



Cobbs, Molly <mcobbs@blm.gov>

sharing some lessons learned for rural development projects

1 message

Ann Rappoport <arappoport@tnc.org>

Wed, Feb 17, 2016 at 4:34 PM

To: "Fritz, Stacey" <sfritz@blm.gov>, "s05mcint@blm.gov" <s05mcint@blm.gov>, "Molly Cobbs (mcobbs@blm.gov)" <mcobbs@blm.gov>, "Sweet, Serena" <ssweet@blm.gov>, "Cohn, Steven" <scohn@blm.gov>

Hello BLM partners –

I wanted to share the attached paper that was basis for a session I was asked to moderate at last week's Ak Forum on the Environment – "Mining and Sustainable Communities" is a 25- year review of how the Red Dog mine has affected NW villages. See the "Lessons for Rural Development Projects" (7th page of article) – several points are applicable to GMT-1. Apparently they have a Subsistence Committee that advises the mine and can actually shut it down if needed – hasn't happened to date.

Do any of you have email addresses for NVN? I would be interested in sharing this article with them.

Molly – I tried to go online to the Mar. 8-9 Workshop RSVP workshop but it did not work – I'm pretty sure I RSVP'd a few weeks ago that I plan to attend, but if not, please put me down and my contact info is below.

Thanks, Ann

Please consider the environment before printing this email.

Ann G. Rappoport
Director of Conservation,
Alaska Program

The Nature Conservancy
715 L Street, Suite 100



2015-MiningAndSustainableCommunities.pdf

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mining and sustainable

COMMUNITIES

By Bob Loeffler

Politicians and planners work to attract economic development because of the desire to provide jobs and income for residents, and to find tax revenue to fund government services. Their focus is usually statewide: jobs, income, and taxes for Alaskans. This article is about the impact of one remote development project on nearby, Native communities. It is about the community effects of the Red Dog Lead and Zinc Mine in northwest Alaska. 2014 was the 25th anniversary for the mine, which began operation in 1989. This case study evaluates the mine's effects on the communities after 25 years of operation. It begins with an overview of the communities and the mine. It evaluates the mine's effects on these communities in four ways: 1) jobs and income, 2) governance, 3) education, and 4) subsistence. This case study provides lessons for development in other rural communities.

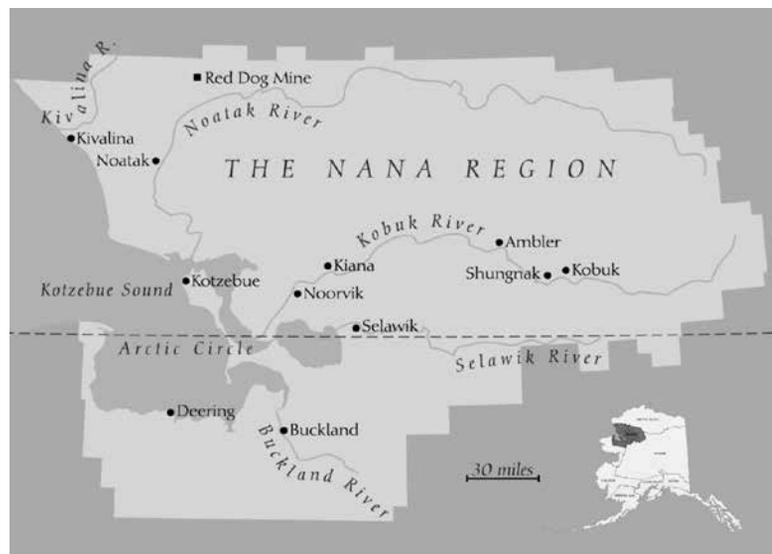
INTRODUCTION TO THE COMMUNITIES AND THE MINE

The Communities of the Northwest Arctic. This article focuses on the 11 villages of the Northwest Arctic Borough. (Boroughs are Alaska's version of counties). The villages in the region are small, Iñupiat Native communities, unconnected by road. In 2013, the population of the region totaled 7,796 residents, of which 41 percent live in the regional hub, Kotzebue, and the rest in 10 peripheral villages varying in size from 159 to 872 people. The villages are spread throughout the borough, which is about the size of the state of Virginia (approximately 40,000 square miles). The region is on the northwest coast of Alaska, 400 miles from Alaska's road system. (See Figure 1.)

A CASE STUDY OF THE RED DOG MINE

The Red Dog Mine celebrated its 25th year of operation in 2014. This article evaluates the mine's effects on 11 remote, predominantly Iñupiat Native communities in Northwest Alaska. It evaluates the effects in four ways: 1) jobs and income, 2) governance, 3) education, and 4) subsistence. The article describes significant positive community effects and attributes these achievements to institutional relationships between organizations within the region; and to goals, strategies, and leadership. The contributing factors to the mine's community benefits provide lessons for achieving positive community effects from development in other rural communities.

FIGURE 1



The region is 85 percent Native. More non-Natives live in Kotzebue than in the surrounding villages, which are typically 95 percent Native. Nineteen percent of residents live below the poverty line. All villages are unconnected by roads. Goods are transported to the villages by small plane, though some of the villages also get a once-per-year barge. As a result, prices are expensive in the region, especially in the outlying villages. In the fall of 2014, the gasoline price in Shungnak, one of the region's villages, was approximately twice that of Anchorage: \$7.50 per gallon. Groceries, heating oil, and other goods are similarly expensive.

For 10,000 years, the lives of the region's first residents have revolved around fishing, hunting, and gathering nearby resources. Today, this subsistence use remains an important part of the diet and economy. Essentially all residents participate in subsistence activities during the year. The major sub-

Bob Loeffler is a visiting professor of public policy at the Institute of Social and Economic Research, University of Alaska Anchorage. (bobl@uaa.alaska.edu)

sistence species, depending on the village, are caribou, seal, Dolly Varden char, salmon, moose, and for some coastal villages, beluga whale. In 2007, a study estimated that in Kivalina the per capita consumption of subsistence foods was almost 600 pounds per person – over 1.5 pounds per day.

While subsistence plays an important part in Iñupiat culture and economy, most families in the region exist in a mixed cash-subsistence economy. Households rely on local subsistence food, but also require cash for housing, fuel, heating, electricity, non-subsistence groceries, and so forth. The hunting, fishing, and gathering requires money for boats, motors, snowmachines, etc. A comfortable life in the villages requires a mix of subsistence and cash. Unfortunately, the economy of northwest Alaska offers limited opportunity for well-paying jobs.

The Red Dog Lead-Zinc Mine. The Red Dog Mine is a lead-zinc mine in northwest Alaska. It is the second largest producer of zinc and the fourth largest producer of lead in the world. Red Dog production represents 5 percent of global zinc production and 3 percent of global lead production. It is just over 100 miles north of the Arctic Circle and 50 miles from the Chukchi Sea. It is connected to the sea through the road constructed for the mine. The mine trucks carry concentrate to a dedicated port site. Ore is stockpiled there for eight months, and then shipped from the port between July and October when the port is ice-free.

No villages are connected to the mine road. Mine workers commute to the mine by airplane from area villages or from Anchorage (air cost paid by the mine). They work on a variety of schedules, with two weeks at site and two weeks off being the most common schedule.

The relationship between the mine and the region is not the typical employer-town relationship. The

The regional Native corporation for the northwest arctic is NANA Regional Corporation that was capitalized with \$28.9 million and the right to select over 2.2 million acres of land in the region. In 1980, NANA selected the area of the mine because of its mineral values. The Native people of the northwest arctic own the ore body through their private corporation, NANA, in which they are shareholders. The act also requires the Native corporations to share natural resource revenues with each other.

unique relationship is important and greatly influences its effects on the villages.

In most of the United States, aboriginal land rights were settled by force and treaty and resulted in Indian Reservations with which most Americans are familiar. In Alaska, the Alaska Native Claims Settlement Act of 1971 settled the Native land rights differently. The act established for-profit corporations with exclusively Native shareholders.

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The story of the mine started before NANA selected the land. For generations, the Natives of the area knew about red-stained creek beds with water so acidic that fish could not survive. In 1968, bush pilot and prospector Bob Baker, who flew with his companion Irish Setter (the Red Dog), noticed the reddish streams and lack of vegetation. During the 1970s, USGS publications called attention to the area. But during the 1970s, NANA regional shareholders did not support mineral exploration. They feared it would harm traditional subsistence resources and lifestyle. For a time, the corporation even had an explicit policy against mineral development.

During the 1970s, NANA discussed mining with the region's residents, and discussed the Red Dog deposit with mining companies interested in developing it. In 1979, NANA polled its shareholders and "results indicated that most individuals felt the Red Dog mine could be developed in a way that protects the traditional way of life." The result of these discussions was an agreement between NANA and a mining company that included provisions for the



Courtesy of Carl Portman.

The Red Dog Mine. The open pit is in the lower left of the picture. Tailings lake and mill complex stretches across the picture. The road to the port leaves the picture in the upper left.

mining company to develop the site, share revenue with NANA, bring economic opportunity to the region, and protect subsistence.

In 1982, NANA signed the Development and Operating Agreement for Red Dog that gave Cominco (now Teck) the right to build and develop the mine. In return, the corporation received \$1.5 million, plus an additional \$1 million every year until the mine went into production (which turned out to be 1989). Once production began, NANA received 4.5 percent of net smelter returns (essentially a gross royalty before costs are deducted). After Teck recovered its capital investment in 2007, NANA shared in the net proceeds of the mine beginning at 25 percent and increasing every five years until NANA and Teck share equally in the profit. As of today, 2015, the corporation receives 30 percent of net proceeds.

The agreement is important not just for NANA's income, but also for the community aspects of the project. It established a 12-person committee equally split between NANA and Teck to oversee all mining activities. The agreement also established a goal of 100 percent shareholder employment at the mine by 2001 and established specific measures to implement this goal, including a joint committee to oversee employment matters at the mine. The agreement also included shareholder hire preferences and mechanisms for shareholder training and promotion.

The provision for contracting preference to NANA companies has allowed the corporation to use the mine to develop companies and expertise that then spin off to compete elsewhere. This expands business expertise and shareholder employment opportunities beyond the mine. NANA/Lynden operates the fleet of trucks that transport ore from the mine to the port site and bring supplies up the road to the mine. NANA Management Services is the house-keeping/catering firm that provides the food and housekeeping services for mine employees. Both are now profit-making subsidiaries of NANA that operate in other locations.

The agreement also established a Subsistence Committee, which is made up of Elders from the two nearest communities – Noatak and Kivalina; Teck representatives are ex-officio members. The committee provides a mechanism to work out environmental and subsistence issues related to the mine. According to the NANA-Teck agreement, the Elders have the power to shut down the mine in certain situations if they see a threat to subsistence.

After 25 years of mine operation, the close working relationship between Teck and NANA is part of the two groups' working culture, but it is also promoted by the details of the original Development and Operating Agreement by which Teck operates the mine. This agreement and relationship is an important factor in the mine's community effects.



Courtesy of Carl Permann

The port on the Chukchi Sea. The ore storage buildings in the foreground are the largest buildings in Alaska. Ore is stored there during the winter, and during the summer ice-free period, the ore is lightered from the shallow water at the port to the ocean-going freighters in the upper part of the picture.

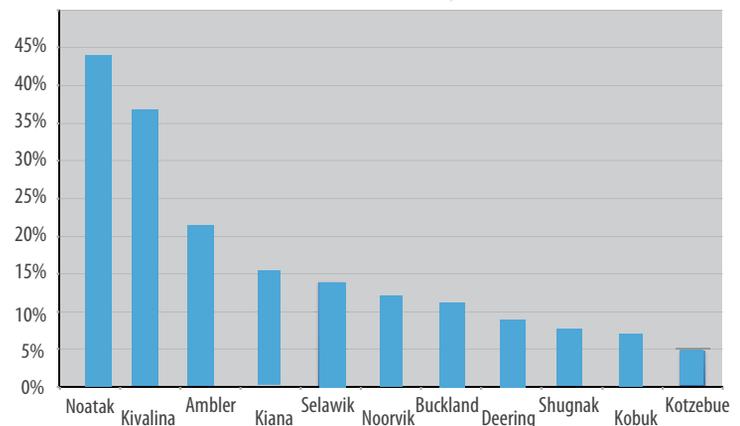
EFFECTS ON VILLAGES OF THE NORTHWEST ARCTIC BOROUGH

Jobs, Income, and Shared Profit

Jobs. An August 2014 evaluation of the Socio-economic Benefit of Red Dog Operations by the McDowell Group presents the jobs and income effects of the mine. The McDowell Group reported that, in 2013, Teck employed 480 workers. On-site contractors, mostly NANA Lynden and NANA Management, employed another 130 workers. Of these 610 employees, 57 percent of them were NANA shareholders – i.e., Native Alaskans. The 57 percent shareholder employment is less than the 100 percent goal in the original agreement, but it is high by global standards.

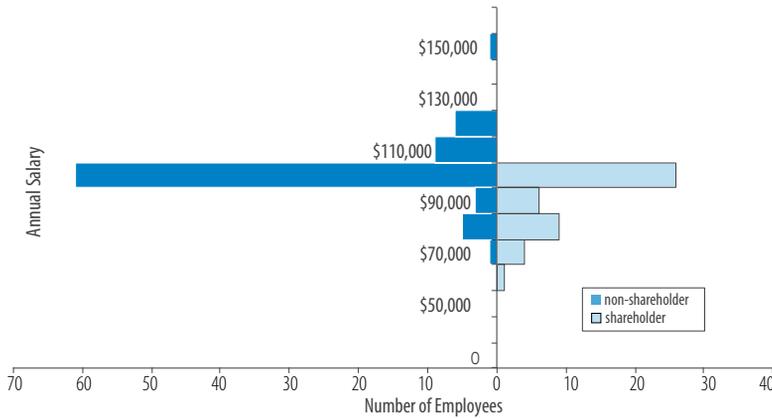
Figure 2 shows that for many villages, Red Dog jobs are an important proportion of the total employment. Of the roughly 350 Native shareholders

Figure 2
Red Dog Employment As a Percent of Total Employment in Northwest Arctic Villages, 2000



Source: Haley and Fisher, 2012.

Figure 3
Shareholder and Non-Shareholder Employment at the Red Dog Mine, 2007



Source: Haley and Fisher, 2012

at the mine, 144 lived in the 11 borough villages and the rest lived throughout Alaska, primarily in urban Alaska. Village employees varied from a low of two in a few villages to 40 employees from Noatak. These figures include only direct employment; they do not include indirect or induced employment from mine operations. Including direct and induced effects, McDowell Group estimates that the total 2013 effect on the borough villages is 715 jobs and \$65 million in wages.

Figure 3 shows the distribution of shareholder and non-shareholder employment by income in 2007. It shows a concentration of shareholder employees at the upper end of the income scale, but below management. The figure shows that Red Dog has done quite well with shareholder hire in some job classes, but less well in others, particularly management. A study of the mine (Haley and Fisher, 2012) concludes, “the commitment to shareholder hire by Red Dog managers is quite sincere, but the barriers they face to improving shareholder hire and retention in certain areas, especially in supervisory and management positions, are not easily overcome, and the solutions are long term, with no quick results.” Barriers include a lack of shareholders with college degrees, the need for managers to learn by working at other mines far from the region, and differences between village and western work culture.

In part because of the goal in the mining agreement and the Teck-NANA committee to oversee hiring practices at the mine, the mine developed a series of initiatives to improve shareholder hire, including at managerial levels. These include initiatives with the local school district (described later in this article); university scholarships; shareholder relations positions at the mine to provide counseling, mediation, and advocacy for work issues at the mine or work-related conflicts at home; and other programs. However, all of

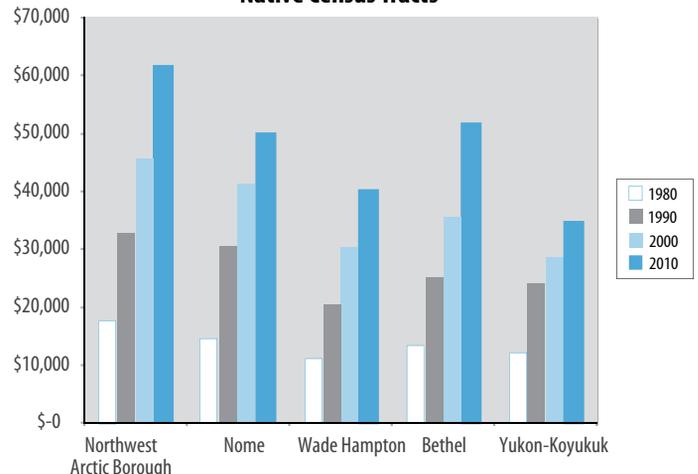
these are long-term initiatives with benefits presumably spread out over the next decades.

Income. The 610 Red Dog jobs paid an average wage of \$99,000 for a wide variety of occupations such as drillers, truck drivers, geologists, millwrights, water chemists, cooks, and housekeepers. The average Red Dog employee earned almost twice the average annual private sector wage in Alaska (\$50,340), or elsewhere in the Northwest Arctic Borough (\$51,630, excluding Red Dog employees). This payroll is important to the overall income in the region.

A list of the largest employers in the region provides evidence of the limited private economy in the region. An Environmental Impact Statement (EIS) for the Red Dog Mine included a 2007 list of the 20 largest employers in the region. Those 20 largest businesses employed 2,227 people (including those at Red Dog). Almost all of those businesses were government or funded by government, such as a publicly funded health authority or the school district. These 20 largest businesses included only 191 employees from non-Red Dog, non-publicly funded private employers. In fact, according to the McDowell Group, the 2013 total direct payroll of \$55 million in the region was 40 percent of all private sector wages and 30 percent of all wages, including government.

Given the number of high-paying Red Dog jobs relative to the otherwise limited economy, Red Dog’s high wages are reflected in a higher median household income in the region. Figure 4 compares the median household income in the Northwest Arctic Borough with those of other predominantly rural Native areas. None of the other areas has a similar economic engine to Red Dog. (The North Slope, which has a great deal of oil wealth, is excluded from the comparison). The figure shows that the borough enjoys a higher median income than those rural, Native areas without an economic engine such as Red Dog.

Figure 4
Median Household Income Northwest Arctic Borough and Rural, Native Census Tracts





Noorvik, Alaska, on the banks of the Kobuk River. 2010 population, 688.

Shared Profit. There is one additional economic effect on the villages: most village residents actually own the mine through their role as stockholders in NANA Corporation. In 2013, NANA received 30 percent of the net proceeds of the mine: \$143 million. However, because of the provision that requires Native corporations to share natural resource revenues, \$93.5 million was shared with Native corporations in other regions of Alaska. Since the mine started, it has paid over \$1 billion to NANA; more than \$617 million of that amount has been shared with other regions.

These payments are an important source of income to NANA and to other Alaskan Native corporations. They fund corporate dividends, a corporation's other investments, and fund services that NANA and other corporations provide to shareholders. NANA's 2014 dividend was \$9.4 million to shareholders both within and outside the region.

Governance. Most Americans take local government for granted. They are served by city government, county government, or both. Rural Alaska is different. Large parts of Alaska are without local government. Sometimes there are incorporated cities, but unless the city has a significant tax base, it provides few services.

Prior to the Red Dog Mine, 10 of the region's 11 villages were incorporated as cities. But the villages lacked a revenue source and provided few services. At that time, there was no borough, and no school district. Decisions about whether and how to fund a new school, barge landing, etc. were made by state agencies or the legislature. The agencies were typically in Anchorage and the Alaska Legislature meets in Juneau.

Juneau is approximately 1,000 miles from the region. This distance is greater than the distance from Washington, D.C. to Oklahoma. Including travel from a peripheral village and time between planes in Kotzebue and Anchorage, the travel to Juneau takes

all day, if not two days. It is easier and usually faster to fly from Los Angeles to Washington, D.C. than to travel from the region to Juneau.

Negotiations between NANA and the mining company were accompanied by an agreement to establish local government using the tax base of the anticipated mine. The Northwest Arctic Borough and the school district were established in 1986. As part of the negotiations for the mine, the company agreed to a payment in lieu of taxes – essentially a negotiated tax payment.

Red Dog's payment to the borough is 89 percent of the borough's general fund revenue. In 2013, the mine paid \$11 million to borough government, including a \$2.4 million payment directly to the school district. Between 1982 and 2013, the mine's payments have totaled \$116.4 million. It is unlikely that the borough would have formed without tax payments from the Red Dog Mine.

It is difficult to convey the sense of lack of self-determination when what should be local decisions are made from such a distance. It is a major change to bring those decisions back to the region and make them by locally elected officials with ties to the villages. It is a significant step in local democracy and makes an unmeasurable but important change for residents of the region.

Education. The Red Dog Mine affects education in the Northwest Arctic Borough: 1) it provides funds to the school district through its payment in lieu of taxes; 2) it provides programs including various training and apprenticeship programs, and scholarships for youth; 3) it provides a career path for students; and 4) it helps teach the work culture of America's western society. (Subsistence activities require hard work and high skills but in a different manner from western work culture).

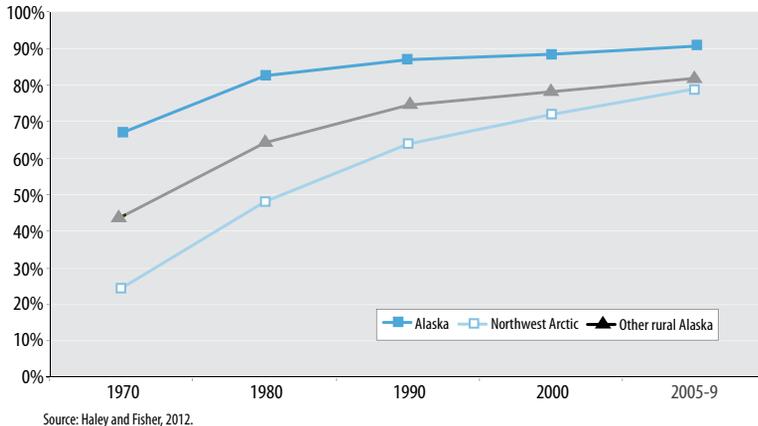
In addition to funding the school district as described previously, the mine provides various train-



Photo credit: NANA/Arend

The Napaaqtugmiut School (K-12) in Noatak, Alaska, built in 2009. The building, like most in the region, is elevated above the ground to prevent its heat from melting the permafrost.

Figure 5
Percent of the Population (Over 25) with High School Diplomas or Equivalency, 1970-2009



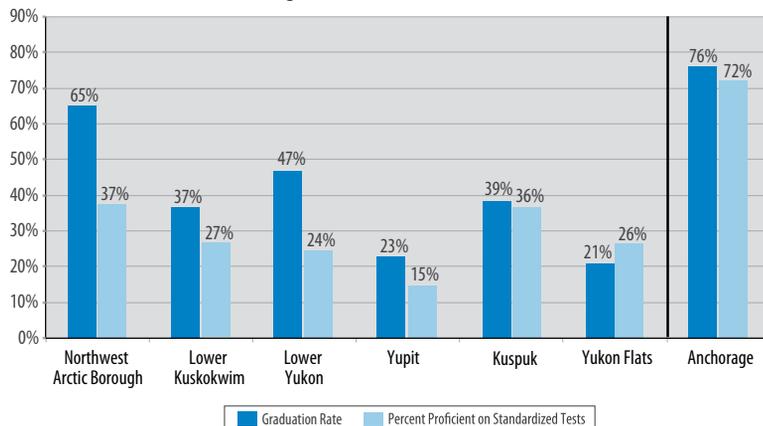
Source: Haley and Fisher, 2012.

ing and apprenticeship programs, scholarships for youth, and tuition assistance programs for mine employees. One of the important high school programs is a job shadow opportunity in which high school students come to the mine for a week and shadow employees to understand the skills and work environment.

The presence of a large employer provides the critical mass for other school district initiatives. For example, the school district operates the Alaska Technical Center, which is a statewide vocational and technical education training facility. The school district also operates a high school magnet program with dormitory facilities for high school vocational training. These facilities benefit more than the Red Dog Mine, but the presence of the mine as a major employer provides the critical mass that makes them possible, or at least easier.

There is only indirect evidence that links the mine's funding and programs to an increase in student achievement. Figure 5 from Haley and Fisher, 2012, shows the increase in high school graduation compared with elsewhere in Alaska. It shows the low starting point (less than 25 percent of students graduated in the 1970s) but that the region has caught up to other rural areas and is close to the statewide average.

Figure 6
Northwest Arctic Borough School District and Other Native, Rural Districts



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While Figure 5 compares the Northwest Arctic Borough with Alaska in general, Figure 6 makes a similar comparison for the rural, predominantly Native census districts. These comparison districts offered few economic opportunities in 1980 and, unlike the northwest arctic, still lack them today. It is a small subset of the "other rural Alaska" in the previous figure.

Figure 6 shows that the Northwest Arctic Borough School District had the highest graduation rate of any comparable rural, predominantly Native school district. Its 65 percent graduation rate is still lower than that of Anchorage, 76 percent, shown for reference. The figure also shows the results of statewide proficiency tests. The rate is the percentage of students who achieve the proficiency standard for that grade. The Northwest Arctic Borough School District has a low proficiency rate compared with urban Alaska, but it has the highest proficiency rate compared with similar rural districts without an economic engine.

In 2013, staff of the school district in discussion with the author, described that the mine provides a realistic career path for many students in the district, especially the over 90 percent who are not college bound. Even though the mine is only one employer, the career path is important. In a 2001 employment access survey for 10 villages, 26 percent of the residents had worked at Red Dog at some point in their career. Another 18 percent had applied but not been hired. District staff indicated that this career path motivated many students in high school, including careers that did not involve the mine.

According to some, the mine also has had an important effect on work culture. In one telling exchange, a school district official told the author, "You know what the mine does that no one else does in this area? They fire people." To which another official responded, "You mean, like your son." The original official said, "Yes. He was fired twice from Red Dog. And now he gets it." The message from this exchange was that in an area dominated by subsistence, which requires hard work and its own set

of skills, the mine is one of the region's most effective methods of teaching the western work culture to residents.

It is difficult to empirically evaluate the extent of mine-related programs' effects on student achievement. And the data provided in Figure 6 are unavailable for the 1980s for a before-and-after-Red Dog comparison. Further, it is unrealistic to expect a single employer to transform educational achievement. However, considering the evidence above, and information provided to the author by school district staff, it appears that the Red Dog Mine is associated with an improvement in K-12 achievement in the region. However, given the proficiency results in the figure, there is significant room for further improvement.

Effect on Subsistence. NANA's initial discussions with its shareholders, before the mine was authorized, centered on potential economic opportunity and the potential for the mine to disrupt traditional subsistence activities. In 2009, the U.S. Environmental Protection Agency completed an EIS for expansion of the mine. As part of that EIS, the agency reviewed the mine's past effects on fish, wildlife, other resources, and subsistence use.

Red Dog is within the subsistence use area of two villages: Noatak, 35 miles south of the mine in a different watershed, and Kivalina, approximately 50 miles downstream from the mine on the coast of the Chukchi Sea. Other villages are much further away. Residents of Kivalina in particular have voiced concern about the mine's potential negative effects on caribou, beluga whales, and fish, all of which are important for village subsistence use.

Caribou. The most significant concern of residents with respect to caribou is that traffic on the road could disrupt a portion of the caribou migration of the western arctic herd (200,000 to 490,000 caribou, depending on the year). During fall migration, approximately 20,000 cross the road as they travel south. "To avoid impacts, the Red Dog Mine has a policy in place that includes informing drivers about the presence and location of caribou and requiring

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Lessons for Rural Development Projects

The experience of the Red Dog Mine provides lessons for other resource development projects in rural communities. The lessons are, in part, taken from the data presented in the article, and, in part, from the author's observations.

1. **Goals are important.** Even before the Red Dog Mine was permitted, the mine and NANA agreed on important goals: shareholder employment, business development, establishing local government, and minimizing effect on subsistence.
2. **Goals by themselves are not enough. It is important to have specific procedures and strategies.** The 1982 agreement between NANA and Cominco (now Teck) included goals but also includes specific procedures to oversee progress toward those goals: the management committee, employment committee, subsistence committee, and specific strategies overseen by these committees. The procedures and programs are necessary to ensure that the goals are not empty promises and hopes.
3. **Strategies must be able to change due to results (or lack of them).** The programs described in this article were not all implemented initially. The school district's vocational programs, the job shadowing program, and the shareholder relations counselors were added at some point over the years. What is expected to work initially may not always be correct; conditions change. It is important to have the commitment and oversight to modify programs due to success and failures, and as conditions change. Today this goes by the somewhat overused jargon of adaptive management. But it is necessary.
4. **Partnership is important.** The author's observations of NANA, the Red Dog Mine, the borough, and the school district make clear that the partnership accomplishes much more than individual groups could accomplish. That is, the mine has a greater proportion of shareholders employed because they share strategies and vision with the borough and NANA. Teck's commitment to the goal is crucial, but they could not do it alone. Similarly, the school district's relationship with Teck helps the students through vocational training, the job shadow program, and other ways. Strategies for achieving the goals require work across jurisdictions – the school district, borough, the mine, and others. A partnership among the groups has been important in making the strategies work.
5. **Leadership is important; culture is important.** From the author's visits to the Red Dog Mine, to NANA, and to the northwest arctic, it is clear that commitment to the social and environmental goals described here is a part of Teck's work culture at the mine. Working as a partner with Teck is a part of NANA's culture and its community partners. That is not to say there are not differences and disagreements between the partners, but a culture of commitment to the goals and practices seems critical. From the observations of this author, this commitment occurs only because of strong leadership at Teck, NANA, the school district, and the borough.

The importance of strong leadership is crucial. Leaders create the programs, and they create the culture that binds others to the programs. The strong leadership was present in the 1980s for the discussions that brought residents to the conclusion that mining was appropriate, it was present for the negotiations that included social and environmental goals into the mining agreement, and it is visible today in Teck, NANA and their partners. The leadership at the mine, the borough, and elsewhere is a critical part of the socioeconomic success in the communities.



Drying salmon in Selawik, Alaska.

that drivers stop until caribou have moved through. The policy calls for closure of the...road for short periods during the migration (i.e., when caribou are crossing the road).”

However, Kivalina residents are concerned about potential effects of traffic on the migration. The EIS did not indicate that the mine and mine road had a significant effect on the caribou population or on the overall migration pattern. It concluded that there may be some localized effects – changes in behavior or migration – and this may have affected local caribou harvests by Kivalina residents. The EIS did not indicate significant subsistence effects from any other village.

Whales. Kivalina concerns with beluga whales were similar to concerns about caribou. Kivalina residents hunt whales as they migrate along the coast in the spring. Village harvests have decreased in recent years, but residents still hunt beluga whales. The subsistence committee for the mine regulates when ore loading may begin at the port. They give approval only after the spring migration passes the site. The EIS did not report a decrease in whale populations, but Kivalina residents report that whales travel further from the coast to avoid the port activity.

The EIS reported that port activities are not the sole reason for local changes in migration patterns. Other factors include changing ice conditions and outboard motor noise, particularly when hunting the whales. However, port activities may be part of the change in migration pattern and partially responsible for decreased hunting success by Kivalina residents.

Fish. Fish are an important subsistence food source for residents of the northwest arctic. For Kivalina residents downstream of the mine, Dolly Varden char make up approximately a quarter of the villagers’ subsistence food. The mainstem of Red Dog Creek, which runs through the mine deposit, is a tributary of the Wulik River, which flows adjacent to Kivalina.

Before the mine existed, Red Dog Creek picked up lead and zinc from the deposit and became acidic. During the spring high flows, the natural pre-mining metal concentrations and acid in the water killed fish and aquatic insects in the creek before it merged with a larger creek that diluted these natural toxins. The mine now routes Red Dog Creek around the deposit so that it does not pick up the acid and metals.

The mine operates a water treatment plant and discharges consistent with a government permit that limits the metals and requires a neutral (non-acidic) discharge. According to the state monitoring agencies, the mine has improved water quality and fish habitat downstream.

The Alaska Department of Fish and Game monitors the habitat, algae, benthic environment (the bugs and invertebrates that are the foundation of the aquatic food chain), fish population, and fish health including metals uptake by fish. Consistent with improved water quality, the agency reports an aquatic environment that is healthier than before the mine existed: a healthy benthic environment downstream of the mine, and healthy fish populations with metals within safe concentrations. The Red Dog mine has produced the unusual situation of improving downstream water quality.

Despite these monitoring results, Kivalina fishers still have concerns. In interviews with subsistence fishermen completed for the 2009 EIS, 65 percent of the interviewees in Kivalina and 32 percent of those in Noatak indicated concern about the health of Dolly Varden char. Concerns included physical abnormalities, fewer fish, and changes in texture of the meat. There is a difference between the conclusions of agency scientists and the conclusions of subsistence fishers, especially from the downstream village of Kivalina. The fishers’ perceptions may influence their harvest and enjoyment of the fish.

CONCLUSIONS

Effects on Communities. After 25 years, the health of the Red Dog Mine and the health of communities in the Northwest Arctic Borough are interconnected. Red Dog has increased villagers’ economic opportunity, provided employment, and increased median household incomes for village residents. The shareholder hire rate of 57 percent, while not achieving NANA’s goal of 100 percent, is high by global standards. Through NANA’s requirement to share profits with other regions, the mine has shared these benefits with Native corporations throughout Alaska.

The mine has also provided the opportunity for self-government by the region. It funded the borough and allowed decisions previously made thousands of miles away by strangers to be made locally. It allows villagers to achieve local democracy that most Americans take for granted.

It is probably unfair to expect a single employer to transform K-12 education. However, it appears

that the mine has had a generally positive effect. It is associated with increased graduation rates, possibly with increased student performance (certainly for some individuals). It has provided a path to a career, and provided the critical mass to allow the school district to provide vocational training and other services. Finally, it has helped many individuals with the transition from a subsistence lifestyle to western work culture.

Village concerns about the mine include more than material well being, governance, and education. They also include maintenance of subsistence populations and opportunities. The mine has not changed subsistence for most of the region's 11 villages, but there are clearly some concerns from Kivalina, and to a lesser extent from Noatak, about perceived local displacement of caribou and whales, and the health of an important food source: Dolly Varden char.

There is room for improvement in most of the effects – increases in shareholder hire, especially management; improvements in school performance; and possibly decreasing subsistence concerns. But none of the improvements will be quick. After 25 years of work on the issues, the remaining barriers are difficult and the returns long term. For example, increasing the Native college graduation rates (especially those interested in working at Red Dog) will take years. Working with mine processes and Kivalina residents on subsistence effects and concerns is probably also a long-term effort including both scientific monitoring and working with locals and their knowledge and perceptions.

Red Dog has accomplished some impressive and important achievements for the villages of the North-

Photo credit: NANA/Arend



Getting ready for fishing in Kiana, Alaska.

west Arctic. These achievements were not pre-determined; resource development does not automatically create these improvements. The achievements were the result of the on-going partnership between the mining company, NANA Corporation, the borough government, the school district, and others. The partners created concrete strategies to achieve these results – high levels of local employment, career pathways, etc. The continuing commitment to the original goals, the ability to adapt strategies as needed, and the multi-party partnership have all contributed to these achievements for the communities of the Northwest Arctic Borough. 🌐

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