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Technology, Transportation, and Scale in the Koyokuk Placer Mining District 1890s - 1930s

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TECHNOLOGY, TRANSPORTATION, AND SCALE IN THE KOYUKUK PLACER MINING DISTRICT
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By

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Abstract

The Koyukuk Mining District was one of several northern, turn of the century, gold rush regions. Miners focused their efforts in this region on the Middle Fork of the Koyukuk River and on several of its tributaries. Mining in the Koyukuk began in the 1880s and the first rush occurred in 1898. Continued mining throughout the early decades of the 1900s has resulted in an historic mining landscape consisting of structures, equipment, mining shafts, waste rock, trash scatters, and prospect pits. Modern work continues in the region alongside these historic resources. An archaeological survey was completed in 2012 as part of an Abandoned Mine Lands survey undergone with the Bureau of Land Management, Michigan Technological University, and the University of Alaska Anchorage. This thesis examines the discrepancy between the size of mining operations and their respective successes in the region while also providing an historical background on the region and reports on the historical resources present.

Introduction

We rush like a comet into infinite space. –Fisher Ames

During the late 19th century the Koyukuk Mining District was one of the most remote mining locations in North America. Still today, it is characterized by extreme seasonal temperature fluctuations, physically demanding landscapes, limited accessibility, and unpredictable placers which limit mining operations in the region. It seems inevitable that these challenges negatively affected early gold mining success in the Koyukuk though they were certainly not the only factors involved in the rise and decline of this district.

Major national political and economic conditions also contributed to aspects of remote mining including who made it into such a remote area, who succeeded or failed in locating and extracting gold, how well operations could sustain themselves, and how these operations went about extracting and processing gold.

One notable difference that set the Koyukuk apart from other Alaskan mining districts was the scale of individual prospecting outfits which were typically comprised of one to three individuals. Companies comprised of many individuals, in this setting, had difficulty establishing operations and extracting a profit due to several significant factors which will be addressed herein. Some of the factors that influenced settlement and mining patterns in the Koyukuk include transportation and shipping costs, technological limitations, and of course, the landscape and geology of the region. The primary purpose of this thesis is to examine this scalar discrepancy and outline the factors that influenced the outcome of operations in the region.

Alaska, since named the 'Last Frontier', represents a final stage in westward movement through industry and settlement in North America. The gold rush era has been sensationalized and romanticized in popular media continuously since the inception of the first gold rush at California's Sutter's Mill in 1849.[1] This has resulted in the modern mythos of the common citizen struck by 'gold fever' flooding into the 'wild west' as prospectors searched for gold in an irrational quest for wealth and prosperity. Gold and the prospects of finding it were used as marketing schemes for newspapers, for railway profits, and to mitigate the effects of the economic downturn and social unrest caused by dramatic class separation which had plagued the nation since the early 19th century. Alaska fits into this mythology as a natural continuation of the political and social expansionist movement declared as the American 'manifest destiny' while also being integrated into a burgeoning capitalist economy.[2]

The process of westward expansion was not a new concept in the late 1880s but merely a more intense movement –the culmination of centralized power of the American government and the pressures placed on the lower classes. The platform of expansion was built on the entirely normative expansionary ideology of colonialism and control. The historic media representation of expansion, cultural establishment, and resource development was depicted through artistic expression and popular literature encouraged excursion into a primarily unexplored area of the North American continent. Additionally, the flood of people into Alaska overwhelmed both the original inhabitants and the Russian colonists remaining in the area. This acted as a settlement mechanism which would lead to the eventual American economic control, in addition to political control, of a large area of essentially untapped natural resources. Likewise the 1867

acquisition of Alaska was a huge boon in terms of unexplored national resources in addition to the westward expansion of political boundaries. It was, however, loosely managed and remained so well into the 20th century.

What is now portrayed as a simple case of 'gold fever,' was realistically a very complex reality that involved the political, economic, and social environment. This was created by multiple devastating wars, economic fluctuation, and a class divide that drastically affected ideas about what it meant to be American. The means for a person's prosperity and self-sufficiency were obtained through a degree of individual agency rather than determined by the industrial corporations that had risen to power.[3] In many ways the gold rush can be attributed to a gradual disassociation of personal identity within a system. A marginalization of specific classes and the resulting segregation between classes became more pronounced beginning in the 1840s as the new East coast wealth grew and the lower classes continued to be relegated to factory work which involved long hours with little pay. The upper class flourished while the lower class lived and worked in poorly regulated conditions. This trend continued into the late 1880s and the promise of gold represented not only wealth, but freedom and personal control. Gold alone did not prompt such a massive westward migration and its promise of financial security is only one of the factors that can explain the influx of prospectors into some of the harshest and most remote environments in Alaska's vast expanse.[4]

Though they occurred several decades later than the first California gold rush, the Alaskan gold rushes followed on the coat tails of that period's momentum. The movement north and west involved miners of varying experience embracing new opportunities for wealth in untapped gold fields. And it was based on reports,

newspapers, and tall tales and encouraged by old nostalgias predicated on personal experiences and romanticized notions of the 'Old West'. In the Koyukuk and many other Alaskan gold districts this resulted in a mixture of old timers and new initiates who mined the region in search of wealth to take back home.

Following an initial rush to Alaska in the 1890s many mining districts were established and defined by transportation routes, commercial supply depots, and natural landscape features that acted as physical and geological divides. Located within these natural features is the Arctic Koyukuk Mining District whose boundaries are defined by the three branches of the Koyukuk River drainage. Gold was discovered in the Koyukuk as early as 1887.[5] The subsequent gold rush which began in 1898 led to the export of this wealth, which contributed substantially to national gold reserves. The continued search for gold in this region was guided by highly influential political and economic movements 'Outside'[6] or in the contiguous United States. Circumstances outside of the District of Alaska were integral to the exploration and extraction of natural resources in even so remote a region as the Koyukuk.

The local environment and geology also played major determining roles in the organization and distribution of mining outfits, shipment of materials, and the relative ability of large companies to establish and support themselves in this region. In some cases it was simply a matter of luck which, when paired with varying levels of experience, competence, and perseverance, allowed some to succeed while others failed and left the region empty-handed. The environment alone was enough to turn back many of the initial prospectors who flooded the area following rumors of gold. Many of those who stayed through their first winter abandoned their camps the following year due to

lack of preparation for extreme weather in the region, isolation, and lack of solid prospects.[7] While this strongly suggests an explanation based on environmental determinism it is also important to study the broader scope of problems which affected the success of prospectors and miners in this region.

In any remote settlement, transportation and subsequently the availability of supply depots become integral to maintaining a systematic connection between production and consumption centers.[8] The Koyukuk had supply depots relatively early. Due to the quick succession of gold rushes in the Klondike and interior Alaska, commercial companies were quick to move into new mining districts. Various routes could be taken to get into the north country through supply centers like Bergman and Bettles, located south of the confluences of the Koyukuk River branches and the Alatna River, Coldfoot along Slate Creek, or Wright's, which would eventually become the current settlement of Wiseman.. Moving supplies into the tributaries along the Koyukuk River, however, could be complicated due to the challenge of river navigability, which was frequently difficult along the Koyukuk due to unpredictable rainfall. While establishment of northern shipping companies, specialized knowledge regarding local conditions, and technological developments eventually made the process of remote mining easier. The first westerners in this Arctic landscape were often reliant on their own ingenuity and physical strength as well as the aid of the local native settlements and guides who played an integral part in many of the early surveys and expeditions into the Koyukuk.[9]

To critically explore the Last Frontier's gold rush days and to understand the contributing factors which defined mining activities in the Koyukuk District, it is

necessary to examine this district within the national as well as the territorial systems which were so influential to its growth, development, and decline. Further, to interpret the modern archaeological remains of the historic mining related sites, it is important to delve into the histories of individual creeks as well as the miners who operated them.

The Koyukuk district is one among many historic Alaskan mining districts. It is characterized by the presence of many small scale mining ventures with only a small number of larger mining companies with external investors which defined the extent of mining operations in the region and the technologies implemented in the area. A close examination of the Koyukuk District through a comparison to environmentally similar Alaskan mining districts and integration of the Koyukuk into the greater national scene it will be possible to more closely examine the factors that determined the developmental patterns that are visible in this district's historical record and physically represented in its archaeology.

Furthermore the case study of the Koyukuk Mining District will in turn aid in an understanding of how production methods and technologies were implemented in a remote setting and the degree to which they helped or hindered the success of historical mining activities in these areas.

Project Overview

This thesis is one part of a project that began in 2010 and which has been completed through the joint efforts of Michigan Technological University (MTU), the University of Alaska Anchorage (UAA), and the Fairbanks District Office and Central Yukon Field Office of the Bureau of Land Management (BLM). The project leads represented each of these institutions: Dr. Patrick Martin (MTU), Dr. Paul White (UAA),

and Bill Hedman (BLM). Field crews were comprised of graduate and undergraduate students from both universities as well as Steve Lanford, a seasonal archaeologist with BLM. All data post-processing was completed by graduate students from UAA and MTU.

The scope of this project has thus far included pedestrian and aerial surveys of select BLM managed mining claims in the historic Fairbanks and Koyukuk Mining Districts in addition to historical research regarding these districts. The claims were selected by BLM archaeologist Bill Hedman with the goal of identifying and evaluating environmental hazards and physical or chemical hazards to human health and wellbeing. These hazards, produced as a result of mining, fall within the guidelines of the United States Department of the Interior BLM Abandoned Mine Land (AML) Program to mitigate "physical safety risks at AML sites on or affecting lands administered by the BLM, and [provide] solutions to degraded quality and other environmental impacts."[10]

Additionally, under the National Historic Preservation Act (NHPA) of 1966 which serves to protect historical and cultural sites, a survey and recordation of historic archaeological sites was conducted in order to aid in the inventory of cultural and historical sites on public lands.[11] In the Koyukuk, our surveys were conducted along creeks known to have been substantially worked by prospecting outfits or mining companies that were likely to have produced potentially hazardous environmental or landscape features. Evidence of this mining history was clearly visible in these areas and our survey proved rewarding in terms of historical data in addition to our identification of mining related hazards.

Though three years of field work have been completed during the course of this project, this thesis relies primarily on the results of two weeks of intensive field work conducted in May of 2012 during which several creeks were surveyed in the Koyukuk Mining District. Over 2000 acres were surveyed, a total of three hundred fifty-eight features culminating in a total of thirty-one sites, seventeen of which were previously unrecorded (See Figure 1). Previously recorded sites were revisited in order to monitor their conditions. Our surveys were conducted along Gold Creek, Minnie Creek, Myrtle Creek, Porcupine Creek, and Twelvemile Creek. Additionally we surveyed Tramway Bar, Ironsides Bar, and Gold Bench, sections of the Hammond River and its tributary Jennie Creek; and sections of Prospect Creek and Linda Creek. This was an intensive survey of some of the most historically significant creeks in this region.

Crews for this project were selected from Michigan Tech, UAA, and an additional graduate student from Central Washington University (CWU) employed by BLM. The survey was divided into two parts with a shift in crew at the half-way point. From May 4 – 8 the crew consisted of graduate students: Kelsey Anderson (UAA), Tamara Holman (UAA), and myself. From May 9 – May 14 the crew consisted of Ayla Aymond (CWU), Dr. Patrick Martin (MTU), Alfonso Tinoco (MTU), and myself. Additionally BLM archaeologists Bill Hedman and Steve Lanford directed our surveys and coordinated our transportation throughout the survey.

Two or three team pedestrian surveys were equipped with Archer Field PCs using Arcpad to digitally collect information based on the rubric designed in 2012 which includes an assessment of accessibility, physical or environmental hazard, and allows

further documentation of site specific details, measurements, and photographic data. Additionally each team had a digital camera and designated photographer and note taker.

Previous Research

Previous research on the Koyukuk Mining District has been scarce in regards to historical publications; however, there are several resources on which I have heavily relied. These have included *Gaunt Beauty; Tenuous Life*, a National Park Service (NPS) report on the central Brooks Range in the Gates of the Arctic National Park and Preserve; *CRMIM: The Quest for Gold*, an NPS report on the history of mining across Alaska in NPS managed parks and preserves; and a navigability study completed for the State of Alaska in 1982 and which has been made available by BLM. Additional scholarly and documentary resources have included individual published accounts and experiences in the northern Arctic and the Koyukuk region, technical reports completed by BLM, historic newspapers, annual United States Geological Survey (USGS) mineral and mining reports, and annual Alaska Road Commission (ARC) reports, archival collections at UAF, UAA, and the Anchorage office of the USGS, data from the Alaska Heritage Resource Survey (AHRS), as well as private personal collections of documents and photographs from the 1920s-1950s period of Koyukuk mining activity. An all-inclusive list can be found in the reference section of this thesis.

This thesis will address the narrative history of the area in regards to specific historically influential events, influential internal and external contexts and settings, and the impact and evolution of technological and operational systems in addition to the recordation of individual sites and an evaluation and assessment of their hazards. While not all the sites surveyed and inventoried will be addressed within the main body of this

thesis, they will all be included in an appendix in order to illustrate the broad range of sites present within this region; these sites descriptions will however be provided in Appendix A.

The subsequent chapters are ordered to address the significant factors which contributed to the Koyukuk Mining District's specific developmental trajectory in terms of environment, geology, technology, and the local and global contexts. Chronology will be taken into account regarding the ordering and depth of several topics to develop a smoother historical narrative for the region. The first chapter will serve as an introduction to the project which led to this thesis as well as an introduction to the survey work completed in the Koyukuk during the 2012 field season. Additionally it will focus on the history of the region which encompasses the Koyukuk Mining District, the Koyukuk River drainage systems, their geology and general environment, the prehistory and populations who inhabited the region prior to the entrance of Russian and American explorers and prospectors, and a history of mining in the Koyukuk. This history will address both the 1898 and 1911 gold rushes and explore what makes them distinctive and from 1918 into the 1930s to trace development patterns through the integration of mechanized mining methods. [12] The decline of the district will also be addressed briefly.

In order to better understand the mode and method of development as it relates to the people who worked in this district the next two chapters will identify those who moved into the region and why they did so as well as discuss what they accomplished and how. Chapter two will address the motivations which spurred gold rushers to move into Alaska and more specifically to the Koyukuk in order to place Alaska and the Koyukuk in context as one of the last western American frontiers and one of the final 19th and 20th

century gold rushes. Chapter three will introduce the applications of transportation and technology in the Koyukuk Mining District and will provide a timeline of development and change from the initial 1898 strikes to the implementation of modern technology in the early 20th century.

Chapter four will address the primary research question of this thesis which is the explanation of the division between large scale and small scale operations in the region and will address the factors which allowed some to succeed while others failed. It will use specific examples of Koyukuk mining operations to identify and discuss the factors which limited large scale mining operations in the region and encouraged small scale, technologically simplistic mining methods. An inventory of individual site reports and associated maps will also be included.

Chapter five will primarily focus on two comparative districts which will aid in creating a contextual mining history for the Koyukuk in order to understand what factors are specific to the Koyukuk as well as what difficulties were shared by other districts with similar characteristics. To address the Koyukuk District specifically in regards to what factors limited mining operations and using evidence from the Chisana District and the Hot Spring District this chapter will tease out those factors which are either Alaskan limitations or are distinctly Koyukuk traits. The Chisana placer mining district, which shares a similar environmental landscape, is located within Alaska along the Yukon River Basin, and the Hot Spring District, located in Western Montana, are included in order to connect the Koyukuk to national mining trends and experiences. The Hot Spring District is an area of late 19th century placer gold discovery which shared many aspects with the Koyukuk including terrain, remoteness, and a range of successes and failures in regards

to similar factors of environment, geology, technology, and accessibility. These comparisons will be drawn through the research of archaeologists and historians who focused on documenting the histories of these districts. Information on the Chisana District is from Geoffrey Bleakley National Park Service study entitled *A History of the Chisana Mining District, Alaska, 1890-1990*, while information on the Hot Spring District has been primarily drawn from Jeffrey J. Safford's *The Mechanics of Optimism*.[13]

Chapter five will place the Koyukuk in context of national politics, social history, and economics, which prompted the rise and decline of gold rushes as well as how they affected Alaska and in turn the Koyukuk in order to better understand the district's significance within Alaska's historical record and gold rush era trends. Additionally this chapter will tie the Koyukuk into the territorial political and economic systems in order to understand its contributions to the development of natural resources in the territory.

Chapter six will serve as a conclusion for this thesis and will address the value of the data collected for this project and its relevance for historical research.

1. Landscape and Mining History of the Koyukuk Region

The research compiled for this thesis is based on an intensive survey of select creeks within the eastern portion of the Koyukuk Mining District. The history of these creeks and of the overall Koyukuk District as well as the archaeological data collected during field surveys are the foundation of this research project. They will be used in order to better address the differences between large and small scale mining operations in the region and to discuss the elements that contributed to the development of infrastructure and support systems within the eastern portion of the Koyukuk Mining District.

Environment, Landscape, and Climate

North of the Arctic Circle, at the southern edge of the Brooks Range, and on the eastern edge of the Endicott Mountains are three river drainages: the Noatak, Koyukuk, and Chandalar. One of the major river systems of the northern Alaska Arctic, the Koyukuk flows south towards the Yukon River, forming a veritable highway of water systems which allow passage into and across the interior of the state. The Koyukuk river itself is about 500 miles long and its drainage basin captures approximately 26,000 acres. Historically during spring these river systems became swollen with the heavy flow of snowmelt and icepack which made passage difficult. However, during summer, low water was more often the cause of hardships. While in their frozen state, from October to May, they were more reliably navigable by dogsleds and later by motorized equipment.

At its southern extent, the Koyukuk landscape is one of dense spruce thickets, alder and willow patches near flowing water, birch and cottonwoods, and a generous cushion of mosses below. Farther north into the headwaters the landscape becomes dramatic. High peaks and what some might call the sparse vegetation of the arctic tundra

is characteristic of the area. In reality vegetation is simply much closer to the ground where it cannot be damaged by high wind, extreme temperatures, and altitude. Here, willow and alder cluster near the edges of creeks and spruce vie for a space amongst them. Moose leave their mark with stripped bark while bears frequently tear holes in the thick mat of plants that layer the slopes above quartz, schist, or limestone outcroppings. Mankind has also left its mark. Several waves of Bering Sea crossings led to the establishment of the first inhabitants who subsisted off of the arctic landscapes, ancestral to the many communities that continue to do so today. They were joined in the mid 19th century by Russian, American, and European explorers, miners, and fur trappers following the lure of curiosity and potential wealth into the interior of Alaska. Of these, miners have left some of the most distinct marks on the current landscape, the primary concern of this thesis.

The majority of the Koyukuk District lies above the Arctic Circle in an environment that experiences dramatic seasonal climatic changes. Short summers are punctuated by early freezes; winters, bordering on eight months long, are ended with a rapid breakup.[14] Typically winters in this region range from -60F to a high of -18F. The coldest temperatures recorded in the region have been measured as low as -80F. Summer temperatures are moderate and range from 36F to as high as the mid 80's. Precipitation in the region is low throughout the year (See Table 1).[15]

Geology and Geography

In terms of its geology, the Koyukuk is categorized in early literature as a part of the Yukon Mining District, though it is commonly referred to in its own right as a singular district due to distinctive characteristics which set it apart both physically and

environmentally.[16] It is also commonly subdivided into the Bettles District and the Wiseman District.[17] Irving Reed defines these two subregions geographically.[18] The Wiseman district is the larger and more northern region. It includes the Koyukuk River's Middle Fork tributaries as far north as the Hammond River and Gold Creek in the southern extent of the Endicott Mountains. The Bettles District includes the section of the Koyukuk near and south of the Arctic Circle encompassing Tramway Bar as well as the South Fork Koyukuk River and drainages within the Kanuti Flats south of the Brooks Range foothills. The distinction between these two sub-districts lies in the type of bedrock on which the placers are located. The Bettles District is located in a region of lower cretaceous bedrock while the Wiseman District is located in a region of upper cretaceous bedrock which is a continental deposit.[19] This division suggests that the north is constructed mainly of metamorphic rock: schists rather than granite, while the southern portion of the district is mainly quartz.[20] For the purposes of this thesis it is pragmatic to refer to them as one district since they functioned historically as a single district.[21]

This district is rich in minerals and includes deposits of gold, antimony, copper, zinc, tungsten, tin, manganese, galena, and coal.[22] Kurtak states that "Out of 56 placer-producing districts in Alaska, the Koyukuk ranks 17th highest, with production totaling approximately 286,000 ounces of gold."[23] Placer gold deposits were the primary focus of early miners along many of the Koyukuk's tributaries. Placer mining played a pivotal role in the development of mining in the region.

Placer gold deposits in the Koyukuk are typically derived from deposits in metamorphic rocks such as schists and quartzites, sedimentary rocks such as limestones, and in igneous formations. There are multiple types of deposits which became the focus

of prospectors and miners in the region. The first of these are alluvial placer deposits that have been formed due to water-based erosion across ore-bearing rock followed by redeposition. Gold Flakes concentrate in the creek beds making them easy to find by prospectors using pans, rockers, and sluices. Additional concentrations can occur by repetition of the process of water eroding old stream beds and redepositing the gold and gravel in new locations. "A common form of enrichment is the dissection of an auriferous gravel bench of the slopes of a stream valley by a tributary stream. This tributary stream carries the gold derived from the bench to the main stream."[24] Processes like these made prospecting in many placer locations difficult due to unpredictability. Concentration was only generally understood by many prospectors at the turn of the century, often leading to a reliance on luck as much as geological knowledge. The most commonly identified placer deposits were bench placers and creek placers, though throughout the Koyukuk district concentrated placers located at or on bedrock were also prevalent.

Topography

In so large a region the topography is naturally diverse. The northern extent of the district is comprised of both rugged, steep-walled valleys and hilly plateaus within mountains ranging between 3000 and 5000 feet in elevation. The southern extent is primarily made up of mountains between 1000 and 2000 feet in elevation and foothills which lead into flat-lands characterized by broad creeks and boreal forest vegetation. Reed describes the region thoroughly, suggesting a series of low mountainous passes within the more rugged terrain which form the drainage systems and tributaries which feed the Koyukuk River as it runs wide between bluffs.[25] Despite steep slopes and

numerous tributaries the creeks remain relatively wide and subsequently shallow with riffles, large boulders, wide gravel benches, and winding oxbows within flat valleys.

Contextualizing the Koyukuk Mining District within Alaskan History

Alaska has a very young American history. Purchased in 1867, there was no coordinated exploration effort into the interior until the 1880s and little local political control until the establishment of a civil government in 1884.The interior was one of the last regions of Alaska to be penetrated by explorers, trappers, and prospectors in the nineteenth century. However, these newcomers did not enter a barren, unoccupied landscape, but one with a rich cultural heritage of its own, developed in a complex environment, an environment that these newcomers were typically unprepared for. A level of reliance on local, indigenous knowledge became necessary both in terms of navigating this foreign terrain and in surviving under new environmental conditions. It has been suggested that the Koyukuk was unpopulated during the period of the early gold rush.[26] This is not entirely accurate. However, the population of the area consisted of small migratory groups and despite the late arrival of prospectors in the 1880s, European influences and illnesses had already effected populations in the area.[27]

Three cultural groups inhabited the regions adjacent to the Koyukuk drainage during the late protohistoric period. In the 1850s this area was on the borders of three major linguistic and cultural groups that include regional bands of Inupiaq Eskimo in the Endicott Mountains and the Colville River region, Koyukon Athabaskans along the main branch off the Koyukuk and south into the Yukon River valley, and the Kutchin who ranged east of the Koyukuk River and into the northern branches of the Koyukuk system.[28] These populations were far ranging and depended on the annual presence of

caribou and other big game and the availability of other food sources such as fish, birds, or small woodland mammals. Subdivisions within each group and tensions between the major groups led to conflict in and around this region and farther north into the Colville River system. The presence of native groups in the Koyukuk region appears to have fluctuated due to these tensions, as well as to epidemics of smallpox, which led to the reorganization and condensation of groups within the region. Despite this reorganization, however, small familial bands of Central Koyukon were likely the most frequently encountered by prospectors during the early historic gold rushes into the region.[29] The cultural landscape that western Americans were entering was both complex and intricate, though the majority of newcomers recognized little influence on the landscape they entered. Very little mention is made of native presence in the region by the gold rush participants from 1898 onwards.

The earliest explorations of the Koyukuk River region were of Russian origin. The first occurred in 1838 when a Russian-American named Malakof made it to the mouth of the Koyukuk River by travelling east from the mouth of the Yukon River at Unalakleet.[30] The second occurred in 1842 under the competent leadership of Lieutenant L. A. Zagoskin of the Imperial Russian Navy, whose orders were to make an inland exploration of northern Alaska.[31] Trade rights were an essential part of the Russian presence in Alaska in control of the vast frontier landscape. The Russian American Company, the British-owned Hudson's Bay Company and the American-dominated coastal fur trade all held stakes in the undeveloped wealth of Alaska.

By the 1830s, control over trade routes was as much an economic and political issue inland as it was along the coast. It was also in the best interests of the Russian

American Company, however, to remain in good standing with Britain and the new American presence, because this was a remote outpost for Imperial Russia, one which required supplies that could not be easily provided without some degree of cooperation with more efficiently run companies such as the Hudson's Bay Company. Competition between the Hudson's Bay Company and the Russian American Company drove out many smaller American competitors leaving only the British and Russian trade giants. A mutual agreement over leased land in 1839 allowed the two companies to balance their controls in the region as well as improve relations between the two nations on the European front where Britain's commercial strength was on the rise. Shutting out American trade in the region was beneficial to both parties.[32] The Hudson's Bay Company continued inland explorations along the Yukon into the late 1840s, establishing Fort Yukon in 1847, which would become a major trade and transportation outpost for the Koyukuk River operations.

American interests in gold during the mid-nineteenth century played a major role in the acquisition of Alaska by the United States. The process began in 1852, when native prospectors brought samples of gold to the Hudson's Bay Company and reported that there was gold in the north. American interests were piqued as reports continued when American prospectors moved first into British Columbia and then into the Northwest Territory.[33] By the 1860s, Russia was losing its financial interest in holding on to its colonies in Russian America. The current political climate made the United States the logical purchaser of Alaska from Russia, due to poor relations on the part of both nations with Britain. The American Secretary of State at the time, William H. Seward, had an expansionist policy and a strong belief in America's "Manifest Destiny."[34] Purchased in

1867 at the price of $7.2 million, Alaska was considered by many to be a poor purchase, "Seward's Folly" paid itself off in short order.[35] Following its purchase, Alaska was managed by the military as 'The Department of Alaska' until 1884 when a civil government was formed for the region providing it with a territorial legislature and representation in Congress.[36]

By the late 1880s, word of gold in Alaska had spread as prospectors and miners established outposts in Canadian territories including Dawson City and Fortymile, and later at Circle City on the American side of the border in 1894. While the Fortymile strike in 1886 provoked a rush up the Chilkoot Pass and the White Pass, it wasn't until the Klondike rush in 1897 that the gold rush was truly underway in Alaska. A second route into the interior from St. Michaels in the west and up the Yukon River provided a less strenuous, albeit slower, route into the Yukon gold fields (see Figure 2).[37] In the last years of the 1890s, an overflow of prospectors from Dawson, on the eastern side of the Yukon and Council City established in 1898 on the west, turned the banks of the Yukon into a series of small tent cities leaving the Koyukuk and other basins essentially uninvestigated.

Gold in the Koyukuk was first reported in 1885, which led to a reconnaissance mission consisting of a team of Yukon River and Koyukon guides, led by the American Lt. Allen, to map and describe the landscape of interior Alaska via its waterways.[38] With the help of his guides, the expedition made it to the northern extent of the Koyukuk drainage and into the John River and the Wild River tributaries. Along the way they made note of native village sites and preexisting trails, and engaged in trade with local settlements and communities. They traversed a total of 1,500 miles along the Copper,

Tanana, and Koyukuk rivers, which they mapped in detail. It is in part through Allen's reports that native life along these river systems has been recorded and his engagement in their histories has allowed an understanding of the native role in Euro-American settlements in these regions. While Allen's expedition exposed him to the hardships of travelling this landscape, he quickly learned to rely on the skills and knowledge of his guides and adapted his strategies as it became necessary.[39]Incoming prospectors, on the other hand, did not have the luxury of his reports to aid them. They would encounter scarcity of game and food, rough terrain, problems navigating rivers, and they would be unprepared for the harsh winter.

An Overview of Early Mining in the Koyukuk District

John Bremner, Peter Johnson, Al Mayo, and James Bender were the earliest recorded prospectors in the Koyukuk River region. All experienced prospectors, these men were not new to the challenges of young undeveloped mining districts.[40] Al Mayo worked for the Alaska Commercial Company, later manning a supply station at Nukukayet, while Bremner and his mining partner Johnson prospected successfully at Tramway Bar in 1887, starting rumors of gold in the region. Additionally, according to Gordon Bettles, gold had been found at Hughes Bar and Evans Bar, also in the Koyukuk, by 1890.[41] None of these strikes was as notable as Knute Ellingson's, who located gold on Myrtle Creek in 1899.[42] His find is credited with starting the first rush into the region.

The Klondike's promise of gold dwindled as good prospects were claimed, leaving overpriced claims of dubious worth for the continuing influx of people into the Klondike and Yukon regions. This led to the quick circulation of word that gold had been located in the Koyukuk, Yukon, and Kobuk river systems.[43] Prospectors trickled into the

Koyukuk throughout the summer of 1898 and by winter the migration began in earnest as prospectors stampeded into the area. In late 1898, the Koyukuk experienced an influx of nine hundred people, who then became trapped in the region when the sixty-eight steamers that brought them were caught in an early freeze, unpredictable circumstances which were to be common complaints about the region.[44] Some stayed in the region, attempting to mine in the frigid conditions while others turned south, forsaking their investments to return to the States or diverting their interests toward other mining districts.

The earliest forays into mining within the District of Alaska had occurred in Southeast Alaska within the Inside Passage in 1880. This led to the implementation of previously established U.S. mining laws, which were extended to the District of Alaska in 1884. Due to a lack of government presence in the Interior, mining districts adhered to the miner's code which produced communities that were self-organized and self-governed, the case with many turn of the century settlements in the Koyukuk.[45]

Due to the sudden influx of miners, scant supplies were available for these erstwhile prospectors through the establishment of several trading posts in the region, which allowed most of them to survive their first winter in the region's harsh environment. Bettles, familiar with the region and its prospectors, had established a store in Bergman, at the mouth of the Koyukuk, in 1898. In anticipation of the gold rush to come he ordered 20 tons of extra supplies for his trading post at Nuklukyet Station and supplied Bergman with enough goods for 1000 men.[46] The unexpected stranding of prospectors that winter led to the establishment of small mining camps in the Koyukuk region which were recorded on several maps, including Beaver, Rapid City, Soo City,

Seaforth, Peavey, Jimtown, and Union City.[47] The latter was named for the *Alaska Union*, the sternwheeler that landed there in 1898.[48] While most of these camp locations were short-lived there is indication that not all of these sites were expected to be abandoned so soon. It is suggested that Arctic City had electric lighting, Union City a sawmill, and Peavey a schoolhouse.[49] There is no indication that these sites were inhabited for more than a year, however, and little remains archaeologically of these camps.

The level of interest in the Koyukuk District can be seen through the growth and development of its primary communities. The rush led to the establishment of Coldfoot, where an additional supply depot was built by the Northern Commercial Company in the early 1900s.[50] An estimate of their numbers ranges from 300 to 400 individuals.[51] By 1902 Coldfoot had two roadhouses, two stores, seven saloons, one gambling house, and ten prostitutes.[52] The community of Bergman, which would later move downstream to become Bettles, became the primary supply and navigation depot for the region and remains significant to the region today.

In 1901-1902, a second wave of prospectors joined those that remained in the Koyukuk. Interest in Koyukuk placers was repeatedly diverted by the Tanana strike in 1900, the rush to Fairbanks with Felix Pedro's discovery in 1902, the Innoko River strike in 1906, and the 1908 strike on the Iditarod River. There were a number of smaller rushes to the Koyukuk in 1906 and 1908 but not until 1910-1911 was interest renewed in the Koyukuk District with the joint discovery of rich pay deposits of gold along the Hammond River and Nolan Creek. However this second rush lasted only a few years and

by 1915 it had reached its peak. Interest in the district continued well into the 1930s and 1940s but never with the same intensity (see Figure 3).

Mining in the Koyukuk Mining District's Eastern Placer Location

The Koyukuk Mining District includes over 11 million acres of land with several major river systems which flow into the Koyukuk River. Within this district placer gold is widely distributed, with three primary placer gold regions that became the focus of prospecting efforts (see Figure 4). The western most placer district included portions of the Alatna River drainage with a focus around the Help-Me-Jack Creek area and its confluence with the Alatna River. Centrally, the John River and Wild River as well as the Allen River, a tributary of the John River, north of their confluence with the Koyukuk were the focus of placer mining efforts. On the western edge of the Koyukuk Mining District is a placer region consisting of the Middle Fork Koyukuk south of the Deitrich River and portions of the South Fork of the Koyukuk River north of its confluence with the Middle Fork. Each of these placer regions was explored by prospecting outfits with varying degrees of success throughout the history of the Koyukuk Mining District. The eastern region was the most successfully and the most heavily mined of these and was the most thoroughly documented area during its historic mining period. It has also been the focus of several geological and historical investigative reports in the years since its overall decline in the 1930s.

The eastern region is also the primary focus of this survey and includes locations along the Middle and South Forks of the Koyukuk River from Linda Creek in the north to Twelvemile Creek in the south and locations on the South Fork including Gold Bench and Ironside Bar as well as a survey of Prospect Creek, a tributary of the South Fork.

Over 2000 acres were surveyed, and a total of three hundred fifty-eight features were recorded post-processed to represent a total of thirty-one sites, seventeen of which were previously unrecorded. Previously recorded sites were revisited in order to monitor their conditions. Pedestrian and aerial surveys were conducted along Linda Creek, Minnie Creek, Gold Creek, sections of the Hammond River and its tributary Jennie Creek, Myrtle Creek, Tramway Bar, Twelvemile Creek, Porcupine Creek; and locations along the South Fork which included Ironsides Bar and Gold Bench, as well as sections of Prospect Creek.

Prospecting in the Koyukuk region began in the mid 1880s following the exploration of Lt. Allen's survey for the War Department in 1885. Interest in the region grew with the exploratory surveys of USGS geologist F.C. Schrader in 1899 of portions of the Chandalar River, the Deitrich and Bettles Rivers, as well as the Middle Fork of the Koyukuk and south into the main Koyukuk River. Reconnaissance surveys of the Koyukuk River drainage system continued in 1901 and included additional surveys by Schrader as well as other USGS geologists into 1909 with studies focused on the John and Alatna Rivers, as well as the South Fork of the Koyukuk all of which are major river systems that contribute to water flow into the Koyukuk north of its confluence with the Yukon River. These papers were published by the USGS as professional papers and bulletins in the years following the surveys and contribute to the historic knowledge of the district's development and the available information concerning its topography as it was understood during the Koyukuk's gold rush period from 1899 to the late 1920s.

In 1903, USGS geologist Alfred Brooks states that since the initial gold rush in 1899 that district has produced from $100,000 to $200,000 in placer gold annually.[53] This

gold was primarily extracted from the Upper Koyukuk region along the Middle Fork. Following an initial rush to the area, the number of prospectors in the region dropped in response to the realization of the challenges they faced; provisions were costly, shipping was expensive at $100 per ton from Seattle to Coldfoot, and the summer working season was shorter than many anticipated. The following year, in 1904, Brooks writes that the district produced upwards of $300,000 dollars in 1903 but operations were hampered by heavy rains.[54] He notes that there were approximately 300 men working about a dozen creeks in the area during the summer season.

By 1905 the number of prospectors had dropped to approximately 150 men working in the summer season and states that "The fact that mining continues under these adverse conditions bears testimony both to the richness of the deposits and to the determination of those who had developed them".[55] Despite having only half as many prospectors as in 1903, the district produced $200,000 in gold on the 28 claims that were worked.

The richest creeks during the first decade of work in the Koyukuk were Smith, Emma, Nolan, Myrtle, Blake, Vermont, Swift, Julian, and Nolan Creek. Open cut mining methods occurred as early as 1907 on Myrtle and Emma Creeks but the majority of creeks were drift operations including one of the richer prospects in the region which was located in 1907 on Nolan Creek. In 1907 Brooks reports that 200 men were working the area but production fell to approximately $100,000 for the year. Brooks attributes this fall to the diversion of interest to new strikes in other districts.[56]

By 1909 the population had leveled out at about 200 men on the creeks surrounding the settlement of Coldfoot and a newly established town site 16 miles north

at the mouth of Wiseman Creek. A. G. Maddren, reports that shipping costs from Seattle or San Francisco to Bettles and then north to the mouth of Wiseman Creek had an accumulated cost of $200-$280 a ton or 10 to 14 cents per pound. The annual cost of living for the region is estimated at approximately $1000 per man including only food and clothing; wages are estimated at $1 a day with food provided. Maddren's evaluation of living conditions concludes that

> "Most [rich localities] of such opportunities have been short lived, and a large part of the mining has been done with a relatively low percentage of profit, so low in many instances as to furnish no more than a bare living under the harsh conditions of climate and isolation that characterize this region, where only the optimism that is the predominant characteristic of the gold-seeker's temperament serves to stimulate many of these men to continued effort from year to year".[57]

Output varied by creek with some being highly successful stakes and others abysmally bare. A table of the creeks surveyed during the 2012 field season as well as several other important creeks in the area is reproduced below showing the output by creek per year from 1900 to 1909 reproduced from a more thorough documentation provided by Maddren (See Table 2). The totals provided by Maddren include estimates of the value of gold removed in the years prior to 1900, with gold valued at $17 dollars an ounce, unrefined.[58]

While gold production was estimated at $418,000 in 1909, despite the location of new placers it fell dramatically in 1910 and 1911 averaging $140,000-$160,000.[59] In 1910 the overall population of the region, including both the Chandalar and Koyukuk Mining districts, was reported as 823. This including both white and native population

groups and approximately 200 of these individuals were miners on the Koyukuk placers.[60] By 1912 approximately 400 miners were recorded in the region. Brooks comments on this variability stating that "It is not to be expected that under present industrial conditions there will be any stability of placer-gold output in the Territory. So long as the high cost of transportation prevails, the production of placer gold must depend on the exploitation of bonanza deposits..."[61] Likewise the population of the district fluctuated based on the publicity that each of these bonanzas finds received resulting in a variable population of miners from year to year with only a small number remaining in the season year round or returning from one season to the next.

Operations in 1914 experienced water shortages but an estimated 300 to 400 individuals were working the placers. The most notable change from prior years was the development of the Hammond area which in addition to the Nolan Creek placers would consistently contribute to much of the district's later gold output. In the years following the majority of the district's output came from claims on these two locations.[62] Brooks estimates that four-fifths of the gold was removed during winter mining operations. During the winter mining season in 1914 six mines were operating on the Hammond River and five on Nolan Creek. Summer operations dropped to two on the Hammond River and three on Nolan Creek.[63]

The challenges faced by operators in 1914 were further complicated by rising costs of shipping particularly to the northern claim locations like the Hammond River and Nolan Creek claims. Brooks notes that "There is not a wagon road in the district except a few inferior ones built by private enterprise." High costs of transportation and the high cost of supplies limited mining operations to working only the richest claims. Brooks

states that "much of that [rich ground] available under present conditions is approaching exhaustion".[64] Additionally, deep placers like several mined on the Hammond River and Nolan Creek required the use of steam pumps to keep them dry. Several of these pumps were imported in 1915 and Brooks speculated that these would allow an increase in deep mining in the Koyukuk. Production of the district as a whole actually declined with only 20 mines operating in the summer of 1918 and 3 mines operating during the winter season. Production peaked in 1913 but operations experienced a gradual decline through 1918 with a continued focus on only the richest placers.[65]

In 1921, 18 open-cut operations, three of which were hydraulic, were reported. Overall production in the district showed a trend towards decline.[66] By 1922, little drift mining was being done in the district and only 75 men were working the upper Middle Fork in groups of 2 to 3 men. Operations were limited due to lack of water and high costs which led to a transition towards shallow bench deposits and sluice operations.[67] Overall, 106 men worked the district and several newly located prospects on the Hammond River and on Nolan Creek boosted output for the district.[68]

Higher output and continually rich placers in the Nolan and Hammond area drew new interest in the district. In 1925, the Detroit Mining Company promoted their mining project on the Hammond River. In a 1929 report, the Detroit Mining Company had two sixty-horsepower boilers and a hoist working a shaft on Discovery. Drill work was also done on Jennie Creek though gold was not located.[69] An *Alaska Weekly* article published April 30, 1926 states that Captain William Royden acquired a total of seventy-two claims between Nolan Creek and the Hammond River on behalf of the Detroit Mining Company. Royden and a small group surveyed the area in 1925 designing plans for a major ditch to

be constructed forty-five to sixty miles from the North Fork of the Koyukuk to the primary mining site closer to its confluence with the Middle Fork. An additional party was designated to manage the freight into the Koyukuk in 1926.[70]

By July 25, 1926, thirty-five men and a portion of the company's machinery had been flown in to work the company's holdings.[71] In 1926, precipitation was scarce across the Interior and the Koyukuk mining season lasted only 60 days. An attempt to transport machinery and supplies from Bettles to the company's worksite on the Hammond ended with supplies left in Bettles, Wiseman, and Coldfoot with only a portion of it actually making it to the worksite before freeze-up. The following year was no better in terms of transportation options and again, no work was completed. There is little evidence suggesting that their ditch was ever constructed or that much work in the area was completed and the company disbanded in 1930.

Despite the high value of placers in the district, the complications of high freight costs and unpredictable precipitation and water availability severely limited operations beyond the scale of small prospecting outfits on the richest placers.

Processing methods in the region remained fairly rudimentary from the 1880's until the late 1920s and consisted primarily of hand mining methods including the use of shovel, pick, and pan extraction and processing methods, the use of rocker boxes and sluices, and drift and open cut methods. The latter two methods could be approached by either manual methods, using man or horse powered windlass or more efficiently with the use of wood or coal powered steam boilers and hoists or pressurized water with the use of hydraulic machinery. These types of partially mechanized operations were typically processed with the use of a sluice apparatus. In 1914 Brooks observed "A few steam

hoists and thawing outfits constitute about the only mine equipment, except pick and shovel, used in the entire district. No steam scrapers have been utilized and only one or two small pumps".[72] Two drills were shipped to the Koyukuk in 1916.[73]

Mechanized mining did not occur successfully until the late 1920s and was never fully adopted by miners in the region. Hand methods remained the prevalent mining technique throughout the district's history. Several aspects of mechanized mining were introduced early on such as hydraulicking, drift mining with the use of a hoist, or gas powered drills for testing but these were typically implemented in conjunction with manual systems. Steam power was the predominant power source into the late 1920s in the Koyukuk region.

Other types of mechanization were more difficult to establish in the region. Hydraulic mining began on Myrtle Creek in 1909 but was poorly managed and shut down the next year. The first bulldozer was introduced in 1929 and aided in a partial transition from drift mining and manual open cut operations to more efficient open cut mining methods with the use of bulldozer. This would eventually lead to a more widespread integration of gas-powered machinery though hand methods remained common. It wasn't until the 1940s that a more fully mechanized operation was introduced on Myrtle Creek with the addition of a dragline and bulldozer operation which led to another significant year of production increases for the district. A 1949 survey of the Koyukuk detailed the Myrtle Creek Mining Company operations. The operation included a ten man crew, "two D-8 Caterpillars, a D-4 Caterpillar, dragline, rooters, [and] diesel operated pump and pipe for hydraulic water."[74] This operation was a re-mining of the creek, breaking into the bedrock to reach gold that had settled into the fractured bedrock.

By 1950 there were a total of 19 operations; in addition to the continued operation of the Myrtle Creek dragline operation there were six bulldozer operations, three hydraulic operations, eight hand operations, and one drift mining operation.[75] By 1960 there were only two operations working in the district, one of them by hand.[76]

The continued and ongoing use of the landscape as well as natural landscape changes have erased many of the early mining features but the physical remains of these decades long operations illustrate the long term value of gold extraction operations in the region as a monetary resource but also as a cultural resource as knowledge and claims are passed from one operator to the next.

Data for the region is not as detailed as other districts in Alaska for a number of reasons and is due in part to its remoteness but also due to the fluctuating nature of the mining population in the Koyukuk District. In 1914 Brooks noted in his annual report that

> Reports from the Koyukuk district are very meager, as but few of the mine operators there return the schedules mailed to them each year. Nor has the writer been able, as he has in nearly all the other Alaska mining districts, to find anyone who is willing to furnish the Survey with any information on the mining development. It is therefore impossible to do justice to this important camp in the annual reports on the mining industry of Alaska.[77]

This data limitation is also useful as an indication of the impermanent nature of many of the operations working the region but also highlights the insular nature of many interior prospectors and mining communities as well as the overall lack of a government presence or development of structured community organizations in many settlements.

Though the Koyukuk district was considered an important contributor to the gold output of the District of Alaska, it was never considered a major success in terms of overall gold production. Kurtak states that "Out of 56 placer-producing districts in Alaska, the Koyukuk ranks 17th highest, with production totaling approximately 286,000 ounces of gold".[78] Early mining operations focused on shallow placers and eventually led to a drop in district production due to scarcity as they were quickly mined out. Drift mining on Nolan Creek in 1907 brought the highest production levels the district had yet seen and renewed interests in the area. The fineness of gold in the district, tested in 1950, ranged from 820.7 to 978 parts per thousand (ppt) with a mean of 930.2ppt from 79 samples. An additional 24 samples read below 150ppt indicating the sporadic presence, quality, and concentration of the remaining gold in the region.[79] Table 2 illustrates production values from specific creeks in the region.

Table 1: *Modern climate data from weather stations in the Koyukuk Mining District.* [80]

Location	Average High (F)	Average Low (F)	Average Total Precipitation (inches)	Average Snowfall (inches)
Allakaket	30.9	5.7	12.3	61.4
Anaktuvuk	21.7	5.3	10.1	57.0
Bettles	30.6	13.5	13.7	84.4
Coldfoot	29.9	8.7	15.4	116.5
Indian Mountain	32.2	16.6	18.7	112.9
Wiseman	32.2	11.8	11.5	80.5
Average	29.6	10.3	13.6	85.5

Table 2: *Placer Gold Production on Select Creeks in the Koyukuk District. Total includes estimates of production values for years prior to 1900.Unless otherwise noted, localities are creeks or rivers.* [81]

Localities	**1900**	**1901**	**1902**	**1903**	**1904**	**1905**	**1906**	**1907**	**1908**	**1909**	**Total**
M.F. Koy.											
Tramway Bar	$5000								$300		$8000
Twelvemile	$1000	$1500									$5000
Porcupine	$500	$1000									$2000
Slate	$1000										$3000
Myrtle	$40,000	$7000	$50,000	$30,000	$15,000	$5000	$5000	$5000	$5000	$10,000	$182,000
Emma	$27,000	$40,000	$13,000	$15,000	$10,000	$15,000	$5000	$5000	$5000	$5000	$160,000
Nolan					$14,000	$40,000	$90,000	$125,000	$208,000	$288,000	$765,000
Minnie					$500		$400				$1000
Hammond	$2000	$2000	$10,000	$2000	$2000	$2000					$20,000
Vermont		$5000	$30,000	$25,000	$22,000	$20,000	$20,000	$20,000	$10,000	$20,000	$172,000
Gold	$2000	$50,000	$30,000	$70,000	$45,000	$24,000	$3000	$3000	$2200	$3000	$232,200
Linda			$8000	$10,000				$400	$300		$20,000
S.F. Koy.											
Gold Bnch	$25,000	$60,000	$20,000	$15,000	$5000						$125,000
Ironsides Bnch	$500										$2000

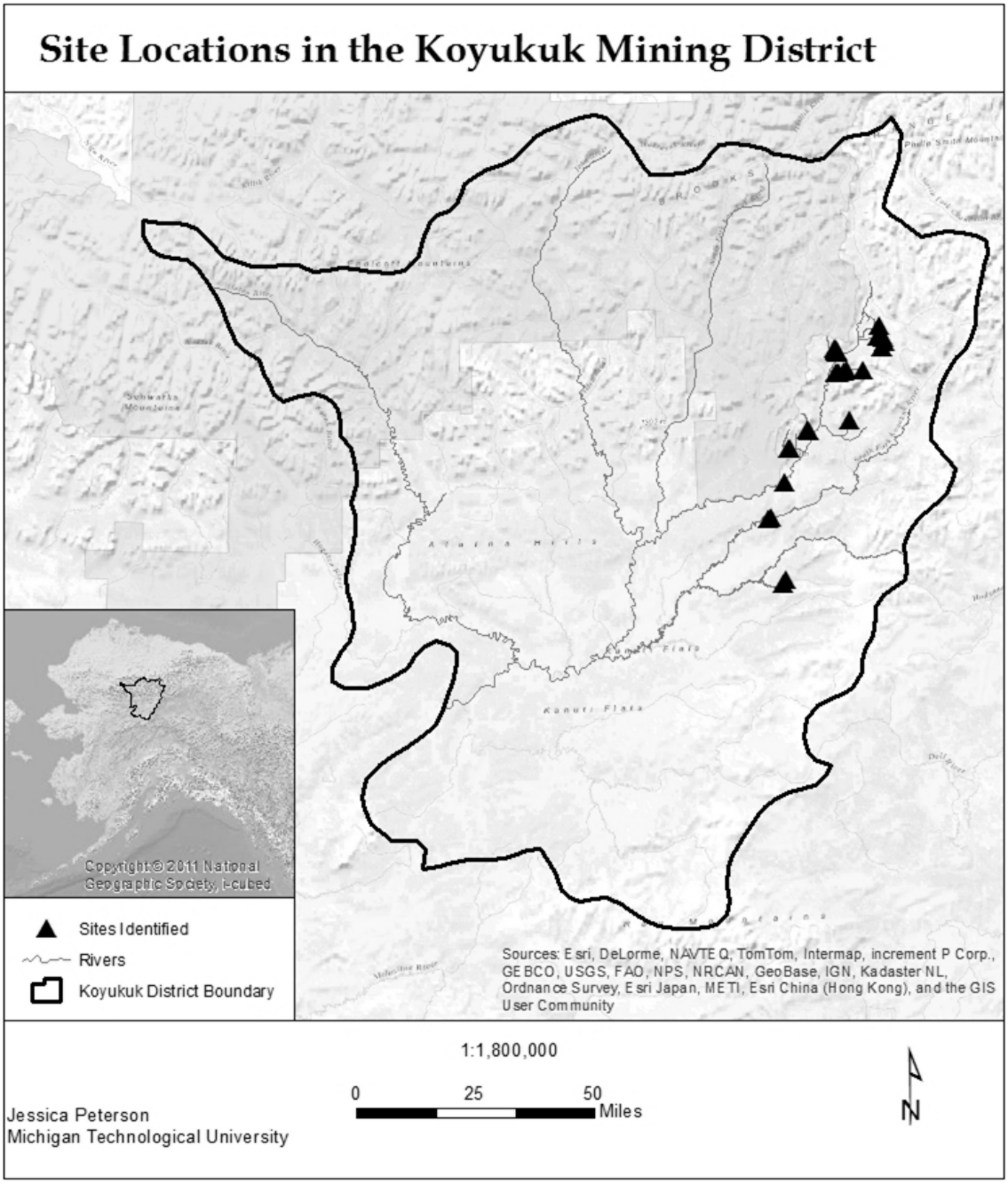

Figure 1: Sites located within the Koyukuk Mining District during a 2012 survey of select creeks.

Figure 2: Major routes to the Alaska gold fields, 1897.
(Rare Maps Collection, Alaska & Polar Regions Collections.
University of Alaska Fairbanks, UAF-G4371 H2 1897 C)

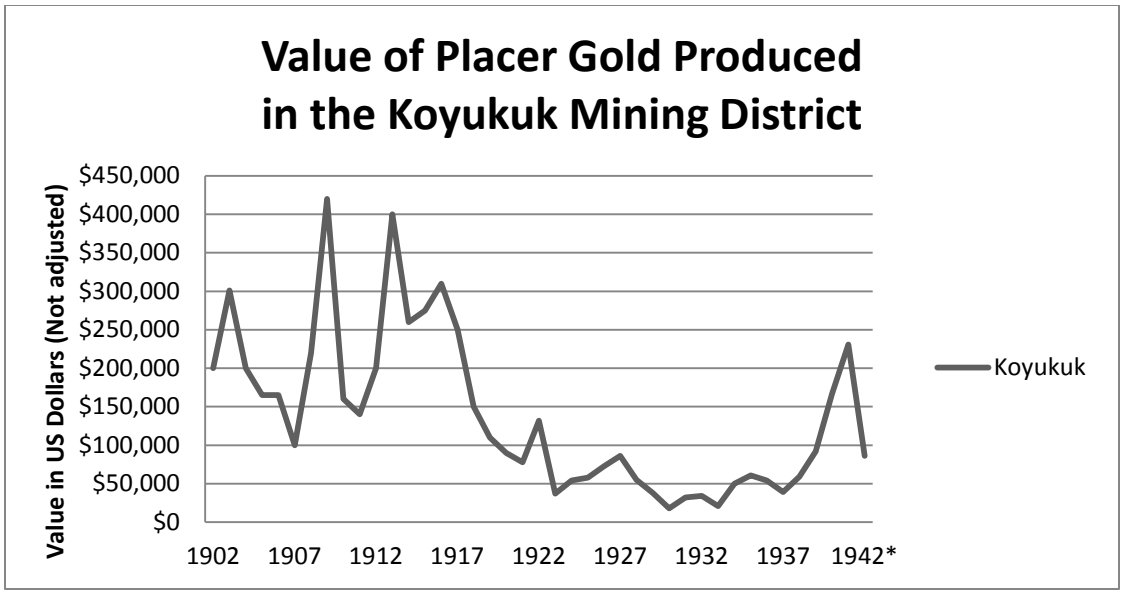

Figure 3: Value of Placer Gold Production from 1902 to 1942 based on annual mining reports. Periodically districts are combined for reporting purposes. Typically the Koyukuk was combined with the neighboring Chandalar District. Production values were also recorded as estimates in years where data was lacking. Graph created by the author.[82]

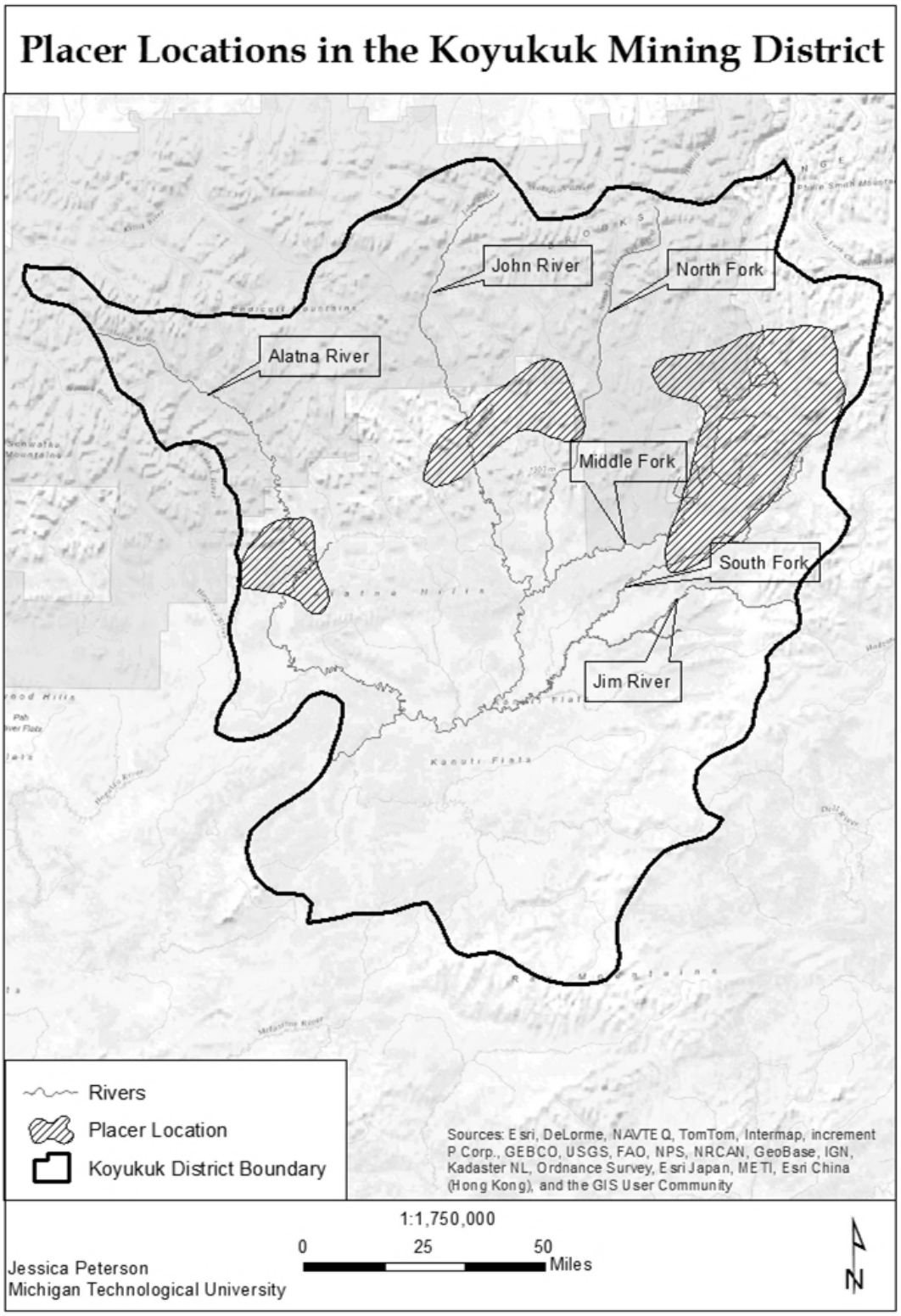

Figure 4: Placer Locations within the Koyukuk Mining District

2. Political Influences

The Political and Economic Pulse of 19th Century Expansion

In many ways, the purchase of Alaska in 1867 represented a continuation of the dreams and ideals understood to be the birthright of America through the expansionist policy, which was at its height in the 1850s. While the active policy of expansion was curtailed in 1861 by the Civil War, the addition of Alaska was an afterthought to this era of American policy. Seward, who pushed the legislation through for the purchase of Alaska as a part of the 1867 Russian-American Treaty of Cession, was clearly of an expansionist persuasion. The purchase was completed, literally, in the dark of night and signed at four in the morning on March 30 while the Senate was still in session and without broader consultation; when put to a Senate vote it passed with a one vote majority.[83]

Major opposition to this legislation was not met until it was time to pay for the Russian territory and the acquisition became public knowledge. The purchase was widely regarded with derision due to Alaska's lack of infrastructure, its low population levels, and the isolation of the new district. Not contiguous with the rest of the United States, this distant and unmanageable area made up over 1/3 the mass of the U.S. owned property. Alaska became a military district managed under the Department of War and it was not until the 1880s that Alaska was given representation in Congress or had an organized civil administrative or judicial body in place to manage the development of its resources or to govern its fluctuating population.[84]

By 1884 Alaska was made a civil and judicial district though its laws were poorly established and ill enforced and the governor lacked any real influence. The appointed

governor in 1885, a Michigan newspaper editor, characterized Alaska's government as "little, if any, better than a burlesque both in form and substance."[85] While civil and judicial systems were mandated, Alaska had neither the means nor the support to develop these systems.

The only real change for miners was the extension of federal mining laws that then superseded the self-governorship that had become common in mining communities. It has been suggested that this failure to establish either an effective territorial government or municipal government is due to both national ignorance regarding the district and poor representation by the major commercial interests including the Alaska Commercial Company and the major fisheries business interests.[86] Needless to say there was little preparation for the gold rush which caused a major population spike that few communities were capable of accommodating.

Nationally the financial markets and political atmosphere had primed the population for a renewed westward movement. In 1884 the effects of economic instability reverberated across the nation due to the failure of four large banking firms. Their failure caused a mass panic; an economic depression began in the same year due to surplus production of wheat which caused a crash in prices and resulted in an imbalance between the agricultural economy and its investors who had paid heavily this year to support the industry. The concentrated control of big industries—steel, which was heavily tied to the railways, textiles, machinery production, and factory ownership—led to the rise of a relationship between big banks and industry heads who wielded control of the financial market. This contributed to a decade-long depression that began in 1893 and

by 1895 the United States treasury was financially outweighed by east coast investment bankers and monopolistic corporations.[87]

Howard Zinn suggests that while the economy was kept stable by the syndicates it was maintained at cost to the populace:

> Control in modern times requires more than force, more than law. It requires that a population dangerously concentrated with cause for rebellion, be taught that all is right as it is. And so, the schools, the churches, the popular literature taught that to be rich was a sign of superiority, to be poor a sign of personal failure, and that the only way upward for a poor person was to climb into the ranks of the rich by extraordinary effort and extraordinary luck.[88]

Corporate control of labor was enforced with low wages, and the additional surplus population caused by high immigration to Pacific and Atlantic coasts created innumerable problems within the labor force adding fuel to preexisting race and class conflicts. The American administration looked to global expansion as a solution for unrest on the home front through the purchase and subsequent annexation of Cuba, Guam, and Puerto Rico from Spain and Hawai'i from its own monarchy in 1898. The Philippines were also purchased the annexation process instigated a three year war from 1898 to 1902.[89] Colman in *The Industrial History of the United States* suggests that these moves were primarily economic and commercial enterprises.

> The rapidly increasing proportions of our export trade necessitate the seeking out of new purchasers. The industrial justification for the purchase of Alaska, the annexation of the Hawaiian Islands and of Porto Rico [sic], the retention of the Philippines, and the maintenance of reciprocity relations with Cuba is the advantage of securing commercial control of these complementary markets.[90]

While the underlying purpose of these invasions was to prevent another depression by creating English-speaking markets managed by the United States, the result was a vocal outpouring of criticism towards the methods of American capitalists. These political policies ran hand in hand with ideas of standardization, scientific management, and the creation of more unskilled jobs. However, these also led to more labor unrest, a financial panic in 1903, continued strikes into 1909, and to the 1907 financial crash.

These problems carried over into the experiences of miners in Alaska, despite the remoteness and separations between the Alaskan population and the contiguous United States. Though linked by political and economic systems, it would be a mistake to assume that Alaska's physical isolation was either political or economic. One prospector in the Koyukuk, C.K. Snow, stated that:

> Once a prospector, always a prospector—until I strike it. No one knows except those who have tried it, how strenuous the life is, and no one knows, unless it be the man with his pack on his back, the incurable nature of the fever that gets into the prospector's blood. If it were not for the necessity of working for wages during the summer in order to get a winter grubstake, the labor would not be so burdensome and the end would not be so far off. During the months when I am working for enough money to get supplies so as to return to the wilderness I feel like a prisoner. I chafe under the conditions which compel this interference with my quest.[91]

A poem from the Rampart paper *Alaska Forum* in April of 1904 also illustrates the desire of the Koyukuk miner for economic autonomy, an echo of the sentiments shared by many factory workers, miners, and laborers across the nation at the time:

"Pay"
The Koyukuk Miner's Lament

Listen to the windlass
All the livelong day;
How the creaking of its crank
Sings the song of "Pay".

We who delve in this land
Simply have a lay;
Ours to do the digging
The STORE takes all our "Pay".

All the word's a windlass
Turning day by day;
Labor gets the waste dirt—
The FEW take all the "Pay".[92]

While some miners may have gone to the Koyukuk to escape the overbearing costs of living or economic structure created by land and industry owners, the Koyukuk was not immune to the social problems of the States.

By 1880 the estimated Euro-American population of the District of Alaska as a whole was less than 31,000. The Koyukuk region had only a small number of people, native or newcomer, until the Klondike rush of 1898-99 which spilled over into the Koyukuk resulting in an influx of around sixty-eight steamers with approximately 1000 individuals.[93] From this first rush into the Koyukuk three primary groups have been documented: the Galesburg-Alaska Mining and Developing Company from Galesburg Illinois, the Iowa Alaska Mining Company, and a group of prospective miners from Ohio called the St. Mary's Mining & Milling Company. The Galesburg-Alaska crew included initial hopeful prospectors from a range of backgrounds including an architect, engineer, geologist, machinist, assayer, boat pilot, housemover, banker, cook, two college students, butcher, barber, physician, school principal, photographer, and several farmers. Many of those in the St. Mary's company were oil men before they became miners. All of those

who joined had broad skill sets which might have aided the expedition under ideal circumstances. With 65,000 pounds of provisions the Galesburg Alaska Mining and Development Company was well prepared for two years of work. But the group did not make it onto the Yukon River until late in the season and reached as far as the Koyukuk River by August where an early freeze-up suspended the hopes of many who still needed to stake claims and break ground for the winter mining season.[94]

Despite preparations for two years, the Galesburg-Alaska Company broke camp after thirteen months and dismantled their cabins to use as fuel for the steamer that would take them back to the States. While the Iowa group eventually returned to the States following unsuccessful operations in the Koyukuk District, those from the Ohio company mined through the winter season in the Koyukuk before moving on to Nome and then the Tanana and Chena rivers over the next several years.[95] Many companies were self-supported, relying on personal investment to support their operations in the region. One author described the prospectors as "…very intelligent. They came from all parts of the world, have seen much of life in multitudinous phases, and have profited by their experience."[96] Regardless of their qualifications or preparations, few of the 1000 individuals who made it into the region in the fall of 1898 made it to a second season in the Koyukuk. Brown, in *The History of the Central Brooks Range*, estimates that 90 percent of those who entered the Koyukuk in 1898 left in the spring.[97]

The Gold Conflict

Currency was a key point of economic discussions on a national level from 1830s until the year 1900, when the gold standard was officially declared and then again in 1913 with the establishment of the Federal Reserve System. The gold standard was

tentatively maintained by the U.S. Department of the Treasury through an act in 1882 which gave the Secretary of the Treasury the authority to maintain a reserve.[98] Prior to 1873 a bimetallic currency system was in place, but the United States, following a national trend across Europe, demonetized silver in 1873 through the Coinage Act. In the U.S. this led to conflict as the value of gold rose and the value of silver fell, just as the market was being flooded with Nevada silver. The Bland Act of 1876 led to a reestablishment of silver coinage for more than a decade, until the Sherman Act of 1890, which repealed the Bland Act in favor of a compromise intended to aid in the stabilization of both the gold and silver markets.[99] However, the Sherman Act failed to adequately stabilize the market, and Congress repealed the act three years later.[100]

Instability in the economic system and continued fluctuation in the value of silver led to an increased reliance on gold, which the government ensured would maintain its value as national credit, even as silver fell in and out of favor. This instability touched all markets in various measures including the agriculturalists of Ohio, Illinois, and Iowa, the factory workers in New England, and the miners from districts who extracted minerals less valuable than gold, which continued to fluctuate in price as the markets wavered.

By 1900, as seen in the McKinley versus Bryant presidential race, the gold standard represented stability, both economic and social. It was a symbol of morality, values, and economic prosperity. Bryant's backers suggested that the value of gold was not established by nature but by the value of human labor and the economic worth determined by society rather than tradition. He suggested that the economic value of a resource was not simply determined by one extracted metal but by all extracted, manufactured, or potential products and resources, including human labor.[101] While

McKinley's gold standard and the people's desire for financial stability won him the presidency, the philosophical approach to understanding the value of resources had already begun to take hold.

The Homestead Act and Alaska as the Next and Last Frontier

The term 'frontier' was a symbol of freedom defined by open skies, the grandeur of the landscape, and its perceived ability to develop characteristics of strength and health in the people who lived there. It was romance and legend, vast and untapped, and a place for those who did not fit into crowded industrialized cities. Though vague, the term 'frontier' was also a geographic region that initially referred to land west of the Mississippi and east of California.[102] This region became gradually smaller as populations moved into it from either direction. Eventually 'frontier' was as much an idea as it was a place. According to Rodman Wilson Paul, the term 'frontier' "...connotes sparseness of population, richness of untapped natural resources, isolation, hardship, and danger."[103] Alaska was not typically considered a part of 'the west' but by the 1860s it was certainly becoming a part of America's frontier land.[104]

Athearn suggests that it was commonly believed that "the western environment would produce a new society, endowed with a moral superiority drawn from the pure atmosphere of an unsullied land".[105] By the end of the nineteenth century the frontier was occupied by miners, ranchers, and farmers as the landscape was developed. However the landscape was changing rapidly by what Athearn refers to as 'the agrarian horde' that had begun to move into lands that had only been sparsely populated prior to 1890.

This westward movement was instigated thirty years prior in part by the Homestead Act of 1862 which encouraged settlement, land improvement, and

development. This not only allowed frontiersman who had been legally squatters to officially gain ownership of the land but to do so without formally paying the full land-value to the federal government. The few requirements for the homesteaders were that they must live on their 160 acre parcel for five years, file paperwork stating their claim, and develop the land agriculturally.[106] The Homestead Act opened up large tracts of land for settlement that had previously been too expensive for settlers to afford. This act was intended to encourage individual families to begin settling the area and to socially claim the vast expanse as American by population in addition to legal right.

The Homestead Act went into effect in the early 1860s but the effects of it on the western landscape are most noticeable by the 1890s and into the early twentieth century. What had been a frontier landscape characterized by transient mining prospectors and ranging cattle ranches became a landscape defined by agriculture. In 1890, an end to what was known as 'the frontier' was declared by the U.S. Census Bureau and by 1910 permanent settlers had established themselves and towns became cities. While the early legislative acts regarding the Homestead Act had little direct influence on the permanent settlement of Alaska it may have encouraged the continued westward movement of those seeking the opportunities and promising characteristics the frontier represented for America.[107]

Though the Homestead Act had dramatically changed what American had once known as the 'frontier west' it did not have the same effect on Alaska. The beginning of Alaska's gold rush brought the district into national awareness in 1897, following the Tanana and Nome gold rushes in Alaska and the Yukon's Klondike rush. The need for stricter government control was realized in 1897 though a concrete system of governance

had not yet been developed. At this point there were many parties interested in the resources of Alaska, including the Department of the Interior and the War Department, which managed Alaska, as well as lobbyists for the Alaska Commercial Company, fisheries, and mining industries. While legislation for the overall governance of the district was not yet agreed upon, several pieces of legislation went into effect including the Homestead Act of 1898.[108] The alterations to the original act extended the rules and regulations to Alaska while restricting the size of the plots to 80 acres. It was not until 1912, when Alaska was made a territory that a notable number of families began to homestead in Alaska. When the last claims were appropriated in the late 1980s the number of claims in Alaska had reached only 3,500, suggesting how relatively insignificant homesteading has been to the settlement of Alaska.[109]

While some northern frontiersman did take part in the opportunities offered by the Homestead Act there is no indication that the Alaskan mining community either benefitted from it or suffered any ill effects because of it.[110] While some communities in the Koyukuk, such as Wiseman and Bettles, (which functioned as satellite locations for supplies and social activities), have weathered the decades, many of the early communities have disappeared due the nature of their construction or what Margaret Purser terms 'planned impermanence.'[111] Purser suggests that these communities are ephemerally constructed "with high levels of dependency on outside sources for food and other consumables."[112] Archaeologically these sites are defined primarily by the remains of their garbage scatters, typical of many cabin sites in the Koyukuk that were constructed of local materials and began to decay rapidly when maintenance ceased. Returning to the Galesburg example, this expedition had planned for no more than two

years. Though they made it through thirteen months, like many other stampeders their investment in their northern habitations was temporary.

Extending the Homestead Act to Alaska was a congressional decision in response to the Gold Rush and in anticipation of future development.[113] But unlike in frontier lands in western states it did not act as a settlement mechanism in Alaska, particularly not in mining communities where many individuals lived on their claims or only worked their claims during the summer seasons and did not see the need for permanent settlement. In the Koyukuk communities like Wiseman and Coldfoot absorbed many of the permanent residents of the area without the aid of the government program. Thus, while the Homestead Act altered the western frontier of the United States, its effect on the Alaskan frontier was less notable.

3. Technological Influences

While the Koyukuk District is physically one of the largest mining districts in Alaska, it is also one of the most remote. Its remoteness became one of several limiting factors that defined how the landscape was used, how gold was processed, and the extent to which placer deposits could be extracted profitably. Miners typically extracted placer gold using comparatively simple methods, that included using pans, rocker boxes, and shoveling techniques in addition to ground sluicing, drifting, and some hydraulicking. The late 1920s brought the addition of bulldozers and other heavy gasoline-powered equipment.[114] The introduction of larger scale equipment was made possible by an increase in federal funding for infrastructure, increased accessibility by airplanes, and reduced shipment fees as a result of airplane activity, all of which occurred after the primary gold rush period. These amenities renewed interest in the Koyukuk and led to a later wave of miners into the region in the 1930s.

In order to more accurately discuss the mining landscape of the Koyukuk, its history has been divided into two segments representing the periods of heightened activity, distinct technologies, and the development of infrastructure. The early period from 1885-1915 and the late period from 1915-1930s represent distinctive periods in the history of mining in the Koyukuk mining district.

Introduction to Technology

The mining methods used in the interior were primarily dictated by the types of placer deposits present, the characteristics of the gold, and the access miners had to technology. In the Koyukuk the primary placer deposits identified by prospectors are 'sorted' placers, which have been transported via flowing water from weathered

geological deposits that contain gold or that have been 're-sorted' from water flowing across older creek beds where placer gold had accumulated. Sorted and resorted placers are typically located in creek and river beds but may also be located in materials on gravel benches or bars. Loose gold may also be found in large quantities at bedrock where its movement through the glacial gravels was halted. These alluvial deposits were the most successfully mined in the region. Miners have also located gold located within matrices of stibnite quartz veins in several locations. These hardrock deposits became significant at Nolan Creek and in the Hammond River area in the 1920s and later.[115]

The characteristics of gold vary depending on the processes that have led to their deposition. Weight, shape, size, and color can all vary depending on the gold deposit. Specific gravity is one characteristic that is consistent in deposits of the mineral. Because the specific gravity of gold is greater than the gangue material (non-metal bearing rock) it is usually found in, gravity sorting methods have typically been used to concentrate gold flakes out of the gangue. The specific gravity of placer gold is typically between 14 to 19 while that of quartz is between 2 to 3 and schist and schist composites range from 1-3. The shape of gold within placer deposits also influences the types of extraction and concentration methods. Gold that has been water-worn is typically flattened or rounded while gold that has accumulated between boulders or in creeks at bedrock is more likely to be coarse. Gold placers located closer to the source are more likely to be large or coarse flakes while those that have flowed across streambeds are more likely to be fine due to the natural sorting that occurs with the flow of water over a boulder, gravel, or sand streambed.[116]

The technology and equipment required for gold extraction also depended on the type of environment. Permafrost was the most notable environmental challenge for inexperienced miners and prospectors in the northern placer fields but it was poorly understood, and the technologies used to overcome it were developed by trial and error. The first attempts to use explosives on permafrost proved ineffective.[117] Steam points were developed in 1898, with hot-water thawing experiments which were never widely adopted for mining. Cold-water thawing techniques were developed in 1917, generally for preparation of frozen ground prior to dredging.[118] These techniques depended on the availability of steam boilers and pumps as well as other equipment typically used to make the process of breaking ground for drifting and sinking shafts to access placer deposits more efficient. Other techniques for thawing permafrost included wood fires set on top of frozen ground, heated stones, or simply exposing the frozen layers to sunlight and air. Dredge equipment was brought into the Koyukuk with the sternwheeler *Lavelle Young* during the 1898 rush but was found to be ineffective due to low water and the equipment was abandoned within the year.[119]

The typical prospector in the Koyukuk used simple surface methods during the initial search for gold using tools such as a pan, pick, shovel, sluice boxes, which separated gravel from gold using a series of riffles of gradually finer gauges with a cloth apron at the base to collect the finest materials or rockers, which used either riffles or screens to separate materials and allowed the prospector more control over water use.[120] Surface methods requiring more investment included sluicing using a long tom, shoveling-in, or 'booming.' These methods typically required more than one individual to manage, relying on open cut practices which required miners to process more volume in

the hopes of increasing the overall collection of dispersed gold. Subsurface mining was primarily limited to drift mining, the process of sinking a shaft through frozen gravel to bedrock, excavating drifts horizontally from the shaft. Later miners conducted open-cut mining using bulldozers, hydraulic mining, or other heavy machinery.

Technology: 1890-1915

Early miners had broad skill sets by necessity. The earliest of these individuals were long-time prospectors who had developed the necessary abilities by adapting to the northern environment in other gold districts like the Klondike, where miners were forced to become self-reliant. Miners that traveled into the interior prior to 1898 had already experienced many of the hardships of isolation, terrain, food limitations, and the overall lack of a supporting infrastructure. Reporting for the U.S. Government, Goodrich stated, "At present a man must not only be a miner, but house-builder, carpenter, and cook. To a great extent this is due to the absence of investment capital…but it is being remedied by the immigration of laborers attracted by the high wages of the country."[121] Prior to the arrival of a more diversely skilled population, personal experience, and likely shared knowledge provided the miner with necessary skills.

Pick and shovel were the most basic methods of extracting gravel and placer materials. The next stage involved washing and sorting the materials to separate the gold from the valueless materials. While the flat-bottomed pan was effective for testing small quantities of gravel during summer when creeks were free of ice and water flowed, once gold was located more complex equipment was required to increase the scale of the operation and to accommodate the separation process of larger quantities. This typically required the use of a 'cradle' or rocker box into which shovels of gravel and sand could

be processed. The cradle was a multi-level tool that sorted gravel and sand by weight and size using side to side agitation and the flow of water to separate the materials. Because the gold was heavier and denser than other materials of its size it would settle while water and lighter materials flowed across it. Thus a series of riffle bars, square, u-shaped or v-shaped, could catch the majority of the gold and heavier sands. A cloth apron was built into the bottom of the cradle as an additional measure to catch finer particles of gold that flowed past the riffles.

The sluice box, launder, long tom, or ground sluice worked on a similar system and greatly increase the amount of gravel that could be processed. The sluice box was based on similar principles as the rocker box using a series of riffle bars, an apron beneath them, and the flow of water to separate materials. The sluice was typically tapered from the top to the bottom to allow for greater separation and allow for additional segments to be attached and set along a grade or incline to increase the efficiency of water flow. The ground sluice was constructed from a channel cut into the ground just below the surface, and lined with wooden boards. Sluices are most effective during spring, taking advantage of maximum water flows. Water diversion from the creek would create a constant flow of water over the sluice box as men shoveled materials into the sluice. Because it was small, a typical sluice box could be worked with one or two individuals, while larger operations might use a long tom in addition to a line of sluice boxes, which allowed for a greater capacity of materials to be separated. While long sluices were more common in the States, Alaskan sluices did not generally exceed 200 feet except for the disposal of waste materials.

The optimum flow of water to separate materials was two inches of water flowing across the long tom. In Alaskan placer operations this was called a "sluice head" and could vary from 30 to 100 miner's inches of water, depending on the measurements and grade of the sluice. The miner's inch, commonly used to measure water flow across the American West, was defined according to California law as "1.5 cubic feet of water per minute." A measurement of 40 miner's inches is a flow of approximately 1 cubic foot of water per second.[122]

Many of the Koyukuk operators worked benches, bars, and creek beds where water was generally available for small operations. The problem became diversions of water flow in such a way that the flow was useful without requiring too much energy to maintain and without resulting in wasted water or minerals. Any more than 6 or 8 inches of flow over the materials led to loss of finer gold particles.[123]

Water diversion became more important with larger operations. Infrastructure included ditches, holding ponds or reservoirs, dams, and booms. These allowed operators to store water for later use and to control the quantity and speed of water that flowed across the gravels they were processing. Precipitation and topography played a large role in determining how and where these control features were implemented. Water availability became very important for mining operations in the Koyukuk, where streams are fed initially by run-off in the spring and then by unpredictable precipitation during the remainder of the season. Effective water management was paramount to a successful operation. While most water control features were constructed of wood, ditches varied in that the most efficient systems were either lined with canvas, constructed using sod walls, or were rock-lined in order to convey as much water as possible to the work site. When

dealing with permafrost, miners would strip the area down until it was exposed at a greater depth than needed for the ditch itself. The permafrost was then covered with the sod, which had initially been removed from the surface, to prevent continued thawing of the permafrost when in contact with the running water. This helped to maintain the structural integrity of the ditch and prevented the walls from slumping over time.[124] The longevity of the ditch was principally determined by its construction method, and many ditches had to be reconstructed after a season due to swelling and contraction of materials through a freeze-thaw cycle.

Permafrost also became an issue for operations using drift mining methods. In some areas permafrost extends 400ft below the surface while other areas have no more than 10ft. In order to work this ground miners first had to strip the moss or sod overburden, which insulates the ground and helps prevent seasonal melting. Once the permafrost is exposed it will begin to melt on its own but this process is often very slow and creates muck and muddy conditions that were not conducive to easily working the ground or collecting the maximum amount of mineral available. During this early period of mining, stripping of the surface would likely only have occurred in specific areas that were intended for mining due to the time and expense required to clear large areas without hydraulic power which was introduced in about 1908 or larger machinery which wasn't transported into the Koyukuk until the late 1920s.[125]

Drifting was an important mining method in the Koyukuk and was typically applied to placer deposits, which were located within a few feet of bedrock. Shafts were often extended beyond the pay streak to bedrock when possible. These shafts ranged in depth from 25ft to bedrock, which could be greater than 200ft deep. Drift mines could

operate as either winter mines or as summer mines. Winter shafts dug through permafrost often did not require timbering because of the ice; they also did not have to deal with the muck produced by running water or shafts collapsing as ground thawed. Once material was loose it was hoisted to the surface and either wheel-barrowed to the winter stockpile or, in larger operations, hoisted there with the use of self-dumping buckets. If it was a summer operation it could be dumped right into a ground sluice or long tom. The expense and uncertainty of winter drift mining were its primary disadvantages.[126]

Drift mines were more complicated because they required the removal of materials from shafts into winter dumps where they would be stored until spring cleanup. The earliest drift mines were worked with simple tools which included shovel, pick, and a man or horse powered windlass. Later equipment for this process included boilers, hoists, and pumps. Gin poles and derricking systems were also used to transport ore. The typical setup in the Koyukuk used a vertical or marine steam boiler and a hoist. Smaller operations might use a doghouse or porcupine boiler and a hoist or a windlass. Drift mines in Alaska typically worked off of a shaft that measured approximately 6 ft x 6 ft down to bedrock or up to 14 feet below bedrock to provide drainage. Winter shafts were often timbered near the surface but typically did not need timber below surface due to the structural integrity of permafrost, though deeper shafts were timbered as necessary. It is estimated that sinking a shaft cost $6.00 to $15.00 per foot depending on conditions. This is more than twice the cost of other districts including Fairbanks where the cost ranged from $2.50 a foot for partially frozen ground and up to $8.00 in frozen ground.[127]

Wimmler estimates that one 16 foot cord of timber with a diameter of 3 to 6 inches could crib 8 feet of shaft.[128] Drifts extending from the shaft were generally less

than 200 feet in length. The first drift mine in the Koyukuk was excavated in 1904 on the Nolan Discovery Claim. In the first season $17,000 was extracted leading to the installation of more machinery to work the ground including steam boilers, points for thawing ground, hoses, and piping.[129] The average drift mining operation required 8 to 10 men and included a hoist man, a surface worker, and a crew of men who physically excavated the rock. This number varied depending on the type of machinery on site as well as the extent of the work site.

Thawing permafrost to sink a shaft was one of the problems miners faced in the Koyukuk and there were a number of methods that could be implemented. The simplest method involved exposure of the frozen ground to sunlight. This method is slow and impractical in most scenarios. One method that was widely utilized involved setting kindling and dry wood in the area that needed thawing and setting it afire. The disadvantage to this is an excess of smoke which makes it difficult for miners to work in the shaft or drift while ground is being melted without concern of suffocation or smoke inhalation. While more expensive, steam thawing was the most efficient method to thaw permafrost. Steam points, attached to the boiler by hydraulic pipe, could be hammered into the ice. Steam would be pushed out the head of the steam point and quickly thaw through the ice. Wimmler suggests that "In average gravel the points can be sunk at a rate of about 2 feet per hour."[130] Thawing with the use of hot water was found to be effective but ground thawed unevenly. The use of water at ambient temperature was not developed until the 1920s. Miners typically preferred steam point thawing because it was more efficient, faster, and more easily controlled while using smaller amounts of water.

Technology: 1915-1930

Power machinery was introduced to Alaska in Nome and Fairbanks during the early years of the twentieth century. This equipment was expensive to purchase and then to ship, even to these locations which were relatively close to the shipping routes. Using these types of equipment was typically only cost effective for large-scale operations or for very rich pay streaks. Powered scrapers and shovels, power hoists, drills, and dumping systems were introduced, many of which were powered with combustion engines rather than steam.

Open-cut mining became more popular in the 1920s and 1930s in conjunction with the use of hydraulic nozzles. Smaller hydraulic nozzles could be carried by hand to direct the flow of water while larger machines like hydraulic giants were more complicated and required multiple operators. The major limiting factor in hydraulic operations was the availability of water, which increased the need for ditches, reservoirs, dams, and water control features. Reuse of water was paramount for many operations in the Koyukuk due to low precipitation. Hydraulic operations were most successful on shallow placer deposits where the bedrock is even and soft with few pockets. The absence of boulders is also preferable. Once hydraulicking is done any pockets in the bedrock that have collected gold particles were cleaned by hand. A hydraulic operation could be worked with as few as two members though for the sake of efficiency a crew of up to eight men was considered normal.[131]

In areas where machinery was readily available, open-cut mining operations were improved by the use of steam scrapers, Bagley bottomless scrapers, and slip-toothed scrapers. These innovations are primarily used in large areas where the overburden has

been removed hydraulically. They are most effective in ground that is thawed though the Bagley scraper was more precise and was capable of removing shallow cuts of thawed ground. Wimmler suggests that, "During an average season thawing ordinarily keeps pace with scraping, varying from 4 to 12 inches a day."[132] The scrapers were a high cost investment—they required a power plant, the cost of installation and labor was expensive, and they were most effective in broad, open areas. Wimmler even suggests that it was cheaper to shovel gravel directly into sluice boxes, considering the cost of more complex operations in addition to the cost of fuel, wages, and equipment maintenance."[133] While these technologies were utilized in other areas of Alaska, there is little evidence that they were widely used in the Koyukuk.

Drills were introduced for prospecting in the mid 1920s and early 1930s and included several types of steam and gasoline drills. The former could weigh up to 10 tons while the latter were much lighter and were typically no more than 3,500 pounds. In addition to being lighter, gasoline drills were also less expensive. While heavier drills are much faster, lighter drills can be moved more easily from location to location. Steam-powered churn drills were capable of drilling through frozen ground and cost an average of $2.50 to $5 per foot with a 6-inch drill. While the gasoline drill is lighter and can be moved more easily, in order to function as a churn drill for testing it typically requires a drill-casing which results in a smaller core and thus a smaller sample.[134]

By the 1930s deforestation limited the use of wood powered steam boilers and made them more expensive to operate than more modern alternative power sources and machinery. The influx of heavy machinery such as bulldozers led to a shift towards open-cut mining rather than drift mining. The first Caterpillar bulldozer was brought in by Sam

Dubin in 1929.[135] With the bulldozer and gasoline powered drills came a new demand for this fuel, leading to a less localized economy for fuel, which would soon be shipped in by airplane.

The loss of trees that had been used to fuel boilers also contributed to environmental changes that included a faster runoff of water from the slopes in the spring which shortened the effective season for sluice operation along many creeks. Brown notes that "Deforestation to fuel the old boilers had stripped the country of timber for miles around, so old-style drift mining was impossible except in isolated sites that had escaped the woodcutters. Marshall noted this deforestation (in the 1929 or 1930) and also the effect it had had upon water supplies for sluicing. The quick runoff over barren ground had shortened the sluicing season several weeks by the time he got there."[136]

Transportation and Infrastructure

Roads and communication systems become lifelines in isolated communities and those that are in the early stages of development. In the Koyukuk the construction of roads, telegraph lines, and supply routes kept the mining district functional. Initially routes into the district included boating up the Koyukuk from the mouth of the Yukon, preexisting trail systems used by the indigenous populations, and winter dogsled trails.[137] These systems allowed movement of people, machinery, supplies, and information to claims, camps, and communities. The development of these systems was a direct result of the establishment of mining districts as an investment in the expected gold output; their maintenance and improvement relied on the success of the miners and the wealth of the district. At the same time, miners relied on these developments to support their continued work in remote regions.

During the late 1800s, Alaska was explored by survey teams of army personnel following the U.S. acquisition of Alaska and its subsequent status as the Department of Alaska from 1867 to 1884 and then as an incorporated district from 1884 to 1912 under the management of the War Department. By 1900, military garrisons were located at Fort St. Michael, Fort Gibbon, Fort Egbert, Fort Greely, and Fort Rampart. In addition to transportation routes for military and public use and interior surveys of the landscape, the military installed the Washington-Alaska Military Cable and Telegraph System (WAMCATS) in 1900, which ran from Fort Egbert along the Yukon River to the east. It connected with earlier lines allowing communication to Dawson and from there to Whitehorse. Underwater cable connected Fort St. Michael to Fort Gibbon by 1901, and landlines connected Prince William Sound to the Yukon by 1902. The trans-Alaska telegraph system, 1,506 miles of overland cable, was completed in 1903, allowing telegraph contact through Seattle to the States. In 1907, the region switched to the use of wireless radio, which gradually replaced much of the active WAMCATS lines (see Figure 5 and Figure 6).[138]

The War Department was aware of the need for interior passageways and as early as 1901 began the development of a trail from Valdez, on the Pacific Ocean, to the Yukon basin in Alaska's interior which cost approximately $100,000 to complete. But it would be several years until an organized effort to develop infrastructure was undertaken in the interior. Two administrative boards were established during the early decades of Alaska's development. The first was a Board of Road Commissioners for Alaska was established in 1905 as a part of the much broader Nelson Act, which also included legislation concerning the development of rural schools and the collection of business and

liquor license taxes which contributed to "The Alaska Fund." Seventy-five percent of the fund went to the Road Commissioners to support the construction of roads, bridges, and trails while the remaining 25% went to the establishment of Nelson Act schools which were opened in rural, unincorporated communities including many gold-rush settlements. In 1920 the board became the Alaska Road Commission (ARC). The ARC, like the district itself, was managed by the War Department until 1932 when it was transferred to the Department of the Interior.[139]

Prior to the establishment of ARC road systems, much of the transportation in Alaska took place on trail systems developed by native inhabitants or trails established by prospectors who needed them to transport supplies. Heavy use and seasonal changes often made these roads impassible due to lack of adequate engineering skills and damage caused by spring thaws. Water transportation was also heavily relied upon by many prospectors who used the Yukon River to access interior gold districts. An early subcommittee meeting with senators noted that: "It has neither built roads nor provided other means of transportation, and the hardy and adventurous who have sought the wealth hidden in the valleys of the Yukon, the Koyukuk, and the Seward Peninsula have done so amidst difficulties that can only be understood by those who have made a study of the situation."[140]

Allocations from congress, in addition to the Alaska Funds' contributions, allowed for a total expenditure of $18,312,825 from 1905 to 1932; also contributing to ARC funding were companies interested in the development of infrastructure, which included several mining companies or communities of miners. By 1913, the Valdez-Yukon trail was accessible by automobiles and by the late 1920s it became the

Richardson Highway allowing ready access to Fairbanks.[141] Despite the interest in interior resources apparent in policies and the development of major highways, the Dalton Highway, which primarily serves the North Slope oil fields and connects to both Wiseman and Coldfoot, was not constructed until the mid 1970s.

In its earliest stages the Alaska Road commission was comprised of three men who were responsible for the construction, and any subsequent maintenance, of roads and trails throughout the state. However, the commission was not allowed to build roads or trails to settlements or communities deemed non-permanent, which limited its power in some rural areas. Cumulatively a total of 11,008 miles of trail and road were developed and by 1932 many of which were gravel roads under use by automotive traffic.[142] Of these, two trails built by the ARC were in use during the Koyukuk's gold rush era: the Fort Gibbon-Koyukuk Trail, established in 1906 with continued construction through 1917 consisted of 273 miles of maintained path, and a trail that connected Chatanika to Beaver and on into the Chandalar mining district was established in 1909, with construction until 1913, for a total of 195 miles.[143]

Most supplies headed for the Koyukuk were loaded on steamers that made their way to Bergman and later Bettles, the centers of navigation. From this point, supplies were loaded onto pole boats or scows sometimes drawn by horse. These boats could be taken as far north as Coldfoot and Wiseman, previously called Nolan. Trails were primarily utilized during the winter to transfer supplies from Bergman and Bettles north to the mines. The mode of travel during winter was typically by dog or horse-drawn sleds. Winter mail was transported by dogsled along these routes.[144]

In addition to the trails and roads, the development of the Alaska Railroad commission hugely impacted the ability of miners to move materials and to develop resources. Following a multi-year battle for government funding for the development of the railroad, a commission for this purpose was finally created as a part of the legislation establishing the Alaskan territorial administrative government in 1912.[145] A part of the second organic act enabled the commission to develop a plan to aid the development of interior resources. In 1913 $40,000,000 was allocated from the federal treasury to aid in the development of railroads. Two railway segments were developed. The first made its way from Cordova to Fairbanks via the Copper River to the Tanana River while the second travelled from Seward to the Kuskokwim River. These two routes connected the Pacific to major interior Alaskan waterways and opened up the development of many resources including the Matanuska coal fields and agricultural development, and interior mining.[146]

Federal funding to the territory was an ongoing problem. While the ARC was aware of the need for roads in remote areas like the Koyukuk, allocations from congress were consistently far less than requested, which further limited the effectiveness of the ARC. One example of the continued costs of establishing and maintaining roads is that of the Richardson Highway. Following the gold boom to Fairbanks in 1902, the ARC began the process of upgrading the trail to Fairbanks from Valdez to accommodate wagons. By the 1920s, it was again upgraded for automobile traffic. A total of 368 miles from Valdez to Fairbanks, the cost of construction and maintenance of this road was slightly less than $12,000 per mile.[147] By 1928, Wiseman had roads leading to nearby mines in the Koyukuk region but was not connected to any of the major routes. Bettles remained the

head of navigation for the river routes into the region until the construction of the Dalton Highway which was completed in 1974.

Several influential military forts contributed to the location of trail routes including Ft. Yukon, Ft. Gibbon, and Ft. Hamlin. These locations acted as way-stations, offering roadhouses, mail stations, and stores including those run by the Alaska Commercial Company of San Francisco, later renamed the Northern Commercial Company, and several other companies, which shipped equipment, food, and other supplies from the States to Alaska. The fort at St. Michael, located at the base of the Yukon River in the Norton Sound and run by the Alaska Commercial Company from 1870 to 1890, was also very significant as a way-point for miners and traders headed into the interior. The trail from Ft. Gibbon into the interior was the major ground transportation route into the Koyukuk region (see Figure 7).

Privately owned stores were located at Nuklukayet, at the mouth of the Tanana River, Bettles, Coldfoot, Wiseman, and Nolan, all of which supplied the Koyukuk mining district at various points throughout the gold rush era. Supplies were delivered to these locations by steamboat when the waterways were open. The town of Slate Creek, renamed Coldfoot, was settled in 1899. While a post office was established in 1902, mail service was discontinued in 1912 as Wiseman's population superseded Coldfoot's. The town-site was largely abandoned by 1906 with the development of rich placers in Nolan Creek, a tributary of Wiseman Creek, fifteen miles north. Several families persisted in Coldfoot into the 1920s, though many of Coldfoot's structures had been moved to Wiseman.[148] Wiseman's residents met with success and by 1911 the community had two stores, several roadhouses, and in 1912 telephone service connecting it to Nolan.[149]

In 1900, trail systems linked Wiseman and Coldfoot to the Yukon River region and south to the town of Beaver. Mail was packed in or brought in on sled during the winter. By 1915, Wiseman had a population of approximately four hundred people and gold production was approximately $290,000. With the installation of a wireless radio in 1925 and the construction of an air field Wiseman was no longer the isolated community it had been. Interior aviation reduced the weeks or even months of travel to Fairbanks or the States to a matter of hours, though poling boat and trail were still the primary modes of transportation for the region. Despite these improvements, the population had declined to fewer than 80 individuals by 1931, many of whom were not representative of the older mining tradition but were newcomers to the region.

The addition of a Caterpillar tractor in 1929 was also a boon for the community and was often used in addition to ARC maintenance of trails. In addition to being a mining tool and a maintenance vehicle, its tertiary role became freight hauler for the area reducing rates from 8 cents to 6 cents per pound. As Naske notes, while the freight costs were reduced much of the profit from freighting was spent outside the community on gas, oil, and parts reducing the insular and semi self-sufficient nature of the community.[150]

The first automobile was shipped to Wiseman in 1931. It was transported by boat and could only run on the ARC road from Wiseman to Nolan Creek during the summer months when the roads were in good condition. It was primarily used to haul materials from town to the mining claims located along Nolan Creek and the Hammond River.

It wasn't until the 1950s that many of the early trails were upgraded to roads. The Commission constructed a series of road segments from Wiseman to the surrounding mining claims including a 5.5 mile road to the Nolan claims, 7.5 miles to the Hammond

claims, 12 miles to Vermont Creek, a sled road from Coldfoot to Wiseman that was approximately 11 miles, a 7 mile segment to Myrtle Creek, and a 15 mile road segment to Porcupine Creek.[151] The Dalton Highway, which runs north from Livengood to Deadhorse connected Wiseman to the Alaskan highway system.

These methods of transportation were eventually aided by the first airplane which arrived May 11, 1925.[152] But despite the advantageous arrival of air transport into the region, mining was on the decline. The First World War led to higher wages in the States and many left the Territory. The 1920s were referred to as "The Twilit Twenties" as Alaska foundered financially and developmentally. While the Great Depression led to rising gold prices, Koyukuk mining operations remained small due to the expense of developing new operations. During World War II, gold mining was shut down and the mining industry in the region never recovered.[153] By 1950 there were a total of 19 operations in the district and a total of 37 operators working a variety of different types of mining operations including ground sluice, hydraulic, bulldozer, dragline, and drift operations.[154]

Though mining reports are tentative for the first several years of the Koyukuk gold rush, from 1902-1940 the Koyukuk produced $5,353,500 in placer gold or approximately 1.5% of Alaska's placer gold during this period. Estimates for the value of gold from 1896-1901 vary wildly but raise the percentage contributed negligibly.[155]

Shipping Costs

While both roads and the railway contributed to the development of interior resources, they were far distant from the Koyukuk mining district and shipping costs were still high. Shipping costs could make or break an operation. In 1903, the cost of

shipping for one ton of supplies from Seattle and San Francisco to Bettles, the region's head of navigation, was $337. From there it ranged from 10 to 20 cents a pound to ship supplies up the Koyukuk to mining locations.[156] Costs during winter for shipping were increased, though it was often easier to sled supplies in on winter trails or across ice than to pole a boat up the Koyukuk as was typically necessary due to low water which prohibited steamers from making it very far beyond the mouth of the Koyukuk River without risking damage.

Staking a Claim

The Koyukuk district fell under the jurisdiction of a mining commissioner, who reported to territorial officials. The district followed the Miners' Code clause which limited claims to 1,320 feet long by 660 feet wide. Claims typically followed the length of the creek, though on bars or benches the arrangement followed the likely location of gold. Prospectors in the region were only allowed one claim per man at each location. Individual prospectors were required to make $100 worth of improvements per year.[157]

The Catch-22

In Robert Marshall's *Arctic Village*, he illustrates the limitations of the transportation systems in the Koyukuk noting that in order to get a pair of boots from Portland, Oregon to Wiseman, Alaska the boots would have to travel 3,700 miles "by train, truck, steamer, train, steamboat, gasoline boat, horse drawn scow, and back packing before they would reach the feet of their owner."[158] Even with the advent of air transportation to the region, the costs made living and working in the region economically difficult.

The developmental speed of mining in the Koyukuk was hampered by the lack of seasonally consistent transportation systems to the region, while the output of the region was insufficient to encourage federal investment in the infrastructure of the area but without further investment miners felt limited. In some cases, miners believed that the Koyukuk had not lived up to its full potential during the gold rush era because these systems were insufficiently funded. This limitation defined the perspective of local communities and is one of the contributing factors guiding the district's overall developmental trends.[159]

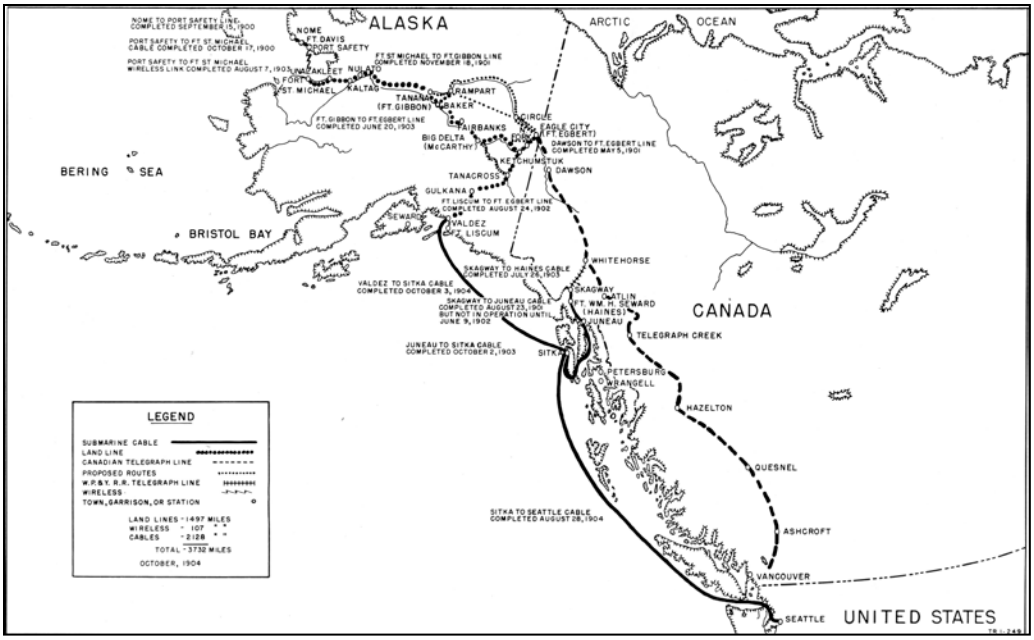

Figure 5: Communication lines installed by 1904 (CECOM Historical Office, Image 4158g).[160]

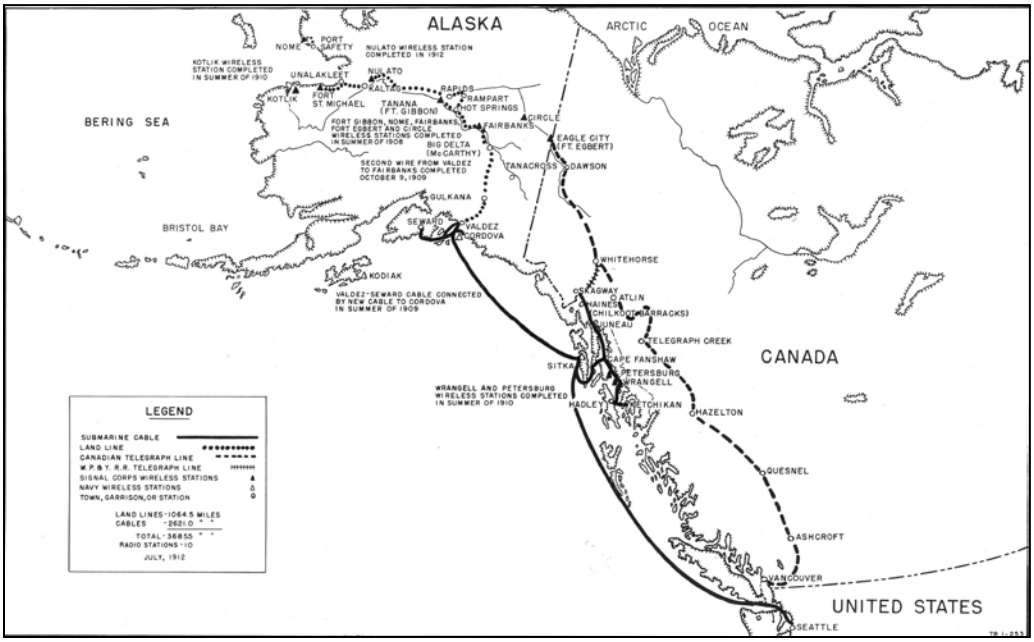

Figure 6: Communication lines installed by 1912 (CECOM Historical Office, Image 4158f).[161]

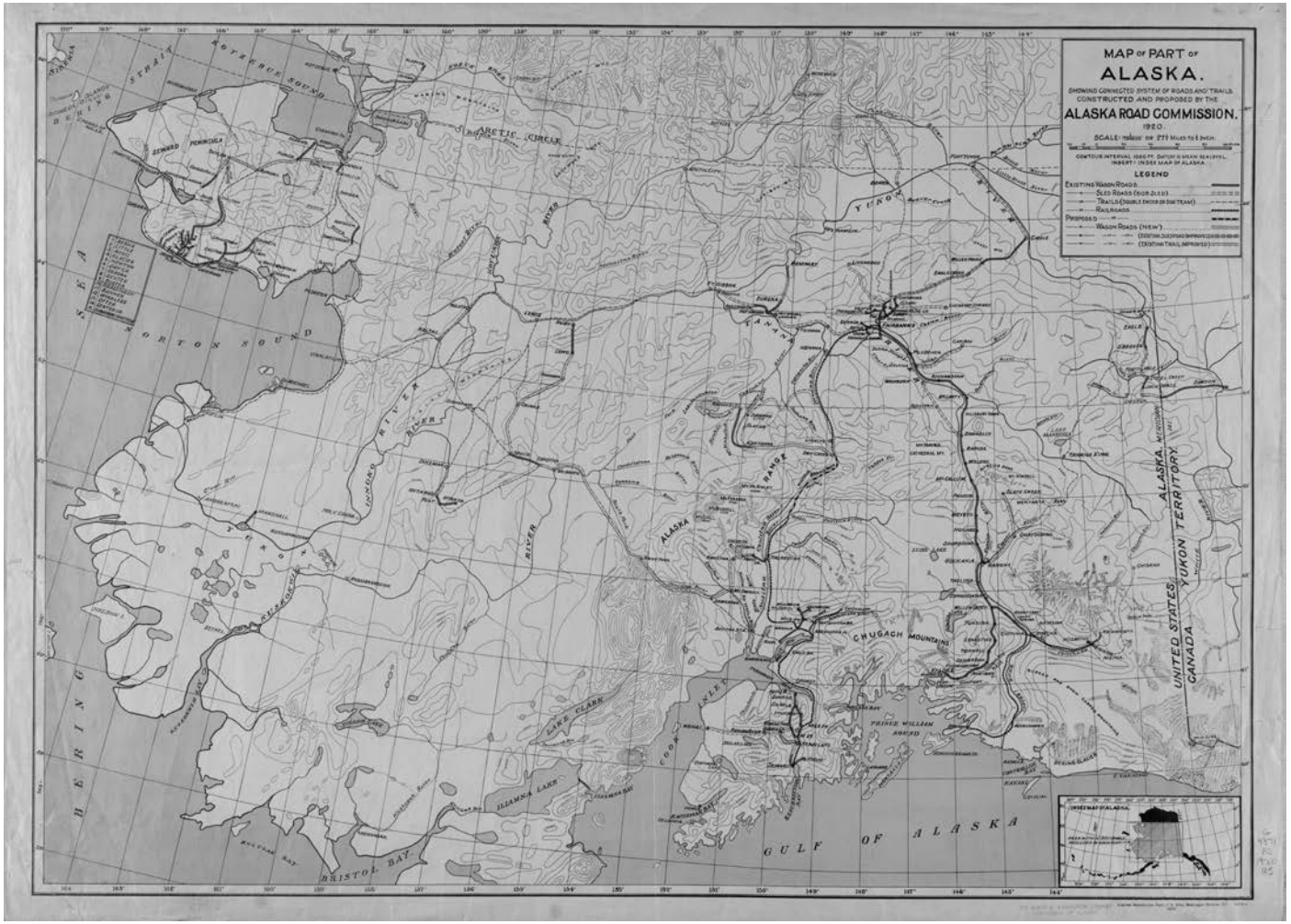

Figure 7: Trails and road systems proposed or constructed by the Alaska Road Commission, 1920.
(Manuscript Maps Collection, Alaska & Polar Regions Collections.
University of Alaska Fairbanks, UAF-00689.)

4. Inventory of Koyukuk Mining

One distinctive aspect of Alaskan mining district is the overall lack of diversity among mining outfits within the industry. Invariably the most successful mining operations were manned by small informal groups of individuals rather than by large companies that typically dominated other U.S. mining districts. In many districts, gold was generally located by individual prospectors. Larger companies then moved in with the support of Eastern investment capital, which allowed them a greater measure of success than their smaller counterparts due to the availability of funding, quality of machinery, and the quantity of mineral that can be processed by more advanced technologies

While many Alaskan districts developed large scale operations for the extraction of gold placers alongside smaller prospecting outfits, the Koyukuk is a case wherein company investment was low while private, small-scale development was much higher. The few companies that attempted to establish extensive, long-term operations in the district met with almost unanimous failure removing the competition from smaller operations which were better able to adapt to circumstances in the Koyukuk.

The overall trajectory of mining techniques, technology, and resource development in the Koyukuk Mining District can only be partially understood by the broader contexts which have been briefly discussed. In order to understand the circumstances which led to this distinctive pattern, where small operations were more successful than larger ones, it is necessary to look at specific areas of development as

well as examples of both large and small scale operations that will give insight into the success and failure of specific cases.

During the summer of 2012 9 creeks in the eastern Koyukuk region were surveyed. An additional 3 locations along the Middle and South Forks of the Koyukuk River were also recorded. The result is 31 sites, along 12 creeks and rivers in the Koyukuk region which will be described within this chapter. These creeks were selected because of their historical importance; they are a representative sample of mining locations in the Koyukuk's eastern placer deposit. They include some of the more successfully mined locations in the area as well as several creeks that were sparsely recorded, have little historical documentation, and were less successfully mined.

Survey location discussions will include an historical background of the individual creeks and locations as well as the discussion of specific sites designated through the post-processing of field data. Many of the sites are comprised of ephemeral and extant features which are the remains of these historic mining operations. In many cases mining has occurred in the decades since the original occupation, resulting in the archaeological representation of several non-concurrent mining operations that are, in some cases, no longer physically divisible. When possible, sites will be linked to specific historic mining operations identified through current and historic literature.

The first section of this chapter will include an historical overview of each drainage and location surveyed with attention to the types of mining technology used, the style of mining, and specific sites that have been identified within the drainage with reference to their Alaska Heritage Resource Survey (AHRS) designation. Secondly, this chapter will discuss the presence of large and small mining operations in the Koyukuk

and compare the strategies utilized by both in terms of organization and their mining processes. Furthermore, it will explore the distinction between large and small scale operations in the region and draw conclusions regarding their success and failure in the area relative to the operating challenges that the operators faced.

All claims referenced regarding the 2012 survey season use the modern claim names unless otherwise specified. The original claim names have been retained on several creeks but many have been renamed and are thus not representative of the historic information available. When possible distances from landmarks are used to connect features to historic or modern reference points.

Locations in the Koyukuk Mining District Surveyed in 2012

Tramway Bar

Tramway Bar is located on the Middle Fork of the Koyukuk about ten miles below the mouth of Twelvemile Creek. It is one of the earliest known prospected locations in the Koyukuk, mined as early as 1885 and received its name because miners trammed paydirt to the river for sluicing.[162] Operations continued sporadically until 1899. In 1908 a small sluice operation of four men constructed a ditch to Tramway Bar from nearby lakes. It has been suggested that the poor finds on Tramway Bar were caused by the origins of the gold which were likely carried down the Middle Fork from Chapman Creek rather than from a vein near the bar. A 1939 report suggests that "Evidently the gold was disproportionate to the work involved in its recovery."[163]

Thirteen or fourteen pits were sunk at the mouth of Chapman Creek and several more were dug in the bed of the Middle Fork but lack of sufficient water limited interest in the bar's potential.[164] In the 1920s the ditch system was extended to the upper reaches

of Mailbox Creek four miles from Tramway Bar. In the late 1930s miners proposed the idea of working a broad area of ground north of Tramway Bar, measuring one mile by four and a half miles, by building a ten mile ditch from Twelvemile Creek. This work had not been completed as of 1939. No later reports confirmed that the ditch was ever completed. Ground sluicing, shoveling-in, and hand methods were the most common methods of extraction at Tramway Bar.[165]

A pedestrian survey of approximately 50 acres was completed at this site location by four members of the field crew over the course of a day. This survey included a GPS recording of 45 site features including nine structures, several trash scatters, equipment, a sledge, and two backfilled pits. Additionally, a sawmill was documented though all that remains is a collapsed wooden table with a 3ft diameter blade. Oxygen tanks, 55-gallon fuel drums, a 59in diameter tractor tire, and more modern sluice box parts suggest that the site was used up until the mid-seventies though several of the cabins are potentially from the 1930s.

Neither the original thirteen to fourteen pits, nor the original ditch-line extending to Mailbox Creek or the proposed line to Twelvemile were identified in this survey. Hydraulic piping extends towards the west end of the site for 200m and ends at the top of an older tailings pile located at the western extent of the site. The claims behind Tramway Bar which were in planning for mining in the 1930s appear to have been worked in the decades following its establishment as a mining location. The ground has been flattened and is currently marshy with a heavy growth of alders indicating no recent work has been done. Beyond being worked there are no other features within the area surveyed though a

cleared airstrip is present on USGS maps. Tramway Bar has been assigned the AHRS number WIS-00285.

Gold Creek

Gold Creek was first mined in 1899 and placer gold was discovered in 1900. The first six miles north of its confluence with the Middle Fork were heavily mined during the Koyukuk's early period at the turn of the century. Low levels of overburden and less permafrost would have made the creek a lower investment operation. It was mined almost continuously from 1899 to the late 1940s. In 1901, $52,000 in gold was removed from Gold Creek by miners and in 1902 J.C. Short recovered $1000 from 'a box length', a measurement of twelve feet by sixteen feet or 200 ft^2 along Gold Creek. The same year Gordon Bettles mined an old creek channel on Gold Creek and located pay that averaged $0.20 per pan.[166] In 1909 bedrock was measured at 200 to 250 feet below the surface on claim number 5 Below. In the first four years of production the combined gold extracted from Gold Creek and Gold Bench was valued at $250,000.[167] Several claims proved to be rich, including Discovery which yielded a total of $15,000 in 1901 alone. By 1913, claims numbers 1-9 Above were the most successful while little work was being done on numbers 9-17 Above.[168] A fifteen-foot wide channel was drifted on claim number 7 Above in the 1930s. One shaft from this operation was reported to be thirty-five feet deep and yielded an average of $0.52 per square foot of bedrock.

The work on this creek was primarily completed in winter using wood fires to thaw permafrost during drift operations. Mining at this location was continuous from 1900 to 1913. In the 1930s open cut mining began on claim number 9 Above and in the following years on claims number 10 and number 11 Above with depths of up to four feet

deep. Mining continued through the 1930s with drifts 100 feet along the creek in claim number 7 Above and open cuts on claims numbers 6 and 7 Above with an accumulated 2000 ft^2 opened.

During this period a tractor trail was installed by the ARC following Gold Creek and extending around the origin of Linda Creek; reports suggest plans to extend this trail from claim number 9 Above to claim number 11 Above.[169]

The 2012 survey of Gold Creek examined approximately 340 acres with five crew members. Six sites comprised of 55 features were identified from number 1 Below Discovery to the modern named Gold IV claim near the head of Gold Creek including the previously identified CHN-00066. While much of the early work on Gold Creek occurred in claims numbers 1-9 Above Discovery, several sites from later gold mining periods were recorded near the head of Gold Creek. The features identified on this site show evidence of hydraulic work, drift mining, ditches, and water control features as well as the collapsed remains of a log cabin. The sites established on Gold Creek are CHN-00066, CHN-00111, CHN-00112, CHN-00113, CHN-00114, and CHN-00115.

Gold Bench

This location was first located in 1899 and by 1901 Gold Bench was the most successful placer location on the South Fork Koyukuk River, contributing $85,500 in an economic estimate from the district,[170] the results of an operation using shovel and sluice methods. The bench was so successful that in 1904 two miners were killed by their partner for the rights to the property.[171]

The richest gold was located on a quarter mile stretch of land that was 150 to 200 feet wide; a total of 100 acres was mined in the early 1900s. The environment was

particularly suited to a basic sluice box because much of the gold was either located in gravels or had settled just above a "false bed rock" or thick sand layer. Water was brought in from a nearby tributary of the South Fork, Jean d'Arc Creek.

In 1926, Gold Bench and Ironside Bar were both drilled by members who would form the Detroit Mining Co. In the years following, eight men, including one mining engineer, invested in the work at the South Fork to continue testing at the site. Two lines of drilling were completed in 1926 with over thirty core samples beginning at a location between Gold Bench and Jean d'Ark Creek on high ground. The first hole was thirty-eight feet deep. From this point samples were drilled towards the south every seventy feet for fourteen intervals and then spread thirty-five feet for the next seven intervals. Gold was located in an area thirty-eight feet wide approximately 200 feet from the river.[172]

Gold Bench was mined sporadically from 1900 until 1913; by 1925 there were only three men at Gold Bench. Ownership was transferred in 1937 and mining continued at Gold Bench and the nearby location of Ironside Bar. Operations, though intermittent, continued until the 1960s.[173]

This site was documented by four members of the field crew. A total of 45 features were recorded. Archaeological remains at Gold Bench, BET-00181, include eight equipment scatters, the remains of two washer ponds, several standing and collapsed structures, and several areas of worked ground including two pits, a shaft, and an area of clearly bulldozed ground. The modern site is in an area of approximately 80 acres and includes a portion of what appears to be an old road and an airfield. There is no current evidence of the original drill-work or of the ditch-line from Jean d'Arc creek.

Ironside Bar

Located one mile above Gold Bench on the South Fork Koyukuk, Ironside Bar was mined in a similar fashion to Gold Bench though with fewer returns. Early prospectors stripped the vegetative mat to increase the speed of permafrost thawing and then sluiced the upper three feet of loose gravel using water from a ditch excavated from Ironsides Creek. A reservoir dam and booming system were in place to conserve water. In the 1920s following the drill work done at Gold Bench, the Detroit Mining Company driller, Jim Kelly, moved to Ironside Bar, drilling three forty-foot deep holes with poor results.[174]

Documentation at Ironside Bar, BET-00182, included a pedestrian survey of approximately 95 acres where a total of 26 features were recorded. Features at the site include four equipment scatters, an ephemeral workshop, several boulder-heaps that likely relate to early mining on the site, and the possible remains of a wash plant. While no sign of the dam or boom remain, one of the equipment piles includes the disassembled remains of Jim Kelly's Keystone Drill which was utilized in both the South Fork sites at Ironside Bar and Gold Bench and at the Detroit Mining Company's claims on the Hammond River.

Myrtle Creek

Myrtle Creek was one of the richest creeks in the district throughout the Koyukuk's gold rush; because of this it was also one of the most extensively mined. Gold was located on Myrtle Creek by Martin Nelson and C.L. Carpenter in 1898.[175] Coarse gold was first located on claims numbers 10-11. By 1909, there were twenty claims staked on Myrtle Creek, the most successful of which were from claim number 9 to

number 15 which were being mined with the use of pick, shovel, and sluice box. A total of 33 claims were staked on Myrtle Creek from its headwaters to its confluence with Slate Creek, approximately seven miles south. Claim number 11 was the most profitable documented by 1913. None of the claims above number 20 proved profitable. Ground sluicing and shoveling-in operations continued into the 1930s on many claims including claim number 11 using an older hydraulic ditch that runs from Kelly's Pup to the claim. An inclined shaft prospected near claim number 10 above the ditch reached a depth of fifty-six feet at bedrock. A forty foot shaft was sunk at the upper end of this claim while a sixty foot shaft was excavated in the vicinity. Water for these operations was brought along a one and a half mile ditch from King Gulch.[176]

While there were many small operations on the creek, it was also mined by larger operations. Hydraulic operations were run on claim number 6, about 1 ½ miles from the mouth of Myrtle. This was the only hydraulic operation in the Koyukuk district by 1909. In order to fuel the hydraulic operation a dam was constructed on claim number 12 with a conveyance ditch that measured 1 ¾ miles long and three to five feet wide. The ditch's depth was originally two to three feet deep. It conveyed water to a penstock located on claim number 6. The lumber, pipe, and monitors were shipped to Coldfoot and then hauled nine miles during the winter with two horses and a sled. The ditch required additional work during the summer of 1909 and was lined with lumber due to permafrost complications. The operation allowed for excavation of a pit 200 feet long, 100 feet wide and as deep as 20 feet.[177] The operation was abandoned in 1910 due to poor management. It's possible that this operation was the Koyuk Mining & Development Co. managed by

Harry Cook which appears to have been a short-lived venture with few references documenting it.[178]

In the late 1930s a larger operation moved onto Myrtle Creek operated by John Repo who had previously mined in the Ophir District. Equipment was purchased from the Northern Commercial Company and according to a 1939 report included "75 tons of machinery, and 425 drums of diesel oil, gasoline, and lubricants. The largest pieces of machinery are two D-8 caterpillar diesel tractors, each with LeTourneau bulldozers, a 200-ampere Lincoln electric welder, and 3,000 feet of hydraulic pipe." The claims that were leased to Repo extended one mile from the mouth of Myrtle Creek. [179]

Cobb reported in 1973 that Myrtle Creek had been worked for several years by the largest operation in the district which included the use of dragline and bulldozers and which continued to work until the 1950s. Over the next ten years the district as a whole declined and by the late 1960s only five men were working claims on Myrtle Creek.[180]

By the late 1930s the ARC had installed a winter trail from Coldfoot to Myrtle Creek crossing several waterways including Slate Creek and Sutton Creek. A winter landing field had also been cleared.

It is apparent from the mining reports that a great deal of work was done on Myrtle Creek during its earliest period of production from 1899 to 1912 but in a report from 1939 there was little evidence of the early era of mining. The survey in 2012 of approximately 290 acres of the creek documented 28 features which were combined to form CHN-00120 extending from claims number 13 to claim number 17. Two ephemeral ditch lines were recorded; the first runs from claim number 17 to claim number 14 Above Discovery while the second follows a tributary on the left limit of Myrtle Creek into the

left limit bench claim number 15 Above. Both ditch segments have been obscured by erosion and could not be followed to their entire length. There are also several segments of hydraulic pipe on claim number 13 in addition to evidence of bulldozer work. Shafts were located on the right limit of claim number 13 ½ Above Discovery and on claim number 14 Above Discovery.

Twelvemile Creek

While claims were staked along much of Twelvemile Creek and both its tributaries, little work appears to have been done on the creek prior to the 1920s. Though reports suggest that it had been worked it was not a creek with consistently rich pay.[181] The creek was mined by hand methods into the 1920s and 30s though working the ground proved difficult due to the overabundance of water which continually flooded shafts. During low water claim numbers 1 and 2 Above Discovery paid well. A shaft was dug to five feet on number 2 Above before it was flooded. Open cut mining also took place on number 2 Above. An adit was dug across from Discovery Claim and during the late 1920s a forty foot shaft was dug during winter on this same bench across from number 1 Above. Opposite claim number 2 Above, five shafts were sunk to thirty feet while a six-hundred foot open-cut was processed across from claim number 3 Above.

In the 1930s, drilling occurred on claims number 2 Below and number 6 Below with approximately 40 holes sampled. The operation revealed the irregular pay along this creek, a trend visible across the region due to the deposition processes leading to the distribution of gold. The mid 1930s brought hydraulicking to Twelvemile Creek on claim number 1 Below Discovery. Water power was conveyed to the location via a two mile long ditch with a penstock.[182]

Documentation of this creek in 2012 included 60 acres from claim number 1 Above Discovery to 1 Below Discovery. The majority of documented features on this site relate to late mining on Discovery evidenced by a large Kolman-Athey grizzly wash plant and a collapsed motor home in its vicinity (WIS-00423). There are also cans of antifreeze, fuel cylinders, and fuel barrels in the area. One historic site was identified on claim number 1 Above Discovery and included a cabin footprint, cache, and can dump (WIS-00424).

Porcupine Creek

According to A.J. Maddren's field notes from 1909, four men worked Porcupine Creek in 1901 and averaged $8 a day per man[183] but there is little indication in other literature to suggest that more than prospecting was accomplished until 1916 when the Stannich brothers began working the creek. Drift mining on the deep channel was done in the winter from 1922 until 1936 resulting in 900 feet of excavation and approximately six shafts were sunk in the area to a depth of thirteen feet to avoid surface permafrost. To combat water, the Stannich brothers constructed an 1185 foot drain on their operation.[184]

The Marsand operation also worked the deep channel, met similar challenges with permafrost and running water, and was flooded out in 1925. This operation worked on the deep channel 100 feet south of the creek and produced a shaft seventy-four feet to bedrock. Marsand continued mining on Porcupine until at least the late 1930s despite the difficulties.

A 50 acre survey of Porcupine Creek in 2012 identified 12 features on claims number 3 and 4 Below Discovery including the Stannich cabins (WIS-00292) and a more modern series of structures, some of which are on skids, and equipment including a

double-axle travel trailer, 1960s Jeep, Kawasaki bike, sluice, and assorted fuel containers (WIS-00422). The cabin was originally recorded in 1990, has been essentially undisturbed and still contains original furnishings and homemade furniture. Also associated with WIS-00292 is a boiler-house with 16ft boiler labeled "Farquar, York, PA" and a Little Giant Hoist. While it is apparent that more modern work has been done at this location the historic cabin has been avoided during these operations. The ground around WIS-292 and WIS-00422 has been extensively worked and is now overgrown with alder and willow.

Minnie Creek

The Miller Roadhouse was established at the mouth of Minnie Creek across the Middle Fork from the current location of Wiseman in 1902 though the earliest reports of mining on this creek do not begin until 1904.[185] The first shaft sunk to bedrock yielded $500 in 1904 and additional work in 1906 produced $400 in gold. Additional reports from 1906 suggest that self-dumping buckets were being utilized. Mining occurred from 1904 to 1907 and then sporadically thereafter into the 1930s. By 1938 prospecting and drifting had occurred primarily on the deep channel. Profits were difficult to make on Minnie Creek for the same reasons as on Porcupine and Twelvemile Creek; the combination of permanently frozen ground and flooding made the creek challenging to work. Drift mining continued into the 1950s though operations were sporadic.[186]

A 750 acre survey on Minnie Creek in 2012 recorded 47 features that culminate to a total of six sites. The survey area begins near the Dalton Highway and extends three and a half miles upriver. A portion of the creek an additional four miles upriver was also surveyed. This creek has several early historic sites including four cabin sites, a windlass,

a porcupine boiler, and fifteen shafts, several of which have cribbing present. One site, CHN-00117, is a well-preserved example of historic mining on Minnie Creek and includes several deep, though collapsed, shafts, a log cabin and associated cache and privy depression, in addition to two possible tent pads representative of the ephemeral nature of many early prospecting outfits. One of the shafts is associated with the windlass which is constructed of pegged spruce timbers with wire nails as fasteners. In addition to these historic features are more recent excavations from the mid to late twentieth century that illustrate the inclusion of more modern equipment such as the bulldozer. These later excavations are now overgrown by thick alders that are the typical evidence of ground disturbance.

Hammond River and Jennie Creek

The Hammond River is one of the major rivers in the Koyukuk drainage system. It has a total of thirteen tributaries including Jenny Creek on its left limit near the confluence of the Koyukuk and Hammond Rivers. The 2012 survey of this area focused on the area of confluence between Jenny Creek and the Hammond and approximately half a mile in either direction. The total mined length of the Hammond is estimated at approximately six miles from the confluence of Vermont Creek to the Hammond's confluence with the Middle Fork.

In 1900, word spread of gold on the Hammond River and Myrtle Creek prospects and brought an additional 1000 prospectors to the region. As with many operations in the region, the expense of working the ground outweighed the value of the gold recovered, so despite an early recovery of $10,000 in 1902 it was difficult to successfully mine the location. Following discovery, the river was mined with profits but would not become

efficient until later years when mining operations in the area were able to import more effective machinery. Permafrost extended to around five feet below the surface and water flow due to the river's continuously large outflow were challenges on the Hammond. Operations were active on several of the Hammond's tributaries including Jenny Creek which abuts claim number 2 Below Discovery on the Hammond River.

In 1910, Knute Ellingson sank a shaft fifty-five feet deep to bedrock on claim number 4 Above Discovery. Using steam points, water pumps and a crew of twenty-seven men, his drift mine removed $128,000 in the first season. Three years later, a drift mine 200 feet long on claim number 3 Above yielded $80,000. Despite the overall decline in the district, two miners in the Hammond River area located rich pay in 1915 within a shaft dug on number 4 Below. An investment of $20,000 resulted in returns of $100,000. One pan brought a total of $1632. This brought renewed interest to the district though it was primarily focused on the Hammond region in conjunction with rich finds on Nolan Creek.[187]

Two companies were present on this creek: the 4-H Mining Company and the Detroit Mining Company. In the 1920s or 1930s the 4-H Company mined on claim Number 3 Above with the intent to bring in a tractor as well as other equipment. This company also worked an area above Vermont Creek, planning on bringing water through a conduit from the Hammond River to supply their operations. There are few mentions of the 4-H Company and the degree of their success is questionable. The Detroit Mining Company is better documented than the 4-H Company. In 1925, the Detroit Mining Company promoted their mining project below Discovery Claim on the Hammond River. Claim number 1 Below Discovery was likened to wet quicksand and was unsuitable for

drifting. In a 1929 report, the Detroit Mining Company had two sixty-horsepower boilers and a hoist working a shaft on Discovery. Drill work was also completed at the mouth of Jennie Creek though gold was not located.[188]

Surveys of this area documented 290 acres of land. A total of 87 features were recorded and parsed into eight sites. The majority of these relate to the site of the Detroit Mining Company (WIS-00250) and its associated testing locations nearby which include two drills (WIS-00396, WIS-00397), the structural remains of the company's camp location, over 40 shafts, and an early prospecting camp (WIS-00393). Dating to about 1914[189], the location consists of a flattened area that is likely a tent pad, a depression that may have been an outhouse, and an extensive can scatter that is well preserved. In addition to these sites which have been previously recorded, an ephemeral cabin was documented in the vicinity of five shafts (WIS-00425) farther south along the Hammond towards its confluence with the Middle Fork.

Prospect Creek, S.F. Koyukuk River

Gold was first identified on Prospect Creek in 1909 according to Maddren's 1913 report, however, this creek did not become an established mining location and was 'lost' by miners.[190] In Reed's 1938 report he suggests that it had still not been worked due to inaccurate Geological Survey maps which prevented relocation.[191]

A 40 acre survey of this area concluded that while one location was clearly defined many features at this location are ephemeral. Two sites were identified, one of which had clearly defined prospect pits and shafts in addition to the remains of a structure (BET-216), while the other included a possible ditch and only one pit could be identified in an area that has been recorded by previous archaeologists as 'worked.' The area is

marshy and transected by small creeks. It's possible that this difference between site locations is due to environmental erosion in the area of the second site which is in a broad lowland area likely subject to annual flooding.

Scale Disparity: Large and Small Scale Mining Operations

One distinctive aspect of the Koyukuk mining district is the overall lack of scalar variability represented within the mining industry. Invariably the most successful mining endeavors were manned by small groups of individuals rather than by the large companies that typically dominated other U.S. mining districts. While gold was generally located in many areas by individual prospectors, larger companies then moved in with the support of Eastern investment capital. Such investments allowed them a greater measure of success than their smaller counterparts due to the availability of funding, quality of machinery, and the amount of rock that can be processed by more advanced technologies. The Fairbanks Exploration Company (F.E.) is one example of the success of larger scale operations in Alaskan placer mining districts. The company was a subsidiary of the United States Smelting Refining and Mining Company (USSR&M) working in the Fairbanks Mining District during the 1920s, established following the major gold rush to the area in 1902. The F.E. Company received funds through USSR&M which had its headquarters in Boston, Massachusetts allowing it to estimate its overall planned investment in Fairbanks at approximately $10,000,000 in 1926.[192] The company acquired large numbers of claims from smaller mining operations and was very successful in the region. The Koyukuk did not have any examples of large operations running successfully or making a profit in the region.[193]

Two examples of large scale operations that attempted operations in the Koyukuk suggest a number of reasons for this regional discrepancy. From 1898 to 1900 the Galesburg-Alaska Mining and Development Company worked on the Alatna (then Allenkaket) River, a tributary of the Koyukuk. Secondly, in 1926 the Detroit Mining Company began operations in the Nolan Creek and Hammond River area with thirty-five men and the support of British capital. It's easy to suggest that bad luck was the root cause for the failure of many who went to the Koyukuk but the hardships met by these two companies were also experienced by the smaller operations and by individual prospectors in the region as well, with different outcomes.

Galesburg-Alaska Mining and Development Company

The Galesburg-Alaska Mining and Development Company (Galesburg-Alaska Company) left Illinois in April of 1898 bound for Alaska. Twenty-five men and one woman with a well-rounded set of skills and experiences and enough supplies for two years work making their way to Seattle and leaving for Alaska on May 19 aboard the *G.W. Watson*. Twenty-seven days later they arrived at St. Michael near the mouth of the Yukon River. It took a week for them to offload supplies, sand pumps, a steam engine, and enough lumber to construct a river steamer which combined weighed 150 tons. The construction of their steamer, the *Illinois*, was completed on July 17 and began its journey up the Yukon River. Along the way low water, the shifting channels of the Yukon, and engine troubles led to delays and gear being dropped for later retrieval. The Galesburg-Alaska Company reached the mouth of the Koyukuk on August 8 and on August 28, they reached a point about ten miles north of Arctic City (later named Bettles) where they would set up camp.

Six men were sent out to prospect only to find that many claims had already been staked in the area. The group ended up settling on Help-Me-Jack Creek late in September during the first stages of winter freeze-up, finally settling in on October 8 after constructing their cabins. By mid-October, temperatures were already below zero. Prospecting individually or in pairs continued until late October when one group, consisting of J.N. Wyman who was a rancher and photographer and N.K. Aldrich who was an architect, decided to sink their first hole near the mouth of Young Creek. Using a fire to thaw through frozen ground, they shoveled gravels out to be sluiced. This process allowed for approximately two to three feet of thawed ground to be shoveled in a day. The pair worked for four days to reach bedrock at eight feet below the surface but the pit did not yield any gold.

Mid-December temperatures had settled to about sixty degrees below zero and none of the prospecting parties from the Galesburg group had located gold. By March, temperatures had risen above zero but still no gold had been located and the discouraged prospectors decided to return to the States. Despite word of the first major strike on Myrtle Creek, much of the Galesburg Company did not believe the rumors and decided to leave the Koyukuk. Others signed up for work with the Alaska Commercial Company so they could remain in the North. Ice broke on May 19 and by May 26th the *Illinois* was on its way back to St. Michael.[194]

The Galesburg-Alaska Company had diverse skills including a professional assayer, geologist, engineer, and machinist; they also had the supplies and the combined investment capital of twenty-five individuals. The Galesburg-Alaska Company failed in their search for gold for a number of reasons, the first of which was a lack of coordination

between members and a disparate level of interest in the project as time and hardships accumulated. Wyman likened the company to a flock of sheep as he was contemplating leaving the group due to their lack of dedication and organization. His major criticism of the mass of people rushing to the region was that "…they expect to pick it [gold] up any old place, but Oh, no! Sure there is gold all through this country, but those not experienced don't realize how it is to be gotten."[195]

The company began falling apart well before they had experienced any of the real hardships the region had to offer. By September the group was fragmented with several members already headed to the States. Difficulties on the river, an early freeze, the challenge of locating gold, and the unexpected winter conditions wore many of them down over the course of the next six months. Poor timing and a new environment broke down what preparation the Galesburg-Alaska Company had going into the venture.

Detroit Mining Company

Following rich gold strikes in Nolan Creek and the Hammond River in 1906 and 1915, respectively, the Detroit Mining Company acquired claims at the northern extent of the Middle Fork Koyukuk River. An *Alaska Weekly* article published April 30, 1926 states that Captain William Royden acquired a total of seventy-two claims between Nolan Creek and the Hammond River on behalf of the Detroit Mining Company. Recognizing the necessity of water to a mining venture in the region, Royden and a small group surveyed the area in 1925 designing plans for a major ditch to be constructed forty-five to sixty miles from the North Fork of the Koyukuk to the primary mining site closer to its confluence with the Middle Fork. An additional party was designated to manage the freight into the Koyukuk in 1926.[196]

By July 25, 1926, thirty-five men and some machinery had been flown in to work the company's holdings.[197] Unfortunately, in 1926 precipitation was scarce across the Interior and the Koyukuk mining season lasted only 60 days. An attempt to transport machinery and supplies from Bettles to the company's worksite on the Hammond ended with supplies left in Bettles, Wiseman, and Coldfoot with only a portion of it actually making it to the worksite before freeze-up. Low water and riffles forced the crew of the *Emma R.*, the first power boat to attempt the Koyukuk, to drag the boat via cables. The planks comprising the base of the boat had to be replaced several times.[198]

Despite the delays experienced during the initial attempt to become operational, the Koyukuk District as a whole was also seeing the positive results of petitions for ARC roads which were being constructed from Wiseman to the town of Nolan in addition to a road connecting Wiseman to the Hammond River. While the Hammond and Nolan area was recognized as being rich this signifies a significant, long-term, state investment in the region's infrastructure that had not been fully supported prior to 1926. While summer and winter trails had been cleared for use by the ARC for the use of miners, they could not accommodate more than wagons or sleds. While these roads were likely partially funded by the company as well as by the ARC, the installation of roads suggests a strong investment towards the local resource development by the company and a greater degree of planned permanence. The Detroit Mining Company continued to construct buildings and install what machinery had made it to the site throughout the 1926 season.[199]

Delays continued for the Detroit Mining Company to such an extent that their ditch was not constructed in time for deep excavation. Testing took place during the summer of 1928 but many of their tests were flooded. The company began focusing on

shallower excavations and did a small amount of hydraulicking on their Nolan claims. Despite the overabundance of water flowing through the Hammond River and into thawed shafts, the water could not be economically made useful and due to the lack of the originally planned ditch, hydraulicking also became a challenge for the company.[200]

In 1930, the company was again hit with a very short working season and very little precipitation. However, prospecting in the region continued with drilling on Ironside Bar and Gold Bench on the South Fork of the Koyukuk River though these ventures failed when the sites yielded poor returns. Three years of work in this area and in the South Fork at Gold Bench and Ironside Bar were abandoned after an investment of $120,000. Power of attorney for the buildings and equipment were transferred to a resident of Wiseman when the company disbanded. [201] No further mention of the company is made in mineral reports from the 1930s. The Nolan and Hammond grounds continued to be a primary focus for prospectors. An increase in the value of gold in 1934 brought even more intense prospecting to the area.

Both the Detroit Mining Company and the Galesburg-Alaska Mining Company experienced the unpredictable nature of the Koyukuk, as did many individual prospectors. Money was lost on a large scale by companies and on a smaller scale by individuals and neither group saw a great deal of success. However, individual prospectors typically found it easier to work in the Koyukuk than companies for a number of reasons. While companies had a larger financial base to work from and in many cases superior equipment to the prospectors, companies had to invest more to work in the region and were limited in their ability to move from one location to the next due to the scale of their operations, the extent of their equipment, and the cost of moving.

Companies, once established, expect to be able to work in the same location for a long enough period of time to make back their investments.

The limitations are apparent when looking at the Detroit Mining Company, which experienced the unpredictable nature of navigation in the Koyukuk and was unable to transport all of its equipment from Bettles to the Hammond River work site for two years. The failure of the company to build the planned ditch further limited how much work they could do in the area without the necessary water-power. And despite attempts to locate gold at Ironside Bar and Gold Bench, the failure to find gold in those locations contributed to the company's inability to establish itself successfully in the region.

Additionally, while companies might have a broader range of individuals who have specialized knowledge, they are limited by their lack of knowledge in other areas. The Galesburg Company had twenty-six individuals, each of whom had specific skills to contribute. Once the company started fracturing as some members returned to the States, those skills were lost and became unavailable to the group. Without enough capital to make it through the season as a group and without the experience necessary to work in the region, many of the remaining individuals also returned home unsuccessfully.

Prospectors, on the other hand, have less capital invested in specific locations and can move from creek to creek or lease claims from owners in other areas if they don't want to invest in claims themselves. Their knowledge base becomes more diverse as they are exposed to more experienced prospectors and they are more capable of acquiring technical knowledge outside of their own skill sets because they are not bound to a company which might limit them in that regard. And while their equipment may be more basic, in the case of pan, shovel, and basic sluice components, it can be more easily

moved from location to location. Once a rich claim has been located more permanent equipment and a greater financial investment may come into play if the claim yields enough gold for the investment. These factors contribute to the overall adaptability of the Koyukuk prospector.

Additionally, the Koyukuk, as a primarily placer district, is uniquely suited to be worked by prospectors. It requires a smaller capital investment and the machinery to process gravels is more easily acquired and assembled, maintained, and moved than that of lode processing machinery, which would have included a variety of milling equipment, larger power sources, and more technical knowledge. Prospectors could invest in sluice components that could be moved from one location to the next by sled or boat and reconstructed with a minimum amount of specialized or technological knowledge and be processing gravels again fairly quickly.

The perspective of the prospector and the company were also different. Prospectors were drawn to the Koyukuk by a mixture of ideas and ideologies: curiosity, the search for wealth, the concept of freedom; for some it was simply because they had nowhere to go and nothing else to do; Alaska offered opportunity. One prospector likened his journey north to *Alice's Adventures in Wonderland*, a journey outside of traditional working experiences which led to unanticipated and absurd adventures. [202]

Other factors contributed to the hardship of individuals and companies alike including the cost of transportation, lack of consistent year-round infrastructure such as roads or an extension of the railroad from Fairbanks and Chatanika, and the unpredictable nature of the gold itself. Placers, by their very nature, are sorted materials that have been transported from a vein by way of water or erosion. The Koyukuk's geology includes

sorted placers, and also includes a large number of resorted placers in which gold has been transferred from old stream beds to modern creeks. These resorted placers can be misleading as it may be difficult to determine where the older stream beds are located or where gold originated. The sheer cost of staking a claim and then holding it for a year in addition to the costs of supplies required that the claim have a rich enough placer to pay for itself. Brown estimates that this would require prospectors to be making $115 to $125 in a ten hour period with the use of a shoveling-in sluice operation.[203] In the end, very few prospectors were successful in the region and often owed their success to chance as much as to personal skills or experience.

5. Comparisons with Other Mining Districts

The Hot Springs and Chisana Mining Districts: a National and Regional Study in Context

This chapter will briefly compare the development of the Koyukuk Mining District with that of Montana's Hot Spring District and Alaska's Chisana Mining District located in the Tanana and Copper River region. Remoteness and lack of infrastructure are not inherently unique aspects of the Koyukuk mining district. Many districts across the United States and within Alaska share these challenges. In order to understand what limited the success of companies in the Koyukuk these two examples will examine mining communities that share these challenging aspects in situations where companies were capable of establishing themselves and either replaced individual prospectors or functioned alongside these smaller prospecting outfits. The Hot Spring and Chisana Districts also dealt with issues of remoteness and unpredictable placer and lode gold deposits. Using these two districts as comparisons to the Koyukuk District will aid in understanding the challenges inherent to developing mining communities across the nation and those that are unique to the Koyukuk District and which influenced the success of company and prospector alike.

This chapter will also give a local and national context to the overall decline of the Koyukuk Mining District as a means towards evaluating its place in Alaska's mining history. Much of the data regarding the Hot Spring District is drawn from Jeffrey J. Safford's *The Mechanics of Optimism*, which outlines the history and duration of the Montana gold rush to the Hot Spring District, the development of the mining industry there, and the eventual decline of the district. Literature for the Chisana District comes

from historic mineral reports as well as NPS district documentation and mineral reports from the early 20th century.

Montana's Hot Spring District

Like the Koyukuk, most of Montana's gold bearing areas were considered very remote during the state's gold rush era which began in the 1860s. The Montana gold boom occurred in 1863 around a discovery estimated at approximately $30-40 million made in Alder Gulch in southwestern Montana. East of this claim the Hot Spring District was established in 1864. The district is located in what is now Madison County and is approximately 14 miles from north to south and fourteen to twenty miles east to west, an approximate 267 square miles of land. Unlike the Koyukuk District the Hot Spring District was mined for both lode and placer gold during its initial boom and development of the area led to predominantly hard rock mining. By the end of 1864, ninety-two placer and quartz lode discovery claims had been claimed by sixty-six individuals.

Despite the rich finds in Alder Gulch and the movement of prospectors into the Hot Spring District, initial investments in the region were primarily focused on developing farms and ranches. Though claims were staked in 1864, it wasn't until 1865 that the first companies moved into the area. As Safford quotes one prospector, "Mining even in good mining countries is uncertain business. Probably not more than one in fifty of the mining population ever get rich at it. While farming in a good mining country has almost universally proved profitable."[204] Because many of the prospectors to this area had initially been farmers many who prospected turned to farming when prospecting did not profit.

Safford notes that the district was in the early stages of developed by miners two years prior to larger scale investment towards mineral extraction in the area and suggests that the Hot Spring District showed all the qualities of an easily worked and profitable gold district to those initial prospectors. "Geologically, prospectors in the 1860s found in the Hot Spring District quartz vein outcroppings at the surface that held so much free gold it could be separated from the gangue (minerals with no economic worth) by mere pick and shovel."[205] A number of minerals that are typically found with precious metals were abundant including iron oxides, copper, and galena. Additionally, due to oxidation, gold was naturally already freed from the quartz in some areas. Water was readily available and mines were accessible during any season. The Hot Spring District showed a great deal of promise as a localized and self-sufficient district-in-the-making despite the national perspective expressed by the mining engineer Rossiter Raymond who stated that "When it is considered with what difficulty and expense communication, travel, and transportation are maintained between the Territory of Montana and the rest of the world, it seems marvelous that any one should come there or stop there at all."[206] That Virginia City, with a population of about 10,000 in 1864, was located centrally in the county also aided in alleviating the isolated nature of the district and also allowed for more direct communication with the county recorder's office, assayers, and supplies.

The formation of companies in the Hot Spring District occurred quickly as mining camps were established, claims were staked, and mills were planned. Safford notes "That prospectors often worked in teams proved the maxim that group effort generated a greater chance of success."[207] But despite this collective approach prospectors still needed very specialized skill sets to test the placers and the determination to extend testing to

subsurface levels of up to eight feet in depth. Some of these prospecting parties eventually formed or joined larger companies in a collaborative approach to mining.

In many mining districts the involvement of Eastern investors allowed companies to intensify mining efforts resulting in a major transition from placer to lode processing which was more complex and often more profitable. As Alfred Brooks notes, "As districts become more accessible the small operator is supplanted by companies with ample financial backing, to bring about a reduction of costs of operation. Moreover, the wasteful methods of the pioneer prospector can find no reward except in the richest and most favorably situated placers, and the gravels of lower value must await better capitalized companies."[208] This was certainly the case with the Hot Spring District. Many prospectors left the region totaling as much as a 90 percent reduction in population estimates.[209]

However, investment and persistence do not always result in a profit. Companies had a difficult time making returns in the district despite the early assessment of its promise and continued optimism despite the odds. Safford quotes an 1866 report on the district from the *Montana Post* which states:

> "That which has proven one of the most serious obstacles to successful mining in the Territory has been the profusion of gold bearing veins showing temptingly at the surface. Nature is never so lavish as she…in this case appears, and in the light of general mining experience, we have no right to expect more than a small percentage of true, strong, and uniformly rich veins from this great surface display. Thus it is that several failures may precede one great success in the development of mines."[210]

When surface mining did not yield the returns this company was looking for, they shifted tactics and transitioned towards subsurface mining in hopes of finding the source of the surface outcroppings. "Indefatigable energy, and untiring perseverance will alone reveal its true magnitude."[211]

The district's decline, as with many other districts, can be attributed primarily to a lack of readily available or predictable gold. Despite the capital investment made by numerous companies and the determination to make a profit in the region, their overall optimism in regards to the actual value of the district was misguided. Safford suggests that even those companies with superior machinery were incapable of making a profit in the region. In part this was due to overinvesting in a region where processing gold could cost more than the gold was worth but additionally it can be attributed to the fact that high grade ores were simply absent below the surface. Companies also experienced a number of complications including an inability to run a mill during winter months when temperatures could fall to thirty degrees below zero, damaging equipment. The cost of mining and ore processing in the region as well as higher than expected cost of wages and a general lack of knowledge regarding mining and geology by some of the primary operators further complicated working in the region.[212] Finally, the remoteness of the region meant that the transportation of any goods to or from the district added additional costs to the operation.

Chisana Mining District

The Chisana (pronounced Shushanna) Mining District is located in the southeastern corner of Alaska between the Nutzotin and Wrangell Mountains and is transected by both the Copper River and tributaries of the Tanana and Yukon Rivers. The

region is comprised of steep ridges and a number of navigable waterways though, not unlike the Koyukuk, unpredictable rain and water-flow during spring and summer made mining the region's placer deposits challenging and limited hydraulic mining. Despite the remoteness of the Chisana District, the strike was internationally reported, leading to the development of two communities which supported several thousand prospectors during the gold rush. The Chisana rush was the last major gold rush to Alaska.

Geoffrey Bleakley, author of the National Park Service study on the Chisana Mining District entitled *A History of the Chisana Mining District, Alaska, 1890-1990*, suggests that the 1913 gold rush was ultimately defined by two elements: transportation and timing. Nearly a generation after the initial strike to the Koyukuk, the Chisana rush occurred when mining was in decline across the nation as well as across much of Alaska resulting in a mixed population of sourdoughs and new comers. Though the two main routes into the region were via the Yukon and Tanana Rivers, Bleakley states that "Prospectors approached the Chisana from every possible direction. Most were poorly equipped and many lacked a clear concept of where they were headed. Consequently, many failed to arrive, and of those who did, few remained for more than a few days."[213] Rather than a revitalization of mining in Alaska, the Chisana illustrates the dichotomy of gold rush era participants' levels of experience and preparation for both the industry and the environment.

Within a month of the U.S. commissioner and recorder setting up a tent-based office, 250 claims had been registered. Additionally, due to the high number of prospectors and claimants, general mayhem was a continual problem in the first year of the Chisana boom. Claim jumping, poor recordation of claims information, and supplies

shortages plagued the miners throughout 1913. The onset of winter curtailed the work of many prospectors prompting the abandonment of claims. Many prospectors continued to work throughout the winter though and thawed frozen ground to sink drifts.

During the winter, small settlements continued to grow, gaining stores, churches, and more permanent log cabin habitations. Trails to nearby settlements were also constructed fairly early in the region and telephone lines were erected between several of them. By 1915 Chisana had 18 businesses.

While most ventures were fairly simple and included sluices and simple water diversions, early in 1914 eight steam boilers and a sawmill were transported in to run a large-scale sluicing operation. Many operations required water transportation and consolidation with the use of ditches and dams or pressurization using steam pumps and hoses in order to maintain sufficient head to wash gravels. On Little Eldorado Creek, a 350ft flume was constructed by ten men to divert the creek to their sixteen-sluice operation. Another operation on the creek hired a crew of up to one hundred men to work the placers. Horse-drawn scrapers and boom dams were commonly used to remove surface layers.

Rather than small groups of prospectors, the Chisana District's overall lack of useable head and the limited areas of placer deposits required miners to coordinate efforts on a much larger scale than was typical in the Koyukuk to extract gold. Despite the early reports of broad wealth, Bleakley notes that the gold bearing area of the district was primarily within a five mile radius, an area not capable of sustaining long term mining efforts. One manager attempted to lower the cost of mining in the region by curtailing the standard six dollar a day wage to five dollars a day resulting in a strike by the Shushanna

Miners Association, a labor union formed by 115 individuals. By the end of 1914, 17 mines had been established in the area requiring the labor of approximately 110 individuals.

In addition to labor, prices in the region were also high due to the necessity of transporting lumber and water. The remoteness of the area pushed up the cost of supplies and unpredictable weather eventually culminated in a mass flood towards the end of 1914, which resulted in a shortened season as well as a great deal of property damage. The region experienced a drought in both 1916 and 1917, speeding the process of decline that had begun as early as 1915. By 1917, eleven mines employed forty-four individuals. The Chisana's decline continued on the heels of World War I adding to a general decline in the Alaskan territory's population and mining production. By 1921, six mines employed sixteen men using limited machinery. Despite several periods of renewed interest, the district continued to decline until finally, the 1942 Limitation Order L-208 caused the closure of gold mines across the nation resulting in abandonment of mining in the district.[214]

Because of the terrain, remoteness, and the predominance of placer deposits rather than lode, large-scale hard rock mines were never established in the district. Instead, companies were formed to process the mass of gold bearing gravels typically located within eight feet of the surface via man-power, water-power, and large numbers of sluices. Like the Koyukuk, the region was hard to work in during the winter season but unlike the Hot Spring District, miners were capable of thawing gravels with the combined use of newer technologies, like steam points, with more traditional techniques used to

thaw drifts, and continued processing, which allowed an extension of the productive season.

Worker-manager relations functioned similarly in both the lode and placer operations in the Chisana and Hot Spring Districts resulting in disputes when wages fell too low or work conditions became untenable. In the Koyukuk, where individuals or small groups were more successful than companies, labor disputes occurred on a much smaller scale between mining partners who relied on one another to make a profit. Disputes were settled by the miner's code or by locally designated mediators. In all cases, the eventual decline of the district was a result of the economic situations in which the districts found themselves. The expense of transportation and labor, the availability of water, and the eventual decline in the grade of ore available and expense of processing it were all factors in the decline of these districts. Additionally, they all suffered from the instability of the national economy and global politics. The Chisana district contributed a total of $943,700 in placer gold from 1913 to 1940, less than 0.27% of Alaska's placer gold output during that same period.

The Progressive Era: The "Modern Man" and the decline of Mining on the Frontier

Mining in Alaska followed a national trend that began during the late 1800's Gilded Age with social disruptions caused by the Panic of 1873 and 1893. Economic fluctuations, poor working conditions, and impoverished living conditions led to a desire for economic independence which was the true promise of the mining frontier. The idea that individuals who had nothing could strike it rich and become independent overnight was not entirely a myth, though it was extremely rare. However, in the urban environment of factories and wage labor, these individuals typically fared no better.

While the life of a prospector was very difficult it offered a modicum of control over one's destiny and livelihood.

The limitations of individuals within social classes to influencing their living and working environments within the existing system influenced Progressive Era ideologies. Turner stated in his book *The Frontier in American History* that "Best of all, the West gave, not only to the American, but to the unhappy and oppressed of all lands, a vision of hope, and assurance that the world held a place where were to be found high faith in man and the will and power to furnish him the opportunity to grow to the full measure of his own capacity."[215] As Turner also notes, the frontier would not be available in perpetuity for miners or for farmers in the 20th century:

> "But when the arid lands and the mineral resources of the Far West were reached, no conquest was possible by the old individual pioneer methods. Here expensive irrigation works must be constructed, cooperative activity was demanded in utilization of the water supply, capital beyond the reach of the small farmer was required. In a word, the physiographic province itself decreed that the destiny of this new frontier should be social rather than individual."[216]

The need for capital to more thoroughly extract minerals from the landscape was one limitation that often constrained mining endeavors. In the Koyukuk this limitation was often detrimental to individual operators and to companies with investments in the region who ran out of money before they had a chance to fully understand the environment or geology of the area.

Malin, discussing adaptation within an agricultural setting, contends that "—the acquisition of skills in the handling of machines and soils… can only be acquired and

transmitted from person to person by precept and practice… Except in the best years, the critical margin of tolerance is so small in Plains agriculture that only those possessing both the skills and the managerial ability can have a reasonably safe chance of success."[217] While some who mined in the Koyukuk did have previous mining experience, there were vast numbers who did not, who did not or could not acquire that knowledge from more experienced miners, and ultimately paid the price for their lack of experience.

While Turner suggests that the frontier required a level of social cooperation despite the ubiquitous image of the lone prospector that typically represents the historic "West" today, Limerick emphasizes the competitive nature of frontier activities including mining. She argues that competition for resources including water and wood, the right to use roadways, and the legal right to land claims all created tension between individuals, parties, and companies all fighting for the same resources.[218] In many cases, knowledge was just as valuable a commodity.

By the 1930s and 1940s mechanization and a national increase in specialized knowledge resulted in an industry transformed. Barger and Schurr state that "No longer does the success of the mining enterprise depend on the expertness with which the miner breaks the mineral and segregates it from the waste; it is now a question of how well the engineer has designed mining and beneficiating operations on the basis of his geological data, and how carefully he has determined the geological structure and chemical nature of the ore deposits prior to the working out of suitable techniques."[219] The modern skills of a professionally trained geological or mining engineer far supersede the abilities of the 19th and early 20th century miner. This restructuring of the industry was the result of the

rise of mechanization and the gradual increase in specialization within the tiered management system that had become prevalent throughout the American mining industry.

Money and Politics: Alaska's Urbanized Cores and Rural Mining

Alaskan resource development essentially came to a halt in the 1930s when the U.S. stock market crashed, leading to the Great Depression. Mining declined, the lumber industry hit a standstill, and the value of salmon dropped. The Alaska Railroad, which had been failing to earn a profit, was increasingly threatened with loss of funding. What little federal investment in the state had existed was cut. The New Deal appropriations and programs benefited the nation at large but because Alaska was still a territory it received limited aid.

The increase in the price of gold led to a revitalization of the gold mining industry which affected even so remote an area as the Koyukuk. The value of gold mined in 1930 was $17,800 and rose steadily until 1934 when the value reached $50,000 and in 1940 reached a high of $167,000, a value reminiscent of its early output. Operations during the 1930s and 1940s included mechanized mining on Myrtle Creek by Repo and Schwaesdall which likely included a dragline operation recorded on the creek in 1938.[220] A total of 25 camps were recorded in 1940. Multi-individual camps were recorded at Nolan creek, Tramway Bar, the Hammond River while the other camps were identified as one or two man operations.[221]

Following the purchase of Alaska and the eventual gold rushes to Alaska, federal interest in the territory was not renewed until the late 1930s and 1940s as U.S. involvement in World War II loomed inevitable. Interest in natural resources fell off and

the territory was once again militarized. Bases were authorized as early as 1935 though funding was severely limited. Eventually they spanned the Aleutian Islands in addition to military bases in Anchorage and Fairbanks. Strategically Alaska was recognizably valuable though that was certainly not its only merit. While gold was declared nonessential during World War II, as a part of Alaska's natural resources it still held value. Gruening quotes Brigadier General Frank M. Andrew who stated in 1935 that "Alaska with its tremendous and almost untouched resources should not be left defenseless. A base in Alaska is therefore required to deter any enemy desirous of seizing and utilizing its resources and geographic location against our west coast."[222] During the war, Alaska's infrastructure received a huge boost with the renewal of funding for transportation, the railway, and construction of docks many of which were ceded to the territory after the war.[223] National attention continued into the Cold War and the value of developing Alaska as an economic base was conceived in parallel to its continued military expansion in order to further stabilize the region and strengthen the U.S hold on it.

Much of northern interior Alaska, including the Koyukuk region, remained unnoticed during the war until the development of oil resources on the North Slope and the installation of the Dalton Highway in the 1970s which brought a degree of revitalization to Wiseman and Coldfoot. Despite this, mining continued as it had since the 1920s—with a mix of mechanization and simple hand methods and a mix of sourdoughs and newcomers who continue to carry on the tradition of small scale mining in the Koyukuk. This included several small companies that began in the late 1930s like Myrtle Creek's Repo operation which involved mechanized open-cut mining and with smaller

individual enterprises which continued into the 1940s and 50s with relatively simple one- or two-man drift or hydraulic operations. Much of the modern landscape remains marked by these later operations which left open pits and shafts, bulldozer scars, remnant ditches, and equipment scatters in addition to cabins and features associated with habitation and the everyday lives of miners.

6. Conclusions

Documenting the Koyukuk Mining District

While the Koyukuk Mining District was not physically the biggest placer gold producer or the richest placer gold producing district in Alaska or in Alaskan history, it is distinctive within both Alaskan and national mining history. The documentation of a placer district that is physically remote, deals with harsh environmental pressures, erratic water supplies, and unpredictable placer deposits provides insight into the trends in developmental patterns of boom districts.

Like many turn of the century gold rush districts more individuals flooded the region than the gold deposits could support; the resultant dispersal of unprepared prospectors led to more serious attempts to extract gold in the area by larger companies as well as many smaller collaborations and individuals. The outcomes of these enterprises efforts in the region provide an interesting perspective on the conditions under which companies and small operations are capable of working. In some cases profit was merely a matter of luck, while in the Koyukuk it was as often the harshness of unexpected or unplanned for circumstances which resulted in failure. Persistence alone was not necessarily a guarantee for success; the history of the Koyukuk district and the accounts of individual operations in the region illustrate this point.

Alaska was one of several noncontiguous territories and states held by the U. S. in the 1800s, which made it that much more remote than the historic mining camps of California or Montana whose districts could be accessed primarily by land route. They did share many environmental and ecological similarities with the Koyukuk though,

including water availability and high transportation costs which makes them valuable as comparative tools in understanding the development of Alaska mineral districts. The documentation of the Koyukuk district in conjunction with the nearby Chisana District and the Montana Hot Spring District allows a more in-depth study of the development and life span of its gold industry and the degree to which these limitations affected its evolution over time.

It also provides information for future studies in a remote region where cultural resources are often damaged over time due to environmental impacts such as wildfires, spring runoff, and the movement of icepacks which can shift along river banks altering the landscape and in turn any features that may have been there. Wooden structures also deteriorate rapidly following abandonment, limiting long term study and appreciation of these features. And in some cases human destruction occurs, eliminating mitigation options.

The historical value of these data cannot be contested as they contribute to knowledge of mining in the Koyukuk and to Alaska's industrial heritage. More importantly they provide a look at how individual factors can influence the progress of a variety of enterprises under adverse conditions. Documentation on the region is not overabundant and is often scattered amidst larger works which do not focus specifically on this region. Much of the Koyukuk is difficult to access, which makes studies like this invaluable for public awareness of cultural resources and for current and future interpretive sites which will contribute to public knowledge and interest in the region.

End Product: A Combined Koyukuk and Fairbanks Survey Geodatabase

In order to manage the data collected during the project, the Bureau of Land Management requested that we create a GIS geodatabase that focused on rating environmental and physical hazards associated with historic mining features.

Following the collection of Fairbanks field data in 2010 and 2011 a geodatabase was constructed in order to further process and manage data collected during this project. Additionally, following the 2012 field season which included surveys in both Fairbanks and the Koyukuk, a second geodatabase was created to manage that year's data with the intent to merge the two geodatabases at the conclusion of the project. The final geodatabase will contain points, lines, and polygons associated with historic mining features and designated site boundaries and will include site numbers, feature measurements, hazard ratings, access ratings, feature descriptions, and a number of other attribute fields to aid in the management and value of the data collected. The data has been differentially corrected, post-processed, and managed by Tim Goddard (MTU), John Baeten (MTU), Jessica Peterson (MTU), and Tamara Holman (UAA). Federal, state, and historic mining claim layers were provided by BLM.

Points, lines, and polygons divide features into subsets based on physical dimensions and shapes. Points include prospect pits, shafts, can scatters, habitations, waste rock, and structures. Lines include roads, ditches, trenches, blaze lines, airfields, and other linear features. Polygons include site boundaries, large ground disturbances, and large waste rock piles that could be better represented by a polygon than by a point.

The data are divided into two subsections: sites and isolates. Features within sites have retained their field numbers in addition to being assigned the AHRS number

associated with that site. Sites that were not included in boundaries were deemed less significant and included modern benchmarks, mining claim markers, individual features such as lone prospect pits, or other features not clearly associated with a distinct site. These isolates have also retained their field number but have been assigned a secondary isolate number based on the quandrangle in which they are located followed by a numeric series.

The Merits of Digital Data and the Construction of a Geodatabase

This geodatabase contributes to the digital data that have been collected during past BLM surveys while simultaneously providing more information that can be easily used in land management and in the monitoring and mitigation of damage to archaeological sites. Many of the features recorded from the 2010-2013 field seasons were previously unrecorded. This collection of data will contribute the maintenance of historic features that are often in danger due to human interference, environmental and seasonal damage, and animal disruption. The application of environmental data and current mining activities to the geodatabase could anticipate or prevent damage to valuable sites. This geodatabase also allows further historic research which may allow a better understanding of environmental, industrial, and social processes within these regions.

Contextually, this database has contributed to the analysis of surface archaeological features that are the remnant of historical mining operations in the region. While many sites in the Koyukuk have been previously recorded they have not been recorded in this detail, fresh documentation has increased the analytical value of the data with the addition of greater detail which can be used to illustrate the types of mining

operations on the landscape and within specific creek drainages. Site analysis for this project drew from the geodatabase when considering the types of machinery, the scale of the operations, the number of individuals and the types of habitations that previously existed on the landscape. The addition of these data to the geodatabase allow for easier management of the archaeological data, preservation of specific sites and features, and provide a tool for future research.

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Appendix A

This appendix includes site data collected during the 2012 field season in the Middle Fork region of the Koyukuk. Sites are arranged by drainage location. No maps or location data have been included in order to aid in the preservation of site integrity.

Middle and South Fork of the Koyukuk River Drainage
Pedestrian Surveys, June 2012

Survey Locations: Gold Creek, Myrtle Creek, Twelvemile Creek, Porcupine Creek, Minnie Creek, Hammond River, Jennie Creek, Prospect Creek, Tramway Bar, Gold Bench, Ironside Bar, and locations on Linda Creek and Larson Creek.
Survey Participants: William Hedman (BLM-FDO Archaeologist), Steve Lanford (BLM-FDO Seasonal Archaeologist), Dr. Patrick Martin (MTU), Dr. Paul White (UAA), Jessica Peterson (MTU), Kelsey Anderson (UAA), Ayla Aymond (CWU), Tamara Holman (UAA), Alfonso Tinoco (MTU).
Survey Dates: June 5-14, 2012.

Result of Surveys

A total of 31 sites were identified and recorded, 15 of which were previously recorded. Previously identified sites include Gold Bench mining location (BET-00181), Ironside Bar mining location (BET-00182), worked ground on Prospect Creek (BET-00196), Gold Creek cabin location (CHN-00066), Detroit Mining Company Complex (WIS-00250), Tramway Bar mining location (WIS-00285), Minnie Creek industrial equipment scatter (WIS-00290), Larson Creek Cabin (WIS-00291), Stanich Cabins (WIS-00292), the Jennie Creek Prospector Camp (WIS-00393), the Hammond River Mining Shafts (WIS-00394), the Hammond River Prospector Camp (WIS-00395), Hammond River

Steam Boiler Churn Drill (WIS-00396), Hammond River Combustion engine Churn Drill (WIS-00397), and worked ground on Jennie Creek (WIS-00398). New sites include Prospect Creek mining location (BET-00216), Linda Creek cabin (CHN-00110), Gold Creek prospecting site including a ditch segment (CHN-00111), Gold Creek mining location including nine shafts and a possible prospecting camp (CHN-00112), Gold Creek ditch segment, equipment scatter, and sluice (CHN-00113), Gold Creek Prospector Camp (CHN-00114), Gold Creek cache and hydraulic piping (CHN-00115), Minnie Creek Cabin (CHN-00116), Minnie Creek Prospecting Camp and mining location including a possible windlass (CHN-00117), Minnie Creek mining location including eleven shafts (CHN-00118), two cabins on Minnie Creek (CHN-00119), Minnie Cree mining location and industrial equipment scatter (CHN-00120), Porcupine Creek Mining Camp (WIS-00422), industrial scatter including a Kolman Athey Grizzly on Twelvemile Creek (WIS-00423), Twelvemile Creek Cabin (WIS-00424), and a mining location and cabin remains on the Hammond River (WIS-00425). Detailed descriptions will follow.

Middle Fork Koyukuk River Sites:

Gold Creek

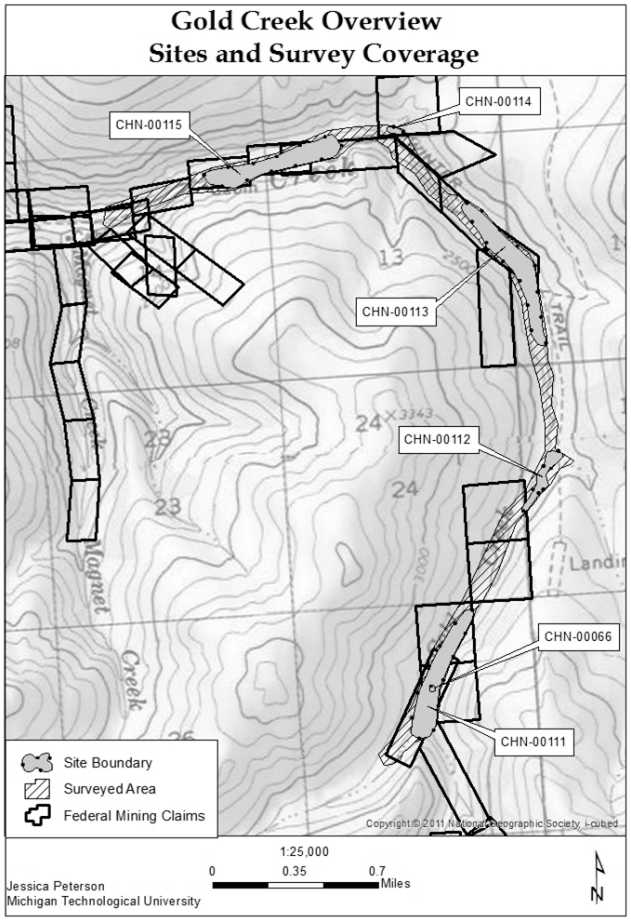

Figure 8: Gold Creek sites and survey coverage. Data collected in 2012.

Gold Creek Cabin Location (CHN-00066)

This site is located on the west bank of Gold Creek near its source. It is east of Poss Mountain, located near the southern extent of the Brooks Range. An historic airfield marked on USGS quad maps is located approximately one mile north-east of the site.

Steve Lanford's 2009 AHRS entry reads: "Collapsed, vertical spruce log, cabin ruin. Ruin is 10' l X 8'6" w. Wall height appox 5', possible low gable roof shape. Door used handmade flattened metal hinges. one small window opening on S wall. Site located 30m W of creek on elevated ground. Door opening on creek side, 5m dia trash scatter immediately down slope of cabin ruin. Trash scatter indicates two periods of use. Log Cabin Syrup can (1910-1918 style), Hole-in-cap cans, Fernet-Branca Bitter Bottle, Hills Bros. coffee 2lb can (Lanford and Mills 2006 Fig 14, 1952-1963) and 1lb Darigold butter can (Mid 1930's-1950's). Sluice box remains and tailings are upstream of cabin ruin."

A 2012 revisit suggests that the site has undergone negative effects due to weathering. There are currently no standing logs though a wall that fell outward away from the structure remains measurable. The can scatter appears to be essentially complete. There has been no apparent vandalism nor does the site appear to be in any danger due to human interference with natural weathering processes.

Gold Creek Prospecting Site (CHN-00111)

The site runs parallel to Gold Creek for just under a mile and is defined at its extents by a water-filled shaft to the north and a shallow prospect pit to the south. The shaft is 1.5m x 1.5m with an unknown depth. The prospect measures 1m x 1m with a depth of 0.2m. The interior of the site is comprised of a cluster of features primarily located at the southern end of a small ditch. This site includes the mining landscape surrounding AHRS site CHN-00066 the remains of which are likely associated with mining activities that extend beyond the functional scope of CHN-00066. CHN-00066 includes a cabin ruin and associated trash scatter.

The ditch is located 40m upslope on the left bank of Gold Creek and was measured at almost 200m in length with a depth of 10cm. It likely extended farther to the south historically though it was not conclusively visible during pedestrian or aerial surveys due to vegetation regrowth.

50m south of the cabin ruins is a shaft that measures 2m x 1.5m with a depth of 0.75m.

A site previously recorded, CHN-00066, is located within the boundaries of this site but none of its features have been included in CHN-00111 as it's extent has been defined by previous surveys.

Gold Creek Mining Location (CHN-00112)

CHN-00112 runs along both banks of Minnie Creek and includes several shafts, a tent frame, and a trash scatter all associated with historic mining on Minnie Creek. Additionally there is evidence of modern testing along the southern extent of the site as well as interspersed amongst the older features.

All that remains of the tent frame is a series of hewn logs in a generally flattened area. The logs are 13ft long and extend to the northwest. No other elements of the structure remain.

A trash scatter is located at the northeast extent of the site. The scatter is 3m in diameter and consists of several can types including a mix of crimped and lapped seams from fuel, meat, and other unidentified cans. The scatter is located in a relatively flat area suggesting a possible camp location. Cut stumps were noted in the area.

There are nine historic shafts within the site boundary, three of which appear to be potentially cribbed. The shafts are dispersed equally along both banks of the creek. Seven of the nine are clustered in an area 200m in length towards the center of the site. All of the modern excavations are located within this cluster or to the south of it. The historic shafts measure: 1.5m x 1.5m with a depth of 0.25, 1.5m x 1.5m with a depth of 0.5m, 2m x 2m with an undetermined depth, 2m x 2m with a depth of 0.75m, 2m x 2m with a depth of 1.5m, 2m x 2.25m with a depth of 1m, 3m x 2.5m with a depth of 0.5m, 3m x 2.5m with a depth of 0.75m, and 3m x 2.5m with a depth of 1m.

There are four modern excavations that measure 10m x 5m with a depth of 2m, 15m x 4m with a depth of 1m, 15m x 5m with a depth of 1m, and 4m x 4m with a depth of 1m. These features are located fairly close to Gold Creek towards the southern extent of the site.

Gold Creek Equipment Scatter (CHN-00113)

This site is located on the banks of Gold Creek stretching along a gradual bend. It is located northeast of Poss Mountain in the southern extent of the Brooks Range. It is about 3/4mi from an airfield marked on USGS quad maps.

CHN-00113 is composed of numerous features including equipment related to historic and modern mining efforts, shafts and prospects, and a ditch with several associated water control features. These all run roughly parallel to Gold Creek on either side of it's primary channel. The site is roughly a mile long.

The central feature of this site is the ditch which runs along the east bank of Gold Creek. It was measured for approximately 500 meters of its length with an average depth of 50cm and a range from 25cm deep to 75cm deep. Associated with the ditch three water control features were documented including a small pegged structure with four vertical posts fastened with wooden pegs, a culvert constructed from multiple 55 gallon fuel drums that runs perpendicular to the ditch allowing water from the ditch to flow

downslope, and finally a small box shaped structure that has collapsed but includes some small pipe fixtures located on an arm of the ditch that turns downhill toward Gold Creek.

Equipment is scattered across the southern end of the site and primarily located near the creek. One small location consists of the remains of a sluice within a creek diversion which is potentially a human constructed flow. The sluice appears to have been constructed of local timbers lined with soldered and riveted iron sheeting. There is a wooden handled shovel nearby. A second location consists of a can scatter, steel cable, fuel cans, and a heavy duty metal brace. A wooden drift bucket was located on a hillside not far from the creek. Rope handles were still present and mostly intact. One final part of some larger piece of equipment was located but not conclusively identified.

In addition, three prospect pits were identified measuring from 1m - 2m in length with a consistent width of 1m and a depth ranging from 0.5m - 1m.

One cribbed shaft was located on the east bank. The cribbing was visibly notched on the east wall but most of the shaft was overgrown with vegetation and the timbers covered in moss. Its dimensions are 1m x 1.5m. Due to overgrowth, depth could not be accurately measured.

Additionally four 55 gallon fuel drums were recorded in the vicinity of the ditch, towards the center of the site, near where the winter trail veers north towards Linda Creek.

Gold Creek Prospecting Camp (CHN-00114)

This site is located on the banks of Gold Creek stretching along a gradual bend. It is located northeast of Poss Mountain in the southern extent of the Brooks Range. It is about 2 miles northwest of an airfield marked on USGS quad maps.

The site measures approximately 100m from east to west and the greatest distance between features is approximately 70m.

This site consists of a tent pad, privy, and prospect pit on the northeast bank of Gold Creek as it turns from a north-south bearing to a westerly direction. There are no structural remains of either the tent pad or the privy. However their location and orientation, in addition to the landscape certainly suggest that this was likely an early camp site. The prospect pit measures 2.5m in length and 1.5m in width with an unknown depth due to moss growth. The privy pit measures 1m x 1m.

The tent pad and privy pit are located on the western half of the site while the single prospect pit is located at the eastern extent of the site. A trash scatter was also located south of the tent platform, near the privy pit. There are several diagnostic cans at the site including a 1899 Coldbrook Creamery can, an external friction fit can of Bensdorps Cocoa produced in Holland (collected), Eagle Brand Condensed milk can, and a possible Hills Bros. brand butter can. There are approximately 40 cans in the scatter including

hole-in-cap, solder-dot, and screw cap cans. A 5 gallon square fuel can is also present (Standard Pearl Oil Company).

Gold Creek Cache and Hydraulic Piping (CHN-00115)

This site is located on the banks of Gold Creek stretching along a gradual bend. It is located northeast of Poss Mountain in the southern extent of the Brooks Range. It is approximately 4 miles east from the Dalton Highway.

This site primarily relates to historic hydraulic mining and includes several large areas of tailings near Gold Creek. Additionally, there is a standing cache and a water-filled shaft that have been included in the boundary of this site.

The equipment on site mostly consists of hydraulic piping towards the north-east end of the site. In that same area are the remains of an iron stove near a shaft. The shaft measures 4m x 4m with a measurable depth of 1.5m. It is water-filled and circular shaped.

The cache is located on the south-western side of the site on the right bank of Gold Creek. It is constructed of unpeeled spruce pole stilts covered with tin can wraps. It measures 14 feet in length. The cache structure is absent and all that remains are the stilts. The tailings stretch longitudinally, parallel to Gold Creek in several areas across the site and are also found in smaller piles near the north-east end of the site.

Myrtle Creek

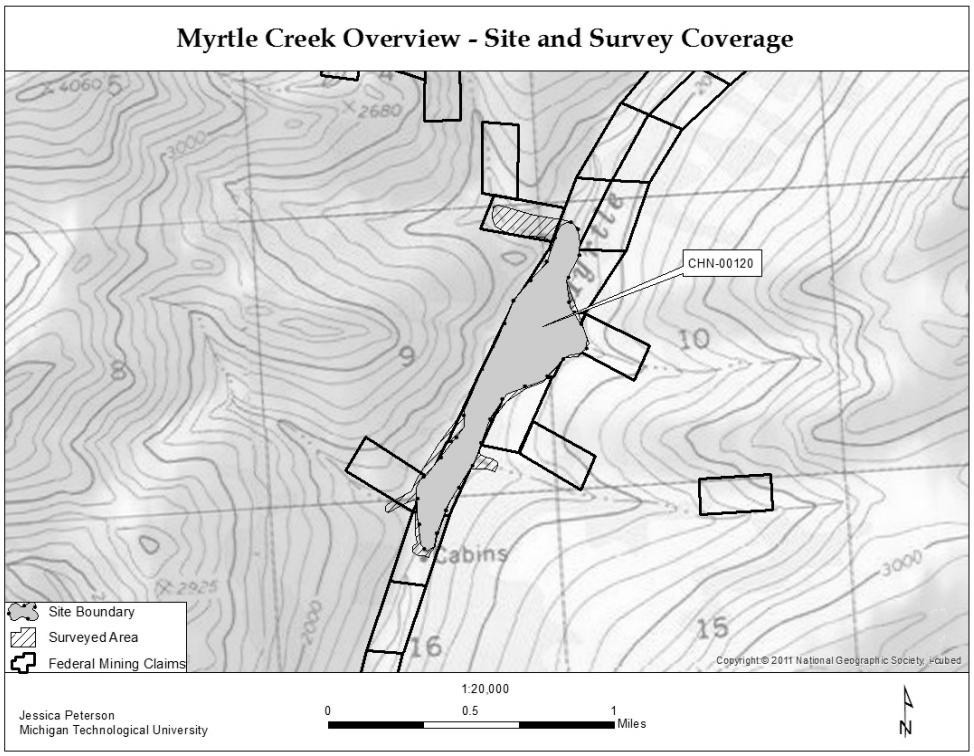

Figure 9: Myrtle Creek sites and survey coverage. Data collected in 2012.

Myrtle Creek mining location (CHN-00120)

Hydraulic operations were in operation on claim number 6, about 1 ½ miles from the mouth of Myrtle, which was the only hydraulic operation in the Koyukuk district by 1909. In order to fuel the hydraulic operation a dam was constructed on claim number 12 with a conveyance ditch that measured 1 ¾ miles long and 3 to 5 feet wide. The ditch's depth was originally 2 to 3 feet deep. It conveyed water to a penstock located on claim number 6. The operation allowed for excavation of a pit 200 feet long, 100 feet wide and as deep as 20 feet.

This site is located on claims number 13 - number 17. There is evidence of hydraulic work, several scatters of industrial equipment, multiple shafts, a prospect pit, and several tailings piles. There are two ditches, the first of which runs on the western bank of Myrtle Creek. The second ditch is located just south of a small tributary that enters Myrtle Creek on a federal claim currently recorded as "#15 Left Limit Bench Above". There is also evidence of bulldozer work.

The equipment scatters are primarily located towards the southern extent of the site. Two locations are equipment platforms constructed from dimensional lumber in staging areas where the ground appears to have been levelled. Both are approximately 6m in diameter. The largest scatter of equipment includes three sets of three 55-gallon fuel cans that are

welded together in addition to weather worn hydraulic piping. This scatter is located in an area of worked ground that measures approximately 15m x 5m. Nearby is one segment of hydraulic pipe and an additional 55-gallon fuel drum located mid-creek.

There are three shafts located at the southern end of the site in the vicinity of the equipment scatters. The shafts are all fairly large with the following measurements: 3.5m x 3.5m with a depth of 3.5m, 3m x 3m with a depth of 3.5m, and 5m x 3.5m with a depth of 2.5m. Near the largest site is evidence of hydraulic work including rubber hosing and a hose fixture that appears to be an aluminum coupling.

A small prospect pit is also located on the southern end of the site. It is square and located on the left bank of Myrtle Creek, measuring 1m x 1m with a depth of 1m.

There are multiple tailings piles located along Myrtle Creek. Several of them have a red lichen growth on them that suggests that they are older. They are located from 20-30m away from Myrtle Creek. There are a total of nine piles. They measure 21m x 7m with a height of 3m, 23m x 8m with a height of 3.5m, 15m x 10.5m with a height of 1.5m, 83m x 10m with a height of 5m, 28m x 10m with a height of 1m, 9m x 4m with a height of 1.5m, 10m x 4m with a height of 5m, and 7m x 5m with a height of 3m. These are primarily located in clusters near equipment and shafts.

The most visible section of ditch within the Myrtle Creek drainage runs from claim number 17 Above Discovery to claim number 14 Above Discovery, measuring 1220m in length with a width of 1m and a depth of approximately 0.3m. It is located on the western bank of Myrtle Creek. A second ditch, visible for 352m is located on claim number 15 on the Left Limit Bench Above and flowed along an unnamed tributary of Myrtle Creek to the eastern bank of Myrtle. It measures 0.25m wide with a depth of approximately 0.15m.

Evidence of bulldozer work is apparent towards the center of the site where an area measuring 10m x 5m with a depth of 5m has been scraped. Though much of the ground within the site boundary appears worked, this area was particularly obvious.

Twelvemile Creek

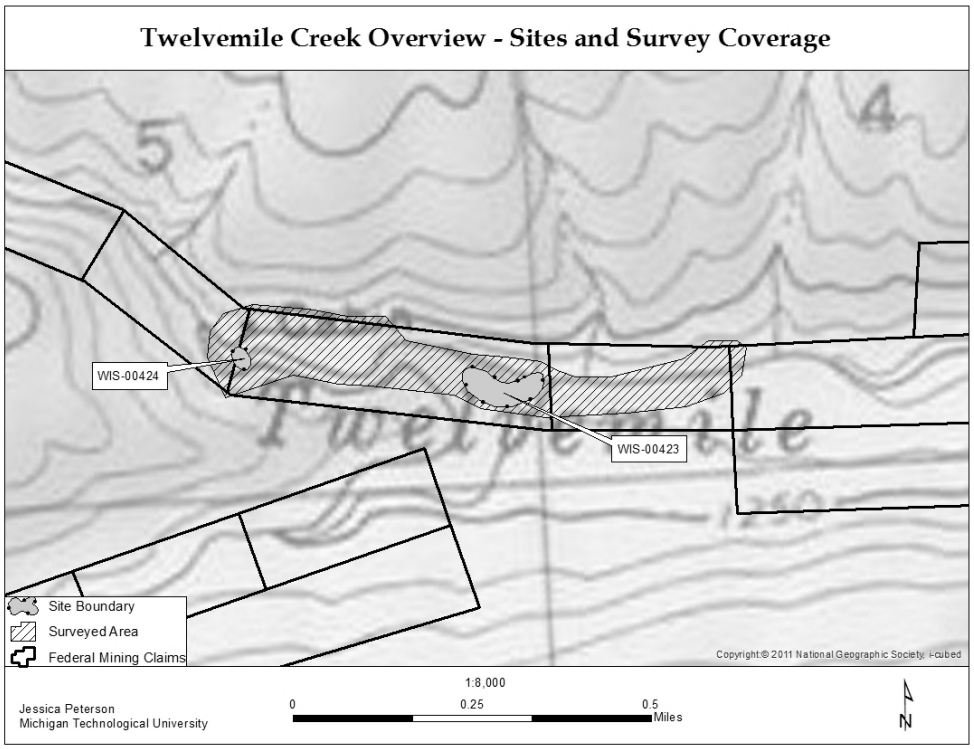

Figure 10: Twelvemile Creek sites and survey coverage. Data collected in 2012.

Industrial scatter on Twelvemile Creek (WIS-00423)

This site is located on Twelvemile Creek, a tributary of the Middle Fork Koyukuk River. It is located approximately 3 miles west of the confluence of Twelvemile Creek with the Middle Fork.

There are two structures, a motor-home, a modern grizzly with its associated equipment, and several drums at this site. They are all related to relatively recent historical mining activities.

The structures are both primarily constructed out of plyboard on a wooden frame. Both of these are located at the western extent of the site. They appear to be storage units. The first structure contains a washing machine and assorted garbage while the second appears to be related to machine maintenance. It contains a 1lb fuel cylinder and containers of chevron antifreeze. The second structure, located at the farthest western extent of the site is collapsing. Associated with these structures are two 55 gallon barrels. These drums are located between the two structures and are partially filled with what is probably fuel. Near the structure is a collapsed motor home.

East of the structures is a second pair of 55 gallon drums that are also partially full as well as approximately 30 plastic containers for motor oil and several fuel cans. Additionally there is a grizzly screen or rock separator.

There is one large heavy duty wash plant grizzly labelled "Kolman Athey/Sioux Falls SD". Associated with the grizzly is a boulder chute attachment for the grizzly that is constructed of iron sheeting with internal timber bracing. It is open on both ends with a flat base. There is no visible axle or wheel system though it has been moved about 50m away from the grizzly. There is also a manifold, a grizzly screen, timbers, cable, an electric pump, and the side board of a truck located on boulder tailings about 20m southwest of the boulder shoot and 30m northeast of the grizzly.

The area appears to have been fairly extensively worked.

Twelvemile Creek Cabin (WIS-00424)

This site is located on Twelvemile Creek, a tributary of the Middle Fork Koyukuk River. It is located on the north bank of Twelvemile creek approximately 3.2 miles west of the confluence of Twelvemile Creek with the Middle Fork.

The cache is the best preserved feature of this site. The structure measures 8ft 5in x 9ft 10in with a northwest by SE bearing. The logs are white spruce and hewn on the interior wall. The crownsa re both sawn and axed at different extension lengths. There is no apparent chinking and no siding. The corners are notched with square dorsal, dorsal saddle, and double square. The supports are 32in long and there are a total of eight stilts. The top of each support is protected by an unfurled fuel can. The roof is a gable style with a double ridge pole and one pair of purlins. The floor is constructed of split spruce poles. The door is located on the northwest wall. Inside the cache are glass bottles , the lid from a mayonnaise bottle, a Hills Bros. can, a can of Swift's Silverleaf, and a square five gallon fuel can. There is also a can scatter associated with the cache that is comprised of modified five gallon fuel cans, a galvanized three gallon pale, wooden shipping crates.

All that remains of the cabin is a bermed footprint that has a few assorted timbers present to the east with a possible entrance to the west and the north. There is a possible cold storage pit in the south. Associated with the footprint are a washtub, and enamelware shovel head, and pieces of corrugated copper sheeting.

A can scatter was also located down slope of the cache and included a mix of solder dot and vacuum sealed cans, a fuel can, and condensed milk cans. The opening technique was jab-lift rather than a can opener or other method.

Porcupine Creek

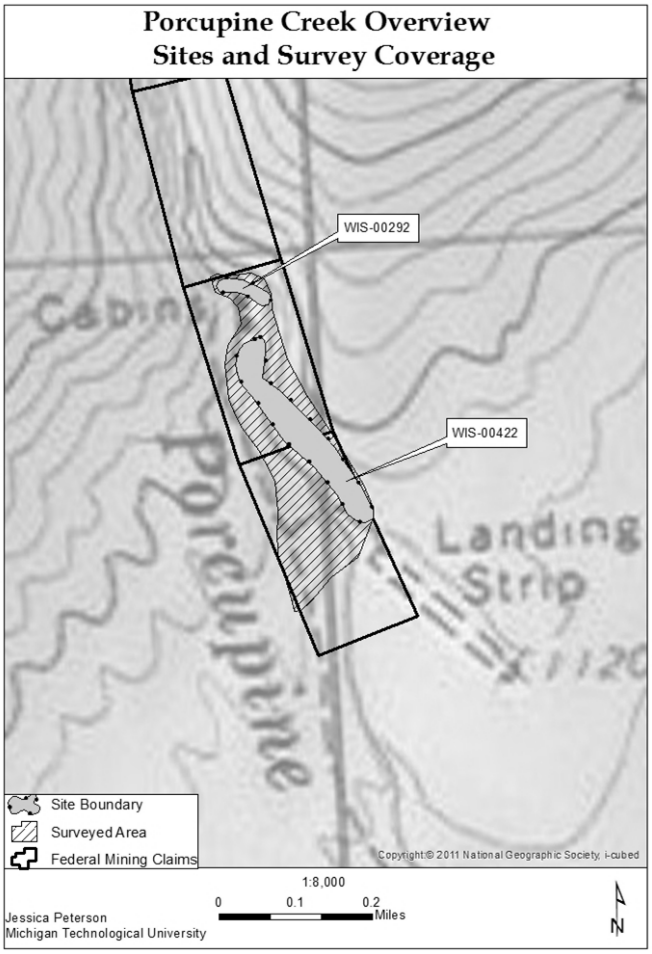

Figure 11: Porcupine Creek sites and survey coverage. Data collected in 2012.

Stanich Cabins (WIS-00292)

WIS-00292 is located on Porcupine Creek 1.3 miles northwest of the confluence of Porcupine Creek with the Middle Fork Koyukuk River. It is on the edge of the Koyukuk River corridor at the mouth of the Porcupine drainage where hills reach an elevation of 1200ft. It is also just northwest of a landing strip marked on USGS maps.

This site was originally recorded in the early 1990's. It consists of a multi-sectional cabin, a cache, and a boiler house. According to the original report, the structures on site were built by the Stanich brothers, Obrien and Sam. The buildings were built by Obren and Sam Stanich who mined the creek in 1916.

The cabin is the most complex structure on site and is composed of a main structure with two additions likely added at separate times. The primary room of the cabin, the original structure, measures 18ft x 20ft and is constructed of white spruce logs. The logs are dorsal square notched with pegs in the eaves logs. The crowns are sawn to the same

length and the logs are chinked with mud daub, poles, and moss. There is no siding. The roof is a medium-sloped, gable-style design with a ridgepole and two pairs of purlins. The ridgepole is on an axis of 206 degrees. The rafters are constructed of sawn poles and the roof is constructed of moss and sod covered by boards and unfurled five gallon fuel cans. The floor is constructed of sawn planks that are 9in wide running across the length of the structure. The door is located on the south wall and there are windows on the east, west, and south walls all measuring 10in wide x 12in tall.

There is a possible garden in the front of the cabin west of the entrance that is fenced with light materials, it is possible that this was originally a garden. Also located nearby are a porcupine boiler, a doghouse boiler, a winch, a governor, and a drift bucket. The boilers were likely locally manufactured.

The interior of the cabin has been left undisturbed and is essentially a time capsule. There are a number of artifacts located inside including two stoves, two homemade table, wo handmade wooden beds, a bench constructed from spruce poles. Silverware and dishes are still present in the cabin as are clothes which hang from a line across the cabin. A caribou skin is also hanging on the line.

The first addition is located on the north end of the cabin. It measures 14ft long and is built of off gable and structural extensions from the original cabin. The first addition is constructed of round white spruce logs, the walls abut the original cabin and have no notching. The crowns are sawn. The walls are chinked with moss and covered in some areas with unfurled five-gallon fuel cans. There is a door on the east wall and a window on the west wall. The roof is a gable with a single ridgepole and two pairs of purlins. The roofing is sod on top of spruce poles, additionally it has been covered with five-gallon fuel cans. The floor is dirt. This addition appears to have been used as storage during its final use but originally the north wall was covered in bunk beds which extend the length of the north wall. There are several mattresses present. Numerous boxes, suitcases, crates, cans, and food cases are present. There is also a stove sitting beneath the shelving that appears to have been stored there and was not in use. Internally there is some canvas along the walls and hanging above the window.

The second addition is located on the north wall of the first addition. It measures 7ft long and constructed of vertical spruce poles that are 2-3in in diameter. The roof is gable style with and constructed of spruce pole braces beneath wooden planks. The purlins from the first addition extend into the second addition but not all the way to the north wall. The roof is covered in recycled fuel cans but there is no sod beneath the cans. The floor in the second addition is also dirt. This addition looks to be primarily storage as shelving extends across the southern wall. The shelves are currently filled with sections of pipe with 6in diameters, boxes, and miscellaneous smaller pipe lengths. Around the shelving the area is filled with card board boxes, bits of insulation, canvas fabric, and assorted other supplies. Most of the items are in poor shape. The contents of the western half of the shed are unreachable due to the debris. There is no electric wiring in this addition. One crate is labeled "Obrion Stanich/ Porcupine Creek/ Bettles Field".

Approximately 10m to the southeast is a medium-sized cache structure that is filled with suitcases, bedding, and insulation. The cache is constructed similarly to the main structure of the cabin. It is partially collapsed. It is constructed of white spruce logs that are hewn on the top and bottom of the logs. It is notched with a mix of dorsal saddle and v-notch. It measures 9ft x 8ft with a northwest-southeast axis gable. The roof was a single ridgepole with two pairs of ridgepoles. The rafters were spruce poles covered with unfurled fuel cans. The floor is constructed of spruce poles 2in to 4in in diameter on the same axis as the ridgepole.

Approximately 80m to the northwest of the cabin and cache is a partially collapsed boiler house. It measures 17ft x 15ft, the west wall is partially collapsed. The door is located on the north wall. It is constructed of white spruce logs, with mixed notching styles and both sawn and axed crowns, and the crowns extend to different lengths. The logs are chinked with moss and burlap. The roof is gable style with a single pair of purlins. The roof is constructed of spruce poles covered in unfurled 55 gallon fuel drums and drum ends. The floor is dirt. In the southwest corner of the structure there is a 16ft boiler labeled "FARQUAR, YORK, PA". The exhaust stack is lying diagonally across the collapsed roof. Additionally, in the northwest corner there is a Little Giant hoist.

Porcupine Creek Mining Camp (WIS-00422)

This site is located on Porcupine Creek 3/4 of a mile northwest of the confluence of Porcupine Creek with the Middle Fork Koyukuk River. It is on the edge of the Koyukuk River corridor at the mouth of the Porcupine drainage where hills reach an elevation of 1200ft. It is also just northwest of a landing strip marked on USGS maps.

WIS-00422 is a relatively recent site that was likely occupied into the 70's. It is comprised of three structures, multiple pieces of large equipment, a privy, and a cache of fuel drums. Additionally the area is scattered with tools, materials, and supplies associated with mining.

None of the structures appear to be permanent installations. The majority of them are either constructed of poor quality materials or are mounted on skids for easy transport. All the the structures are clustered in a 100m diameter area.

The structure located farthest to the south is a shed style structure constructed of plyboard. Inside there are an assortment of tools and supplies including an acetylene cylinder, hosing, a Hackney/Milwaukee cylinder, oil cans, plastic fuel cans, and recreational equipment. This structure measures 24ft x 16.9ft with a height of 9ft 9in.

A square pyramidal food storage structure is located north of the shed structure. This structure includes an electric refrigerator and interior shelving. It measures 8ft x 6ft 4in with a height of 7.6m. The door is inaccessible and access to the interior was not possible. Outside there are two 55 gallon drums, one of which is full. Additionally there

are several plastic lube buckets north of the structure, a Kawasaki bike, and a 1960's hardtop "Willys" jeep.

Just north of the square pyramidal structure is a two-roomed structure joined on mounted skids . There are two drums located outside of this structure and two cylinders to the north of it. The southern room measures 14ft x 14ft with a height of 8ft 4in while the northern room measures 8ft x 8ft with a height of 8ft. The northern room appears to be a shower room while the southern appears to be a residential structure.

There are three mobile structures including a 23ft travel trailer on a double axel that is partially collapsed, a large freight sledge, and a refurbished Wanogan that measures 7ft 6in x 18ft with a height of 7ft. There are pieces of hydraulic piping, military bunk beds, a stove, a retired army truck, a truck bed, and three wheel valves labeled Joshua Hendy Ironworks SF Cal. There are also 10 complete 55 gallon fuel drums and 7 halved fuel drums associated with these features.

A privy is located at the far north end of the site. It a wood frame covered in corrugated aluminum. Associated with it are a 5 gallon lube can, several aerosol cans, and a 5 gallon covey can.

Additionally there are two fuel caches within this site. The first is located near the northern cluster of buildings and consists of 9 complete 55 gallon fuel drums, several halved drums, and miscellaneous equipment parts including tires, a skid mounted drill complete with a drill frame and rope. Labels on the drums include: Hillman Co./Seattle Wash and one labelled Link/Belt.

There are several 5 gallon cans of oil and a 10ft x 10ft beam board platform. Two cylinders with unknown contents were also located. The second fuel cache is located at the souther extent of the site approximately 300m away. This cache consists of 39 complete 55 gallon fuel drums. Many of these are full and there is one drum that was on its side and oozing prior to our arrival on the site. The drum was righted, the contents appeared to stop leaking.

Minnie Creek

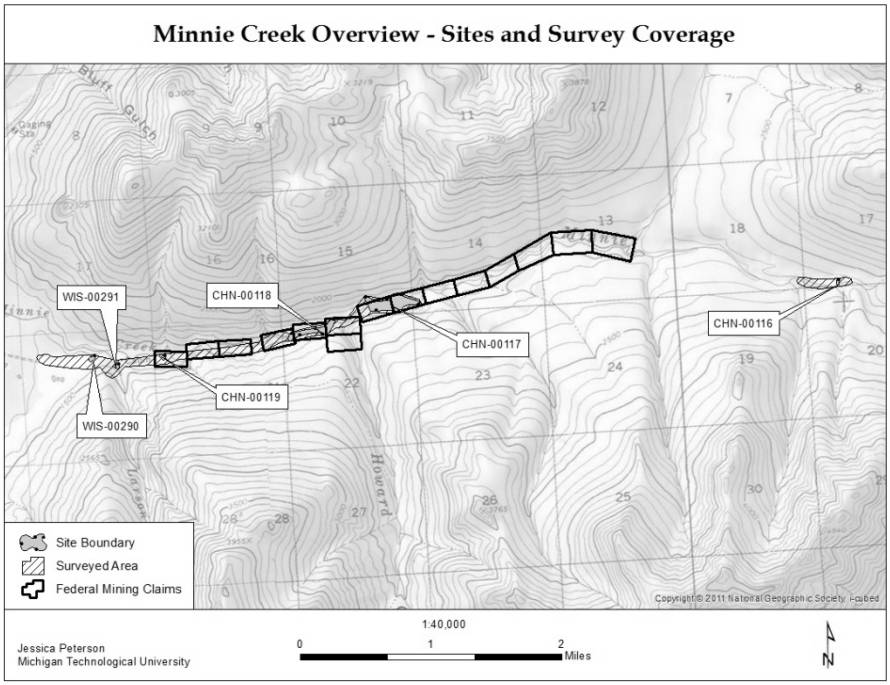

Figure 12: Minnie Creek and Larson Creek sites and survey coverage. Data collected in 2013.

Minnie Creek industrial equipment scatter (WIS-00290)

This site is located near the confluence of Minnie Creek and Larson Creek. Minnie Creek is a tributary to the Middle Fork Koyukuk River. This site is located approximately 1.5 miles east from the confluence of Minnie Creek with the Middle Fork Koyukuk River.

This site is comprised of four features: two mining shafts, a porcupine boiler, and a scatter of industrial equipment.

The shafts are located 30m apart on an east-west line that parallels Minnie Creek. The first shaft, located to the east, measures 2m x 1m with a depth of 1.5m. The second, to the west, measures 5m x 5m and has a depth of 2.5m. Both are water-filled.

The porcupine boiler appears to be hand manufactured from sheets of iron that have been riveted and banded together. The boiler measures 1.5m x 0.6m with a height of 0.8m. Not far from the boiler is a small area of approximately 5m in diameter that appears to be a collection of parts that may have contributed to the construction of a doghouse boiler. The scatter consists of several sheets of used iron sheeting, pipe segments, and several other pieces of hand manufactured equipment.

Minnie Creek Cabin (CHN-00116)

Minnie Creek is a tributary to the Middle Fork Koyukuk River. This site is located approximately 7 miles east from the confluence of Minnie Creek with the Middle Fork Koyukuk River.

This site consists of a cabin and its associated can scatter along the north bank of Minnie Creek.

The cabin measures 10ft square with incomplete walls on all four sides. Due to its collapse its directional orientation is indeterminate. Wall heights vary from 4-7 logs high or a measured height of 13in to 36in tall. The logs are unmodified and unhewn and are constructed of white spruce cords. The notching is dorsal saddle style and the crowns have been axe cut to different lengths. The logs are chinked with moss. The roof is likely gable style though the roof system has collapsed. Additionally the collapse has obscured the floor system. The doorway is located to the west and there is a window on the south wall.

Inside the cabin on the SW corner is a hewn piece of spruce board, possibly a shelf. A stove safety is also located outside the cabin.

The can scatter consists of evaporated milk cans, Lipton tea and coffee, cocoa Planter Ceylon, and a lard pale. There is also an enamelware kettle with a riveted handle and a can modified as a candle holder.

There is a possible outhouse pit 2.4m from the NW corner of the cabin that measures 32in x 16in x 5in.

Minnie Creek Prospecting Camp (CHN-00117)

Minnie Creek is a tributary to the Middle Fork Koyukuk River. This site is located approximately 4 miles east from the confluence of Minnie Creek with the Middle Fork Koyukuk River.

This site has a total of fifteen features in two distinct clusters. The first include several shafts, two tent pads, a possible cache and privy, and a windlass all of which span both banks of Minnie Creek as well as a water diversion ditch which runs parallel to the creek.

There are a total of five shafts spanning both sides of the creek. The shafts are all large, over a meter wide, and four of the five appear to have been relatively deep and have large waste rock piles associated with them. Two of the shafts appear to have possible timbering and one large shaft is water-filled. One of the largest shafts located upslope to the north of Minnie Creek also has an in situ rope-handled shaker box.

An additional excavation is located near the northern-most shaft and appears to be a relatively shallow prospect.
Four of the pits and the prospect run in a line that is perpendicular to Minnie Creek.

A windlass constructed of spruce timbers was also located near the eastern extent of the site. It is an A-frame windlass constructed using wire nails as fasteners. A combination of wire nails and pegging consists of the primary structural supports. The crossbeam measures 78 1/2in across and is 7 3/8in in diameter. The legs measure 60-63in long from the ground to their peggings in the crossbeam. 3-6in in diameter.

Two tent pads are located to the south of the shaft work. There are no structural remains but the areas are noticeably flattened and there is a possible berm on one edge of one of the tent pads. There is also a small depression that may be the remains of a cold storage pit nearby. A second depression nearby may be the remains of a privy. The ephemeral nature of the remains limit detailed descriptions. There is one can associated with these features but no other can scatter was located nor are there any other artifacts in the area.

300m to the west of this cluster is a secondary area of the site that consists of two prospect pits, a shaft, and a cabin.

The prospect pits appear to be modern excavations but have been revegetated by heavy alder growth and some spruce. These pits measure 2m x 3m with an average depth of 0.5m. They are located at the same elevation as the northernmost pits at the first cluster.

The shaft is located on the southern bank of MInnie Creek in the vicinity of the cabin. The shaft measures 2m x 1m with a depth of 1m.

The cabin is located on the south bank of Minnie Creek at the western extent of the site. It measures 14ft 8in x 16ft on an axis orientation of 183 degrees. It is partially collapsed with no wall more than 6 logs high. It appears to have been bermed on the northeast and southeast walls. Prior to collapse it would have had a gable style roof with two ridgepoles and an overlay of sod which has consumed the interior of the cabin.

Much of the cabin's floor is obscured by vegetative growth which prevented an investigation of construction style.

Several cans were located near the cabin but no distinct scatter was located.

Additionally there is a ditch that runs parallel to Minnie Creek for over 60m. It is rock-lined in many areas and ranges in width from 0.5m to 1m with a depth of 0.5m.

Minnie Creek Mining Location (CHN-00118)

Minnie Creek is a tributary to the Middle Fork Koyukuk River. This site is located approximately 3 miles east from the confluence of Minnie Creek with the Middle Fork Koyukuk River.

This site consists of 18 features that span both sides of Minnie Creek along a span of approximately 660m and all within 90m of either side of the creek. These features include prospect pits, shafts, several can scatters, two claim markers and a set of modern cat tracks.

Eleven of these features are shafts that span the full extent of the site from east to west and includes the southernmost point at 90m from the creek though the shafts are located primarily within 10-20m of the creek. The majority of these shafts have collapsed or are water-filled. They range in size from 4m x 3m with a depth of 2m to the smallest shaft which measures 1.2m x 0.8m with a depth of 1.2m. Water-filled pits do not have known depths but were estimated from 0.5m deep to 1m deep. The shafts measured: 1.2m x 0.8m with a depth of 1.2m, 2m x 2m and water-filled, 2m x 2m with a depth of 0.5m, 2.4m x 1m with a depth of 1m, 2.5m x 2.5m with a depth of 2m, 2.5m x 2.5m with a depth of 2m, 3m x 2.5m and water-filled, 3m x 3m and water-filled, 3m x3m adn water-filled, 3.7m x 2.5m with a depth of 2m, and one which was not recorded.

Three can scatters were recorded and are located across the site. They consist of several small groupings of cans and in one case there are cut logs in the area but no cabin or tent frame was located. There is a flattened area nearby but it could not be conclusively identified as a feature.

There is a prospect pit that measures 2.5m x 2.5m with a depth of 2m. It is possible that this is a shaft. It is debris-filled and heavily vegetated with ephemeral edges.

A modern excavation near the center of the site and in an area pocketed by shafts measures 2m x 1.5m with a depth of 0.75m. It has an orientation of NE-SW and is water-filled. There are cat-tracks visible in the area.

Two cabins on Minnie Creek (CHN-00119)

Minnie Creek is a tributary to the Middle Fork Koyukuk River. This site is located approximately 2 miles east from the confluence of Minnie Creek with the Middle Fork Koyukuk River.

This site consists of four features, two partial log cabins and two shafts.

The shafts are both at creek level and one is water-filled. Both have undetermined depths due to debris and water. The first measured 2m x 3m while the second measured 4m x 2m with depth measured at 2.5m deep but is debris-filled and is likely deeper.

The first of the structural remains consists of the displaced logs of a cabin. There is no structural definition and no berm to suggest where the cabin was located originally or how it was oriented. One log has a portion of a pipe associated with it, possibly used for pegging. None of the logs were complete. There is a can scatter to the southeast that appears to be associated as well as a portion of a crate.

The second structure is a partially complete cabin though all of the southern wall has been completely bulldozed. The cabin is set on an east-west axis and likely had a gable roof. This structure has two rooms separated by a log wall. The walls measured 17ft 6in along the north wall in the west room and 19ft 4in. in the east room. The east wall in the east room measures 7ft 6in. There is a doorway on the east wall located 5ft from the SE corner. It is possible that there was a window located south of the door. The notching on the wall corners is a mix of dorsal and ventral saddle notching styles with the butts cut to different lengths. There is some peg work between the logs. The southwest corner and much of the south wall has been bulldozed. Most of the damage to the structure appears to have been caused by natural weathering prior to the razing of the southwestern corner though.

Larson Creek

Larson Creek Cabin (WIS-00291)

This site is located at the confluence of Minnie Creek and Larson Creek. Minnie Creek is a tributary to the Middle Fork Koyukuk River. This site is located approximately 1.5 miles east from the confluence of Minnie Creek with the Middle Fork Koyukuk River.

This site consists of three features: a cabin, privy, and associated prospect pit all of which are located within 20m of Larson Creek.

The cabin was originally recorded in 2008. The cabin was complete at the time of the original survey and measured 10ft 8in x 10ft on a north-south axis. The logs are round and slightly ax-hewn on the inner and outer surfaces. The upper and lower surfaces of the logs are unmodified. The notches are square and the crowns are of mixed length, both sawn and axed. They have been chinked with moss. The roof system is gable with double ridgepoles and no purlins. It is shallow sloped and a combination roof of sod over poles covered by corrugated aluminum roofing. The floor system is Anglo-Western and constructed of slightly hewn spruce poles running north-south and tightly laid. There is no subterranean storage. The door is on the north wall and measures 45in tall and 33in wide. There is a porch addition on the north side with a screen door. The addition measures 3ft 5in x 10ft.

There is also a trash scatter associated with the cabin that measures approximately 5m x 3m with materials dating from the early 1950's to the early 1980's.

A privy is located 15m to the northwest. The privy measures 6 ft 6in tall in front and 6ft 2in in the rear with a shed roof. It is 3ft 9in wide and is constructed on a spruce pole frame. It is sided with unfurled 55 gallon fuel cans.

The prospect pit measures 1.5m x 1m and has a depth of 1m. It is located 30m southeast of the cabin.

Hammond River

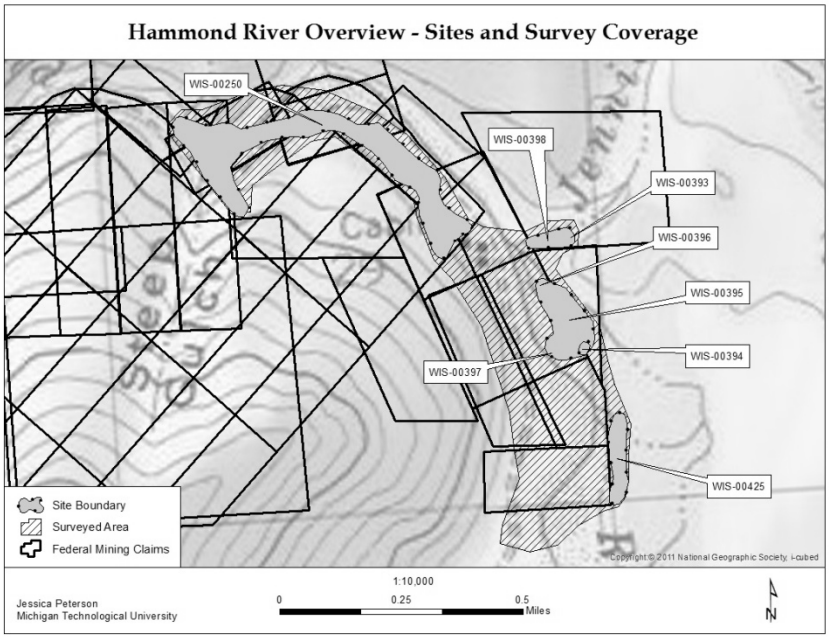

Figure 13: Hammond River and Jennie Creek sites and survey coverage. Data collected in 2012.

Detroit Mining Company Complex (WIS-00250)

This site is located primarily on the southern banks of the Hammond River, a tributary of the Middle Fork of the Koyukuk River. The site is northwest of the Jennie Creek confluence. It is located approximately 1.5mi upriver from where the Dalton Highway crosses the Hammond River.

WIS-00250 is the site of the 1920's and 30's Detroit Mining Company operation. When it was last visited a total of seven features were identified. These were recorded as a 15' x 29' cabin depression with no structural remains; two drift mine shafts, the ruins of a 17' x 43' log cabin, the remains of a 21' x 26' log cabin, the remains of a 18' x 18' log cabin, and a 4' x 5' outhouse.

In 2012 the site was revisited and a total of 53 individual features. Of the structural remains, only one log structure remains. It measured 24' x 20'. Four structures were identified by berms and footprints, one of which was identified as crew barracks. The

barracks footprint measures 45' x 16'. The wooden structure is likely the remains of a privy measuring 4' x 1', a second privy was located and measures 5' x 3'. The other structural footprints measure 15' x 14' and 24' x 18'. One can scatter was identified associated with two of the structures in the center of the site. The structures are scattered throughout the site with two clusters of two structures closely associated. What appears to be the barracks is located north of the majority of the site and generally central to the equipment and shafts.

Additionally in situ equipment was documented including a boiler house, a steam pump, a doghouse boiler and associated reservoir structure, two locomotive boilers, and one small prospecting boiler were located. At the westernmost point of the site a two foot damn was identified at the base of a small drainage into the Hammond River. The equipment was documented in generally the same areas as many of the structures.

Two prospect pits and 29 shafts were also identified. The shafts appear to have collapsed or are currently overgrown with vegetation. None appear over 4m deep and they range in size from 2m x 1m to 10m x 8m. The shafts are all clustered primarily on the north east side of the site distributed between the equipment and structural remains. Only three shaft features are located on the western extent of the site. In this same area the ditch was documented.

The shafts measure: 1.2m x 1.2m with a depth of 0.7m, 1.2m x 1.2m with a depth of 1.5m, 2m x 0.8m with a depth of 0.5m, 2m x 1m with a depth of 0.4m, 2m x 1m with a depth of 0.75m, 2m x 1m with a depth of 1m, 2m x 1m with a depth of 1m, 2m x 1.5m with a depth of 0.6m, 2m x 1m with a depth of 2m, 2m x 1.75m with a depth of 0.4m, 2.4m x 2m with a depth of 1m, 2.45m x 2m with a depth of 1.2m, 2.5m x 1.5m with a depth of 3m, 2.5m x 2m with a depth of 1m, 2.7m x 2.5m with a depth of 2m, 3m x 2m with a depth of 2m, 3m x 2.8m with a depth of 1m, 3.4m x 3.2m with a depth of 0.4m, 3.5m x 2m with a depth of 2m, 3.5m x 3m with a depth of 2m, 3.5m x 3.5m with a depth of 1.5m, 5m x 5m with a depth of 1.5m, 5m x 5m with a depth of 1.7, 5m x 5m with a depth of 2m, 5.5m x 5m with depth of 2.4m, 5m x 8m with a depth of 4m, 6m x 5m with a depth of 4m, 6m x 6m with a depth of 2m, and 10m x 8m with a depth of 4m.

The prospect pits measure: 4m x 4m with a depth of 1m and 4m x 4m with a depth of 2.5m. It is possible that these are also shafts.

Hammond River Mining Shafts (WIS-00394)

This site is located at the confluence of Jennie Creek and Hammond River. The site is approximately 1.5mi upriver from the confluence of the Hammond River and the Middle Fork of the Koyukuk River.

The Hammond River was a major area of historic mining and drilling work. Mining began on the Hammond River in 1900 and continued into the 1930's and included one of the only industrial companies in the Koyukuk region. It was one of the most successfully

mined areas in the Koyukuk. At one point as many as 30 miners were housed on site to mine these claims.

WIS-395 is a large prospecting camp located on the Hammond River just west of the Jennie Creek confluence. This site is a composite of multiple important features which have been assigned AHRS numbers including WIS-00394, WIS-00396, and WIS-00397.

WIS-00394 was originally recorded as a pair of well-preserved prospect shafts with vertical post walls. They measured 2.5m x 2m with an erosion depression of 4-4.5m in diameter. Rerecording these sites, they are no longer in such good shape. Both of the shafts have collapsed inwards and the timbers have fallen into the center of the pits. The first now measures 4m x 4m with a depth of 3m while the second measures 3m x 3m with a depth of 2m. They are located approximately 17m apart on a NNE-SSW alignment.

Hammond River Prospector Camp (WIS-00395)

This site is located at the confluence of Jennie Creek and Hammond River. The site is approximately 1.5miles upriver from the confluence of the Hammond River and the Middle Fork of the Koyukuk River.

WIS-395 is a large prospecting camp located on the Hammond River just west of the Jennie Creek confluence. This site is a composite of multiple features which have been assigned AHRS numbers including WIS-00394, WIS-00396, and WIS-00397. It was last visited in 2008 and at that time 33 features were identified. The primary area of the site, consisting of 30 features, was spread within an area of 110m x 70m. The additional features consisted of the steam boiler churn drill recorded as WIS-396 and located 58m to the NW, a combustion engine churn drill (WIS-397) located 86m to the S, and finally a trail which at the time appeared overgrown. The features identified during the 2008 survey include a domestic log cabin foundation, a machine shop log foundation, a boiler, a pump, several wood piles, four prospect shafts, a tailings pile, a collapsed gin pole, drainage ditches, and associated artifacts. Two components were dated circa 1914-1918 and circa 1938-1942.

This latest survey recorded 24 features. The drainage ditches and trail were not relocated. Additionally two prospect pits were located and six prospect shafts were identified. Two timber piles and a waste rock pile were identified. Four pieces of equipment including an in situ drill collar, a collapsed gin pole wrapped in cable, and an incomplete vertical boiler.

All of the shafts and prospects are located running on a bearing of NW/SE parallel to the Hammond River. The structures are similarly distributed along that same bearing. The structures are located at either end of this line of exploratory excavations. Both structures were ephemeral at the time of the survey, the cabin is located at the northwestern extent of the explorations while the machine shop is located to the southeast. They are approximately 74m apart. Additionally, at the western wall of the machine shop is an A.

S. Cameron steam pump, to the southeast are self-dumping buckets. The steam pump is a single cylinder, 8ft long x 2ft 9in wide, and produced in New York City.

The cabin remains measure 15ft 8in x 19ft 4in. The structure is fairly ephemeral at this point, a more accurate description can be found in Mills and Hedman's 2008 report on the area. The structural elements of this site were in better condition but due to environmental impacts they have deteriorated markedly.

The shafts measure: 2.5m x 2m with a depth of 1m, 2.3m x 2.3m with a depth of 0.65m, 3m x 2m with a depth of 1.5m, 3m x 3m with a depth of 0.7m, 3m x 3m with a depth of 1m, and 7m x 7m with a depth of 2m.

The prospect pits measure: 1.5m x 1m with a depth of 1m and 2m x 1m with a depth of 1m.

Only two of the original wood piles were located. The first within the cluster of shafts and prospects and the second located upslope 100m to the north of the center of the site.

Hammond River Steam Boiler Churn Drill (WIS-00396)

This site is located upcreek of the confluence of Jennie Creek and Hammond River. The site is approximately 1.5mi upriver from the confluence of the Hammond River and the Middle Fork of the Koyukuk River.

This site is a feature within WIS-395. It is comprised of an in situ churn drill used as an assessment tool for subsurface mineral testing. It would be powered by a vertical steam boiler. In 2012 it was revisited and the steam drill and its derrick are in place as is the vertical boiler. The boiler is labeled "Erie City Iron Works, Erie PA". Additionally there is a hoist labeled "Hallidie Mach. Co./ Seattle Wash."

Associated with the churn drill and boiler is a spruce tree nearby with several hooks holding equipment including a link of heavy chain, a pipe with a can fixed to one end, and a large wrench. Nearby are two tool crates with rubber hosing covered in fabric, a toolbox, and a pully-hoist hook.

The tools hanging from the tree include two wrenches measuring 41inches in length and 6 1/2 inches wide at its widest and 1 1/2 inches wide at its thinnest tapering towards the end of the handle. A swivel hook measures 22 inches long while the greatest width of the hook is 6 inches, the swivel measures 15 inches across. A water barrel located near the hoist measures 2 feet wide with a diameter of 21 3/4 inches, and with a height of 33inches.

The hoist is a Hallidie Machine Company model from Seattle Washington. The base measures 28 inches wide by 40 inches long. Each part has an assembly number beginning in A followed by 2-3 digits.

The drill is 4.5 feet from the hoist at 195.5 degrees. The base measures 21ft 9in x 39in. A plaque reads "Stetson Ross Machine Works/ Trademark/ Shop NO.____/Seattle Washington".

Hammond River Combustion Engine Churn Drill (WIS-00397)

This site is located at the confluence of Jennie Creek and Hammond River. The site is approximately 1.5mi upriver from the confluence of the Hammond River and the Middle Fork of the Koyukuk River.

This site is a feature within WIS-395, a large multi-component site related to historic mining on the Hammond River and Jennie Creek confluence.

This site was originally located in 2008. The primary feature is a combustion engine churn drill. This survey's revisit suggests that the drill is still in excellent condition and does not appear to have been tampered with. It is in the vicinity of a second gas powered drill complete with drill frame in a wide open and relatively flat area along the Hammond River.

This site consists of one piece of equipment, a gas powered churn drill labeled with the name "S.A.E. Mining Co. Bettles, Koyukuk" which has not yet been identified. The drill is complete with drill frame. Rope and cable are located on spools within the mechanism. The engine currently present in the drill is a LeRoi gas engine though there is evidence that it replaced an earlier engine. This feature is located at the southern extent of the site on the banks of the Hammond River.

The drill frame is approximately 26 feet tall. The base measures 15ft 8in x 6ft 6in. The rotor is 3ft 5in in diameter and 3 1/4 inches thick. Associated artifacts include a tapered wrench that measures 3ft 11in x 1ft 1/2inches with a tapered handle measuring 1 1/2 inches. The siding reads "C Kirk Hillman Co. Seattle WN". There are small buckets containing nails, nuts, bolts, and washers. A large drill bit was also located. An associated scatter is 5m away on a bearing of 338 degrees. It includes a funnel, a bucket, a crate, a screw jack, a shovel head, and a miscellaneous collection of washers, pipe parts, screws, nuts and bolts inside a crate. A second wrench was located near the northern side of the drill frame with measurements matching the first wrench.

Cabin remains on the Hammond River (WIS-00425)

This site is located approximately 1mi. north of the Hammond River confluence with the Middle Fork of the Koyukuk River and less than a tenth of a mile upslope to the east of the Hammond River.

At the north end of this site are the bermed remains of a 16ft x 17ft 6in ephemeral cabin. Associated with the cabin is a scatter of old cans and several artifacts including a

modified stove guard manufactured from a can, and a 5 gallon fuel can with a manufactured lid constructed of triangular pieces of wood.

Within the vicinity of the cabin to the north and the south running parallel to the Hammond River are five shafts in varying degrees of preservation. Two of these shafts are collapsed and measure 3m x 3m with a depth of 1.6m and 2m. These two are located closest to the cabin and are within a few meters of it. The other three shafts are located towards the southern extent of the site boundary. One of them is rock lined on the southwest wall, is square cut, and measures 3m x 3m with a depth of 1.5m. The final two shafts are in relatively good condition and measure 2m x 2m with a depth of 2m and 3m x 2.5m with a depth of 2m.

Jennie Creek

Jennie Creek Prospector Camp (WIS-00393)

This site is located upcreek of the confluence of Jennie Creek and Hammond River. The site is approximately 1.5mi upriver from the confluence of the Hammond River and the Middle Fork of the Koyukuk River.

The Jennie Creek Prospect Camp appears to be a fairly early representation of historic mining in the area. It was originally recorded in 2008. Three features were documented in the original survey including a flattened area suggestive of a tent pad measuring 10' x 14' that has been dug into the hillside by about 20cm. The second feature is likely representative of an outhouse and measures 1.5m in diameter and is 40cm deep. The third feature is an associated can scatter, which measures 3.5m x 1.5m.

Several of the cans located at the site in 2008 were assigned production dates that suggest an approximate habitation period around 1914. A more in depth discussion of these cans appears in Mills and Hedman's 2008 report "Upper Middle Fork of the Koyukuk River Drainage Class III Pedestrian Surveys, May-June 2008". A combination of can type and can lithography produced a date range from 1906-1914. The latter date corresponds to a period of heightened interest in the area from 1911 through 1915.

This site was revisited and recorded during this survey to correct the original GPS point coordinates. It appears to have suffered little in the way of disturbance beyond squirrel excavations.

Worked Ground on Jennie Creek (WIS-00398)

This site is located at the confluence of Jennie Creek and Hammond River. The site is approximately 1.5mi upriver from the confluence of the Hammond River and the Middle Fork of the Koyukuk River.

This site is an area of prospected ground associated with nearby prospecting camps, specifically a small prospecting camp located on Jennie Creek (WIS-00393). It is located on a bench measuring 43m x 15m. Mills and Hedman suggest that this bench is part of the old channel, an area which would have been prospected for sorted placers. They also noted a hand dug trench or channel that runs parallel to the tailings pile.

The primary feature of this site is a tailings pile located approximately 100m west of WIS-00393 and measures 20m x 6.5m x 2m high. No other artifacts were located at this site though the original site recordation suggests that both domestic and work-related objects were located. The artifacts were identified as a Hills Bros. coffee can dating to 1906-1914, a pipe likely associated with water transportation or distribution, a frying pan, and a number of other artifacts including a stovepipe safety. It is possible that the site's vegetation has overgrown them since the 2008 survey or that seasonal changes or runoff have disrupted the site.

Tramway Bar

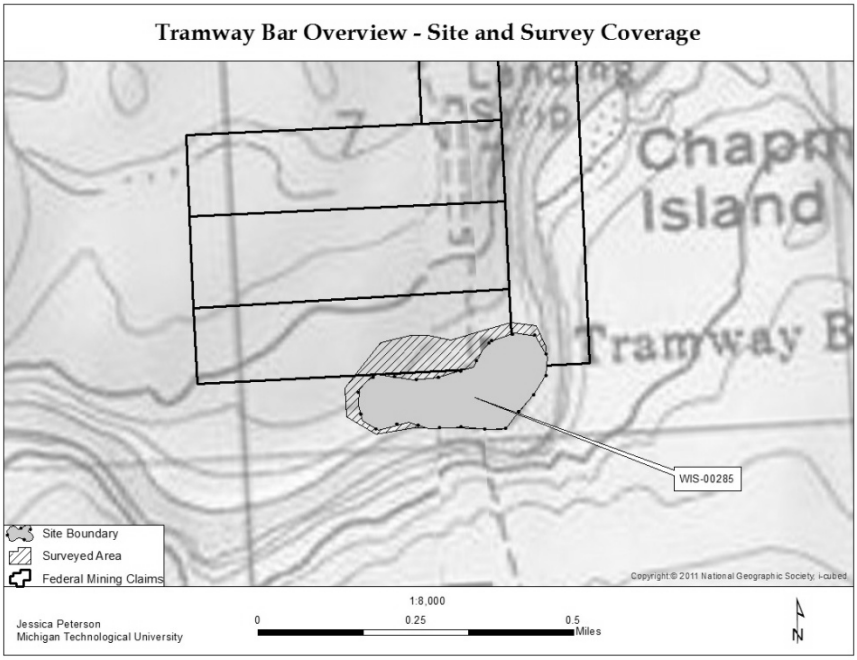

Figure 14: Gold Creek sites and survey coverage. Data collected in 2012.

Tramway Bar Mining Location (WIS-00285)

Tramway Bar is located on the northern banks of the Middle Fork Koyukuk River southwest of Chapman Creek on the east bank and just south of Chapman Island. It is within the James Dalton Highway Corridor.

In 2012 a total of 25 features were recorded including 9 structures and their associated trash scatters, a great deal of equipment including the remains of a sawmill, two privies,

multiple backfilled pits one of which appears to be the remains of a septic tank, and over 24 55-gallon fuel drums.
Between the 2006 survey and the 2012 survey a total of four of the structural features merited detailed recording. These structures included two log cabins (features 1 and 3 from 2006), a log cache (feature 2 from 2006), and a workshop (feature 2a in 2012). Additional structures include a meat drying storage shed, two privies, a lean to that has collapsed, a chicken coop, and two sheds.

Feature 1 is a cabin recorded in 2006 that measures 5ft 1in x 5ft 3in. It is constructed of sawn white spruce logs with three sides sawn flat. There is no notching, the notch is the corner. The logs are chinked with fiberglass and there is no siding. The roof is gable with a single log ridgepole. The gable is oriented east-west. The roofing has been redone with corrugated metal over a plywood and spruce pole frame. The entrance is on the west wall. The door to the cabin has been barred and the interior could not be observed. Feature 1 is located 12ft south of the workshop (feature 2a) and approximately 31 feet south of the elevated cache (feature 2b).

Feature 3 is a cabin recorded in 2006 that measures 15ft x 17ft 7in. It is constructed of round, peeled, white spruce logs that have been notched with the dorsal saddle style. The crowns have been sawn to the same length. The logs are chinked with fiberglass with an interior siding of plywood. It is bermed on three sides. The building is on a north-south bearing. The roof is a gable style with a single ridgepole and one pair of purlins. The roof system is constructed of spruce pole rafters with fiberglass and plywood between the rafters and the roof. There is plastic on the inner surface of the ceiling while the outer surface is corrugated metal. The door is on the south wall. The cabin is located 30m from the feature 1 cabin and approximately 13 meters northeast of the meat drying structure.

The log cache was recorded as feature 2 in 2006 and as feature 2b in 20012. It measures 8ft x 8ft 5in. The cache is constructed of unmodified white spruce logs. The crowns are both sawn and axed. The cache is elevated on a mix of 55 gallon drums and wooden posts. The roof is gable style with a double ridgepole system with two pairs of purlins that has been reroofed with flat metal over boards.

The workshop was originally 12ft x 25ft but has additions on multiple sides giving it the overall dimensions of 19ft wide x 39ft long. It is a two story structure with a garage addition that measures 7ft. The roof of the main building and both additions is shed style. It is constructed of board planks on the first floor and plywood on the second floor. On the east wall there is an addition that is constructed from unfurled 55 gallon drums while on the north wall the addition is constructed of canvas and screening. Both additions have wooden frames. Electrical wiring is present.

In addition to these four structures are a small chicken coop located at the northern extent of the site and a meat drying storage shed at the southern extent of the site. Both structures are built on dimensional lumber frames and covered in either mesh or chicken wire. The meat storage structure has a roof constructed of unfurled fuel cans while the

chicken coop is a mixture of corrugated and flat metal sheeting. The two privies are wooden framed structures. The first was constructed of milled boards with a canvas doorway. There are vertical spruce slats around the frame. The second privy is constructed of a spruce pole frame covered in corrugated sheet metal. It is partially collapsed.

While the original structure of the sawmill is no longer visible but the equipment associated with it is in situ. The wooden table holding a large 3ft diameter blade has collapsed. Northwest of it is a dumpster bin with assorted machinery and parts, empty plastic buckets and fuel cans. To the southwest is a stack of 11 riffles and several nugget trap sheets. An aluminum truck wheel is located to the southeast near the river. Nearby is an area of heavy machinery including a bulldozer and loader, a pair of float plane pontoons that have been converted into a boat that measures 14ft 2in x 7ft 6in, assorted rubber piping, and fuel drums.

A sledge is also located in this area. The runners are constructed of shaped iron while large spruce pole beams serve as vertical tie-ons. The sledge frame is constructed of very heavy spruce timbers.

Additional equipment on the site include three compressor oxygen tanks, a sorting plate, two modified rocker boxes constructed from 55 gallon barrels, riffles, and a 59in diameter tractor tire. A total of 24 55-gallon fuel drums were counted on site.

Two additional features were documented. These are located at the eastern extent and center of the site. On the eastern end is a large pit that has been partially backfilled with bottles, cans, and assorted trash including several fuel cans. The original overburden is located north of the pit and by its size the pit must be fairly deep. It measures 7m x 7m with an observable depth of 4m. The second feature is likely a septic tank that has been partially backfilled with corrugated steel, timbers, and buckets. Both appear potentially dangerous.

Linda Creek

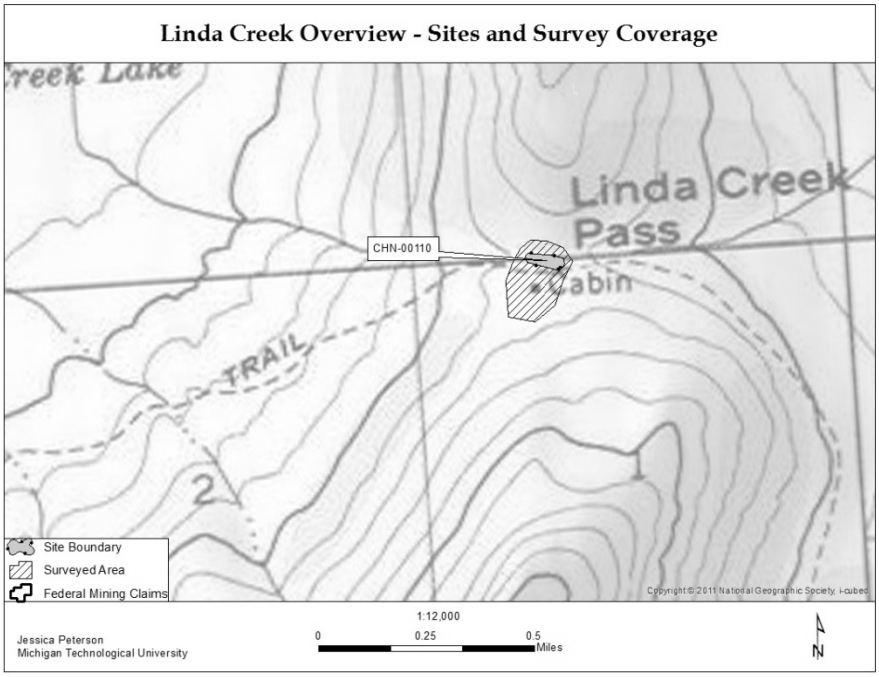

Figure 15: Gold Creek sites and survey coverage. Data collected in 2012.

Linda Creek Cabin (CHN-00110)

This site is located at in Linda Creek Pass at an elevation of 800ft between sections of Linda Creek and within sight of a small pond. It is also positioned on a USGS-identified Winter Trail that runs 5.2 miles from the Dalton Highway east along the Linda Creek Pass to the site and continues on for several more miles.

This site is located along the Linda Creek Pass Trail in an area associated with turn of the century mining in the Koyukuk Mining District. This site consists of the remains of a cabin structure and its associated trash scatter along with some modern materials. There are several cans in the trash scatter that indicate pre-World War II habitation. It has also been identified as a cabin used by Ross Brockman during the 1950's.

The cabin is a gable style log structure that measures 13ft x 13ft and sits on a NE/SW orientation with the ridgepole running NE/SW. It was constructed of white spruce cords and internally hewn. The wall corner notching is double saddle style and the log crowns have been cut to the same length. The roof has completely collapsed but appears to have been sod based on the vegetation currently growing inside the cabin. The floor is obscured by vegetation and by structural elements and thus the construction style could not be determined. A single window is present and was commercially manufactured 3 over 3 pane style with 10in x 12in panes.

The trash scatter is located 5m downslope to the SE, has a diameter of 5m x 5m, and consists of roughly 50 cans. There are solder dot cans with lapped and crimped sides. There is a Calumet brand baking powder can with a lug lid, a Hills Bros. can that dates from 1939-1942, additionally there are skeletal remains from a caribou; portions of long bone and maxilla.

South Fork Koyukuk River Sites:

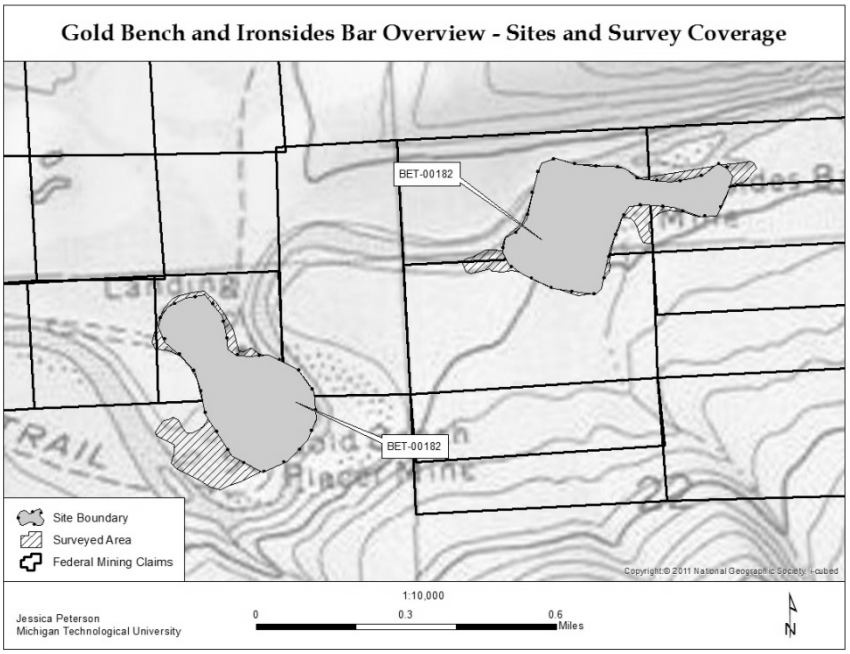

Figure 16: South Fork Koyukuk River sites and survey coverage. Data collected in 2012.

Gold Bench

Gold Bench Mining Location (BET-00181)

Gold Bench is located on the South Fork of the Koyukuk River. It is between the confluences of Chapman Creek and John R. Creek with the South Fork and approximately half a mile southwest of Ironside Bar. It is approximately 1.5 miles east of John R. Creek. The Gold Bench airstrip is labeled on USGS quad maps.

In 1901, Gold Bench, the most successful early placer location on the South Fork Koyukuk River, contributed $85,500 in an economic estimate from the district, the results of an operation using shovel and sluice methods. The richest gold was located on a quarter mile stretch of land that was 150-200ft wide. A total of 100 acres was mined in the early 1900's. The environment was particularly suited to sluice methods because much of the gold was either located in gravels or had settled just above a "false bed rock" or in a thick sand layer. Water was brought in from a tributary of the South Fork. By

1925 there were only three men at Gold Bench but operations continued at this location until the 1960's.

This site consists of a wide range of features including boulder heaps, equipment scatters, several structures, two prospect pits, a shaft, tailings, multiple trash scatters, and evidence of bulldozer work.

There are two boulder heaps present on site, both of which are located on the southeastern edge of the site near the west bank of the South Fork Koyukuk River. The larger of the two consists of over 100 boulders some of which have red lichen growth indicating that they are potentially from the turn of the century period of mining. The boulders are large and rounded and the pile measures 15m x 15m with a height of 10m. The second boulder pile is smaller and consists of approximately 50 boulders. There is trash interspersed. The second pile measures 10m x 10m with a height of 1m.

Eight equipment scatters were located on site. Two wash ponds lined in plastic were located on the western edge of the site. They measure approximately 5.5m x 6m. The plastic is worn in several areas but covers a small berm that marks the edges of the ponds. On the far eastern edge of the site there is a collection of engine block pieces and chains in an area that appears to have been worked over. The materials appear to have been bulldozed forming a scatter that measures 5m x 2m. A dozer blade is located centrally. The measurements for the blade were taken in metric: 4m long with a width of 1.5m. A piece of machinery tread was located at the northern extent of the site. A vertical piece of pvc pipe, possibly a collar, is situated in the southeast of the site near the South Fork. It is open for approximately 2m but is water-filled below this. Near the airfield, at the center of the site there is a scatter of piping that has been bulldozed over, the scatter at this location measures approximately 15m x 15m. Two additional pieces of equipment were identified. The first is a skiff constructed of wooden beams that have been roped together, it measures 10m x 4m with a height of 0.2m. The second is a sledge that measures 4m x 2.5m with a height of 0.2m.

A total of nine structures, one structural footprint, and one possible cold storage cellar were documented. The structures are primarily located in a fairly broad area on the southern half of the site in an area 120m x 160m.

060512-01a and 060512-01b are both cabins located approximately 65m apart near the southeastern extent of the site. 1a is 13ft x 13ft with no complete walls with a possible gable style roof on an east-west axis. The walls are constructed of white spruce logs. The cabin has almost completely collapsed and there is a large amount of debris obscuring the structure's interior. Associated with the site are a stove (A Wilbur and Sons, Fairbanks number 9), piping, a washbasin, and a can scatter including 5 gallon cans with soldered straps and threaded 2in spouts. There is also hydraulic piping near the north side of the cabin and a segment of rail, possibly from a tram line. 01b is a standing structure measuring 27ft x 13ft 6in. It has a gable roof constructed of corrugated metal with ventilation openings on the gable ends. The interior ceiling is double fiberboard. It is a

one room structure with three beds complete with mattresses. There is also a stove with a hinged top inside.

060512-01e is a structure mounted on skids that measures 35ft 3in x 16ft with an addition that measures 14ft 7in x 8ft 3in. The structure's floor is made up of ship lapped board with a layer of tar paper over it and in some places the floor is tiled. The height of the structure is approximately 7ft 5in. Several walls have fallen. Associated with the structure are cables and wire, a transformer, a can scatter with a mixture of matchstick fill, lap, and crimp seam construction. Additionally there is an ironing board and a steel hunting broadhead on site.

The collapsed cold storage is reinforced with wood timbers on two sides measuring 44 inches in height. It measures 59 inches from front to back. Its roof is constructed of repurposed barrel tops.

There are two prospect pits on site, the smaller of which measures 1m x 1m while the larger measures 10m x 10m. The smaller is water-filled while the larger, potentially a shaft, is covered by debris and couldn't be measured. The ground around the larger pit felt hollow.

Two tailings piles were documented at Gold Bench. They are both located on the eastern half of the site towards the center. The larger pile measures 60m long x 14m wide with an approximate height of 2m. The smaller pile measures 15m long x 15m wide with a height of 8m.

There are several material scatters on site. Two of these are mechanical in nature while the third is primarily a can scatter. The largest scatter measures 10m x 5m and includes a corroded vehicle battery. An additional mechanical scatter includes scrap, gears, cams, crushed barrels, and piping. It measures 5m x 8m. The can scatter measures 7ft in diameter.

Additionally there is evidence of likely bulldozer work at the northern extent of the site visible during aerial survey.

Ironside Bar

Ironside Bar Mining Location (BET-00182)

Ironsides Bar is located on the South Fork of the Koyukuk River. It is between the confluences of Chapman Creek and John R. Creek with the South Fork and approximately half a mile northeast of Gold Bench.

The original AHRS report reads as follows:
"An area of approx 40 acres characterized by a collection of tailings piles, ponds, and disturbed ground in the vicinity of the outlet of Ironsides Creek. Currently there are no

historic structures or structural remnants identifiable. Artifacts are limited to a concentration 1920s-30s churn drill parts and miscellaneous fragmentary equipment pieces and a small secondary dump of mid to late 20th century machinery parts and miscellaneous metal trash/debris located on the terrace above the river to the W of the bar. The collection of churn drill parts does not represent a complete disassembled frill. Rather, there are four wheels, a few miscellaneous moving parts and a possible length of derrick embedded within the brush. Terrain features related to mid-20th century mining include several large waste rock piles and scoured channels resulting from hydraulic mining methods. The only remnants of earlier mining activity are in the form of a few small mounds of prospect waste located upstream of the bar. Remnants of a relatively short ditch on the hillside above the mine lead from the W into Ironsides Creek and would have provided additional water to the creek for use in hydraulic mining and washing of the pay gravel. The ditch, visible due to a linear concentration of lush vegetation growth, may have been constructed between 1910 and 1930. A low, slow aerial reconnaissance of the ditch feature failed to identify any obvious water control features and the ditch is generally blown out and eroded at both ends. Ironsides Creek is fairly incised as one would expect of a tundra stream that has been augmented by ditch water and periodically dammed to hold water. These features result from prospecting and mining at the site between the years 1900 and perhaps 1960. Methods range from hand mining and ground sluicing, to hydraulic mining and bulldozer and dragline operations. At the present time there is a relatively large mine camp on the upstream side of the site and partially within the presently defined site area" (Chuck Adkins, 2003).

The 2012 survey recorded 26 features primarily related to equipment or the large number of fuel drums located around the site. Evidence of earlier mining activity was also visible in several boulder heaps and old tailings that exhibit moss, lichen, and tree growth. There is also possible evidence of hydraulic activity or a wash area.

Four equipment scatters were documented including a nearly complete scatter of a Keystone drill which was likely brought in by the Detroit Mining Company and utilized by Jim Kelly and Ike Spinks in the 1920's. An associated scatter nearby included wheels and gears, as well as a small pump and a brass impeller. Additionally there are portions of a drill frame located close by with a collection of equipment including a shower drain, an axel and leaf spring suspension and chassis from a small 1920's vehicle. One final scatter may also include the remains of a workshop but structural remains are ephemeral The outline of the wood suggests a structure that measured approximately 4m wide with a length of approximately 5m.

The equipment scatters are all located within a diameter of 100m at the southwestern extent of the site.

There are three boulder heaps all of which are 50-100 boulders each of fairly large size. These are all located on the eastern side of the site. There are no associated pits or areas of apparent excavation. This may be due to later hydraulic work.

While the ground across the entirety of the site appears to have been worked there is one area specifically that shows signs of erosion potentially linked with hydraulicking. This features is located near several water features. It is east of the equipment scatters and west of the boulder piles. The diameter of the area is likely in the range of 150m-200m wide. The water feature is approximately 35m northeast of the disturbed ground. It appears to be the remains of a wash plant. It measures 4m x 10m with a berm that measures 40cm. Located just to the south there are the associated remains of piping and water distributors.

There are two piles of waste rock on site. The larger of the two measures 25m wide with a height of 20m and a total length of 100m. It is located mid site towards the northern extent of the boundary. The second is smaller and located on the eastern end of the site boundary. It measures 15m wide with a length of 19m and a height of 12m.

There is also one possible ditch or water transportation system on site that is either heavily eroded or simply a natural drainage system. There are no clear edges and heavy vegetation in and around the feature make it difficult to distinguish from a natural water drainage. At its greatest measurement it was 10m wide.

There are a total of 56 55-gallon fuel drums on site,. The size of the drum collections varies from 1 drum to as many as 15 in one location. At the western extent amidst the equipment scatters is a collection of 15 drums while the second largest collection is on the eastern extent of the site near modern workings. The total at the collection located at the eastern extent is 12 drums. One drum located in the collection of 15 is oozing a thick black fluid out one side hole and a lighter brown fluid out the other.

Prospect Creek

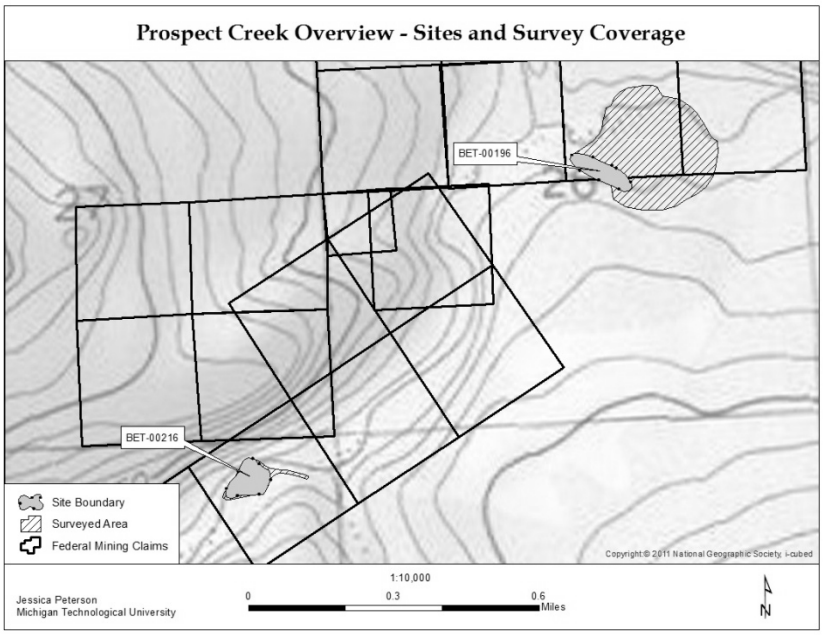

Figure 17: Prospect Creek sites and survey coverage. Data collected in 2012.

Worked Ground on Prospect Creek (BET-00196)

This site is located on the southern bank of Prospect Creek, a tributary of the South Fork Koyukuk River. It is located approximately 7 miles east from the confluence of Prospect Creek and the South Fork.

A USGS survey of Prospect Creek located gold in its gravels as early as 1909. There are few reports on this creek suggesting that it did not pay well or that it was not heavily mined.

BET-00196 is an area of potentially worked ground. The remains of what appear to be a ditch are visible but ephemeral in areas. A small pit was also located but was heavily overgrown by moss.

The ditch is located at the northwestern extent of the site and runs on a bearing of 192 degrees and is clear at several points. It had a measurable length of 19m. The width of the ditch ranged from 0.6m to 1m with an overall depth no greater than 0.5m.

The pit measures 1m x 1m with a depth of 0.3m. The pit is located at the southeastern extent of the site.

Approximately 35m northwest of the pit is a claim marker. The original is a 4in x 4in piece of milled lumber on rebar. There is a newer 4in x 4in block added to the marker as well.

Prospect Creek Mining Location (BET-00216)

This site is located on the southern bank of Prospect Creek, a tributary of the South Fork Koyukuk River. It is located approximately 6 miles east of its confluence with the South Fork and 3 miles directly southeast of an airstrip identified on USGS quad maps as "Prospect Airport".

This site is comprised of fourteen features including shafts, pits, trenches, and the remains of a single structure.

There are a total of nine prospect pits. They measure 5m x 4m with a depth of 2m, 4.5m x 3m and water-filled, 4m x 4m with a depth of 2m, 3m x 3m and water-filled, 3m x 2m and water-filled, 3m x 1.5m and water-filled, 2m x 2m with a depth of 2m, 1.5m x 1.5m with a depth of 2.5, and 1.5m x 1.5m and water-filled. These pits are scattered across the site in no discernible pattern.

Two shafts are present with dimensions of 4m x 4m and 3m x 3m. The depth could not be approximated due to collapse and the presence of water. Both shafts are located on the western half of the site and each is located approximately 30 meters from the south eastern bank of Prospect Creek.

There are the remains of a structure located at the eastern extent of the site. This feature consists of structural elements including milled lumber measuring 4in x 4in x 10ft. Additionally there are scattered fragments of double paned glass present. The remains are strewn across a 10m square area at the edge of an access road.

There are two trench excavations located centrally within the site boundary and near the northern and southern extents. The northern excavation is 10m long with a width of 2.5m and a depth of 1.5m The southern trench measures 3m in length with a width of 2m and a depth of 4.

Notes

[1] H.W. Brands, *The Age of Gold: The California Gold Rush and the New American Dream* (New York: Anchor Books, 2003), 70.

[2] Stephen Haycox, *Alaska: An American Colony* (Seattle: University of Washington Press, 2006), 175-179, 187-190, and 239-243.

[3] Ibid., 164. Robert Athearn, *The Mythic West in Twentieth Century America* (Lawrence: University of Kansas Press, 1986), 10-12. Jacques Barzun, *From Dawn to Decadence* (New York: Harper Collins Publishers, 2000), 468. Howard Zinn, *People's History of the United States* (New York: Harper Collins Publishers, 2003), 238.

[4] Ray Allen Billington and Martin Ridge, *Westward Expansion, a History of the American Frontier* (Albuquerque: University of New Mexico Press, 2001), 259-265.

[5] Michael C. Brown, "Navigability" State of Alaska (Alaska Bureau of Land Management, 1982). U.S Bureau of Outdoor Recreation brochure, 1970's: John Bremner and Peter Johnson were in the Koyukuk in 1887 and found gold at Tramway Bar. A prospector on Myrtle Creek, Knute Ellingson, is also credited with the first location of substantial paydirt in 1899. Paul Solka. *Jessen's Weekly*. 3/14/47. Johnnie Folger and his partners mined Chapman Creek as early as 1891 finding paydirt in 1893.

[6] 'Outside' was a common term that referred to the contiguous United States by miners and frontiersman. It is a term is still used by modern Alaskans today.

[7] William E. Brown, *Gaunt Beauty; Tenuous Life. Historic Resources Study: Gates of the Arctic National Park and Preserve* (National Park Service, 1988), 167-181. The diary entries of Charlie Miller, a green prospector from New York, illustrate the experiences of an 1898-1899 Koyukuk gold rush miner.

[8] President Wilson stated that "Alaska, as a storehouse, should be unlocked. One key to it is a system of railroads. These the Government should itself build and administer, and the ports and terminals it should itself control in the interest of all who wish to use them for the service and development of the country and its people." James Wickersham, *Old Yukon: Tales, Trails, and Trials* (Washington, D.C.: Washington Law Book Co, 1938), 469.

[9] Brown, *Gaunt Beauty, Tenuous Life,* 1988, 66-92 and 146-156.

[10] The Abandoned Mine Land Program is now a part of the broader American Recovery and Reinvestment Act (ARRA) of 2009 which contributed $46.7 million dollars to the process of remediation of abandoned mines and wells on public lands. BLM/WO/GI-11/002-1800. (Washington, D.C.: Bureau of Land Management, 2011), 760-315/42117 Region No. 8.

[11] Abandoned Mine Land Program Policy Handbook: BLM Handbook H-3720-1 (Washington, D.C.: Bureau of Land Management, 2007).

[12] Some argue that the two rushes occurred in 1902 and 1907. For another interpretation see Becky M. Saleeby, *The Quest for Gold; An Overview of the National Park Service Cultural Resources Mining Inventory and Monitoring Program (CRMIM)* (Anchorage, Alaska: U.S. Department of the Interior, National Park Service, 2000), 239.

[13] Geoffrey T. Bleakley, *A History of the Chisana Mining District, Alaska, 1890-1990* (Anchorage Alaska: Department of the Interior National Park Service, 2007). Safford, Jeffrey J. *The Mechanics of Optimism: Mining Companies Technology, and the Hot Spring Gold Rush, Montana Territory, 1864-1868* (Boulder: University Press of Colorado, 2004).

[14] According to many recordings of river navigability from the region, seasons are defined by the flow of water: spring is essentially a two week long period in May when icepack breaks and flows downstream ("breakup") while fall consists of rapid freeze in October. Similar seasonal transitions are common throughout Alaska and it is commonly suggested that there are only two seasons: summer and winter, the latter of which is disproportionately drawn out.

[15] Susan Will, *Coldfoot An Historic Mining Community on the Middle Fork of the Koyukuk River, Alaska* (Fairbanks, Alaska: Yukon Resource Area, Bureau of Land Management, 1981), 6-7.

[16] Alfred H. Brooks et. al., "Report on Progress of Investigations of Mineral Resources of Alaska in 1905", *Bulletin No. 284*, (Washington: U.S. Government Printing Press, 1906), 109-127.

[17] Throughout this thesis, unless stated otherwise 'the district' will refer to the Koyukuk Mining District as a single district that includes both the Bettles and Wiseman subdistricts.

[18] Irving Reed, "Report on a Reconnaissance of Upper Koyukuk Region Alaska" (Alaska: Alaska Department of Mines, 1938).

[19] H.M. Beikman, *Geologic Map of Alaska* (Reston, VA: U.S. Geological Survey, 1980).

[20] Edward Cobb, *"Placer Deposits of Alaska: An Inventory of the Placer Mines and Prospects of Alaska, Their History and Geological Setting*". USGS *Bulletin 1374. (*Washington: U.S. Government Printing Office, 1973), 155.

[21] Irving, "Report on a Reconnaissance of Upper Koyukuk Region Alaska", 4-6.

[22] Cobb; *"Placer Deposits of Alaska"*, 158. Joseph Kurtak, et al., "Mineral Investigations of the Koyukuk Mining District, Northern Alaska" (Anchorage, Alaska: U.S. Department of the Interior, Bureau of Land Management, Alaska State Office), 1999 is one of the latest and most thorough documents on this region.

[23] Kurtak, "Mineral Investigations of the Koyukuk Mining District, Northern Alaska". 3.

[24] S. F., Emmons, C. W. Hayes. "Contributions to Economic Geology 1902" *Bulletin No. 213*. (Washington: U.S. Government Printing Office, 1903), 44.

[25] Reed, "Report on a Reconnaissance of Upper Koyukuk Region Alaska", 7-8.

[26] Robert Marshall, *Arctic Village* (Fairbanks, Alaska: University of Alaska Press. 1993), 29. For more information on the protohistoric cultures present in the Koyukuk see Annette McFadyen Clark's *Koyukuk River Culture*, 1974.

[27] Ernest S. Burch, Jr., "Borders and Boundaries in Early Contact North-Central Alaska" *Arctic Anthropology* 35 (2) (Madison, Wisconsin: 1998), 32.

[28] Kutchin is a linguistic derivative of the name 'Gwich'in' which translates to "people of". 'Kutchin' is a term used to indicate a regional social geography that is much broader than the traditional term 'Gwich'in" which would have been used to refer to a specific geographically located band or group. In many cases there is no all-encompassing name for linguistic or cultural groups, thus new, less-specific terms were created for ease of discussion. It should also be noted that while both the Koyukon and Kutchin spoke Athabaskan languages that they were socially very distinct due to ongoing tensions between the two populations. Burch explains these distinctions in a great deal more detail than I have done here.

[29] Burch, "Boundaries and Borders in North-Central Alaska", 37.

[30] Clarence C. Hulley, *Alaska 1741-1953* (Portland, Oregon: Binfords & Mort, 1953), 156.

[31] Hubert Howe Bancroft, *History of Alaska 1730-1885* (Forgotten Books, 2012).

[32] Claus-M. Naske, Herman E. Slotnick. *Alaska a History* (Norman, University of Oklahoma Press, 2011), 76-87.

[33] Hulley, *Alaska, 1741-1953,* 183-184.

[34] Naske. *Alaska*, 93. William H Goetzman, *When the Eagle Screamed: the Romantic Horizon in American Expansionism, 1800-1860* (Norman: University of Oklahoma Press, 2000), 75.

[35] Also called "Walrussia". Hulley, *Alaska 1741-1953,* 202.

[36] Ernest Gruening, *The State of Alaska* (New York: Random House, 1954), 43-70 and 139-153. Territorial status allowed an elected delegate to speak in Congress but did not give this representative the privilege of voting on issues.

[37] Ibid., 104.

[38] Brown, *The History of the Central Brooks Range,* 36. After completing his mission along the Copper and Tanana river drainages Allen heard word of gold in the Koyukuk, an area that had not been previously well mapped. This mapping expedition has been compared to that of Lewis and Clark in both extent and endurance.

[39] Ibid., 38-40.

[40] Bender, whose family was of German descent, was a part of the Little Rockies Rush in Montana and ran a supply wagon for the Union Pacific Railroad prior to traveling to the Fortymile River in 1887. John Bremner and Pete Johnson were the former partners of Lt. Allen

who made the original geographic survey of the Koyukuk Region in 1885. Brown, *Gaunt Beauty Tenuous Life*, 147. Alfred Mayo was an interior fur trader on the Yukon River. Will, *Coldfoot,* 12.

[41] Dirk Tordoff, *People of the Koyukuk Region*. (Fairbanks, Alaska: University of Alaska Fairbanks Project Jukebox, 1999), 10.

[42] Hully, *Alaska 1741-1953,* 283.

[43] Gordon Bettles actually helped perpetuate the circulation of prospecting news with the establishment of the *Yukon Press* in 1894 which ran news regarding the Yukon River region and included updates on prospecting in the Koyukuk. While he certainly had a vested interest in the success of the region he also warned of the circumstances required to make money in the Koyukuk which typically included wintering in the region. Brown, *The History of the Central Brooks Range,* 62-63.

[44] Brown, *Gaunt Beauty Tenuous Life,* 162.

[45]Marshall, *Arcitc Village,* 187-197; James Wickersham, *Old Yukon: Tales, Trails, and Trials* (Washington, D.C.: Washington Law Book Co, 1938), 126-130.

[46] Tordoff, *People of the Koyukuk Region*, 10.

[47] Including Alaska Road Commission maps until 1909 and regional guide maps of the Koyukuk River. Brown, *Gaunt Beauty Tenuous Life,* 182-183.

[48] Evey Ruskin, "Letters to Lizzie, A Koyukuk Gold Seeker Writes Home". *The Alaska Journal.* (Juneau, Alaska: Northwest Publishing Company, 1986), 123.

[49] Ibid., 163.

[50] Hulley, *Alaska, 1741-1953,* 283. Will, *Coldfoot,* 21-22.

[51] Wills, *Coldfoot*, 18.

[52]Marshall, *Arctic Village*, 39.

[53] A.H. Brooks, "Placer gold mining in Alaska in 1902", in Emmons, S.F. and Hayes, C.W., *Contributions to Economic Geology*, 1902: U.S. Geological Survey Bulletin 213. (Washington: U.S. Government Printing Office 1902), 46.

[54] A.H. Brooks, "Placer mining in Alaska in 1903", in U.S. Geological Survey, Contributions to Economic Geology, 1903: U.S. Geological Survey Bulletin 225 (Washington: U.S. Government Printing Office, 1904), 58.

[55] A.H. Brooks, "The mining industry [in Alaska] in 1905", in U.S. Geological Survey, Report on progress of investigations of mineral resources of Alaska in 1905: U.S. Geological Survey Bulletin 284 (Washington: U.S. Government Printing Office, 1906), 127.

[56] A.H. Brooks, "The mining industry in 1907", in U.S. Geological Survey, Mineral resources of Alaska, report on progress of investigations in 1907: U.S. Geological Survey Bulletin 345 (Washington: U.S. Government Printing Office, 1908), 45-46.

[57] A.G. Maddren, "Gold placer mining developments in the Innoko-Iditarod region, in U.S." Geological Survey, Mineral resources of Alaska, report on progress of investigations in 1910: U.S. Geological Survey Bulletin 480 (Washington: U.S. Government Printing Office, 1911), 290.

[58] Ibid., 288-293.

[59] A.H. Brooks, "The mining industry in 1912", in U.S. Geological Survey, Mineral resources of Alaska, report on progress of investigations in 1912: U.S. Geological Survey Bulletin 542 (Washington: U.S. Government Printing Office, 1913), 38.

[60] A.G. Maddren, "The Koyukuk-Chandalar region, Alaska", U.S. Geological Survey Bulletin 532 (Washington: U.S. Government Printing Office, 1913), 29.

[61] Brooks, U.S. Geological Survey Bulletin 542, 41.

[62] S.S. Smith, "The mining industry in the Territory of Alaska during the calendar year 1915", U.S. Bureau of Mines, Bulletin 142 (Washington: U.S. Government Printing Office, 1915), 25.

[63] A.H. Brooks, "The future of gold placer mining in Alaska", in U.S. Geological Survey, Mineral resources of Alaska, report on progress of investigations in 1914: U.S. Geological Survey Bulletin 622 (Washington: U.S. Government Printing Office, 1915), 59.

[64] Ibid.

[65] A.H. Brooks, "The Alaskan mining industry in 1915", in U.S. Geological Survey, Mineral resources of Alaska, report on progress of investigations in 1915: U.S. Geological Survey Bulletin 642. (Washington: Government Printing Office, 1916), 64; G.C. Martin, "The Alaskan mining industry in 1918", in U.S. Geological Survey, Mineral resources of Alaska; report on progress of investigations in 1918, U.S. Geological Survey Bulletin 712 (Washington: U.S. Government Printing Office, 1920), 47.

[66] A.H. Brooks, "The Alaskan mining industry in 1921", in U.S. Geological Survey, Mineral resources of Alaska, report on progress of investigations in 1921, U.S. Geological Survey Bulletin 739. (Washington: U.S. Government Printing Office, 1923), 42.

[67] N.L. Wimmler, "Placer mining in Alaska in 1922", Alaska Territorial Department of Mines Miscellaneous Report 195-6. (Washington: U.S. Government Printing Office, 1922), 37-38.

[68] A.H. Brooks, and Capps, S.R. "The Alaska mining industry in 1922", in U.S. Geological Survey, Mineral resources of Alaska, report on progress of investigations in 1922, U.S. Geological Survey Bulletin 755, (Washington: U.S. Government Printing Office, 1924), 47.

[69] N.L. Wimmler, "Placer mining in Alaska in 1929", Alaska Territorial Department of Mines Miscellaneous Report 195-12 (Washington: U.S. Government Printing Office, 1929), 229.

[70] Alaska Weekly (Seattle, Washington: Alaska Weekly Corp., April 30, 1926).

[71] Alaska Weekly (Seattle, Washington: Alaska Weekly Corp., July 25, 1926).

[72] Brooks, U.S. Geological Survey Bulletin 622, 59-60.

[73] William Maloney, "Report of the territorial mine inspector to the governor of Alaska for the year 1916" Alaska Division of Geological & Geophysical Surveys Annual Report 1916. (Washington: Government Printing Office, 1916), 35.

[74] J.C. Roehm, "Report of investigations and itinerary of J.C. Roehm in the Koyukuk Precinct, Alaska", Alaska Territorial Department of Mines Itinerary Report. (Washington: Government Printing Office, 1949), 34.

[75] L.H. Saarela, "Report of the commissioner of mines for the biennium ended December 31, 1950". (Washington: U.S. Government Printing Office, 1951), 21.

[76] J.A. Williams, "Report of the Division of Mines and Minerals for the year 1960", Alaska Division of Mines and Minerals Annual Report 1960. (Washington: U.S. Government Printing Office, 1960), 81.

[77] Brooks, U.S. Geological Survey Bulletin 622, 69.

[78] Joseph Kurtak et al. *Mineral Investigations in the Koyukuk Mining District, Northern Alaska* (Anchorage, Alaska: U.S. Department of the Interior, Bureau of Land Management, Alaska State Office, 1999), 3

[79] Arthur E. Glover, *Placer Gold Fineness* (Alaska Territorial Department of Mines, 1950), 42-44.

[80] Joseph Kurtak, et al., *Mineral Investigation sin the Koyukuk Mining District,* 4. Using data from Leslie, 1986 and Western Regional Climate Center, 2001.

[81] Data collected from Gold placer mining developments in the Innoko-Iditarod region, in U.S. Geological Survey, Mineral resources of Alaska, report on progress of investigations in 1910: U.S. Geological Survey Bulletin 480. (U.S. Government Printing Office: Washington. 1911), 292.

[82] Baker, Arthur Alan, Alfred Hulse Brooks, Stephen Reid Capps, Fred Howard Moffit, and Walter R. Smith. *Mineral resources of Alaska: Report on progress of investigations in 1922, by A.H. Brooks and others* U.S. Geological Survey Bulletin 755, (Washington, DC: Government Printing Office, 1924), 46. Brooks, Alfred Hulse, George H. Canfield, Theodore Chapin, George L. Harrington, George Curtis Martin, John Beaver Mertie, and Fred Howard Moffit. *Mineral resources of Alaska: Report on progress of investigations in 1919, by Alfred H. Brooks and others.* U.S. Geological Survey Bulletin 714.(Washington, DC: Government Printing Press, 1921). Cathcart, S.H., Theodore Chapin, George Curtis Martin, and R.M. Overbeck. *Mineral resources of Alaska: Report on progress of investigations in 1918* U.S. Geological Survey

Bulletin 712, (Washington, DC: Government Printing Office, 1920), 47.Philip Smith. *Mineral resources of Alaska: report on progress of investigations in 1924* (Washington, D.C.: Government Printing Office, 1926), 13. Philip Smith. *Mineral Resources of Alaska: Report on Progress of Investigations in 1926* (Washington: Government Printing Office, 1930), 24. Philip Smith. *Mineral resources of Alaska: report on progress of investigations in 1927* (Washington, D.C.: Government Printing Office, 1930), 24. Philip Smith. *Mineral Resources of Alaska: Report on Progress of Investigations in 1928* (Washington, D.C.: Government Printing Office, 1930), 27. Philip Smith. *Mineral industry of Alaska in 1929 and administrative report* (Washington, D.C.: Government Printing Office, 1930), 32. Philip Smith. *Mineral resources of Alaska: report on progress of investigations in 1930* (Washington, D.C.: Government Printing Office, 1933), 32. Philip Smith. *Mineral industry of Alaska in 1932* (Washington D.C.: Government Printing Office, 1934), 30. Philip Smith. *Mineral industry of Alaska in 1934* (Washington D.C.: U.S. Dept. of the Interior, Geological Survey, 1936), 35. Philip Smith. *Mineral industry of Alaska in 1936* (Washington, D.C.: Government Printing Office, 1938), 45. Philip Smith. *Mineral industry of Alaska in 1938* (Washington, D.C.: Government Printing Office, 1939), 42. Philip Smith. *Mineral industry of Alaska in 1940* (Washington, D.C.: Government Printing Office, 1942), 38. Philip Smith. *Mineral industry of Alaska in 1941 and 1942*. (Washington, D.C.: Government Printing Office, 1944), 11.

[83] Hulley, *Alaska, 1741-1953.* 201; Gruening, *The State of Alaska*, 24.

[84] Ibid., 33-43.

[85] Ibid., 55.

[86] Hulley, *Alaska 1741-1953*, 285.

[87] Katherine Colman, *The Industrial History of the United States* (New York: The MacMillan Company, 1914), 314.

[88] Zinn, *A People's History of the United States*, 262.

[89] Ibid., 307-312.

[90] Colman, *The Industrial History of the United States*, 330.

[91] "Type of Alaskan Prospector". *Alaska-Yukon Magazine.* (Juneau, Alaska: March 1908): 58.

[92] *Alaska Forum*, Rampart, AK. (April 16, 1902).

[93] Estimates vary. The native populations included both tundra-dwelling Eskimos and the Kobuk River Eskimo's as well as a northern group of Athabaskan Koyukon Indians. While the Kobuk River Eskimos had settlements along the river both the tundra Eskimo and the Koyukon Indians migrated seasonally across the region in smaller bands. Very few white miners entered the region until the late 1890s.

[94] Jasper N., Wyman, *Journey to the Koyukuk; the Photos of J.N. Wyman, 1898-1899* (Missoula, Montana: Pictorial Histories Publishing Company & Gary Ingman. 1988), 7. The photographer

was J.N. Wyman whose photos have been compiled into the book *Journey to the Koyukuk* with a narrative constructed by Debra Patterson based off of a manuscript that was written by one of the original members of the Galesburg Alaska Mining and Development Company.

[95] Joyce L. Alig, *Old Gold Rush to Alaska Diaries of 1898-1900,* Passport to History Series, Book VIII (Carthagena, Ohio: The Messenger Press, 2001).

[96] Rodman Wilson Paul, *Mining in the Far West 1848-1880* (Albuquerque: University of New Mexico Press, 2001), 95. Quoting John S. Hittell's *Mining in the Pacific States*.

[97] Brown, *The History of the Central Brooks Range*, 68.

[98] Harold Underwood Faulkner, *American Economic History,* 8th edition (New York, Evanston, and London: Harper & Row Publishers, 1960), 520.

[99] Coman, *Industrial History of the United States*, 336.

[100] Faulkner, *American Economic History, 521.*

[101] Katherine Morse, *The Nature of Gold, An Environmental History of the Klondike Gold Rush* (Seattle: University of Washington Press, 2003), 28-29.

[102] Robert G. Athearn, *The Mythic West in Twentieth Century America* (Lawrence Kansas: University Press of Kansas, 1986), 1-14 and 14-21.

[103] Rodman Wilson Paul, *Mining Frontiers of the Far West, 1848-1880* (Albuquerque: University of New Mexico Press, 1963), 10.

[104] Eventually the state would take the nickname 'The Last Frontier'. No specific date can be pinpointed for this though it is still used frequently today.

[105] Athearn, *Mythic West,* 11.

[106] Faulkner, *American Economic History,* 174 and 330.

[107] Roxanne Willis, *Alaska's Place in the West, From the Last Frontier to the Last Great Wilderness* (Lawrence, Kansas: University Press of Kansas, 2010), 3.

[108] Naske, *Alaska A History,* 140. The new act was carried through by alterations made to the 1894 Organic Act which made it more applicable to the Alaskan economy and political system.

[109] "History of Alaska Homesteading, The Last Chapter in America's Homestead Experience. 1898-1988". (Alaska Bureau of Land Management). Accessed December, 2012.

[110] Ibid., 3. Claims were noted in the Wild Lake area north of the Koyukuk River.

[111] Margaret. Purser, "New Perspectives from the North: Comparative opportunities and Challenges in an Archaeology of Eldorado" in *Eldorado!: The Archaeology of Gold Mining in*

the Far North eds. Catherine Holder Spude, Robin O. Mills, Karl Gurcke, and Roderick Sprague. (Lincoln: University of Nebraska Press, 2011), 76-88.

[112] Purser, "New Perspectives from the North: Comparative opportunities and Challenges in an Archaeology of Eldorado", 79.

[113] Naske, *Alaska, A History*, 141.

[114] Harry Leonard's photo catalog, entry 109 identified by George Lounsbury.

[115] John T. Dillon, *Source of Lode- and Placer- Gold Deposits of the Chandalar and Upper Koyukuk Districts, Alaska* (Alaska: State of Alaska, Dept. of Natural Resources, Division of Geological and Geophysical Surveys, 1982).

[116] Donald J. Cook, *Placer Mining in Alaska* (Fairbanks, Alaska: School of Mineral Industry, Mineral Industry Research Laboratory, University of Alaska, Fairbanks, 1983).

[117] J.P. Hutchins, "Frozen Gold Gravel: Phenomena Observed in the Frozen Ground of the Far North—Methods used in Breaking and Thawing it Preparatory to Recovering its Gold Contents—Suggested Improvements." *The Engineering and Mining Journal*. 82 , *16*, (New York: Western & Co., October 20, 1906). Blasting was found to be ineffective because ice and clay do not break easily. Additional problems were caused by blasting powder being frozen.

[118] B.D. Stewart, "Annual Report of the Territorial Mining Inspector to the Governor of Alaska, 1920" (Juneau, Alaska: Alaska Daily Empire Print, 1921), 14-16.

[119] Ruskin, "Letters to Lizzie", 125.

[120] John G. Brady, "Report of the Governor of the District of Alaska to the Secretary of the Interior" (Washington: U.S. Government Printing Office, Department of the Interior, 1901), 22.

[121] Josiah Edward Spurr, "History and Condition of the Yukon Gold District to 1897" (Washington: Government Printing Office, 1897), 127.

[122] Norman Wimmler, "Placer-Mining Methods and Costs in Alaska" Bureau of Mines Bulletin 259. (Washington: Government Printing Office, 1927), 42.

[123] Young, Otis J. *Western Mining An Informal Account of Precious-Metals Prospecting, Placering, Lode Mining, and Milling on the American Frontier from Spanish Times to 1893* (Norman: University of Oklahoma Press, 1970), 123; Wimmler, *Placer-Mining Methods and Costs in Alaska,* 206.

[124] Ibid., 49.

[125] Ray Barber, *The Upper Koyukuk Mining Region Alaska* (Washington: U.S. Government Printing Office, 1939), 77.

[126] Michael Ostrogorsky, *The Influence of Technology on Social Typology and Change in the Western American Mining Frontier* (Moscow, Idaho: University of Idaho, 1993), 212-215. Chester Wells Purington, *Methods and Costs of Gravel and Placer Mining in Alaska* (Washington: U.S. Government Printing Office, 1905), 88-94.

[127] Wimmler, *Placer-Mining Methods and Costs in Alaska*, 35.

[128] Ibid., 116

[129] Barber, *The Upper Koyukuk Mining Region Alaska*, 16

[130] Wimmler, *Placer-Mining Methods and Costs in Alaska*, 75.

[131] Ibid., 137.

[132] Ibid., 95.

[133] Ibid., 94.

[134] Ibid., 37-40.

[135] Brown, *History of the Central Brooks Range,* 116

[136] Ibid., 155.

[137] Wickersham, *Old Yukon: Tales, Trails, and Trials*, 131-133.

[138] Claus-M. Naske, *Paving Alaska's Trails: The Work of the Alaska Road Commission* (Lanham, MD: University Press of America, 1986), 9.

[139] Stephen W. Haycox, *Alaska: An American Colony* (Seattle: University of Washington Press, 2006).

[140] Naske, *Paving Alaska's Trails: The Work of the Alaska Road Commission*, 14.

[141] Hulley, *Alaska, 1741-1953*, 313.

[142] Wickersham, *Old Yukon: Tales, Trails, and Trials*, 472.

[143] *The Iditarod Trail (Seward-Nome Route) and Other Alaskan Gold Rush Trails* (Bureau of Outdoor Recreation, Northwest Regional Office: 1977), 145.

[144] Ibid., 150.

[145] Hulley, *Alaska, 1741-1953*, 311.

[146] Gruening, *The State of Alaska*, 178-179.

[147] Naske, *Paving Alaska's Trails*, 124.

[148] Wiseman was initially called Wrights sometimes spelled "Rights", became the town of Nolan, and was eventually renamed Wiseman. Will. *Coldfoot, An Historic Mining Community on the Middle Fork of the Koyukuk River, Alaska,* 36.

[149] Ibid., 36-40.

[150] Naske, *Paving Alaska's Trails*, 254.

[151] Naske, *Paving Alaska's Trails*, 256.

[152] Marshall, *Arctic Village,* 132.

[153] Brown, *History of the Central Brooks Range,* 113.

[154] J.A. Williams, *Mining Operations in the Fairbanks District and Innoko and Koyukuk Precincts.* MR 194-13. (Washington, D.C.: Bureau of Mines, U.S. Government Printing Office, 1950), 8.

[155] The highest approximate estimates raise the percentage to about 1.7%.

[156] Brown, *Gaunt Beauty, Tenuous Life*, 235.

[157] Ibid., 236.

[158] Marshall, *Arctic Village*, 118.

[159] Brown, *History of the Central Brooks Range; Gaunt Beauty, Tenuous Life*, 89-91.

[160] Image 4158g , "US Army Photo collection, C-E Museum Acquisition" from the CECOM Historical Office archive, Aberdeen Proving Ground, MD.

[161] Ibid., Image 4158f .

[162] Tordoff, *People of the Koyukuk,* 23.

[163] Barber, Report to the United States Smelting, Refining, and Mining Company, 89.

[164] A. G. Maddren, *The Koyukuk-Chandalar Region, Alaska,* (Washington: U.S. Government Printing Office, 1913), 84.

[165] Barber, Report to the United States Smelting, Refining, and Mining Company, 87-94.

[166] Tordoff, *People of the Koyukuk*, 9 and 13.

[167] H. Pringel, "A Short History of Mining on the Koyukuk" *The Pathfinder*: V. 2, No. 5 (Valdez, Alaska: Pathfinder Publishing Co., 1921), 14.

[168] Several individuals mined the creek in the 20's and 30's including Nellie Cashman who held eleven claims adjacent to Discovery in 1920, Hans Christensen on claims number 8 and 9 Above in 1921, Albert Ness from 1925-1929 on claim number 3 Below, Harry Leonard in the 1930's on claim number 2 Above, Rashier Creecy on claim number 8 Above, and Charles and Jack Horner on claim number 11 Above in 1937. Fred Clark was reported to have a cabin built on claim number 4 Below located about 250ft above the creek bed at an elevation of about 2000ft. Maddren, *Koyukuk and Chandalar*. Field Notes, Book 1. 1909. USGS Call No. FN-027. A.P. Ness was born in Sweden 1868, arrived in Dawson 1900, and moved to Wiseman in 1910. Rashier Creecy was an African-American born in Virginia in 1867. Tordoff, *People of the Koyukuk*.

[169] Barber, Report to the United States Smelting, Refining, and Mining Company, 29-30.

[170] A.G. Maddren, "The Koyukuk-Chandalar Gold Region". *Mineral Resources of Alaska, Report on Progress of Investigations in 1909.* (Washington: U.S. Government Printing Office, 1910), 311.

[171] Tordoff, *People of the Koyukuk.* In 1904 Frank Ledger killed Dan McCarty and Frank Messrole. McCarty was from Port Townsend, Washington and a plumber by trade. He arrived in Dawson in 1898 and the Koyukuk in 1901. Frank Messrole was 27 and had arrived at Dawson in 1897 and the Koyukuk in 1900. He was originally from Amherst, Ohio. A third man, French, was injured during the disagreement. The claims they were working were owned by Richmond Gimm, and Bohrer.

[172] Barber, Report to the United States Smelting, Refining, and Mining Company, 97-98.

[173] Cobb. *"Placer Deposits of Alaska",* 160.

[174] Barber, Report to the United States Smelting, Refining, and Mining Company, 99-100.

[175] Martin Nelson was born in 1870 in Wisconsin and arrived at Circle City in 1896. He then came to the Koyukuk in 1899. No information is present on Carpenter. Tordoff, *People of the Koyukuk,* 110.

[176] Barber, Report to the United States Smelting, Refining, and Mining Company , 77-78.

[177] Maddren, *Koyukuk-Chandaar Region, Alaska, 89.*

[178] R.L. Polk & Co. *Polk's Alaska-Yukon Gazetteer and Business Directory 1909-10* (Seattle, Washington: R.L. Polk & Co, 1909), 332.

[179] Barber, Report to the United States Smelting, Refining, and Mining Company , 75-76.

[180] Several recognizable individuals mined along Myrtle Creek including Jack and Martin Slisco in 1916 and 1918, 1916 Vance Harris who sank a 250 foot shaft without reaching bedrock, Ike

Spinks on a left-limit bench in 1925, and Victor Neck in 1937. Peter Doherty mined claim Number 8 in 1937.

[181] Maddren, *Koyukuk-Chandalar Region, Alaska*, 85.

[182] Barber, Report to the United States Smelting, Refining, and Mining Company , 84-85.

[183] AJ Maddren. *Koyukuk and Chandalar.* Field Notes, Book 2. 1909. USGS call number: FN-0272.

[184] Reed, "Report on a Reconnaissance of Upper Koyukuk Region Alaska", 102.

[185] Ertec Northwest, INC. *Koyukuk Hydrological Region: Historical Navigability Study* (Anchorage, Alaska: ERTEC Northwest, Inc., 1982) Vol. III, 232.

[186] Barber, Report to the United States Smelting, Refining, and Mining Company, 46.

[187] Tordoff, *People of the Koyukuk.*

[188] Wimmler, MR 195-12. 1929: 229.

[189] Robin Mills and Bill Hedman. "Upper Middle Fork of the Koyukuk River Drainage Class III Pedestrian Surveys, May-June 2008" (Fairbanks, Alaska: Bureau of Land Management, Fairbanks District Office, 2008), 9-11.

[190] Maddren, "The Koyukuk-Chandalar Gold Region", 105.

[191] Reed, *Report on a Reconnaissance of the Upper Koyukuk Region Alaska,*163

[192] *Alaska Weekly*, January 15, 1926.

[193] John C. Boswell, *History of Alaskan Operations of United States Smelting, Refining and Mining Company* (Fairbanks, Alaska: Mineral Industries Research Laboratory, University of Alaska, 1979), vii-viii.

[194] Wyman, *Journey to the Koyukuk; the Photos of J.N. Wyman.*

[195] Ibid., 125-126.

[196] Philip Smith, *Mineral Resources of Alaska: Report on Progress of Investigations in 1926* (Washington, D.C: U.S. Government Printing Office, 1929), 22; *Alaska Weekly*, April 30, 1926.

[197] *Alaska Weekly*, July 30, 1926.

[198] *Alaska Weekly*, October 8, 1926.

[199] Ibid.

[200] Philip Smith, *Mineral Resources of Alaska: Report on Progress of Investigations in 1928* (Washington, D.C: U.S. Government Printing Office, 1930), 33.

[201] Barber, 1939: 36.

[202] Brockman, Ross C. *Ross C. Brockman Papers*. 1937.

[203] Brown, *Gaunt Beauty, Tenuous Life*, 235.

[204] Jeffrey J. Safford, *The Mechanics of Optimism: Mining Companies Technology, and the Hot Spring Gold Rush, Montana Territory, 1864-1868* (Boulder, Colorado: University Press of Colorado, 2004), 3.

[205] Ibid., 6.

[206] Paul, *Mining in the Far West 1848-1880,* 142.

[207] Safford, *The Mechanics of Optimism*, 9.

[208] Alfred H. Brooks, *Report on Progress of Investigations of Mineral Resources of Alaska in 1906* (Washington: U.S. Government Printing Office, 1907), 30.

[209] Ibid., 16.

[210] Safford, *The Mechanics of Optimism*, 130.

[211] Ibid., 130.

[212] Ibid., 143.

[213] Geoffrey T. Bleakley, *A History of the Chisana Mining District, Alaska, 1890-1990* (Anchorage, Alaska: Department of the Interior National Park Service, Alaska System Support Office, Division of Cultural Resources, Last updated in 2007), 20.

[214] Ibid.

[215] Frederick Jackson Turner, *The Frontier in American History* (New York: H. Holt and Co., 1920), 268.

[216] Ibid., 258.

[217] James Claude Malin, *Winter Wheat in the Golden Belt of Kansas; A Study in Adaption to Subhumid Geographical Environment* (Lawrence: University of Kansas Press. 1944), 251-252.

[218] Patricia Nelson Limerick, *The Legacy of Conquest: The Unbroken Past of the American West* (New York: W.W. Norton & Company, 1988), 55-77.

[219] Hovis and Mouat quote Barger and Schurr in their *Technology and Culture* article: Hovis, Logan and Jeremy Mouat. "Miners, Engineers, and the Transformation of Work in the Western Mining Industry, 1880-1930" *Technology and Culture*. 37, **3** (Chicago: University of Chicago Press, July, 1996): 434.

[220] Smith, P. S. *Mineral Industry of Alaska in 1938*. (Washington: G.P.O., 1939).

[221] Smith, P. S. *Mineral Industry of Alaska in 1940*. (Washington: G.P.O., 1942).

[222] Gruening, *The State of Alaska*, 310.

[223] Naske, *Alaska, A History*, 186.