn to high manganese content foreign ores which are brought into the country from the east coast. Also, the company's markets are in the eastern portion of the country and high freight costs for shipping the products to customers made the Riverton operation uneconomical" (Ibid).

It would take three years for local businessmen and agencies to attract another industry, a plastics molding company, to acquire the property ("New Plastic Firm in Operation" 1965, 1). The industrial plant was then in use until 2012 when the last plastics company using the site, Stern Industries, relocated from Riverton to Brainerd.

Jay Welsh continued his career of inventing new methods to use manganese after working at the Manganese Chemicals Corporation's plant in 1960. His legacy of at least 46 filed patents demonstrate he continued innovating through the middle 1980s. Most of these patents related to processing manganese into materials suitable for commercial products. Later manganese related process patents filed under Welsh and the Manganese Chemicals Corporation reveal the company's headquarters moved from Minneapolis, Minnesota to Baltimore, Maryland by 1962. However, this same document indicates Mr. Welsh continued to reside in Brainerd, Minnesota (Welsh 1961). By mid-1964 patent records indicated that Mr. Welsh had followed his employer, the Manganese Chemical Corporation east to Maryland (Welsh 1967).

Several of the patents filed by Welsh and the Manganese Chemical Corporation were legally “assigned” to Chemetals Inc in 1982 (Welsh 1965). Several of Welsh’s patents filed after 1965 list Chemetals Inc. as his employer (Welsh 1977). While these details do not conclusively show the Manganese Chemical Corporation was acquired by Chemetals Inc. it does suggest that many of the early innovations from their time in Riverton, Minnesota were acquired by Chemetals. Based on similar patent record evidence it seems the ERACHEM-Comilog appears to have taken over the Baltimore based Chemetals company and their patents around 2001 (Welsh 1979). Currently, ERACHEM is a subsidiary of the French mining and metallurgical conglomerate called ERAMET (“Who We Are” 2014). It is likely that this group now controls the rights to the innovations made by Welsh and the Manganese Chemical Corporation from the time they were developing new manganese processing techniques in Riverton, Minnesota.

Once the Manganese Chemical Corporation left in 1962 there was still some interest in the manganese resources of the Cuyuna Range. A 1980 evaluation on the manganese deposits of the Cuyuna Range revealed that the resources were only “marginally economic and extractable by current surface mining technologies.”(Beltrame, et al. 1981: 11). However, given that “our dependency on foreign imports [of manganese], the rapid depletion of industry and government stockpiles, the lack of any other potential sources in the near

future" the manganese ore of the Cuyuna Range is still a vital national resource (Beltrame, et al. 1981: 11).

The emphasis on processing manganese by the Manganese Chemical Company's plant in Riverton shows the origins of a trend that may reemerge in the near future as a viable economic model for the Cuyuna Range's mine economy. As the number of battery powered devices increase and the global demand for manganese increases these once 'marginal' deposits may find use again. Already in the town of Emily, Minnesota at the northern tip of the Cuyuna Range serious efforts since 2009 have been made to develop a manganese processing plant. According to Crow Wing Power's press release statement on their website, much of the feasibility and environmental review stages have been completed ("Manganese News/Events" 2014).

Following the Idea: The Krupp-Renn Process

In the face of declining manganese and iron ore shipments in the early 1960s there was one final push by economic and political stake-holders in the Cuyuna Range to develop new methods and processes to sustain iron ore mining. One eye-catching and unusual headline editorial from this period read: "Range Economy...Your Future: Do you Really Care?". The prominently placed commentary encouraged readers to attend upcoming community meetings to support processes that could revive the flagging mining economy. The article did not mince words in what it expected of the attendees to the meeting, "To our

way of thinking, the right kind of talk is THE RANGE COMMUNITIES TALKING AS ONE, and, at the moment, the right place to say it would seem to be the [upcoming] meeting" [emphasis in original] ("Range Economy" 1964, 1). This emphatic plea reflected the growing economic tensions as communities across the Cuyuna Range felt pressures to compete for dwindling opportunities for new economic growth rather than unify to develop projects with a regional economic scope. The one exception to this trend was highlighted in the editorial, "the new Cuyuna Range Hospital stands as one of our greatest united endeavors" (Ibid). That hospital, built in 1962, is now called the Cuyuna Regional Medical Center and continues to be one of the most successful regional businesses. The projects featured at the February 17th, 1964 meeting that the editorial mentioned would represent some of the last-ditch efforts to reinvigorate a rapidly declining mine economy.

One of the meeting's featured projects was a venture between federal, state, and local private business entities. It was hoped that this venture would have the same success that previous collaborations had in bringing sintering and manganese processing to the Cuyuna Range. This new venture involved West German and United States cooperation to develop the Krupp-Renn steel making process by using Cuyuna Range ores. The final economic feasibility report was published later in the year to encourage investment in the project. (U.S Department. 1964).

While the initial effort to explore the feasibility of this process was fostered by the Itasca County, Minnesota Area Redevelopment Agency, a prominent Cuyuna Range family quickly joined the venture (U.S. Chamber 1964, 1). The report lists members of the local Zontelli family as sponsors of the project, but the larger forces that drove this international collaboration included research based at the University of Minnesota and backing from the United States Department of Commerce. Historic accounts revealed that funding was given to the Zontelli Brothers to experiment with Cuyuna Range ores in Germany in 1961 (Cuyuna Range 2004, 27). The first public mention of the German tests appeared in the *Crosby Ironton Courier* on January 31, 1962 under the headline: “Range Ore is Tested”. The cryptic article only mentioned that the tests are being held in “Essen-Borbeck, Germany by the Fried. Krupp Steel Corp. working with men from Zontelli Brothers of Ironton [Minnesota]” (“Range Ore” 1962, 1).

The description of the Krupp-Renn process provided in the U.S. Chamber of Commerce’s 1964 report echoed some of the features and objectives of John T. Jones’ earlier efforts in 1913 to refine the low grade ores of the Cuyuna Range using his rotary chambered Ardis Furnace. The Krupp-Renn process was “developed in Magdeburg and Borbeck, Germany between 1931 and 1939 for the treatment of ores not economically adaptable to blast furnace use. This process is carried out using a rotary kiln and produces low carbon, high iron, metallic nodules known as ‘luppen’” (U.S. Department 1964, 4).

The first small scale testing for the project was conducted at University of Minnesota's Mine's Experiment Station. Their results showed "Mesabi Cherty, Mesabi Painty, and Cuyuna Manganiferous ores would be amenable to processing in a Krupp-Renn direct [reduction] iron plant." (U.S. Department 1964: 1). The second phase was conducted by the "Zonteli Brothers of Ironton, Minnesota, to investigate the metallurgical feasibility of applying the Krupp-Renn process. Tests during this phase using the Krupp-Renn process at Rheinhausen, Germany, proved the feasibility of operating the process on Zontelli type ore [Cuyuna ores]." The third phase was the main focus of the report which contained engineering and cost analysis for a proposed plant (Figure 25).

This report revealed there was close consultation between German and American engineers on possibility of building a direct reduction plant in the Lake Superior region. Part of the reasoning behind this partnership was based on "practical knowledge developed from Krupp's experience in building similar facilities in Germany. Because the climate conditions of Krupp's plant at Frankenstein, Silesia, Germany are similar to those of the Lake Superior area." Three possible sites for a direct reduction plant were described as "Lake Superior-Duluth Area, Hibbing-Kelly Lake area, and Trommald area of the Cuyuna Range". All three sites had comparable start-up costs in terms of acquiring the property and shipments of raw materials to run the plant. The Duluth site was slightly less expensive at $13,200 rather than the estimated $15,000 for sites in Hibbing and Trommald (U.S. Commerce 1964, 14-15). Under "Minnesota's Iron

Ore Situation" the report noted: "increased competition from the ores of the Labrador-Trough area of Canada and from South America have cut deeply into annual shipments from this [Lake Superior] area" (U.S. Commerce 1964, 16). The report ended on a hopeful note that while foreign ores were out-competing domestic sources, they were expensive to invest-in due to the large amount of new infrastructure required to bring those ores to market compared to ores from the established mines in Minnesota (U.S. Commerce 1964, 16).

Economic feasibility reports were published through the University of Minnesota's Mines Experiment Station's semiannual "Progress Reports" on matters affecting Minnesota Mining. Arthur E. Anderson, a graduate student working with professors at the Mines Experiment Station gave two detailed and sobering economic reports on Minnesota's iron mining economy at that time. In those documents, he portrayed the challenges facing the development of a Krupp-Renn plant or any other type of facility to treat high-grade iron ores on the Cuyuna Range.

Anderson's first report in 1964 appeared to be a rebuttal of the economic arguments put forth in the U.S. Chamber of Commerce's report about adapting the Krupp-Renn process for use in the Cuyuna Range or elsewhere in Minnesota. His abstract opened with the declaration "direct reduction [like the Krupp-Renn process] has occasionally been successful in foreign countries under peculiar conditions but has not achieved commercial status in the United States because of the inability to compete with the blast furnace. Factors which

at times encouraged the development of direct reduction are not now operative. A direct reduction plant should not be constructed in Minnesota and additional market studies, economic appraisals, or process development investigations are not warranted" (bracketed comments added for clarification. Anderson 1964, 66). As if this scathing introduction was not enough, he specifically compared the prices of a Krupp-Renn product against that from a typical North American blast furnace. He stated "It has been estimated that cold Krupp-Renn luppen or R-N briquettes could be produced by a plant for about $41 to $45 per gross ton. Since integrated iron and steel companies are producing hot metal from blast furnaces for $36 to $48 per gross ton and can buy scrap for $20 to $30 per gross ton, the Minnesota plant products could not be competitive" (Anderson 1964, 68).

In 1965, Anderson gave a clear impression of the challenging economic landscape for United States iron and steel production in an increasingly competitive and globalized market. Anderson listed the unfavorable factors to the economics of using direct reduction iron ores, like those in the Cuyuna Range. These included: unfavorable costs of production, high labor costs, low cost of foreign iron ores, inexpensive scrap iron and steel, and a declining global demand for steel as products such as plastics, aluminum, and concrete replaced those once made with iron or steel (Anderson 1965, 69-84).

Besides the investment of local and regional businesses like the Zontelli Brothers towards finding solutions to the looming economic crisis for the Cuyu-

na Range, state appropriations to the University of Minnesota's Mines Experiment Station started around 1960. They focused on looking for new processes to make iron and manganese resources of the Cuyuna Mining district more competitive. A letter dated April 18, 1960 in the files of the Mines Experiment station [Articles and Speeches file, Box 15] from a Mr. Fred Schwanke to members of the Crosby and Ironton business community hosted by the Ironton Lion's Club states that Minnesota's legislature passed appropriations amounting to $50,000 for "general experiments in the benefaction of manganiferous and low grade ores, and for experiments in the direct process benefaction of low grade ores." A second appropriation amounting to $100,000 was also passed to study the same manganiferous and low grade ores "with special emphasis on ores of the Cuyuna Range".

It is highly likely the reports and studies undertaken by the University of Minnesota's Mines Experiment Station in the early to middle 1960s were funded at least in part with the state appropriations mentioned in Mr. Schwanke's letter. A progress report filed by the Mines Experiment Station of the University of Minnesota clearly articulated the difficult economic situation of the Cuyuna Range in the early 1960s by stating, "During the past ten years iron ore shipments from the Cuyuna Range in Crow Wing County, Minnesota, have decreased precipitously. Due to adverse grade, structure, and cost, many of the Cuyuna ores are no longer competitive with high-grade foreign ores or domes-

tic [taconite] pellets. As a result of the decline in iron ore shipments, there have been serious unemployment in Crow Wing County." (Production, 1966, 1).

The studies provided in the 1966 progress report reflected the Mines Experiment Station's attempts to develop a process to make Cuyuna's iron and manganese ores marketable again. Their findings showed a frustrating outcome where combinations of heating, chemical, and magnetic processes where "a high-grade iron product was obtained at high iron recovery, but much of the manganese in the ore was converted to manganese silicates and could not be recovered by leaching the tailing". Conversely, when they used different processes to focus on the manganese content of the ore it led to "high manganese recovery in the leach circuit, but a low-grade iron product at low recovery" (1966: Process, iii).

Following the Idea: Mining Declines, Innovation Continues on Cuyuna Range

One source of regional competition that contributed to the rapid decline in iron ore mining on the Cuyuna Range after the 1950s was the rise of taconite production in Minnesota, especially in the Mesabi Range. In addition to shifts in domestic iron ore production, other current global leaders in iron ore production such as Australia and China began to significantly develop their iron mining capacity after the middle 20th-century (Tuck 2014, 84-85). Domestic taconite production was further incentivized with favorably low taxes and duties on taconite ore legalized by the passing of the Taconite Amendment to Minnesota's constitution in 1964 (Lamppa 2004, 238). High-grade iron ore deposits

in many mines across Minnesota were getting harder to reach or were depleted after the Second World War. Mining the ore was requiring more and more effort with smaller yearly returns. Additionally, the high grade iron ores were taxed more heavily by the state of Minnesota than the taconite being produced by the Mesabi Range. The development of taconite was heavily encouraged by large national steel manufacturers, such as “Armco’s Bellefonte Furnace at Middletown, Ohio. The furnace was able to produce twice as much pig iron per day [using taconite pellets] as it did using natural ore” (Ibid).

The closing of Inland Steel’s Armor #2 mine on June 1st, 1967 sent emotional shockwaves through the communities of the Cuyuna Range. Local interest in the decline of mining activity was so intense around the time of the mine’s closing that the editorial section of the *Crosby-Ironton Courier* reflected many their sentiments. One article in those editorials published around the closing of Armor #2 encapsulated that sentiment better than others. The article states its conclusion that “it is with a feeling of real loss that I see the Inland Steel close down it’s last mine. When I think of the years it supported us and how many years my Dad worked there I feel like I’m bidding good-bye to a dear old friend. Not only will we lose income from the mine, but when we think of the lifelong friends who will have to leave here also it is indeed a supreme loss to all of us” (‘hello everybody:’ 1967, 7). In addition to these editorial statements the *Courier* “published its three-part segments several times in response to demand for reprints and finally urged readers to clip and save the story” (*Cuyuna*

Country 2004, Vol.3, 3). The published segments came with different dramatic pictures of mining facilities being scrapped (Figure 26). The mine's closing marked the end of Inland Steel's involvement with the Cuyuna Range, a relationship that had spanned nearly 57 years of supplying ore to its furnaces in Gary, Indiana (*Cuyuna Country* 2004. Vol.3, 17). The closing of Armor #2 also marked another important watershed as it was the last underground mine operating in Minnesota when it ceased operation (Ibid). All of the remaining Mesabi and Vermilion iron mines were open pit operations by 1967. Since then other underground mines have opened in Minnesota and new underground mines such as the copper-nickel mine proposed near Ely, Minnesota in 2012 may become a reality in the near future (Associated Press 2014). However, the labor-intensive underground operations that had been a feature of early 20th-century mines in the Cuyuna Range and elsewhere in Minnesota ended with the closing of Armor #2.

Another major landmark on the mining landscape was scrapped a year before the closing of Armor #2. For nearly eight years, until 1966, the Portsmouth Sintering Plant had continued to operate intermittently after the closing of it's neighboring Portsmouth mine in 1958 by processing ores from the remaining active mines (*Cuyuna Country* 2004. Vol. 3, 19). In 1966 a scrapping crew led by Duluth Metal removed most of the machinery, corrugated metal exterior, and structure around the plant facility. As of 2015, all that remains of this

local landmark are the poured concrete heating chamber and few surrounding shops and support structures (Ibid, 27).

Very few structures appear to have been from this tumultuous period in the early 1960s based on the survey of historic structures in 2012. Six buildings, including commercial and residential sites, were identified. These early 1960s structures were not significantly different in form or detail from the structures recorded from the 1950s in the Cuyuna Range. From this era onward the survey did find significant evidence of historic dwellings being modified with additional wings, enclosed porches, or even an additional story added to the original structure. This process of modification or moving even relocating historic homes rather than tearing down and starting-over with new construction is a consistent pattern in the Cuyuna region and these processes should be considered carefully by those evaluating the 'integrity' of individual sites or neighborhoods. If anything, modification rather than removal is integral to understanding why so many of this historic neighborhoods survived. Adaptation and modification was key to supporting the community through changing times. This process continued into the local business scene as well.

Smaller industries were being founded in the Cuyuna Range, often taking over facilities and equipment left behind by the closing of iron mines. One such example was the company Trail-a-Sled, founded by Crosby residents brothers Richard and Eugene Harrison along with Glen Gutzman (*Cuyuna Country* Vol 3. 2004, 92). With a team of mechanics drawn from the local pool

of former mine employees they developed the first modern snowmobile in 1965 (Ibid). Until the middle 1970s their company, which later changed its name to Scorpion Snowmobiles, produced and tested their vehicles in the shops and around the former mine lands belonging to the Inland Steel Company (Ibid).

The success of Scorpion snowmobiles led to supporting industries like the Crosby Manufacturing company, later called Acro Tech, which specialized in making molded plastic fuel tanks for snowmobiles and other small vehicles. This plastics company operated out of the same facility in Riverton that had been the home of the Manganese Chemical company during the 1950s and early 1960s (*Cuyuna Country* Vol. 3 2002, 105-106). While Acro Tech remained in the former Manganese Chemical Company Plant until 2004 (when Stern Industries would replace them as tenants), the Scorpion Snowmobile company was the casualty of a merger with and bankruptcy by their competitor Arctic Cat.

The demise of this innovative local company is reported in *Cuyuna Country*: “The Crosby-Ironton [manufacturing facility] was offered for sale in 1980 in a surprise move resulting from Arctic Cat’s own tenuous financial situation. When Arctic Cat itself was reorganized that same year, the Scorpion name was shelved. So the name that took so long to build and into which the community had poured so much was lost -seemingly overnight” (2002 Vol. 3. 97). While some small industries continued, sometimes in the shadows of the closed mine facilities, no single or collection of industries was able to replace

the economic output which the local iron mines had provided to the communities of the Cuyuna Range. The years of adaptation against the demise of the iron mining economy had ended with some modest successes, but forces beyond the boundaries of the Cuyuna Range were pushing mining out of the region for the foreseeable future.

Efforts were beginning in the 1970s from within the local community and by outside agencies to preserve the industrial legacy of the Cuyuna Range. Each group had its own objectives in how to preserve and reuse former iron industry sites. The Scorpion snowmobile company reusing former Inland Steel facilities was just the beginning of how the industrial landscape of iron mining was about to be repurposed.

Figure 27. Image of the Croft Mine Historic Park in Crosby. The site has a mixture of original mine equipment, relocated mine buildings, and a recreated mine hoist building. Photo by Author.

Figure 28. A 2012 image of cyclists at the entry to the Cuyuna Country State Recreation Area. Former mines are acknowledged by their lake names on maps, but other features of the former mine landscape are not indicated even though many of the trails are former mining roads. Photo by author.

Chapter 8: 1976-2010
Years of Change and Reflection

Table 8: US Federal Census of population and change from 1970 to 2010 in three regions of Minnesota that developed iron mining communities. ancestry.com: US Federal Census Collection. Accessed December 7, 2015.

Table of Population Change								
Population By County	**1980**	1970-80 % Change	**1990**	1980-90 % Change	**2000**	1990-2000 % Change	**2010**	2000-10 % Change
Crow Wing [Cuyuna Range]	**41,722**	+20%	**44,249**	+6%	**55,099**	+24%	**62,500**	+13%
St. Louis [Vermilion and Mesabi Range]	**222,229**	+0.6%	**198,213**	-11%	**200,528**	+1.2%	**200,226**	-0.15%
Itasca [Mesabi Range]	**43,069**	+21%	**40,863**	-5%	**43,992**	+8%	**45,058**	+2%

Soon after the middle-1970s, the last active mine operations were on their way out in the Cuyuna Range. This decline in iron ore production was driven by global changes in the iron and steel industry which no single technological innovation could hope to change. Efforts to preserve and recognize the legacies of mining across the landscape of the Cuyuna Range began as mining ended for the moment.

The Mesabi Iron Range had enjoyed two decades [1964-1984] of renewed prosperity using taconite production. However it began to decline rapidly due shifting global markets for iron and steel that put North American production at a strong disadvantage. According to Lamppa,

“[North American] steel companies had been slow to adopt the latest technology [such as using more efficient oxygen steel furnaces rather than the traditional open hearth process], expensive labor contracts had been negotiated, an

energy crisis had set in, but probably more impacting was the steady rise of off-shore steel competition. Steel imports [made with cheaper and more efficient processes] flooded the American market. The demand for domestic steel declined sharply and, along with it, the demand for taconite pellets" (2004, 241).

This decline in demand for domestic iron ores is reflected in the dwindling output of the high grade iron ore mines in the Cuyuna Range during the late 1970s. Yearly accounts of ore mining and shipments from the Cuyuna Range record only "162,056 tons of ore shipped in 1979 and 591,269 tons mined" and by 1983 "the lowest tonnage of ore [shipped] since record keeping began in 1925 on the Cuyuna Range was tallied in the year past at a figure of 14,580 tons" (*Cuyuna Country* 2004 Vol. 3, 29). The final mining report listed in the timeline states: "The annual report of the mine inspector in February showed no ore shipped from the Cuyuna Range in 1985". While the era of mining was over for the time being, efforts to memorialize and commemorate remnants of the Cuyuna Range's mining heritage were just beginning.

Much of the mining infrastructure of the Cuyuna Range was sold or scrapped soon after the last remaining stocks of Cuyuna Range iron ore were drawn down. The patterns of economic stagnation, preservation of landscape features for economic rather than aesthetic reasons, and tearing-down of other features seen as either blights or valuable only for scrap have been reported by different authors throughout the end of the 20th-century. This development in the Cuyuna Range fits the patterns of deindustrialization discussed in detail by

Modell and Brodsky (1998) and about remnant mining landscapes by Richard Francaviglia (1991).

Following the Idea: Mining Heritage Preservation on Cuyuna Range

During this period of dramatic changes to the former active mining landscape, members of the Cuyuna Range communities began to preserve and commemorate features of their mining legacy. In the late 1970s, one of the first large-scale attempts to document the industrial communities of the Cuyuna Range came from a “historical-cultural survey” report jointly sponsored by the Minnesota State Historic Preservation Office, the Minnesota Historical Society, and the Iron Range Resource and Rehabilitation Board (IRRRB). From 1978 to 1979 Joseph Stipanovich, a historian, led a team of seven researchers described as “two full time and six part time employees” that documented historic mining sites and community structures of the Vermilion, Messabi, and Cuyuna Ranges (Stipanovich 1979, 1).

The three expressed objectives of this survey effort were to: “inventory historic resources” including features such as “a building, structure, site, object, or [any] combination”, the “selection and nomination of appropriate historic resources to the National Register of Historic Places.”, and lastly to conduct a “systematic analysis of Iron Range history” with the collected research data. A secondary objective mentioned in Stipanovich’s report is that “the Iron Range survey differs from other historic preservation surveys in both conceptualization

and method. The crucial aspect of its differences is the survey's studied avoidance of the architectural significance of structures as a primary criterion for selection as a historic resource and the elitist social history bias that an architectural approach explicitly entails" (emphasis in original. Stipanovich 1979, 2). The records and report generated from this study formed the core of the files used by the Minnesota State Historic Preservation Office to reference sites of historic importance to the mining efforts of the Vermilion, Messabi, and Cuyuna Ranges.

In Stipanovich's report about 40 structures from the Cuyuna Range were recorded. Most of the recorded sites were concentrated in Crosby and Ironton. Commercial, civic, and infrastructure sites form the majority of the historic features their surveyors documented. In terms of National Register of Historic Places nominations, twelve sites in the Cuyuna Range were selected to be nominated in the early 1980s based, at least in part, on the information collected from the 1978-79 historical-cultural survey. Eight sites were accepted to the register between May 23rd and November 25th, 1980 including the Spina Hotel in Ironton, the mislabeled "Ironton Sintering Plant" (it was the Portsmouth Sintering Plant and was technically within the bounds of Crosby), the Soo Line Depot in Crosby, and five "elevated metal water tanks" (from Crosby, Cuyuna, Deerwood, Ironton, and Trommald) (National Register, 2014).

The nominated sites that were not accepted to the National Register of Historic Places after the historical-cultural survey reveal Stipanovich's interests

and biases. He preferred to highlight sites of historical significance regardless of the architectural qualities preferred by those reviewing nominations in Washington, D.C. in 1980. One such site that was not accepted to the National Register of Historic Places was the “Workers Hall” site also known to members of the community as the Finn Hall in Crosby. This is the same building that featured so prominently in the early labor strikes, a social hub for immigrants, and political headquarters of Karl Nygard, the first elected mayor from the communist party in 1932. The formal rejection letter from the Department of the Interior states the site “does not meet the standards of integrity. The building’s stucco covering has obliterated or obscured any distinguishing architectural features” (Shull, 1980). The failure of the Finn Hall’s nomination may have been as much a part of Stipanovich’s expressed “avoidance” of architectural significance during it’s survey by his team. Attached to Shull’s rejection letter is a copy of the review form for the Worker’s Hall which shows only comments supplied by the National Register’s architectural historian.

The other sites from the early 1980s that went un-nominated included the Spaulding Hotel in Crosby for its “lack of architectural integrity”, the Will S. Pitt block commercial building for failing to make a convincing case about the national significance of the people associated with it, and the block of 19 houses in Crosby which form a neighborhood known as “Honeymoon Row”. These 19 properties are listed in the state register. It is possible the state chose not to submit these structures to the national register. These files from the 1979 sur-

vey form the core of the state historic preservation office's files on historic structures in the region. It is unclear why the state chose not to nominate the Honeymoon Row neighborhood when Stipanovich states the agency's main interest in collaborating on the project was "nomination of selected resources to the national register" (Stipanovich 1979, 2).

The Honeymoon Row neighborhood showed no evidence of relocated homes from Manganese or elsewhere in the Stipanovich survey of 1979 or in the Cuyuna Historic Structures survey of 2012. If it had, then its perceived "lack of locational integrity" could have prevented the neighborhood from being nominated. Concerns about locational integrity in other neighborhoods where relocated miner's homes have been reported could be a serious challenge to getting those places nominated to the national register. If, however, we look at the life-cycle of the mining region then the relocation of miner's homes during the middle 20th-century is a consistent and an integral feature to understanding the former mining landscape. The simplistic criteria for locational integrity of sites, either in 1979 or in 2015, does not consider these relocated structures as eligible or contributing elements to a historic district. This circumstance in the Cuyuna Range cannot be the only case in the United States where structures were moved and rearranged as the life-cycle of those communities progressed.

The efforts to document and preserve the former industrial landscapes created by mining on the Cuyuna Range also occurred around the same time that Stipanovich's survey was conducted. In the late 1970s and early 1980s the

site of the former Croft Mine which operated from 1916 to 1934 became a focal point for local mining heritage and history. Gary and Karen Woehler recalled in those years that a small dedicated group of former miners and local residents helped preserve the Croft Mine site. By the late 1970s this former mine location had the last standing head-frame in the Cuyuna Range. Mr. Woehler remembers helping to intervene during the demolition of remaining standing structures at the mine, eventually persuading the land owner to keep a dry-house and the 100 foot concrete stack from being demolished (Woehler, 2013). Unfortunately, by the time the Woehler's and other residents had taken action the head-frame and boiler structures were already scrapped (Ibid).

The Woehlers were also instrumental in preserving records and ore samples from former mine structures across the region that were slated for demolition. The dry-house structure on the Croft Mine site was first used to store these samples, documents, and other artifacts before it was later turned into a museum space. Mr. Woehler recalls he used to bring boxes of samples, including one important set that once was stored in the Butler Building in downtown Ironton, through a hole in the wall of the dry-house where a bulldozer had started demolishing the structure before he and others had stopped it's destruction (Woehler, Interview, 2013).

The Croft Mine Historical Park, as it would come to be known, was the beneficiary of funding from the Iron Range Resources and Rehabilitation Board (IRRRB). This board was established with the passing of Minnesota's Taconite

Amendment in 1967. The board serves to help distribute a portion of the state taxes on taconite mining set aside to aid mine land reclamation and support communities that had once been economically reliant on iron mining. The funding for the Croft Mine Historical Park was also facilitated by family, community, and political ties to then Minnesota Governor Rudy Perpich. The governor visited the site in 1978 and announced plans to preserve and promote the site as a historic attraction (*Cuyuna Country* Vol. 3. 2004, 174).

The historic park came to include not only original materials from the Croft Mine, but also collections of clothing, equipment, and several historic structures from across the region (Figure 27). One early 20th-century mine company office building is reported to have belonged to Cuyler Adams from his early years establishing iron mines in the district. By 1982 the site "had recorded its 10,000th visitor" and it received additional funding in 1986 to create a "simulated underground mining experience" complete with a reproduction headframe near the site of the former structure (*Cuyuna Country* Vol. 3. 2004 174-175).

Three attempts were made to nominate the Croft Mine Historical Park to the National Register of Historic Places. Files at the Minnesota State Historic Preservation Office reveal that in 1984, 1990, and 1999 the site nominations were rejected by reviewers in Washington, D.C. Based upon the existing National Register standards of historical integrity, all of the modified and relocated structures on the Croft Mine Historic Park have little chance of being success-

fully nominated. Only a few original buildings from the mine's years of operation remain. Those surviving buildings have been significantly modified, such as the dry-house into a museum. The property currently has several additional structures relocated from their original sites and arranged in the park similar to other "recreated" historic landscapes like Sturbridge Village in Massachusetts.

In recent years, other historic mine parks such as the Soudan Mine Historic Park in Tower, Minnesota provide experiences of underground mining history using authentic mine equipment and mine shafts. Several important structures on the Soudan site are in their original locations with minimal modifications. Since the Croft Mine Historic Park's site's peak-visitation in the late 1980s the property faced declining visitation and financial insolvency by the late 1990s. The property was transferred to the City of Crosby to manage in the early 2000s. This arrangement proved to be unsustainable for the town and the Croft Mine was transferred again to the Cuyuna Country division of the Department of Natural Resources (DNR) in the early 2010s. Basic maintenance of the grounds, such as mowing grass and clearing trash is conducted by the local DNR, but much of the museum space and structures are closed with an occasional "self guided tour" the only option for public to learn about the site (Programs 2014). The Croft Mine Historic Park is still a repository of vital documents, artifacts, and historic structures (although out of their original context) for the fortunate few that can persuade the site's supervisors to unlock the museum and storage buildings.

Following the Idea: Cuyuna Country State Recreation Area

After the closing of most open pit iron mines in the early 1970s, the Department of Natural Resources acquired much of the land associated with these former mine locations on the Cuyuna Range. The initial goals of the local sponsors, who supplied much of funding to acquire the lands that would become a state park known as the Cuyuna Country State Recreation Area were to "-prevent commercial and/or residential development, -retain undeveloped shoreline, -preserve the unique recreational opportunities that this area provides, [and] -provide an area where passive [non-motorized] recreation activities would be promoted and encouraged" (*Cuyuna Country* Vol. 3. 179). On March 3rd, 1993 State Representative Kris Hasskamp introduced a bill to the Minnesota legislature to create "a unique new type of state park, a recreation area, modeled after national recreation areas" to preserve the mining remnants and natural resources of the Cuyuna Range ("Hasskamp introduces recreation area bill" 1993, 3). While local leaders saw great advantages by turning the former mine lands into recreational parks administered by the Minnesota Department of Natural Resources, there was significant reluctance by state government to support the proposed park. While this park was debated in the late 1980s and early 1990s "The DNR was always under budget pressures for existing parks and not anxious to take on new ones. Another negative was that the Minnesota Legislature did not want to fund another mining park because state lawmakers

were not enthusiastic about the ones they had funded" in places like the Mesabi Range (*Cuyuna Country* Vol. 3. 179).

A second legislative sponsor of the recreation area bill, Don Samuelson described his motives for creating the park. He states that the lakes and pathways are "a favorite for anglers, canoeists, hikers, and other recreation users… we need this legislation to develop this area and ensure it will continue to provide a multitude of recreational opportunities to the public" ('Bill advances in the senate' April 28, 1993, 1). Even while these lakes and pathways enjoyed by recreational visitors were shaped by mine activity, the main thrust of the legislation was to preserve and feature the 'natural' attractions and resources of the park. Representative Hasskamp described how the new park designation would overcome some of the cost fears by the other state legislators "With this special category we can minimize costs because it won't be developed or staffed like a state park, but we're still preserving this unique area and giving local people access to it and control over it. The point is to leave it as it is and not put a lot of restrictions on the area, but to protect and preserve it from abuse" ('Recreation bill gets house okay' April 28, 1993, 1).

The reluctance to highlight the property's mining heritage at this early stage of the park's development may be one cause for the minimal amount of interpretation and discussion of the mine processes that have shaped the park property. In spite of these political hurtles, local economic leaders sponsored efforts to remove modern garbage dumped by residents on the park properties

in anticipation that would be developed into a state recreation area. Ironically, while much of the former mining landscape was not acknowledged in the proposed state recreation area, the bodies of water created by mining were named after the former mines. By June 6th 1993, a collaboration of federal, state, and local entities joined efforts to form the Cuyuna Country State Recreation Area when governor Arne Calrson signed the bill for the park's creation into law (Park Info 2014, *Cuyuna Country* Vol. 3. 181, 'Recreation bill signed by governor' 1993, 1).

Since 1993, the Cuyuna State Recreation Area has been successful in the development and promotion of scenic trails, fishing, and camping on the former mine lands (Figure 28). Before the acquisition of the Croft Mine Historic Site in the early 2010s little emphasis was placed on the historic and cultural assets within the state recreation area. Each park division is named after the former mine associated with that property such as the "Sagamore" and "Portsmouth" units of the park.

Some former mine lands near communities such as Ironton have been acquired by their municipal governments, but have yet to see much development in the last 40 years. To many municipal leaders in the region view these former mine lands under their control, some of which contain piles of "lean ore" of under 50 percent iron, as a financial asset that could be tapped when iron ore market prices and local budget needs align. These properties may hold

former mining remnants of historic value that remain protected and mostly forgotten for the time being.

Besides the mining remains present across the landscape of the recreation area, the shell of the former Manganese Chemical Company plant remains standing. Until November of 2012 Stern Industries used the site as a plastic pipe and ductwork fabrication plant, which succeeded the plastics company that occupied the building in the mid-1960s. Local residents have indicated that workers from the Manganese Chemical Company plant are still living in the area. Lastly, portions of former mine locations and former mine communities, like the town of Manganese and the ruins of the former Rowe Concentrator are owned privately. These lands were often acquired for vacation properties, especially where those lands are close to present lake shores (whether man-made or natural) such as the case of Rowe Concentrator ruins which appear to be on the shores of Little Rabbit Lake across the shore from Riverton.

This post-mining landscape is what greeted the students and staff visiting the Cuyuna Range in 2011. The process of rediscovering and reconnecting the places with the most historic significance has been a slow process. Individual sites and historic resources have their own individual organizations and community members championing their significance and preservation. The collaborations between local, regional, and institutional organizations that fostered the development of sites like the Croft Mine Park and the Cuyuna Country State

Recreation area in previous decades can serve as models for the latest efforts of shaping the image of this mining region.

Following the Idea: Methods of the 2012 Cuyuna Historic Survey

Nine meetings were held over 2011 and 2012 with attending leaders representing major employers such as the Crosby Medical Center, the Crosby-Ironton School District, and civic institutions such as the Deerwood Lions Club, Heartwood Assisted Living Center, Cuyuna Range Heritage Network, and the Hallett Memorial Library. After a short presentation of the types of work and knowledge generated by past Michigan Technological University ventures with the West Point Foundry in New York and sites of Mormon pottery works in Utah, feedback from the audience was collected about what Michigan Technological University's programs could do in the Cuyuna Range.

By the fall of 2011, visits by students and staff of Michigan Technological University to Cuyuna Range identified many of the remaining sites with connections to the mining heritage of the district. Professor Timothy Scarlett and myself visited the region and began developing ways to identify and encourage public participation for the sites which told the best stories about iron mining history in the Cuyuna Range.

In the community meetings I hosted a common concern voiced by the attendees, and members of the local business community in particular, was that recreational visitors to the region spend little time or dollars in the local commu-

nities. The perception was that the typical regional visitor travels directly to the park or lake they are interested in and then leave without stopping to visit local shops or venues that could generate badly needed economic support to the region. This perception has caused many members of the community to feel they are not benefiting from the recent surges in recreational tourism they had experienced in recent years.

Much of the field methodology and the template used for the field form came from the materials taught in a required class for Michigan Technological University's Industrial Archaeology program (Quivik 2010). For example, the sections in one of the required texts for that class, Recording Historic Structures (2004) provided guidance on how to properly take photograph sand sketch plan drawings of structures. The sections of greatest relevance were "Photography" by William Lebovich (52-87) and "Recording Vernacular Building Forms" by Catherine Lavoie (142-157).

Each surveyor carried fliers describing our documentation project and a way to contact us with questions. Each surveyor was also given a short guide on architectural features from the "anatomy of American houses" and "pictorial glossary" sections from *A Field Guide to American Houses* (McAlester and McAlester, 1997: 32-62). Volunteer surveyors were asked to supply a digital camera capable to recording images at 300 dots-per-inch (dpi) or better. One surveyor decided to craft her own name badge (similar to the one she had as an enumerator for the 2010 Federal Census) so members of the community

could know her name, making her more approachable and giving her a degree of authority about the work she was doing.

Background research into historic Crow Wing County atlas records, Sanborn fire insurance maps, and historic photographs of the communities was done before the survey began. This was helpful for identifying key neighborhoods in the region and how they appeared in the oldest known photographs. The two main repositories of information on the mining communities came from the Gale Family Library within the Minnesota History Center in St. Paul and at the Minnesota Discovery Center, formerly 'Iron World', in Chisholm.

Larger communities in the 2012 survey were divided into segments called "assignment areas" to be canvassed on foot by each volunteer in a manner similar to the assignment areas canvassed by enumerators for the 2010 Federal Census. In smaller communities where the project started, such as in Cuyuna and Riverton, volunteers could be assigned streets without advanced planning, surveyors could see where their fellow surveyors where and alternate blocks with one another. However, with the larger communities such as Deerwood, Crosby, and Ironton surveyors required a map highlighting which streets were a part of their assignment. With larger communities, it was sometimes found that cars were needed to cover the required distances between structures to document.

Despite careful efforts to inform the larger community about the work being done to document homes, businesses, and other community structures our

surveyors were featured in the police blotter section of the *Crosby-Ironton Courier* three times due to calls placed to the police concerning “suspicious persons” seen in their neighborhood in mid to late July, culminating in the notice on July 25th edition on page 6.

These incidents arose for several reasons. Firstly, as the project expanded into larger communities it became more difficult to directly view and supervise each surveyor and see how they did or did not interact with members of their community during the survey. Second, while documenting in larger communities like Crosby in late July, the use of vehicles over canvassing the neighborhood on foot became more common. Vehicle-based surveyors with clipboards and cameras traveling slowly down streets aroused more suspicion and less direct interaction from local residents. Fortunately, the members of the survey were well-known members of the community and after a brief explanation of their work, the local police saw no reason for concern. Thirdly, in the larger communities it was difficult to ensure every member knew who we were and what we intended to do. While older residents tended to closely read local papers and see bulletins in community spaces, fewer of the residents aged 40 and younger had any knowledge of our project before meeting a surveyor directly. There are few media outlets in the region that could directly ensure younger residents had knowledge of the project. Budgetary limits on printing costs also prohibited making enough fliers for every mailbox or doorstep that

was visited by a surveyor. Two of the three police blotter incidents were called in by residents younger than age 40.

In response to the third police blotter posting about a project surveyor A letter to the editor of the *Crosby-Ironton Courier* was published shortly after the third police call was made about a surveyor in the Crosby neighborhood (Sutherland 2012 p. 4). In that letter, I carefully articulated the goals of the project and explained our method of using publicly accessible walkways and roads for documentation unless expressly invited to come onto a particular property. He concluded the letter with ways to contact me if there were further questions or concerns. Later, he spent time with each surveyor mentioned in the police blotter to learn their side of the incident and discuss how future incidents might be prevented. Where possible I did make visits to the dwellings that had called the police and while none came out to speak with him he did leave a flier and ways to contact me with any questions.

One final incident happened to me near the end of a survey in Ironton. It occurred when I was accosted by a local resident who suspected he was documenting the condition of her house for a financial institution. The only way I was able to diffuse the confrontation was to show my driver's license, business card, a project flier, and explaining as calmly as possible that her house was far too recent for to record, I was documenting her neighbor’s dwelling. While surveying so many places and interacting with so many members of the community it seemed inevitable that some incidents would occur. However, further notif-

ication for residents through fliers or additional public gatherings along with similar notifications given the police and sheriff's office could have reduced the number and severity of the negative interactions faced in the project.

In the concluding chapter a multi-sited study of industrial districts using different trajectories will be shown to be effective at revealing connections between sites across the Cuyuna Range. In many cases the narrative made by these collections of industrial and community sites requires more than one trajectory in order to create a rich and detailed story of the district's growth, persistence, and decline. Other scholars provided useful insights into specific details of industrial, economic, and community development. A final summary of the Cuyuna Range's development, through what was learned by studying the community structures across the district shows how the area arrived at its current state and hints at where it might be headed in the years to come.

Conclusions:

The pivotal events in the life cycle of the Cuyuna Iron Range reflected the 20th-century character of this industrial community. Several distinct 20th-century issues are embodied in various sites across the Cuyuna Range. These issues involved imposing morality through liquor laws, conflicts over labor rights, public-private partnerships for development of new industrial technologies, and heritage preservation in a post-mining community. Ryzewski's (2012) multisited trajectories can serve a lens to focus attention on the key sites and relationships which defined each of these 20th-century issues.

The hidden sites of locally produced alcohol were spread across the Cuyuna Range, but were not widely discussed in records except through indictments. These legal records show how community members resisted the social policies imposed by civic leaders like the Crosby brothers. The "Saloon debate" of 1915 ended when all legal outlets for alcohol were closed. This event divided members of the community including local business owners. While most small scale bootlegging has left no physical trace on the landscape a few documented "houses of ill fame" distributed liquor and other vices along Birch Street in Crosby, following an axis that bordered with Ironton and the two largest boardinghouse neighborhoods of immigrant mine laborers. This widespread subversion of the paternalistic morals of community leaders reveals the unequal but negotiated status of power in the mining communities over the issue of liquor and other social activities that authorities defined as criminal. It is

not difficult to envision that an archaeological study of one or more mine laborer's residences will uncover evidence of clandestine alcohol production and/or consumption dating to the early 20th-century like those reported at the Boot Mills by Mrozowski and Beaudry (1989). The periodic spikes in alcohol-sale-related arrests in 1914 and 1926 were followed with a sudden halt in alcohol arrests by county sheriffs in 1928, well before the end of prohibition. These trends along with the records about the neighborhoods most effected by the arrests demonstrated the way that local leaders tried to shape the behaviors of working immigrants in their community. Eventually these leaders grew disenfranchised with the notion of banning all alcohol sale and consumption.

Exploring the sites and neighborhoods where conflicts were embedded within the industrial communities of the Cuyuna Range help to shed more information on the region's development in the 20th-century. Despite the organizational control built into the initial plan for the City of Crosby there are still homes located along alleyways rather than on major avenues. It is highly unlikely the Crosby brothers planned for or desired to see their narrow plots further divided when the City of Crosby was founded. These physical remnants of house infilling on subdivided lots reveals the acute need for housing in that initial era of booming growth. This reflects a similar situation to the company towns studied by Crawford (1995) and Shiflett (1991) where workers found ways to express their individuality whether it was within, outside of, or in the unexpected placement of their dwellings.

A challenge to the orderly working community landscape envisioned by George and Matt Crosby was the building of the Finnish Worker's Hall in 1913, which would become the epicenter of strikes and socialist political activity directed against mining management. This site became a place where diverse immigrant communities met and organized themselves to press for better working conditions, similar to the diverse ethnic workforce studied by Arnesen (1993). This ethnically heterogeneous labor group created political consciousness, like the English working class described by E. P. Thomson (1963), allowing them to strike and negotiate terms with managers without much input from regional or national labor organizations.

Another type of conflict involved the need to make local ores competitive in a changing global market for iron and manganese. Many Cuyuna mine owners in the 1920s faced pressures to keep their ores competitive. The haste and pressures to make Cuyuna iron ores marketable were similar to the pressures on coal mine operators described in Wallace's *St. Claire* (1987). That mine operator haste may have also contributed to the Milford Mine Disaster because efforts to install additional ventilation and exits to the mine were less of a priority to mine owners than making the mine reach profitability as soon as possible. The public debate over blame for the accident reveals the underlaying conflicts between laborers and managers over factors such as safety in mines across the region and not just at Milford.

Forty-one miners that died that day. Many of their relatives endured their loss for generations afterward. Gordon and Malone's descriptions in the "Cost of Wealth" matches some of the losses felt by the mine workers, their families, their community, and their local environment after the Milford Mine Disaster (1994, 50). The lack of any contradictory stories by the survivors from the one provided by the mine engineers and members of the commission to investigate the accident may be similar to the behavior of miners studied by Nash (1993). She had noticed that mine workers described the difficulties of their work differently when they were in the presence of managers. All of the public testimony for the investigation was given by workers after the Milford Mine Disaster were in the presence of their supervisors.

Beyond the conflicts that defined one portion of the region's character, there were many important collaborations that developed into new mining businesses and opportunities. During the Cuyuna Range's formative era from 1910 to 1920 many industrial sites were the result of adaptations, or technological innovations, often through the help of public and private partnerships. The short-lived Ardis Furnace built in 1913 represented the optimism and opportunities that inventor/entrepreneurs like John Jones saw in the new district. In 1914 the first benefaction plant on the Cuyuna Range at the Rowe Mine in Riverton was adapted from designs that the mine operator had studied from Joplin, Missouri. The eventual success of the Portsmouth Sintering Plant could not have been accomplished without the testing of Cuyuna Range ore at the Birdsboro,

Pennsylvania sintering facility in 1923. All of these developments came from independent businesspeople collaborating with others to adapt their technologies to the landscape of the Cuyuna Range.

The iron benefaction plant built in 1914 at the Rowe Mine in Riverton, Minnesota was the first facility of its kind in the district and it was built on a scale to only support the neighboring mine's needs. A decade later, the Portsmouth Sintering Plant was developed through a collaboration of state funding, institutional research, and regional mine company support. The resulting facility pushed the limitations of production capacity in order to support not only it's local mine, but those of the entire region. This focus on sustaining the region's marketable iron ore production is evident by the fact the plant remained in operation for nearly a decade after its adjacent mine ceased operation.

Linking the Portsmouth Sintering Plant to sites outside the region can help enhance the importance of the site. Earlier innovations in benefaction technology at the plant in Birdsboro directly shaped how the Portsmouth plant was designed and operated. Trade literature reveals that elsewhere the technology became more popular at steel mills. This reveals that the Portsmouth Sintering Plant was at the apex of one approach to improving ores at a mine location while the technology shifted by the middle of the 20th-century to become a feature of steel mills. Exploring the history of relationships between a multitude of local mines that utilized the Portsmouth Sintering Plant, even after

the Portsmouth mine was closed, demonstrates the sintering plant's significance as a vital component in the regional economy in the middle of the 20th-century.

In the 1950s, the Manganese Chemical Corporation sought a site to develop new chemical processes when it located its facility in Riverton, Minnesota. Executives chose this site because of its uncommon iron and manganese ore rather than its ideal geographic location for accessing global markets. This was also around the same time that the State of Minnesota began investing significant amounts of tax dollars into research for new methods to keep the products of the Cuyuna Iron Range marketable. These efforts included exploring the uses of manganese and manganiferrous materials. For at least a decade the Manganese Chemical Corporation was funded mainly by government contracts which led research chemists like Jay Welsh to succeed in developing methods of refining manganese for commercial uses, some of which remain relevant today, fifty years after they were patented. Ultimately, geography and global market forces seem to have pulled the Manganese Chemical Company and its researchers away from the Cuyuna Range towards the coastal city of Baltimore, Maryland as the amount of quality manganese ore brought in from networks of overseas shipping and mining made their Midwestern United States geographic location less attractive.

A final large scale public-private partnership was attempted when the Zontelli brothers worked with the U.S. Department of commerce and German

steel firms from Rheinhausen, Germany to adapt the Krupp-Wren steel-making process for a proposed site in Trommald, Minnesota. The facility never came to be, but it followed a pattern of adapting technologies from outside the mine district in order to keep the mining economy viable. Earlier in the 20th-century the Portsmouth Sintering plant and Manganese Chemical Co. plant had accomplished this through the use of public-private partnerships.

The final 20th-century theme faced by the Cuyuna Range was determining how to portray its mining heritage after iron mining ceased in the early 1980s. Cuyuna Range residents endured social and economic trauma as their primary sources of wealth creation closed, similar to the loss felt by working class residents studied by Modell and Brodsky (1998). Rather than preserving the stories of places through photographs as Modell did, other types of commemoration of the industrial heritage of the Cuyuna Range were undertaken from the 1970s into the present. During the mid-1970s people have taken efforts to memorialize and document features of the mining community and industrial landscape, such as the Croft Mine Historical Park. Other efforts came from outside groups, like the 1979 Stipanovich survey of historic structures. Each group's endeavor achieved some degree of success. The legacies of that work remain in the form of the Croft Mine Park property and the files used to manage cultural resources from the state historic preservation offices in St. Paul. These projects also left many other important features of the surviving industrial and community landscape without context.

The 2012 historic structures study was the first time that outside scholarship interests joined with locally supported preservation efforts to benefit the entire mine district. Places to memorialize mine laborers have been few until recently. The commemoration ceremony for the 90 year anniversary of the Milford Mine Disaster occurred on February 5th, 2014 (Richardson 2014). Regional political leaders placed a granite marker on the corner of Curtiss and 4th Street in Ironton on Labor Day in 1995. The marker commemorated the dead and injured miners of the Cuyuna Range during the 20th-century (*Cuyuna Country* Vol 3. 2002, 30). As of early 2014 very little historic signage and interpretation has been provided for visitors traveling in and through this former mining landscape.

Laura Ukura-Leir has purchased the former Finnish Worker's Hall with the intent of restoring the structure back to the way it looked over 100 years ago. The Ironton Town Hall and firehouse are listed on the National Register. However the town government has not yet succeeded in acquiring the funds it needs to stabilize and maintain the structure up to building codes for large social events as it used to host in the early to middle of the 20th-century. A third local landmark and a former social hub of the Cuyuna Range is the Spina Hotel, listed on the National Register and the focus of a 2000 study by the Minnesota Historical Society and midwest office for the National Trust for Historic Preservation for renovation planning and assessment services. Architectural

historian Bob Roscoe has published a short article on the efforts to preserve that structure (Roscoe 2002, 19).

Unfortunately for the Spina Hotel the challenges that face its rebirth have not changed significantly since the writing of Roscoe's article 12 years ago. He stated "In spite of improving economic conditions and favorable building-rehabilitation costs, the Spina is languishing for two reasons. First, a developer for the project has not stepped forward. Second, Carl Perpich, [the owner of the Spina Hotel] has resisted selling the building outright [to any potential developer]" (Roscoe 2002, 58). Despite efforts to share revenues and offer Mr. Perpich rights to live and use portions of the Spina as he wishes he was and is unwilling to reach any sort of compromise. Roscoe (2002) concludes with brief explanation of the possible motives of Perpich to resist the economic and preservation benefits of collaborating with developers. He states, "According to local observers, Perpich continues to live in the Spina as a tribute to his deceased wife" (2002, 58). This motive, to leave things in a seemingly unchanged state as a tribute, is laudable except for the fact the throughout the article there are notes about the deteriorating roof and damage to the upper levels of the structure due to lack of basic maintenance.

Cuyuna's life-cycle from a trajectory of important people

The trajectory of "follow the people" used in Ryzewski's (2012) work is another lens to explore the life-cycle of the Cuyuna Range., easily applies to

the sites of Cuyler Adams early development efforts at the Kennedy Mine location and by his son Robert Adams in fostering the massive sintering plant at the Portsmouth mine. During the middle of the 20th-century, the Zontelli family had a competitive edge on Cuyuna's ore processing at their Virginia Mine, which also processed ores from local mines owned by members of the Adams family (Zontelli 2014, 19-20). Lastly, through the trajectory of families we can explore the sites where debates around developing new processes to revive the mining industry after the early 1960s. The Zontelli family's role in that debate fostered national and international research, in the case of the Krupp-Wren process, with ties extending as far as central Germany. While the trajectory of following families on different sites is revealing, the narrative power of that approach often needs to be blended with information on the ideas which drove these families to create these sites and spaces. This can be accomplished connecting these stories to the works of theorists like Lefebvre (1974) and Pred (1984) that emphasize the creation of space and place. Understanding sites that are bounded by the ideas and people involved with their creation help to address the critiques that Candea (2007) had regarding the seemingly open-ended trajectories used to connect multi-sited studies together.

Some examples of this include Longyear's diamond-core drilling across the Cuyuna Range which allowed for systematic testing for ore that aided in finding the best locations for mines and their communities. This technology helped to quickly transform the landscape into new mine locations and commu-

nities. In another set of examples, the site selected for the Ardis Furnace in 1913 was driven as much by geography as resources. Most of the district did not yet have extensive transportation systems unlike settlements in nearby Deerwood and Aitkin. John T. Jones saw the Mississippi River as a transit system for fuel from the neighboring lumber mills, and finished iron products to markets further south. While the site failed to be successful for any length of time, it shows the limits of opportunities for individual inventors and innovators at that time. Had Mr. Jones been successful in establishing this iron smelting furnace, his innovation could have transformed how the iron industry operated. The adaptation of Longyear's diamond drill technology and intimate knowledge of the local real-estate market in 1910 led to Adam's success in attracting investors and founding the Cuyuna Range. Jones, while technically proficient with his furnace technology, did not know enough about the local infrastructure and economy which contributed towards him abandoning his furnace project on the Cuyuna Range.

The community structures near the mines of the Cuyuna Range provide evidence supporting trajectories following various people in the region. Property investors and developers such as Matt and George Crosby that had experienced the poorly organized, unsanitary, and saloon dominated boomtowns of the Mesabi Range. Instead, they planned to build a community that would not suffer those problems. In a similar way Gordon and Malone's "Human Resources" component of industry includes discussions of organizational skills

from managers and businessmen for other industrial spaces (1994, 41-42). Not every outcome of the highly organized communities such the city of Crosby went according to plan.

Cuyuna's life-cycle shown in community structures and businesses

From the beginning the City of Crosby was carefully laid out and organized. The initial decade of boom growth, from approximately 1910 to 1920, is apparent on the landscape by the general age of most homes and businesses in the commercial districts dating from this period of time. While no true "company towns" were built here, many real-estate investors like Cuyler Adams and the Crosby brothers had a strong influence on the development of the Cuyuna Range's mining settlements. Francaviglia's (1991) discussion of the unique landscape of industrial communities containing rows of similar style homes and storefronts seemingly frozen in time could describe any of the surviving Cuyuna Range communities. It is interesting to see a separation of housing by neighborhoods with "Honeymoon Row" dwellings for workers with families and other neighborhoods such as Lakeview with many boarding houses for single male laborers. This arrangement of houses is similar to the way logging camp housing was divided in the study done by Pappas (2004). He concluded that a paternalist mindset where managers kept themselves within eyesight of, but separated from the un-married laborers was intended to promote better behavior among the single male workers (Pappas 2004, 160).

After 1920, the region underwent a significant economic decline and shift in mine technology towards greater production that required fewer laborers. These conditions kept the number of new community structures built to a relatively low level. However, many middle-manager homes along the “Gold Coast” neighborhood of Crosby date from this era, suggesting those employed to supervise the regular miners were establishing successful careers in the district. Palus and Shakel (2006) observed changes in with the quality of housing and living conditions for workers at the armory in Harper’s Ferry as the regional economy and new technologies developed. It would be very likely that an archaeological study of Cuyuna Range households from the 1920s might show a similar pattern of changing standards of living.

By the start of the Great Depression in the 1930s some satellite communities, like the town of Manganese, gradually became abandoned. People relocated housing from these smaller communities to other towns in the region. The rows of uniform style houses in a place like Riverton are clearly depicted in early photographs. These same “orderly” residential streets are currently interrupted by smaller dwellings. Local residents claim these small homes are of similar age to the original Riverton dwellings, but were hauled in from the Town of Manganese or other former mine communities. This pattern of relocating, rather than demolishing and building new structures elsewhere repeated itself in other communities. According to local accounts, when the construction of a new school led to the almost complete demolition of the “Balkan Street” neighbor-

hood in Crosby this prompted some residents to move their dwellings to neighboring Ironton in the middle of the 20th-century.

Dwellings dating from the 1940s and 1950s are fewer and limited to neighborhoods that developed east and north of the “Gold Coast” area in Crosby and in isolated portions of other surrounding communities like Riverton or Deerwood. This neighborhood of mid-twentieth-century colonial revival structures contains dwellings that are not as large and elegant as those further south and east along the shores of Serpent Lake, but they are larger than the miner’s dwellings from neighborhoods like “Honeymoon Row” further to the north and similar neighborhoods to the west. They likely reflect a growing middle-class of small business owners and professionals developing in the community.

Few community or industrial sites date specifically to the last decade of active mining in the Cuyuna Range from the early 1960s to early 1970s, though many industrial sites were forever transformed during this time. The Manganese Chemical Company’s facility in Riverton was active from the early 1950s until 1962. Scientists in that facility developed new methods for refining and using manganese that continue to have relevance to other patented processes filed very recently. Since the middle of the 1960s this site has had several local industries come and go within its walls. The last of these was Stern Industries, a plastic ductwork manufacturer which vacated the site late in 2012 (“Great Things” 2013). Other sites, like the Portsmouth Sintering Plant were scrapped in middle of the 1960s, but the concrete ruins and remaining shop fa-

cilities would later receive recognition as the “Ironton Sintering Plant”, a national register historic site. The scrapping of the last Cuyuna Range head frame in 1979 at the Croft Mine site triggered a local backlash against this erasing of mine features from the local landscape sparking a new era of commemoration.

The story of the Cuyuna Range has been told many times by focusing upon the extraction of iron ore. The investigations conducted with the help of Michigan Technological University show that themes of innovation, conflict, and peoples provide a more compelling and relevant story than those provided by earlier publications. The story of the Cuyuna’s role as a strategic supplier of manganese in the 20th century has also been under appreciated.

Compared to its immediate neighbors in the iron mining business, the Mesabi and Vermilion Ranges, the local geology of the Cuyuna Iron Range was always at a competitive disadvantage in high-grade iron ore production. However this same geology also provided the region with an important advantage with the trace minerals, like manganese, which North American industries needed when international supplies were unavailable. The role of manganese from the Cuyuna Range clearly illustrates the fluctuating importance of that commodity as tied to national and global trends in the 20th-century. The local geology frustrated both simple and large scale forms of ore processing favored by several of the large mining corporations operating on the Mesabi and Vermilion Iron Ranges. These geologic challenges, overcome by research partnerships with the U.S. Bureau of Mines, the University of Minnesota, and private

companies enabled ambitious and innovative businesspeople, like the Zontelli Brothers, to make the region's mineral resources competitive for much of the 20th-century.

Recent developments that impact Cuyuna's economy and heritage

If the economic importance of the Cuyuna Range is explained through the perspective manganese rather than iron ores, then there may be an opportunity for a resurgence of mining in this district. As the demand for battery-powered devices, charged with the help of manganese, continues to increase. While most manganese ore consumption in the United States remains for supplying the steel industry, manganese is gaining recognition as an important ingredient for modern batteries (U.S. Geological Survey 2014, 100-101). The return of some limited mining activity to the Cuyuna Range promises to bring new opportunities and complications for community efforts of placemaking around the region's mining history. The circumstances allowing for the possibility of mining to return to the Cuyuna Range related to rising global prices for metal and decreasing energy costs due to the energy boom in neighboring states west of Minnesota, such as North Dakota, have created this possibility that did not exist until a few years ago. Previous scholarship on Industrial communities does not frequently explore the return of an industry to an industrial community. Works such as Anna Storm's *Hope and Rust (2008)* explore industrial communities that exist in urban settings and how they adapt to new, mostly non-indus-

trial, uses of former industrial sites. Continued study of the Cuyuna Range could reveal other methods that industrial communities can reemerge from a "bust" economic cycle. It is likely that Cuyuna Range communities will have to negotiate between the supporting recreational tourism and mineral extraction without irreparably harming the either source of wealth.

In 2009, near the town of Emily, Minnesota, Crow Wing Power announced plans to develop a manganese ore processing plant. According to the company, much of the feasibility and environmental review stages have been completed for their proposed facility ("Manganese News/Events" 2014). Starting in the spring of 2014, some preliminary discussions have been announced to see if mining companies would like to purchase low-grade ore piles from former mine locations owned by the town of Ironton. The reactions since that presentation have been mixed with some in support of mining and others deeply concerned with how it might effect the natural and historic landscape (Richardson, 2014). Some local heritage groups such as the Cuyuna Range Heritage Network have published statements against the return of mining that could jeopardize the historic landscape and natural beauty of the area (CRHN Newsletter 2014, 4). A similar resolution drafted by the Cuyuna Lakes Trail Association was recently passed by the Cuyuna Range town of Riverton. In that resolution Riverton formally stated their support for "the continuing use of the abandoned mine pits and surrounding land within the Cuyuna Country State Recreation Area as a unique and valuable recreation asset, to be preserved and protected"

(Riverton Council 2014). Other neighboring communities are considering similar resolutions.

One major group of local stake-holders that has not publicly taken a position on the return of mining is what McGuire and Reckner (2005) called the "descendant community" of working-class families currently living in the Cuyuna Range (235). These workers hold the same social and economic position that most miners held when mining was a central part of the Cuyuna Range economy. While this social group does not have an obvious spokesperson or organization to represent it in these debates, there is a need to determine their thoughts and opinions since the future of region's local economy hinges on the upcoming decisions related to mining, tourism, and the supporting jobs that they create. Connecting with and relating to a shared working experience between historic and current working populations as McGuire and Reckner (2005, 235-236) did in Ludlow, Colorado might be one way to articulate the current interests of the Cuyuna Range's working-class peoples.

Applying Research for Local Tourism

How local leaders choose to balance sustainable economic projects, such as tourism, with the significant economic benefits of rekindling mining activity will determine the fates of many people living across the region in the years to come. Very little academic literature in North America has explored the effectiveness and outcomes of cultural heritage programs link industrial her-

itage to tourism development. Most authors generally assume from circumstantial or colloquial evidence that community-based public archaeology and heritage research are beneficial to local communities. Michigan Technological University has begun to evaluate cultural heritage research by encouraging its students to undertake assessment of their heritage programming as part of the project fieldwork, integrating the measurement of success and effectiveness at every level of their work.

Natiffany Mathews compared data from visitors to the Cliff Mine Archaeological Project in 2011 with reported visitor data from three other industrial heritage studies for her Master's thesis at Michigan Technological University. She noted trends across all of the studies that visitors to industrial heritage sites tended to be over the age of 46, had a background in education, and frequently had close ties to the region or type of industry represented by the heritage site (Mathews 2012, 68 & 115). Mathews' observations reveal the challenge any tourism planner will face in trying to reach younger populations that may also not be as connected to the places and processes featured at industrial heritage sites. Those in an industrial community who are interested in these types of heritage sites could become collaborators in ways to reach new types of visitors.

A Cuyuna Range site that could benefit from collaborative work between scholars and industrial community members would be the Croft Mine Historical Park near Crosby, Minnesota. The Minnesota Department of Natural Re-

sources, which owns the Croft Mine site, could allow for the development of a community-informed plan to manage the structural and artifactual resources of the site. If an effective plan can be made that engages the local community with the site, draws in more visitors with an engaging narrative, and uses the assets of the DNR to their best effect then the former mine site could again reach attendance levels it once had 20 years ago.

Cultural tourism could be used to attract new segments of the tourist population and it can also encourage tourists to stay longer, spending more money to support the local economy. As an example, a report by Utah's Department of Community and Economic Development (DCED) reveals that an average tourist spent $425 per trip, staying 3.3 nights per trip. Tourists coming to Utah especially for cultural heritage spent an average of $615 per trip and stayed an average of 4.7 nights per trip (Buehler and Trapp, 2000). A similar study has not been done for Minnesota, but could be done for the Crow Wing County region as part of a tourism marketing study.

Forms of cultural tourism, including heritage tourism, have been reported to be one of the fastest growing and most important sectors of tourism in the 21st century (Rypkema et al. 2011, 19, Mandala 2009, 2-3, Timothy 2011, 25-27). The types of sites featured in heritage tourism often include museums, cultural events, and historic sites. Featuring a region's heritage tourism potential is gaining recognition from community planners as a key part of any development strategy (Timothy 2011, 259). Academic research enriches the repre-

sentations of places through the discovery of significance and promotion of authenticity to both local residents and visitors. These aspects of authenticity and significance should be a part of any successful heritage tourism strategy.

Scholarship focused heritage tourism has noted that adding a historic or cultural component to a region's featured tourism destinations does improve the average length of time a visitor spends in a region, the amount that they spend during their visit, and it can draw that visitor into a closer proximity to the local community and businesses. Recently, the tourism organization Explore Minnesota has reported that a significant segment of the tourist population classified as the "Cultural Explorers" to Minnesota are one of the most desirable tourist segments. The report states these visitors are an important segment because of their: "past travel to/within Minnesota, leisure spending – both overall and within the state of Minnesota, anticipated increase in travel spending over the next 12 months, interest in visiting Minnesota in the future, and likelihood to visit Minnesota in the next 12 months" (Minnesota Travel 2012, 10).

The 90-year anniversary of the Milford Mine Disaster occurred on February 5th, 2014 and was commemorated by descendants and local leaders at the Milford Mine Memorial Park. The event allowed the children and grandchildren of the miners that worked at the Milford Mine to share stories about how worst single mining accident in Minnesota affected their families. Community leaders attending the commemoration spoke of the need to feature and preserve the places associated with this tragic event (Richardson 2014). The Crow

Wing County Commissioners currently own the former site of the disaster and are planning to develop several phases of public trails and signage to inform visitors about the mine's history. The research from this dissertation could help contribute text and suggest placement of signage to help the park achieve its goals for public interpretation.

Conversations between the Brainerd Lakes Economic Development Corporation, groups representing recreational tourism, and representatives for mining interests have only recently begun. If a comprehensive plan can be developed to ensure each type of economic development compliments, rather than competes against, the others in the Cuyuna Range then the region is poised for a brighter future along with a strong connection to it's mining heritage.

Bibliography

1906 Adams, Cuyler C. *Letter to Mr. J. M. Hannaford Vice President of Northern Pacific Railroad.* On file in the Adam's Family Mining Collection. St. Paul: Minnesota History Center. Accession # 145.I.1.12F-Box 1

Adams Family Mine Company Collection. Minnesota Historical Society. St. Paul: Minnesota History Center. Accession # 145.i.1.12F Box 1

2007 Alanen, Arnold A. *Morgan Park: Duluth, U.S. Steel, and the forging of a company town.* Minneapolis: University of Minnesota Press

1964 Anderson, A. E. "Direct Reduction of Minnesota Iron Ores". Progress Report #6: January 1964" Minneapolis: University of Minnesota. Mines Experiment Station.

1965 Anderson, A. E. "Trends in the Iron and Steel Industry Affecting Direct Reduction Markets". Progress Report #5: October 1965" Minneapolis: University of Minnesota. Mines Experiment Station.

1993 Arnesen, Eric. *Waterfront Workers of New Orleans: Race, Class, and Politics*. Urbana: University of Illinois Press.

2004 Associated Press. "Study for proposed Twin Metals mine due mid-2014". Pioneer Press. http://www.twincities.com/news/ci_24867574/study-proposed-twin-metals-mine-due-mid-2014?IADID=Search-www.twincities.-com-www.twincities.com. Accessed October 11, 2015.

1915 Atkinson, Claude and Mark Atkinson. "It is an Unnecessary Evil" in *Crosby Crucible.* February 20, 1915. Page 4.

1924 "August 1924 Report to the Minnesota Sintering Company". On file in the Adam's Family Mining Collection. St. Paul: Minnesota History Center. 145.I.6.10F Box 80.

1994 Aulie, Berger. *The Milford Mine Disaster: A Cuyuna Range Tragedy.* Virginia, Minnesota: W.A. Fisher Company

1981 Beltrame, R. J., Richard C. Holtzman, and Timothy E. Wahl. "Manganese Resources of the Cuyuna Range, East Central Minnesota. *Minnesota Geological Survey*. Report of Investigations #24. St. Paul: University of Minnesota.

1993 “Bill advances in the senate” *Crosby-Ironton Courier*. April 28, 1993. Page 1.

1941 Brightman, George F. “Cuyuna Iron Range”. *Economic Geography* 18(3), July 1942. 275-286 .

1970 Buder, Stanley, *Pullman: An Experiment in Industrial Order and Community Planning, 1880-1930.* London: Oxford University Press.

2000 Buehler, Daniel and Erin Trapp. *The Economic Impact of Utah’s Cultural Sector*. Denver: Colorado. Western States Arts Federation (WESTAF). http://www.westaf.org/assets/pdf/eis_utah2000.pdf

1951 “Bureau of Mines Seeks Manganese Recovery” *Crosby-Ironton Courier*. August 9th, 1951. Pages 1 and 4.

1950 Burton, C.R. “Powerplants for Production Trucks on Mesabi Range” *Skillings Mining Review*. Vol 39. November 18, 1950.

2011 Byczynski, John. *Claiming the Mines*: Power and Class on the Cuyuna Iron Range, 1910-1933. Masters Thesis. St. Cloud State University, Minnesota.

2007 Candea, Matei. “Arbitrary Locations: In Defence of the Bounded Field-SiteAuthor(s)”. *Journal of the Royal Anthropological Institute*, Vol. 13, No. 1 (Mar., 2007), pp.167-184. http://www.jstor.org/stable/4622906. Accessed April 15, 2014.

1922 Clark, Neil M. “How the Needle of a Compass Pointed the Way to Fortune”. *The American Magazine.* February 1922. Volume 93. 86-93. Transcription: http://ipeopleblog.wordpress.com/2012/12/12/1922-mining-engineer-cuyler-adams/. Accessed October 24, 2014.

2012 Cobb, Charles R. and Chester B. DePratter. “Multisited Research on Colonowares and the Paradox of Globalization”. *AMERICAN ANTHROPOLOGIST.* Vol. 114, No. 3. Pages 446–461.

2009 Cook, Joanna, James Laidlaw, and Jonathan Mair. “What if There is no Elephant? Towards a Conception of an Un-Sited Field”. In *Multi-Sited Ethnography: Theory, Praxis and Locality in Contemporary Research*. M-A Falzon, ed.Surrey, UK: Ashgate. Pages 47–72..

1953 “Cook Stove for Iron Ore” *Crosby-Ironton Courier*. November 18, 1953. Page 7.

1915 “County Goes Wet”. *Crosby Crucible.* July, 3, 1915. Page 1.

1995 Crawford, Margaret. *Building the Workingman’s Paradise: the Design of American Company Towns.* New York: Verso.

2014 *CRHN Newsletter of the Cuyuna Range Heritage Network.* Spring edition. Crosby, Minnesota.

2004 Cuyuna Country: A People’s History. Vols. 1-3. Cuyuna Range Heritage Preservation Society. Brainerd, Minnesota: Bang Printing.

1976 *Cuy-Una...A Chronicle of the Cuyuna Range: Our Little Corner of the Land*. Arvy Hansen ed. Crosby, Minnesota: Cuyuna Range Bicentenial Committee.

1976 Dawley, Alan. *Class and Community: The Industrial Revolution in Lynn.* Cambridge: Harvard University Press.

1929 De Kruif, Paul. *Seven Iron Men: The Merritts and the Discovery of the Mesabi Range.* New York: Harcourt, Brace, and Company.

2010 Dolin, Eric Jay. *Fur, Fortune, and Empire: the Epic Story of the Fur Trade in America.* New York: W.W. Norton & Company.

1979 Dublin, Thomas. *Women at Work: The transformation of work and community in Lowell, Massachusetts: 1826-1860.* New York: Columbia University Press.

1912 Dwight, Arthur S. “Mechanism for Treating Ore”. Patent number 1,027,110. Filed December 23, 1907. Issued May 21, 1912. https://www.google.com/patents/US1027110?dq=1,027,110&hl=en&sa=X&ei=uApIVJbrLIueyASF-soHgCw&ved=0CB0Q6AEwAA. Accessed October 22, 2014.

2014 “Ecological Classification System: Tamarack Lowlands Subsection” *Minnesota Department of Natural Resources*. http://www.dnr.state.mn.us/ecs/212Nd/index.html. Accessed July 16, 2014.

1913 Fenton, George. “The Miner’s Strike at Crosby, Minn”. *The Industrial Worker*. May 1st, 1913. Page 7. https://www.marxists.org/history/usa/pubs/industrialworker/iw/v5n06-w214-may-01-1913-IW.pdf. Accessed February 17th, 2015.

1998 Finn, Janet. *Tracing the Veins: Of Copper, Culture, and Community from Butte to Chuquicamata.* Berkeley: University of California Press.

2004 Foote, Gene. "The Church of Manganese Village" in *Cuyuna Country: A People's History.* Vol. 2. Cuyuna Range Heritage Preservation Society. Brainerd, Minnesota: Bang Printing. Pages 193-195.

1954 Foote, L. L. "Manganese--Ghost Town" *Crosby Ironton Courier*. March 24, 1954. Page 1.

1921 "Forcasts Ore Reserve Depletion, Cuyuna Ores Cited as Example of Exhaustion" *Iron Trade Review.* Vol. 69. July-December. Cleveland: Pennington Publishing Company. Pages 758-759.

1991 Francaviglia, Richard. *Hard Places: Reading the Landscape of America's Historic Mining Districts.* Iowa City: University of Iowa Press.

1980 Gaventa, John. *Power and Powerlessness: Quiescence and Rebellion in an Appalachian Valley.* Chicago: University of Illinois Press.

2014 German, Randall. *Sintering: From Empirical Observations to Scientific Principals.* Waltham, Massachusetts: Buttenworth-Heinemann Publishing Co.

2012 Gibbon, Guy. *Archaeology of Minnesota: The Prehistory of the Upper Mississippi River Region*. Minneapolis: University of Minnesota Press.

2001 Gordon, Robert B. *A Landscape Transformed: The Ironmaking District of Salisbury, Connecticut*. Oxford, England: Oxford University Press.

1994 Gordon, Robert B. and Patrick M. Malone. *The Texture of Industry: an Archaeological View of the Industrialization of America.* New York: Oxford University Press.

2013 "Great things are happening in the world of Stern!" Stern Companies Blog post. January 31, 2013. http://www.sternindustries.com/blog/great-things-are-happening-in-the-world-of-stern/. Accessed April 7, 2014.

1976 Gutman, Herbert. *Work, Culture, and Society in Industrializing America*. New York: Knopf

1913 "Hall is Dedicated" *Crosby Crucible.* December 27, 1913. page 1.

1991 Harrison, Christina. *Report on Cultural Resource Inventory and Evaluation Around the Brainerd Reservoir, Crow Wing County, Minnesota*. Burnett County Historical Society's Department of Anthropology. Siren, Wisconsin. On file at the Minnesota State Historic Preservation Office. St. Paul, Minnesota.

1993 "Hasskamp introduces recreation area bill". *Crosby-Ironton Courier*. March 3rd, 1993. Page 3.

1950 Hatcher, Harlan. *A Century of Iron and Men.* New York: Bobbs-Merrill Company.

1967 "Hello Everybody:" *Crosby-Ironton Courier*. June 7th 1967. Page 7.

1940 Himrod, Anna. *The Cuyuna Range: A History of a Minnesota Iron Mining District.* Washington, District of Columbia: Works Progress Administration.

1950 Hunner, G. B. "Operating Practices at Portsmouth Sinter Plant". *Journal of Metals.* Vol 3. Issue 188. March 1950. Pages 471-473.

1967 "Indictment Record" Minnesota. District Court (Crow Wing County). Volumes 2-4 (1905-1967). Minnesota Historical Society. Minnesota History Center: Gale Family Library. St. Paul, Minnesota. Box number 114.D. 164(F).

1951 Iron Mining Industry of Minnesota. "Self-Made Minnesotans Make Iron Ore" *Crosby-Ironton Courier*. November 15, 1951. Page 6.

2014 Jones, Geoffrey. "A Geophysical Investigation of the Jones Iron Furnace Site". Archaeo-Physics LLC. Archaeological Report number 210. Minneapolis, Minnesota. http://www.archaeophysics.-com/files/fred/jones_furnace.zip**.** Accessed October 8, 2015.

1908 Jones, J. T. "Method of Treating Iron Ore". U.S. Patent number 891,704. Filed April 11, 1908, and issued June 23, 1908. https://www.google.com/patents/US891704?dq=891,704&hl=en&sa=X&ei=GXRmVOuZGKPCsASi9oLgAw&ved=0CB0Q6AEwAA**.** Accessed November 13, 2014.

2001 Kelly, Brian. *Race, Coal, and Power in the Alabama Coalfields, 1908-1921*. Urbana: University of Illinois Press.

1913 Klugh, Bethune G. “The Microstructure of Sintered Iron-Bearing Materials” *Transactions of the Minerals, Metals, and Materials Society of the American Institute of Mining, Metallurgical, and Petrolium Engineers [TMS-AIME].* Vol. 45. 330-345. http://google.com/books?id=LdQwAQAAMAAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false**.** Accessed November 13, 2014.

2004 Lamppa, Marvin G. *Minnesota’s Iron Country: Rich Ore, Rich Lives*. Duluth: Lake Superior Port Cities Inc.

1997 Lankton, Larry. *Beyond the Boundaries: Life and Landscape at the Lake Superior Copper Mines, 1845-1875*. New York: Oxford University Press.

1949 Larsen, Agnes Mathilde. *History of the White Pine Industry in Minnesota*. Minneapolis: University of Minnesota Press

1944 Leach, H. J. “The Evergreen Mine”. *Mining Congress Journal.* Vol. 30 #10. October. Pages 28-33.

2009 Mandala, Laura. *New Study Reveals Popularity of U.S. Cultural and Heritage Travel*, Mandala Research, US Chamber of Commerce, National Trust for Historic Preservation, Washington D.C., Available from: http://mandalaresearch.com/images/stories/pressreleases/CHT_release_Oct_20.pdf. Accessed June 5th, 2014.

2014 “Manganese News/Events” *Crow Wing Power: About Us*. http://www.cwpower.com/manganese.shtml. Accessed February 26, 2014.

1953 “Manganese Plant to Start Test Operations” *Crosby-Ironton Courier*. April 22, 1953. Page 1.

1995 Marcus, G. E. “Ethnography in/of the world system: The emergence of multi-sited ethnography”. Annual Review of Anthropology, Vol. 24. Pages 95–117.

1952 “Masons Buy Worker’s Hall” *Crosby-Ironton Courier*. May 22, 1952. Page 1.

2012 Mathews, Natiffany R., "Public values and perceptions of industrial heritage in the Keweenaw Peninsula, Michigan", Master's Thesis, Michigan Technological University. http://digitalcommons.mtu.edu/etds/302. Accessed October 8th, 2015.

1997 McAlester, Virginia and Lee McAlester. *A Field Guide to American Houses*. New York: Alfred A. Knopf.

1924 McEwan, W. E., Ed Smith, Dwight E. Woodbridge, J. Wilbur Van Evra, and R. R. Baily. "Report of the committee appointed to investigate the accident at the Milford Mine: February 5, 1924" Reproduced in Aulie, 1994. Pages 155-168.

2005 McGuire, Randall H. and Paul Reckner. "Building a Working Class Archaeology" in *Industrial Archaeology: Future Directions.* Eleanor Casella and James Symonds eds. New York: Springer Science and Media Inc. Pages 217-242.

1998 Modell, J. and C. Brodsky. *A Town Without Steel: Envisioning Homestead*. Pittsburgh: University of Pittsburgh Press.

1913 "Miner's Strike! Nearly a Thousand Range Laborers are Out" *Crosby Crucible* April 12, 1913. Page 1.

2012 Minnesota Travel Segmentation Study: Final Presentation. Prepared for Explore Minnesota Tourism by Colle + McVoy inc. http://www.exploreminnesota.com/industry-minnesota/research-reports/researchdetails/index.aspx?nid=195. Accessed February 27, 2014.

1989 Mrozowski, Stephen and Mary C. Beaudry. "Discussions and Conclusions" in *Interdiciplinary Investigations of the Boott Mills: Lowell, Massachusetts.* Mary Beaudry and Stephen Mrozowski (eds). Boston: Center for Archaeological Studies, Boston University.

1993 Nash, June. *We Eat the Mines and the Mines Eat Us: Dependency and Exploitation in Bolivian Tin Mines.* New York: Columbia University Press.

2014 "National Register of Historic Places, Minnesota, Crow Wing County". *National Register of Historic places.* http://www.nationalregisterofhistoricplaces.com/mn/crow+wing/state.html
. Accessed February 27, 2014.

1954 "New Plant". *Crosby-Ironton Courier*. March 24, 1954. Page 1.

1965 "New Plastic Firm in Operation at Riverton". Crosby-Ironton Courier. July 28, 1965. Page 1.

1915 Nicholson, H. L. "Which Shall it Be?" *Crosby Courier*. March 5th, 1915. Pages 1 and 4.

1973 Nygard, Karl Emil. Personal interview by Timothy Madigan. September 13, 1973.

1952 “Ore Shipments Start as Steel Strike Ends” *Crosby-Ironton Courier*. July 31, 1952. Page 1.

2014 “Park Info” Cuyuna State Recreation Area. *Minnesota Department of Natural Resources*. Website. http://www.dnr.state.mn.us/state_parks/cuyuna_country/narrative.html
. Accessed April 16, 2014.

2006 Palus, Mathew and Paul Shakel. *They Worked Regular: Craft, Labor, and Family in the Industrial Community of Virginius Island*. Knoxville: University of Tennessee Press.

2004 Pappas, Efstathios I. “Fictive Kin in the Mountains: The Paternalistic Metaphor and Households in a California Logging Camp.” in *Household Chores and Household Choices: Theorizing Domestic Space in Historical Archaeology*. Kerri Braile and Jamie C. Brandon (eds.). Tuscaloosa, Alabama: University of Alabama Press. Pages 159-178.

1923 Pearsall, W. G, B. G. Klugh, and E. W. Davis. *Summary of Results on Birdsboro Sintering Test of Cuyuna Range Ore.* On file at the Gale Family Archives of the Minnesota History Center. St. Paul, Minnesota. Adams Family Mine Collection 145.I.6.9b Box 79.

1984 Pred, Allan. “Place as Historically Contingent Process: Structuration and the Time-Geography of Becoming Places”. *Annals of the Association of American Geographers*, Vol. 74, No. 2, Pages 279-297,

1966 “Production of High-Grade Manganese Products from Cuyuna R-N Tailing” Mines Minneapolis: Experiment Station, University of Minnesota. Progress Report #13. Prepared for United States Department of Commerce. Contract # C-89-65.

2014 “Programs and Services” Cuyuna Country Recreation Area. Minnesota Department of Natural Resources. http://www.dnr.state.mn.us/state_parks/cuyuna_country/programs.html. Accessed March 10, 2014.

2010 Quivik, Frederic L. “Survey and Photography” *Documenting Historic Structures.* Michigan Technological University, Houghton, Michigan. October 2010. Classroom lecture.

1962 “Range Ore is Tested” *Crosby-Ironton Courier.* January 31, 1962. Page 1.

1915 “Range Saloons Get Notices to Close” *Crosby Crucible.* October 9th, 1915. Page 1.

1993 “Recreation bill gets house okay”. *Crosby-Ironton Courier.* April 28, 1993. Page 1.

1993 “Recreation bill signed by governor”. *Crosby-Ironton Courier.* June 6th, 1993. Page 1.

1951 “Reject Bids on Ore Plant Scheduled for Local Area: State turns down $50,000 offer, to call for new bids” *Crosby Ironton Courier*. August 9th, 1951. Page_. Reprinted Wednesday, July 25, 2012. Page 5.

2004 *Recording Historic Structures*. John A. Burns ed. Hoboken, New Jersey: John Wiley and Sons Inc.

2014 Richardson, Renee. “Memorial remembers lives lost in the Milford Mine Ninety Years Ago: 41 miners lost their lives in the state's biggest mining disaster” *Brainerd Dispatch*. February 5th, 2014. http://brainerddispatch.-com/news/2014-02-05/memorial-remembers-lives-lost-milford-mine . Accessed March 24, 2014.

1962 “Riverton Manganese Plant Will be Moved” *Crosby-Ironton Courier.* February 7, 1962. Page 1.

1952 “Riverton Plant Gets Tax Certificate”. *Crosby-Ironton Courier.* May 22, 1952. Page 1.

2014 Riverton Town Council. “Resolution in support of motion from Cuyuna Lakes Trail Association”. 3 September 2014. Riverton, Minnesota.

1986 Robinson, Kathryn. Stepchildren of Progress: The Political Economy of Development in an Indonesian Mining Town. Albany: SUNY Press.

2011 Robinson, Paula Lekatz. *Native Americans in Cuyuna Country.* Linda Peeples ed. Ironton, Minnesota: Self-published work.

2002 Roscoe, Robert. “Endangered: Spina Hotel, Ironton, Minnesota”. *Architecture Minnesota.* May-June. Pages 19, 58, 60.

2000 Ross, Douglas. “Daily Normals for Brainerd, Minnesota” *National Climatic Data Center.* Ashville, North Carolina. http://www.ncdc.noaa.gov/DLYN-RMS/dnrm?coopid=210939. Accessed July 16, 2014.

2011 Rypkema, Donovan, Caroline Cheong, & Randall Mason. *Measuring Economic Impacts of Historic Preservation*: The Advisory Council on Historic Preservation Report, November 2011. PlaceEconomics and University of Pennsylvania School of Design, Washington D.C. Available from: http://www.achp.gov/docs/economic-impacts-of-historic-preservation-study.pdf Accessed June 5, 2014.

2012 Ryzewski, Krysta. “Multiply Situated Strategies? Multi-Sited Ethnography and Archeology”. *Journal of Archaeological Method and Theory.* 19(2). 241-268.

1911 Sawyer, Alvah Littlefield. *A History of the Northern Peninsula of Michigan and its People: Its Mining, Lumber, and Agricultural Industries, Volume 3.* Alger Co. Michigan: Lewis Publishing Company. http://books.google.com/books?id=_hbiAAAAMAAJ&pg=PA1505#v=onepage&q&f=false. Accessed November 13, 2014.

1995 Schneekloth, Lynda H. & Robert G. Shibley. *Placemaking: The Art and Practice of Building Communities.* John Wiley and Sons Inc., New York.

2009 Shakel, Paul A. *The Archaeology of American Labor and Working-Class Life.* Tampa: University of Florida Press. T21.S53 2009

1980 Shull, Carol D. Letter to Russel W. Fridley, Director of of Minnesota Historical Society. Regarding “Worker’s Hall, Crosby Minnesota”. August 16, 1980 Department of the Interior. Washington D.C.

1991 Shifflett, Crandall A. *Coal Towns: Life, Work, and Culture in Company Towns of Southern Appalachia, 1860-1960.* Knoxville: University of Tennessee Press.

1979 Stipanovich, Joseph. *The Report of the Iron Range Historical-Cultural Survey: October 1, 1978-September 30, 1979.* Saint Paul, Minnesota: Iron Range Resource and Rehabilitation Board and the Minnesota Historical Society.

1952 “Strike Notice Monday Closes Range Mines” *Crosby-Ironton Courier.* June 5, 1952. Page 1.

1913 “Strike Settled: Sixty Percent of the Miners Resume Work” *Crosby Crucible.* April 26, 1913. Page 1.

2008 Storm, Anna. *Hope and Rust: Reinterpreting the Industrial Place in the late 20th-century.* KTH, Royal Institute of Technology, Stockholm, Sweden.

2012 Sutherland, Fred. ‘Local Survey to Document History’ *Crosby-Ironton Courier*, August 1st 2012. Page 4.

1963 Thompson, E.P. *The Making of the English Working Class*. New York: Random House.

2011 Timothy, Dallen J. *Cultural Heritage and Tourism: An Introduction*, Channel View Publications, Bristol, United Kingdom.

2010a Treuer, Anton, *Ojibwe in Minnesota.* Saint Paul: Minnesota Historical Society Press.

2010b Treuer, Anton, Katherine Wood, William Fitzhugh, George Horsecapture Sr., Theresa Lynn Fraizer, Miles R. Miller, Miranda Belarde-Lewis, and Jill Norwood. *Indian Nations of North America*. Washington D.C: National Geographic Press.

2011 Treuer, Anton, *The Assasination of Hole in the Day*. Saint Paul: Borealis Books and Minnesota Historical Society Press.

2014 Tuck, Christopher A. “Iron Ore” *U.S. Geological Survey, Mineral Commodity Summaries. February 2014.* http://minerals.usgs.gov/minerals/pubs/commodity/iron_ore/mcs-2014-feore.pdf. Accessed September, 9th 2014.

1951 “Use All Known Ore Processing Methods Here” *Crosby-Ironton Courier*. September 6th, 1951. Pages 1 and 5.

1924 University of Minnesota. “The President’s Report to the Board of Regents of the University of Minnesota. Digital Conservancy. http://purl.umn.edu/91575. Accessed January 22, 2013.

1910 U.S. Census of Population-1910. Stuntz, Saint Louis, Minnesota; Roll: T624_723; Page: 7B; Enumeration District: 0230; FHL microfilm: 1374736.

1920 U.S. Census of Population-1920. Crosby, Crow Wing, Minnesota; Roll: T625_829; Page: 31A; Enumeration District: 123; Image: 322.

1964 U.S. Chamber of Commerce. *Feasibility of the Krupp-Renn Process for treating the lean ores of the Mesabi Range*. Area Redevelopment Administration. Southwestern Engineering Company, Los Angeles, California and Zontelli Brothers, Ironton, Minnesota.

1920 U.S. Federal Census: Population of Incorporated Places for 1920. Table 51. Page 230. http://www2.census.gov/prod2/decennial/documents/41084484v1ch2.pdf. Accessed May 14, 2014.

2014 U.S. Geological Survey. "Manganese". *Mineral Commodity Summaries.* Washington D.C.100-101. http://minerals.usgs.gov/minerals/pubs/commodity/manganese/mcs-2014-manga.pdf. Accessed November 26, 2014.

1979 Walker, David A. *Iron Frontier: The Discovery and Early Development of Minnesota's Three Ranges.* St. Paul: Minnesota Historical Society.

1987 Wallace, F. C. *St. Clair: A Nineteenth-Century Coal Town's Experience with a Disaster-Prone Industry*. New York: Alfred A. Knopf.

2005 Wallace, Anthony F.C. *Rockdale: The Growth of an American Village in the Early Days of the Industrial revolution*. Third edition. Lincoln, Nebraska: University of Nebraska Press.

1960 Welsh, Jay Y. "Process for producing manganese dioxide". U.S. Patent number 2,956,860, Filed April 11, 1957, and issued October 18, 1960. http://www.google.com/patents/US2956860?dq
. Accessed October 8th, 2015.

1961 Welsh, Jay Y. "Manganese deficiency-correcting fertilizer additive". U.S. Patent number 3,133,811, Filed December 15, 1961, and issued May 19, 1964. http://www.google.com/patents/US3133811?dq
. Accessed October 8th, 2015.

1964 Welsh, Jay Y. "Upgrading manganese ores using HF and H2SiF6 as Leaching Materials" U.S. Patent number 3,330,649, Filed May 27, 1964, and issued July 11, 1967. http://www.google.com/patents/US3330649?pg. Accessed October 8th, 2015.

1965 Welsh, Jay Y. "Reducing to mno the mno2 of a manganese ore". U.S. Patent number 3,375,097. Filed October 18, 1965, and issued March 26, 1968. https://www.google.com/patents/US3375097?dq. Accessed October 8th, 2015.

1978 Welsh, Jay Y. “Leaching, Precipitation” U.S. Patent number 4,123,499, filed May 20, 1977, and issued October 31, 1978. https://www.google.com/patents/US4123499?dq. Accessed October 8th, 2015.

1979 Welsh, Jay Y. “Manganese nitrate decomposition” U.S. Patent number 4,250,149, filed May 15, 1979, and issued February 10, 1981. https://www.google.com/patents/US4250149?dq. Accessed October 8th, 2015.

1915 “Which Shall it Be?” *Crosby Crucible*. March 19th, 1915. Reproduced in *Crosby-Ironton Courier.* July 25th, 2012. Page 5.

2014 “Who we are > ERAMET Group” *ERACHEM-COMILOG: THE MANGANESE SOURCE.* http://www.erachem.com/en/the-group. Accessed September 12th, 2014.

2013 Woehler, Gary and Karen. Personal Interview by Fred Sutherland. Brainerd, Minnesota. August 27th, 2013.

2004 Wood, Margaret C. “Working Class Households as Sites of Social Change” in Household Chores and Household Choices: Theorizing Domestic Space in Historical Archaeology. Kerri Braile and Jamie C. Brandon (eds.). Tuscaloosa, Alabama: University of Alabama Press. 210-234.

2000 Wood, Warner. “Flexible Production, Households, and Fieldwork: Multisited Zapotec Weavers in the Era of Late Capitalism”. *Ethnology*. Vol. 39, No. 2 (Spring, 2000). Pages 133-148.

1916 Yost, Frederick and Bethune G. Klugh. “Ignition Furnace for Sintering Machines”. Patent number 1,206,397. Filed March 11th 1915. Issued November 28 1916. https://www.google.com/patents/US1206397?dq=1,206,397&hl=en&sa=X&ei=LQxIVNS6BseWyASqwoGoCA&ved=0CB8Q6AEwAA. Accessed November 13, 2014.

1957 “Zontelli Bros. Merge Mining Business Here”. *Crosby-Ironton Courier.* August 7th, 1957. Page 1.

2014 Zontelli, David. “Zontelli Story Updated from Trip to Italy”. Unpublished Manuscript. Generously shared by the author. Deerwood, Minnesota. 23 pages.