

TOWARDS INTEGRATIVE PLANNING FOR CLIMATE CHANGE IMPACTS ON RURAL-URBAN MIGRATION IN INTERIOR ALASKA: A ROLE FOR ANTHROPOLOGICAL AND INTERDISCIPLINARY PERSPECTIVES

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ABSTRACT

Severe climate change is one of multiple stressors capable of impacting migration in Alaska. This paper uses a scenario of climate change and rising energy costs to explore potential changes in Interior Alaska that may contribute to higher rates of rural-to-urban migration over the next twenty years in Fairbanks, Alaska. While Fairbanks is planning for the physical infrastructure challenges of demographic growth from outside Alaska over the next twenty years, little holistic attention is being given to challenges in employment, housing, and land use presented by the demographic profiles of potential interior rural Alaska Native migrants. Nearly half of Alaska Natives now reside in urban places in Alaska, a trend likely to be expanded under conditions of severe climate change. Future scenario research should more specifically identify likely indigenous migrant characteristics, employment, and housing needs vis-a-vis urban spatial and environmental issues.

KEYWORDS: Arctic, urbanization, indigenous people

INTRODUCTION

Climate change, in conjunction with other stressors, is expected to significantly affect life in the Arctic in ways that will likely lead to lifestyle, culture, and demographic changes (McCarthy and Long Martello 2005). However, these changes will affect different communities in different ways depending on location, size, economic base, culture, and history. Migration, one potential response to climate change-influenced stress, is an excellent example of an effect that will impact different arctic communities in very different ways. Some communities will struggle with shrinking populations and skewed demographics (Hamilton and Seyfrit 1994) and some will experience population growth.

However, the differential effects of migration demonstrate the linkages between communities and the need to plan for climate change on a regional scale. Anthropology's holistic perspective can be useful in understanding and planning for local and regional population dynamics involving culturally distinctive rural indigenous populations migrating to urban sites such as Fairbanks.

There is growing evidence that climate change will affect human migration patterns as some regions become less livable and people move to more viable regions (McLeman and Smit 2006). As in other areas of the world, climate change in Alaska will not be the sole factor influencing

migration decisions, but in combination with other stressors such as social, cultural, and economic changes it can influence population movements and decision-making about migration. Migration may be a successful adaptive response to climate change-influenced stress for some individuals and communities—allowing people to move to more viable areas and reducing the populations of particularly vulnerable communities. However, the flip side of migration is the effect on host communities and the ability of those communities to adapt to a larger population, particularly at a time when the region as a whole may be experiencing other climate change-related effects. The long-term sustainability of arctic communities depends on considering the effects of both sides of the migration response. Through scenario-building we can examine how climate change might affect migration patterns and suggest how communities, in this case host or receiving communities, might best plan to respond to these changes in ways that ensure minimal environmental, economic, and social impacts of migration flows (see for example Lonergan 1998).

The state of Alaska is already experiencing negative effects from climate change, including erosion and melting permafrost, which may force population displacement. Climate change, in concert with other stressors—particularly energy costs that affect transportation, subsistence practices, heating, and food costs—has the potential to create a migratory “push” out of rural areas and into the state’s urban centers. McCarthy and Long Martello (2005) cite migration to towns as a possible adaptive strategy in arctic communities dealing with economic trends, regulations, and/or the effects of climate change and pollution that may make hunting or fishing in (small) settlements impractical or unproductive. We focus our analysis on the interior region of Alaska, where rural residents still largely depend on their immediate, local environment to supply subsistence foods and important ties to culture, language, and history. We have developed a scenario—one plausible future—in order to explore issues that might arise if climate change and other stressors act to reduce the viability of life in rural communities in interior Alaska.

Climate change, combined with another stressor like rising energy costs, may reduce the viability of rural communities by making subsistence practices more difficult and expensive, increasing the costs of alternative food sources, and making general costs of living too high in comparison to incomes in rural communities. One possible response to these stressors is migration—either permanent movement into urban areas or significantly lengthen-

ing the time rural residents spend in urban areas engaging in wage-work before returning to their home communities. Such changes may cause unanticipated population growth in the region’s urban center—the City of Fairbanks and the Fairbanks North Star Borough—which will also have its own range of climate-change concerns.

We have selected climate change and energy costs as our two model stressors because both are being raised as concerns by rural residents at public meetings and by individuals (de Marban 2006; Dillon 2005a, 2005b). We propose this scenario as a possibility to be considered—not as a definitive prediction. We use this scenario as a tool to ask a range of questions about the region’s vulnerability and resilience to changes influenced by climate change.

Fairbanks is clearly preparing itself for growth in general and expects a population of 100,000 people in the borough in the next twenty years. The community is likely to reach that benchmark much earlier than predicted given that a recent Alaska Department of Commerce, Community and Economic Development (DCCED) report revised the Fairbanks North Star Borough (FNSB) population up from 86,754 to 96,888 (FNSB Community Research Center 2007). However, the focus on in-migration has been on people from outside the state moving into Fairbanks to take jobs in the growing transportation and high-tech industries. The community may need to evaluate the extent to which migration patterns within the state will shift and bring more in-migration from rural communities within the state—and new residents, particularly Alaska Natives, with different needs and experiences.

MIGRATION IN ALASKA

The history of rural-to-urban migration in Alaska has largely been a steady movement of rural residents (mostly Alaska Natives) into urban areas, with some return flows, that has resulted in overall growth of the Alaska Native population in urban areas and a decline in rural populations in general. The urban Native population is the fastest growing sector of the overall Native population. Between 1970 and 2000, an estimated 27,400 Alaska Natives moved from rural to urban areas—11,000 just between 1990 and 2000 (Goldsmith et al. 2004). However, this trend has not resulted in wholesale abandonment of rural regions. While this migration pattern is fairly indicative of a labor-market model, in which rural residents move to larger communities in search of higher-paying jobs, the

fact that rural Alaska communities have remained populated demonstrates that other factors are at work. The most critical exception to the labor-market model, noted by Huskey et al. (2004), is the role of subsistence culture and practices in rural economies and migration decision-making. Subsistence practices, which include hunting, fishing, and gathering, are only available on a regular basis in rural regions to rural residents and are a significant source of real income for practitioners. The economic value of subsistence foods acts to offset the value of cash wages available in urban areas and therefore helps people stay in rural communities despite lower job opportunities. Similar findings are echoed in other studies. Gardner (1994), in an analysis of a proposed Canadian policy to move aboriginal people from rural communities in the Northwest Territories to larger urban centers, found that, because of the economic importance of subsistence food harvests to rural residents, moving Native peoples into cities where they would not be able to practice subsistence harvests would cost the Canadian government more in transfer service payments because of the need to make up for the loss of in-kind income usually provided by subsistence foods.

In this paper, we use statistics generated on Alaska Native populations to represent rural Alaska. Alaska Natives maintain a slight majority of the population in rural Alaska (51% in 1999) (Wolfe 2000). While other rural residents are likely to experience many of the same stressors we propose as drivers of migration, the wage differences between Native and non-Natives in rural areas may help non-Native rural residents to be more resilient in the face of economic and lifestyles difficulties and may not, at least in the short-term, provide the same migration push factors. While rural Alaska Natives have greater opportunities for subsistence harvesting, changes in energy costs and the physical environment, discussed below, may reduce the contribution of these practices to the resilience of Alaska Natives.

PROFILE OF INTERIOR ALASKA

The interior region of Alaska consists of 453,247 km² between the Alaska Range to the south and the Brooks Range to the north. Boreal forest covers most of the land, and discontinuous permafrost underlies the region. Forty-seven small, rural, largely Alaska Native communities are spread throughout the region. Village populations range from twenty to almost one thousand. The

economy of these villages is predominantly subsistence (hunting, fishing, and gathering). Unemployment ranges from a low of about 20% to a high of 90% or more (Tanana Chiefs Conference 2006). Most rural villages are not connected to a road system and must be accessed by air, boat, or snowmachine (during winter). The population of rural Alaska remains largely Alaska Native, with 58% percent of Alaska Natives living in rural Alaska and the remaining 42% (50,426) living in urban areas (the total urban Alaska population is 482,847) (Goldsmith et al. 2004). About 10% of Alaska's urban population is now comprised of Alaska Native residents. Goldsmith et al. (2004) define "urban" Alaska to include Anchorage, the Matanuska-Susitna Borough that borders Anchorage, the Kenai Peninsula Borough, Fairbanks, and Juneau. More than half of this urban Native population resides in the Municipality of Anchorage and about 60% of it in the combined Anchorage–Matanuska Susitna Borough area. The Doyon Alaska Native Corporation area of interior Alaska has about 14.5% (14,128) of the total Native population (119,241) of Alaska (Goldsmith et al. 2004). Some 8,174 Alaska Natives reside in the FNSB, comprising 8.6% of the borough population.

Fairbanks—the urban hub of interior Alaska—is the likely host community for many migrants leaving rural interior Alaska because of its proximity to home villages while offering increased job opportunities. The combined population of the city and FNSB is 96,888. Fairbanks has a history of riding out boom and bust cycles associated with resource extraction: first gold then oil. Population growth not associated with development and economic growth may present new challenges to the community—challenges that can be anticipated and planned for effectively.

Fairbanks last experienced a major population boom in the mid-1970s when the Trans-Alaska Pipeline was under construction. During the "boom," the community was confronted with a range of challenges. Housing was extremely limited and expensive—often only affordable to those who had secured high-paying jobs with the pipeline. The result was the proliferation of substandard housing in scattered areas around the community (Dixon 1978). Although the anticipated spike in unemployment and food-stamp claims did not materialize, this may have been due to an active campaign to dissuade people from moving from the Lower Forty-eight to the community without a prearranged job. Nonetheless, those who came without jobs often did find themselves unemployed for long stretches and were able to avoid claiming welfare only due to their

prior planning before moving north. Environmental concerns also rose along with population. Some were managed with careful planning, such as redirecting traffic flow in the downtown core in order to reduce carbon monoxide emissions. Fairbanks' experience with the pipeline boom, which brought people to the community much more rapidly than is expected under a climate change-influenced scenario, demonstrates some of the areas that may be a concern in the near future, including housing, employment, and the state of the environment.

CLIMATE CHANGE AND SUBSISTENCE IN RURAL INTERIOR ALASKA

Climate change is a factor often linked with changes in subsistence practices. Alaska has experienced some of the most pronounced warming on Earth in recent decades (McBean 2005; Whitfield 2003) with a mean annual temperature increase of 1.7°C from 1949–2005 (Alaska Climate Research Center 2009a). The interior region of Alaska has seen the most marked warming throughout the state, with mean wintertime temperature increases as high as 5.1°C in Big Delta (Alaska Climate Research Center 2009b). Climate models for the northern latitudes project a “middle of the road” scenario for the region of temperature increases of 2–3°C by midcentury (Kattsov and Kallen 2005). Given current observations of the effects of warming on subsistence practices, the projected warming could result in severe changes that will make subsistence life in rural Alaska increasingly more difficult and perhaps even impractical.

Warming temperatures in interior Alaska will affect subsistence hunting and fishing in myriad ways. For example, salmon—the major subsistence fish of the region—may be adversely affected by changing hydrological cycles brought on by climate change. Changes in river conditions in the region may give a competitive advantage to species other than salmon or salmon species of lower desirability for human consumption, such as dog salmon, versus the tastier and more commercially lucrative king salmon. Warming waters are also making conditions for disease more likely to manifest. The infectious protozoan *ichthyophonus* is already negatively affecting the meat of chinook salmon, forcing subsistence harvesters to catch far more fish in order to have a usable amount (Kocan and Hershberger 2003).

Alaska Natives have long been accustomed to the extreme variability of the arctic and subarctic climate. Through specialized ecological knowledge and flexibility

they have been able to adapt to their often-changing and uncertain milieu. However, the rate of weather and climate changes has become more rapid, thereby challenging their adaptive capacities and adding to increased vulnerability (Krupnik and Jolly 2002; Nuttall 2005). One important mode of adaptation is to continue subsistence practices but engage in longer and more far-ranging hunting trips. While these longer trips may allow communities to continue their subsistence practices, they also require more fuel and supplies for each trip, thus increasing the financial costs of subsistence practices.

Climate change is only one driver of change among many, with the potential for cumulative effects on rural Alaska lands and peoples, including pollution, industrial development, international markets, and energy availability and costs. As these factors increase and accumulate, access to subsistence resources will likely become more difficult, and rural residents may feel forced to move into urban areas or remain in rural villages and attempt to live within extremely stressed social-ecological contexts.

Examining the Yukon-Koyukuk (YK) census region of the interior provides a good example of the complex interactions between a warming climate system and its impacts on subsistence. The YK region makes up the bulk of the interior with 383,320 km², one quarter of Alaska's entire land mass. The region is relatively sparsely populated, so by itself won't contribute greatly to increasing rural-urban migration, but it gives us a good indication of how this scenario might play if scaled up to all of rural Alaska, regional differences notwithstanding.

The YK region is 70.7% Alaska Native (Alaska DCCED 2002). In 2000, nearly half of the adult population was outside of the labor force. Per-capita income was \$9,837, of which \$8,865 came from transfer payments (Goldsmith et al. 2004). Because of the remoteness and high cost of transportation, jobs are rare, and many of working age leave for seasonal jobs or educational opportunities (Windisch-Cole 2001). The low per-capita income points to the important role subsistence practices play in the viability of the region. Residents of the YK region harvest an average of 613 pounds of wild foods per person each year (57% of total required calories) with a replacement value estimated from \$1,900 to close to \$3,200 per person per year (Wolfe 2000). At the average household size in the region, wild food replacement costs could be as high as \$9,600 each year.

The YK region has experienced some of the most pronounced changes in temperature and precipitation in the state, with tangible localized effects being seen and felt

by subsistence hunters, fishers, gatherers, and trappers. Residents of the region have observed¹ physical manifestations of concern to subsistence, including decreased thickness of river and lake ice and the timing of breakup or freezeup of the rivers that can make travel dangerous or impossible during key harvest times; melting permafrost and drying of important fishing lakes; and changes in the timing, quantity, and quality of rain and snowfall. All of these physical changes have ecological effects on vegetation, fish, and wildlife, and the linkages are sometimes nuanced and very complex. For example, increased shrubs and thickets are potentially good for moose in terms of increased forage but are also related to local lake and wetland drying that decreases fish and waterfowl habitats. Increase in shrubs combined with the recent trend of low snowfall also decreases albedo (reflectivity of the sun's radiation), which means more heat is retained at the Earth's surface, contributing to even more local warming effects (Hinzman et al. 2005).

These ecological changes have occurred in years with an average warming of 1.9 to 2.2°C (Alaska Climate Research Center 2009a). Projections of continued warming point to further long-term negative impacts on local subsistence resources and practices. For example, the Arctic Climate Impact Assessment projects further changes to freshwater ecosystems. Decreased summer water levels of rivers and lakes, increased sedimentation, decreased spawning grounds for cold-water species, and increased mortality and decreased growth and productivity from parasites are all likely to affect salmon, which make up 57% of the wild food harvest in the YK region, and the nonsalmon fish that account for another 13% (Wrona et al. 2005).

The specific impacts of these changes are hard to predict and must be considered in the context of a whole host of social-ecological factors and changes (McCarthy and Long Martello 2005). However, given the high replacement costs for these resources, any reduction in their accessibility must be considered a serious threat to the region's viability.

ENERGY COSTS AND SUBSISTENCE IN RURAL INTERIOR ALASKA

Energy costs in Alaska in general and rural Alaska in particular are much higher than the U.S. average. Energy use per capita is also much higher in Alaska (1,186 million

BTUs/year) than in the rest of the country (341 million BTUs/year) (Energy Information Administration 2004), making the higher costs even more difficult for residents. At the 2005 Alaska Federation of Natives Annual Convention, energy costs and their effect on rural communities was one of three key issues forming the theme of the convention. Rural residents noted that the costs of heating oil and gasoline made direct use of those products extremely expensive. In addition, all goods that have to be shipped in to rural communities are more expensive because of higher transportation costs (Dillon 2005a; 2005b). Freight costs to rural Alaska can be as high as \$1 per pound for perishable foodstuffs, making locally procured subsistence foods all the more important. If energy costs make subsistence practices cost-prohibitive, the push towards urban areas may become stronger.

In Anchorage, new migrants from rural Alaska often cite three reasons for their move: rising prices, lack of educational opportunities, and better employment opportunities in urban areas (de Marban 2006). However, it is energy costs that account for the recent upswing in rural-to-urban migration, according to a representative from the Alaska Native Policy Center interviewed by de Marban. One family who left Bethel for Anchorage noted inflation as the primary reason for their move. "The food was outrageously expensive, the gas was bad—it was just astronomical to live out there" (in de Marban 2006). This family had two earners and was still not able to put any money into savings due to their monthly costs.

Residential electrical energy costs in the Yukon-Koyukuk census region are also high. Subsidies, while available, are also susceptible to political pressure. For instance, 2006 was the first year that the state fully funded its Power Cost Equalization (PCE) Program, a subsidy for electrical rates in rural villages. In testimony to a Senate hearing on coastal erosion in Alaska, Representative Reggie Joule explained the politics of subsidies to rural Alaska: "There are also a few legislators who believe that no money should be spent in rural areas and that threatened village residents should simply move to the city" (U.S. Senate Committee on Appropriations 2004). Whether from coastal erosion or exorbitant costs, life in rural Alaska is becoming more expensive and subsidies to relieve the burden are politically vulnerable at both state and federal levels. The Denali Commission, a federal agency that

1. Based on interviews in the YK region conducted by McNeeley between 2004 and 2005.

supports infrastructure development in Alaska, has been targeted by fiscal conservatives. Critics view infrastructure services to small Alaska villages as pork-barrel politics (Dillon 2007).

Because energy infrastructure in Alaska villages was largely built under low oil prices, few alternatives to diesel power generation exist. Some villages throughout Alaska have begun to investigate other sources of energy production; Arctic Village and Venetie are investigating solar energy, and Galena has completed a feasibility study for a small nuclear power plant. However, prices remain high across rural Alaska. In Table 1, we report the average cost of fuel, the PCE subsidy, and the average residential rate of energy per kilowatt hour in Yukon-Koyukuk villages. Compare these to an average 13.53 cents/kwh in Fairbanks. At a conservative residential usage rate of 3,000 kwh/year, customers in Ruby would pay \$1,260 in electrical costs over a year, versus \$402 in Fairbanks.

Number two diesel, the fuel most commonly used for heating homes and buildings and generating electricity, cost an average of \$3.34 per gallon in Interior Alaska in 2005 (Alaska DCCED 2005). However, prices were as high as \$5.40 per gallon in some communities. In 2006, Saylor and Haley (2006) reported that home heating costs across rural Alaska averaged 10% of median household income, as compared to 3.1% in Anchorage and 4.8% in other urban areas on the road system. Some relief is available for this category of energy cost as low income households in Alaska may be eligible for the federal Heating Assistance Program subsidy. Gasoline, used to fuel the snowmachines that are the primary vehicle for wintertime transportation and subsistence hunting in rural Alaska, cost an average of \$4.36 per gallon in interior Alaska in

the first half of 2007 but ranged from \$2.89 per gallon to \$7.00 per gallon depending on the community (Alaska DCCED 2007). Given the low incomes in rural areas, costs that take away from the economic benefits of subsistence practices, in combination with generally high living costs, could have very detrimental effects on rural communities, reducing their viability and increasing their vulnerability by lowering the ability of residents to support themselves. The Alaska Department of Commerce found that “[s]ignificantly increased fuel and energy costs, combined with high unemployment rates, limited local economies, and local governments struggling to provide basic local services continue to present rural Alaska communities and households with challenging circumstances with no long-term solution in sight” (Alaska DCCED 2007). Increasing costs in multiple energy sectors will likely continue to serve as a migration push, especially to the most vulnerable sectors of the population—single parents, the disabled or chronically ill, and the elderly.

Subsistence practices, of course, go far beyond mere economic benefits. The practices of subsistence harvesting are critical to the survival of Alaska Native cultures and languages (Active 1998; Anderson 1998; Nelson 1973; Thornton 1998). If costs become prohibitive, more rural residents may be forced out of the region and into cities, disrupting not only rural populations but also entire cultures.

HOST COMMUNITY EFFECTS

Migration affects not just the home community—which will need to grapple with population decline, changing demographics, and culture shift—but also the host com-

Table 1. Residential energy costs in the YK census region

Villages	Average price of fuel		kwh/gallon	Average residential rate (cents/kwh)	Average residential rate with PCE* (cents/kwh)
	FY 2006 (\$)	Power source			
Galena	3.06	diesel	13.24	33.00	15.19
Huslia	2.82	diesel	13.46	54.16	19.87
Kaltag	2.28	diesel	13.94	48.59	19.60
Koyukuk	n/a	n/a	n/a	n/a	n/a
Nulato	2.40	diesel	13.15	52.33	19.78
Ruby	n/a	diesel	n/a	65.00	42.00
Fairbanks	n/a	coal	n/a	14.00	n/a
Anchorage	n/a	mixed	n/a	13.40	n/a

* PCE = Power Cost Equalization Program. Based on data from FY 2006 Statistical Report of the Power Cost Equalization Program, Alaska Department of Energy, <http://www.commerce.state.ak.us/dca/pub/FY06PCEreport.pdf>.

munity, which will need to integrate new populations into the social, economic, and environmental systems of the community without harming new or existing residents in the process. For example, a rapid rise in migration to urban centers since World War II left urban planners and politicians scrambling to provide adequate community services and housing for new residents (Graves and Graves 1974) with the unintended outcome of urban sprawl that has had consequences for land use, transportation, and air quality in many urban regions. Greenwood et al. (1991) note the lack of attention paid to host community vulnerabilities and adaptations in migration studies. Important host-community questions include the impact of new residents on the job market (Todaro 1969), ability to house and educate new residents (Graves and Graves 1974), and the environmental impacts of population growth—particularly in regions already experiencing environmental vulnerabilities (Hunter 2005; Lonergan 1998). For the purposes of this paper, we have selected a sample of possible areas of vulnerability that Fairbanks may experience in light of the scenario outlined above.

Fairbanks provides an opportunity to examine the issues that may face urban Alaska under a new migration regime and how those issues could be addressed through targeted planning. When Fairbanks last boomed, during the construction of the Trans-Alaska Pipeline in the mid-1970s, the most common fears were increased crime, increased stress on welfare systems, and the environmental stress of adding many new vehicles to a community already struggling with poor air quality (Dixon 1978). In fact, major crime rates did not rise, new migrants looking for work on the pipeline did not tend to use the welfare system, and traffic planning was effective in addressing downtown air quality issues (Dixon 1978). However, some problems did arise with a rapid increase in population and may again be relevant with an influx of population from rural Alaska. Housing and unemployment both became issues during the boom. Although the borough was able to address the primary environmental issue of the time—air quality—other environmental issues related to land use and climate change are likely to arise with rapid population growth.

Fairbanks is preparing to grow—both physically and economically—and expects a population of 100,000 by 2018, if not sooner (FNSB Community Planning Department 2005). The community is also aware of and concerned about many of the potential effects of climate change, as evidenced by a 2006 resolution that “recognizes a responsibility to develop a community under-

standing of the potential impacts, risks, and opportunities of climate change and learn what local actions can be taken and then consider appropriate steps to address these issues” (FNSB 2006). However, this resolution focuses predominantly on the physical threats from climate change and on possible mitigation strategies—as opposed to adaptation strategies such as planning for demographic shifts. The recently adopted Regional Comprehensive Plan (RCP) provides a possible roadmap for Fairbanks’ growth but does not necessarily address issues specific to an influx of people from rural Alaska. In the following section, we review employment availability, housing affordability and availability, and some aspects of the environmental health of the region under a scenario of in-migration from rural Alaska.

EMPLOYMENT

New migrants into Fairbanks (and other urban areas) may be leaving rural communities because of lack of economic opportunities combined with reduction in subsistence viability. Therefore, they are likely to be seeking employment in the host community. In order to accommodate new migrants, the host community requires a growing economy capable of producing enough jobs for those seeking work. An unfortunate outcome of some rural-to-urban migration has been rising unemployment rates in urban areas as more people move to an area than there are jobs to employ them (Todaro 1969). An important component of creating jobs for those seeking work is to ensure that jobs are spread across the economy and not concentrated in one sector, so that jobs are available at a variety of skill and education levels and in a diversity of fields.

The unemployment rate for the FNSB overall was 5.8% in 2006, which is down from a recent high of 7.0% in 2003 and slightly down from a rate of 6.0% in 2000 (FNSB Community Research Center 2007). Alaska Natives are more likely to have jobs if they live in urban areas (46% of urban Natives are employed while 36% in remote rural and 19% in other rural areas are employed) (Goldsmith et al. 2004). An important question is how much job experience new migrants from rural Alaska might bring to the city—this is one way to gauge their ability to compete for available jobs. The low levels of rural employment may indicate that rural residents have less job experience than their urban counterparts.

Education rates are another possible measure of ability to compete. Alaska Native education rates are climbing. In

2000, 75% of Alaska Natives had high-school diplomas; 35% of women had some college credit; 26% of men had some college credit; and 6% of Alaska Natives had college degrees (Goldsmith et al. 2004). However, this compares to 91.8% of the FNSB population with at least a high-school diploma and 27% with a bachelor's degree or higher (U.S. Census Bureau 2000). Both lower education levels and less job experience put new in-migrants at a competitive disadvantage when looking for work in Fairbanks.

Availability of jobs may become an issue if more people move into Fairbanks—although a larger population may also spur more development and more demand for labor. In recent years, this has been true for the FNSB. As the population of the FNSB increased from 83,809 in 2001 to 85,930 in 2004 (FNSB Community Research Center 2005), an increase of 2,121 people, jobs in the borough increased from 34,700 to 37,200 (Alaska Department of Labor and Workforce Development 2005)—an increase of 2,500 over the same time frame.

Job diversity in Fairbanks is an issue under consideration in the new Regional Comprehensive Plan. At present, 30% of all jobs in the FNSB are government-related. The next most common industry is trade, transportation, and utilities (which includes retail, wholesale, air, and ground transportation), which provides 20% of the borough's jobs. Education and health services and leisure and hospitality both contribute 11% of local jobs (FNSB Community Research Center 2007). Construction is the fifth-ranked industry with 8% of jobs. However, the industries with the greatest growth (most recent statistics are from 2004–2005) are natural resources and mining, manufacturing, and financial activities (FNSB Community Research Center 2007)—so employment diversity in the region may change in the coming years.

The need to both create new jobs and diversify the local economy was addressed in the FNSB RCP—demonstrating that the community is aware of the need to strengthen its economy in several ways. The goal for job creation is to establish the borough as the center of economic activity for interior Alaska. Some of the proposals for economic growth include increasing the borough's role in supporting statewide energy development; developing and maintaining Fairbanks as the transportation hub for the Interior; and emphasizing development and expansion of mining, local manufac-

turing, agriculture, tourism, conventions and hospitality, and forest-related businesses (FNSB Community Planning Department 2005).

Because new industries will create new jobs and new kinds of jobs, the borough has also recognized the need to train the local population to work in new industries. The RCP proposes that the borough define necessary employee skills and provide training for local residents in conjunction with employers, support increased minority participation, and encourage the provision of day-care service to support employment (FNSB Community Planning Department 2005). Alaska Native-specific vocational training programs are also available through the Fairbanks Native Association (FNA) and may help new migrants to Fairbanks integrate into the local job market much faster and more successfully. The FNA program supports people while they complete two-year certificate programs through the University of Alaska Fairbanks and its Tanana Valley Campus. At present, sixty-six people are enrolled in FNA's program. FNA did not have a cap on enrollment in the program, making it an excellent resource for new migrants from rural Alaska.

The FNSB has thus far more than kept up with job creation and has good ideas about how to continue this trend. Some areas of concern are availability of jobs if people are not already skilled or experienced. This gap in job preparation may leave the community vulnerable to rising urban unemployment rates as more people move into the city in search of work. However, the availability of job training through both local government and nonprofits may greatly alleviate that vulnerability.

HOUSING

When Fairbanks boomed in the mid-1970s, one consequence was the increase in substandard housing in the region. As housing prices rose rapidly and housing availability shrank, many residents who could no longer afford standard housing in the area “ended up living in saunas, garages, Quonset huts, partially-built or partially destroyed dwellings, storage sheds, tents or other types of unconventional housing” (Dixon 1978). The legacy of these unconventional, but resourceful, dwellings is clearly visible in the region, and much of the unconventional construction has continued due to a lack of building codes outside of the

2. The City of Fairbanks has adopted the International Building Code 2000 Edition, with amendments for use within city limits. In the FNSB, outside city limits, the borough does not require building codes for personal residences, although houses financed by banks may be required to meet standards acceptable to the financial institution.

Fairbanks city limits.² Other communities have also noted similar concerns about housing availability. In a study of the effects of migration from rural to urban areas in the Northwest Territory, Canada, in the 1990s, Gardner (1994) found that adequate housing for new migrants would be a significant problem for the host communities.

Housing seemed to become more available in Fairbanks between 2001 and 2006. There was a 34% increase in housing availability during that time. However, by 2006 the first-quarter rental vacancy rate was an “almost non-existent” 1.5%. One year earlier, the vacancy rate was 9.8% (FNSB Community Research Center 2007). Local realtors attribute the drop in availability to the effects of soldiers stationed on nearby Ft. Wainwright returning from duty in Iraq coinciding with a loss of housing on the base (Eshleman 2007)—highlighting the need to plan for growth on a regional scale. Home sales rose 14% from 2003 to 2006 with prices rising 34% during the same period (FNSB Community Research Center 2007).

Differences exist between Alaska Natives and non-Natives in terms of types of housing occupied. Sixty-three percent of Alaska Native housing units were rentals compared to 46% for the FNSB general population, therefore the decline in rental vacancies may disproportionately affect new Alaska Native migrants if the trend continues.

Average monthly rent in 2006 was \$989. The most recent median household income (2005) was \$4,713 per month (U.S. Census Bureau 2005). On average, rents don't exceed 30% of monthly income—the level at which households are considered overburdened. However, median household income statistics from 1999 (the most recent available) show that levels range greatly—from \$25,901 to \$62,917—depending on census tract. At least some residents are likely to fall into the housing overburdened category. The median household income for Alaska Natives in the FNSB (in 1999) was \$31,046 or \$2,587 per month. With an average rental cost of \$989, monthly housing costs could cost Alaska Natives well over 30% of monthly household income.

As in the 1970s population boom, if population exceeds housing space, rents may increase before new housing is created. Affordable housing may need to become a priority for local government so as not to create a situation, as during the oil boom, where the lowest income people find themselves without adequate housing. According to the Alaska Housing Finance Corporation (AHFC), a state-run federally funded housing program, in summer 2007

they were at or above capacity in their two family housing programs. AHFC maintains 253 family housing units but had approximately eighty-five families on a waiting list. AHFC also provides subsidy vouchers for eligible residents to live in market housing. As of summer 2007, the corporation was over-issued on vouchers with 349 families using them and another 200 families on the waiting list. The FNSB has identified the need to provide affordable housing in its RCP, stating that it “encourage[s] measures that provide residents access to safe and affordable housing” (FNSB Community Planning Department 2005). However, the RCP does not outline any specific actions it will take to increase affordable housing in the community. An argument can also be made that a lack of federal government funding for low-income housing is responsible for the shortages in that market (Levy 2006) and it is the federal government's responsibility to remedy the situation. The current shortage in both the general rental market and the affordable housing market point to a need to address these issues before the FNSB population increases any further.

In addition to providing affordable housing, another consideration is the physical placement of affordable housing developments. When areas are developed with only affordable housing, they tend to form areas of concentrated poverty. These areas within cities have been linked to a range of human costs, including reduction of private-sector investment, an increase in prices for low-income households due to lack of commercial competition, inhibition of educational opportunities because schools are usually funded by local property taxes, higher levels of crime, and political and societal divisions (Berube and Katz 2005). The potential for the creation of “shanty towns” during the population boom associated with the pipeline was a serious concern for Fairbanks lawmakers at the time (Dixon 1978). Today, with increasing understanding of the effects of concentrated poverty on residents of those areas as well as the broader community, the FNSB has addressed the issue through the RCP. The borough specifically notes that specialized housing intended to meet the needs of persons with disabilities, low-incomes, and the elderly “should not be congregated or clustered in any specific area” (FNSB Community Planning Department 2005). The understanding that affordable housing must be carefully integrated into the community as a whole is an important first step in providing safe and affordable housing and will serve the community well when, or if, additional housing is added to the community.

LAND USE

As Dixon (1978) noted, a combination of population boom and housing shortage pushed the creation of substandard housing on the outskirts of Fairbanks in the mid-1970s. Even as Fairbanks' growth has slowed over the past thirty years, its reach beyond the urban core has continued. It is important to note that growth beyond current boundaries is likely to continue under any population growth scenario—not just rural-to-urban migration—and should be considered as a general issue facing urban areas in Alaska. However, the issue of population growth in fragile or hazardous areas is a topic under consideration in the migration literature (Hunter 2005; Lonergan 1998) and is, therefore, included in this paper for that reason.

Population growth combined with a shortage of affordable housing might again stretch the boundaries of Fairbanks further into previously undisturbed and possibly permafrost-rich lands. Besides the adverse effects of urban sprawl on land use and air quality, building on permafrost soils can have disastrous effects for the structure, including subsidence, damaged foundations, and other structural problems. If climate change continues to contribute to permafrost melting in the Arctic, these effects may multiply in the Fairbanks region. Across the state, infrastructure damaged by climate change is expected to have a real economic cost for communities. Estimates of the costs to repair and maintain infrastructure damaged by melting permafrost, flooding, and erosion are 10–20% higher than usual over the next thirty years (Larsen et al. 2007). This estimate considers only public facilities such as roads, airports, and schools. Costs for damage to private residences would be borne by the owner and insurance companies.

One of the concerns already identified by the borough through the RCP is development pressures on marginal lands and the need to balance development to meet human needs with mitigation of adverse environmental impacts. The strong ethic of individualism and personal choice in the region appears to inhibit strong regulations about the placement and sizing of developments. In addition, maintenance of a rural lifestyle, demonstrated by large lot sizes sited away from other development or residences, is an important consideration for many residents. However, some specific recommendations from the RCP do indicate a general movement towards slowing the rate of sprawl and protecting sensitive areas from heavy development. The plan calls

for discouraging intensive residential infill on marginal, permafrost-rich lands and limiting residential development on lands with a slope greater than 20% (FNSB Community Planning Department 2005).

An important consideration also being addressed by the borough is the need to increase population density in the downtown area in order to slow the rate of sprawl and to make the best use of existing infrastructure (water and sewer lines, for example). Rather than approach this goal with regulations, the borough is attempting to achieve it with incentives. While incentive-based plans, as opposed to regulations, may be less effective in the short term, within the context of a politically independent community, incentives may be an appropriate approach because they attract less political and economic opposition and rely on individual choice for their success. One set of actions recommended in the RCP is to develop programs and physical structures in downtown that encourage use beyond the regular workday such as theaters, restaurants, housing, recreation, and waterfront amenities including access to recreational trails (FNSB Community Planning Department 2005). These increased and improved amenities in the downtown core may help to attract further investment in the downtown. The borough is in the planning process of an intensive downtown revitalization effort designed to bring residents and business back into the central core (Eshleman 2006). This planning must integrate a range of residences and employment opportunities for all residents and meet, in particular, the specific health, educational, and family needs of the rural Alaska Native migrants transitioning into the urban locale in response to environmental and economic stressors.

Whether population growth in the FNSB is due to rural-to-urban migration, in-migration from other states, or natural increases, the reality of planning for growth that takes into consideration the environmental health and environmental state of the region will be critical to long-term viability of the community.

CONCLUSIONS

The community of Fairbanks is clearly planning for growth in the next twenty years. It is addressing issues of economic development and diversity, protection of marginal lands and slowing the growth of the physical footprint of the community, and revitalization of the downtown area which will support both of the other two goals. However, two critical issues remain in the ability of Fairbanks, and

likely other urban Alaska cities, to adapt to a wave of rural-to-urban migration. First, recommendations included in the RCP are intended to guide development plans but are not a guarantee of their implementation. Like the 2006 Awareness of Climate Change resolution (FNSB 2006), implementation of the recommendations contained in the RCP will require both financial capabilities and political will. Second, the migrants the region seems best prepared for are those moving to the area to take specific jobs—particularly in the oil industry or in other industries being courted by the area. An increase in rural-to-urban migrations within the state may present challenges for which this city is not prepared. Rural migrants might not have jobs awaiting them upon their arrival, the average lower educational experience of Alaska Natives might require additional job training for new migrants, and the lower average annual income for rural Alaska Natives might mean that new migrants are less financially able to buy or rent housing immediately upon arrival. More focus on job training programs and providing affordable housing are two ways the borough and city could help ease the transition for migrants and reduce stress on local social service agencies and the Fairbanks community in general.

The trend toward urban growth and rural-to-urban migration is clear around the world, and climate change appears to be playing an increasingly large role in migration decisions, particularly when combined with existing stressors like rising energy costs. As some communities become more vulnerable to multiple stressors, others must begin to plan to reduce their own vulnerabilities, integrate new residents, and stabilize the population, economy, and environment of the region. Foresight and integrative planning could help host communities avoid some of the challenges of rural-to-urban migration such as an increase in the unemployment rate for the area, rapid development of housing that does not meet adequate standards for humans or the environment, and environmental degradation related to large urban populations. While Fairbanks has considered many of these issues, its focus on in-migration from outside of the state directly related to economic development may leave it unprepared for the unique needs of indigenous rural migrants from within the state. Scenario building, as done above, can help host communities consider who is likely to migrate, on what time scale and in what numbers, what needs must be met, and what attributes new migrants will bring to their host community that can contribute to strengthening the community as a whole.

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