# Methods for Rural / Non-Rural Determinations for Federal Subsistence Management in Alaska

## Final Report

### Analysis and Recommended Methodology

*Submitted to:*

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The analysis and recommendations in this report are those of the authors and do not necessarily reflect the views of the US Fish and Wildlife Service, Office of Subsistence Management, or the Federal Subsistence Board.

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# INTRODUCTION

This report presents alternative methodologies for identifying rural and non-rural areas for federal subsistence management in Alaska. It is the final report for the project, *Rural/Non-Rural Determinations for Federal Subsistence Management in Alaska* (Contract No. 701811CO58), U.S. Fish and Wildlife Service, Alaska Region.

The project was a joint research effort of the Institute of Social and Economic Research (ISER) at the University of Alaska, Anchorage, and Robert J. Wolfe and Associates. The project director was Victor Fischer, Professor of Public Affairs at ISER. The principal investigator was Robert J. Wolfe, a sociocultural anthropologist and former Research Director at the Division of Subsistence, Alaska Department of Fish and Game. ISER Research Associates Amy Craver, Mary Killorin, and Amy Wiita organized and conducted the project's eight focus groups in seven communities, including analysis of focus group materials and presentation of results. Bradford Tuck, Professor Emeritus of Economics at ISER, analyzed economic and commuting variables from the federal census. Cheryl Scott of Alaska Connections developed the project's main database, compiling information and developing variables drawn from federal census and Alaska state information sources. Brian Davis, Subsistence Specialist at the Alaska Department of Fish and Game, Division of Subsistence, analyzed spatial information from the federal census for density measures. The project also benefited from discussions with several colleagues, including Matthew Berman, Professor of Economics at ISER; Stephen Colt, Assistant Professor of Economics at ISER; Joseph Jorgenson, Professor Emeritus of Anthropology, University of California, Irvine; and Stephen Langdon, Professor of Anthropology, University of Alaska, Anchorage. Marcia Trudgen, ISER Business Manager, provided administrative support.

The report develops two alternative methodologies for distinguishing rural and non-rural populations in Alaska for federal subsistence management. The methodologies use measures drawn from the federal decennial census and the State of Alaska's harvest records, among other relevant data sources. An overriding goal of the project was to use a minimal number of criteria that clearly, effectively, and defensibly distinguish between rural and non-rural populations. The two methodologies are tested on a selection of Alaska communities.

This final report (*Deliverable Six*) presents findings of the project. It represents a synthesis of five interim products developed during the study -- a literature review (*Deliverable One*), focus group contributions (*Deliverable Two*), criteria development (*Deliverable Three*), methodologies (*Deliverable Four*), and tests of methodologies (*Deliverable Five*). Each interim product was reviewed by an outside Technical Evaluation Panel with members from five agencies – Laura Jurgensen of the U.S. Fish and Wildlife Service; Taylor Brelsford of the Bureau of Land Management; Don Callaway of the National Park Service; James Fall of the Alaska Department of Fish and Game, Division of Subsistence; and Pat Reed of the U.S. Forest Service.

The report begins with a presentation of rural concepts, including its common meanings and its meanings from the scientific literature. Three core meanings are discussed – rural as "the country," rural as "ways of making a living in the country," and rural as "cultural patterns of country peoples." Rural definitions specific to subsistence management in Alaska by the federal and state programs are summarized. The report then discusses rural concepts contributed by eight focus groups convened as part of the project. The next sections identify criteria (variables and measures) that can be used to distinguish rural and non-rural populations in Alaska. Two potential measures are developed specifically for the project – measures of *country food production* and *population density*. Issues surrounding the aggregation and disaggregation of populations for measurement and analysis are discussed in some detail, including a discussion of *co-resident communities*.

Two alternative methodologies are presented for distinguishing rural and non-rural populations in Alaska -- *Discriminant Analysis Assessment* and *Criterion-Referenced Assessment*. Each methodology is developed and tested using a set of 195 populations. The outcomes of these test assessments are compared. Finally, the report provides recommendations for a preferred methodology and additional data collection for conducting rural assessments. Three appendices provide detail regarding variables (Appendix A), sixteen statistical runs testing the Discriminant Analysis Assessment methodology (Appendix B), and federal census commuting codes (Appendix C). Documentation of the project's database, methodologies, and tests is provided on an accompanying compact disk.

Our tests of methodologies should not to be construed as actual determinations of rural and non-rural status. The analyses were performed to determine whether the concepts developed in the study would work in real world application. Implementation of the recommended methodology requires a number of additional steps outlined in the report.

The recommended methodology does not preempt any Federal Subsistence Board prerogatives. Rather, it is intended to facilitate rural status determinations by the Board. It clarifies the categorization of most areas and focuses on the process of final decision making with respect to remaining communities. Final determinations are thus clearly subject to Board decisions.

Finally, this report is submitted for consideration by the Federal Subsistence Board to help determine methods for future subsistence determination, and it should not be construed to represent policies of the Board. The analysis and recommendations of the report are those of the authors and do not necessarily reflect the views of others involved in the study.

# RURAL CONCEPTS

To avoid challenge, methodologies for classifying rural and non-rural areas for subsistence management cannot diverge too far from common meanings of the term "rural." Evaluation criteria should be firmly grounded in credible, though rigorous, construction of terms consistent with common meanings and the scientific literature.

There appear to be three common meanings of "rural," according to the *American Heritage Dictionary of the English Language, 4th Edition* (AHDEL 2000: 1525):

1. "rural" means of, relating to, or characteristic of *the country*, including *open space* and relatively *low human population-to-land densities*;

2. "rural" means of, or relating to, *farming, agriculture, or other extensive land uses*, which are *ways of making a living in the country*; and,

3. "rural" means of, or relating to, the *people who live in the country*, including distinctive patterns of knowledge, belief, experience, skills, value orientations, and customs connected to country living *(distinctive cultural patterns associated with country living*).

These three dimensions are represented in a definition of "rural" offered by the recently published, *Dictionary of Human Geography*:

> *Rural.* Areas which are dominated (either currently or recently) by extensive land uses such as agriculture or forestry, or by large open spaces of undeveloped land; which contain small, lower-order settlements demonstrating a strong relationship between buildings and surrounding extensive landscape, and which are perceived as rural by most residents; and which are thought to engender a way of life characterized by a cohesive identity based on respect for the environment, and behavioral qualities of living as part of an extensive landscape. In practice, rural areas vary considerably, from those which may still be defined functionally (by land use and geographical location) to those closer to urban centers where 'rural' is more of a socially and culturally constructed and therefore contested category. (Johnson 2000: 718, by P. Cloke)

The above definition from human geography is consistent with common meanings, including as dimensions "large open spaces of undeveloped land" (*the country*), "extensive land uses" (*ways of making a living in the country*), and "way of life," "identity," and "behavioral qualities of living as part of an extensive landscape" (*distinctive cultural patterns of people living in the country*).

Under these general concepts, a population regularly supported by extensive land uses (such as country food production, commercial fishing, forestry, and so forth) within a sparsely-populated, open country is "rural." That is, *extensive land use* and *sparsely-populated, open country* are each a primary mark of being rural. A population with both

features appears doubly qualified. Conversely, under these general concepts, a population not supported by extensive land uses within a relatively densely-populated area is "non-rural," failing two of the primary features. Populations displaying a mix of features are of less certain classification and might need additional assessment.

In addition, under the general concepts, one would expect a rural population to display certain distinctive patterns of knowledge, belief, experience, skills, value orientations, and customs connected to country living. Through regular daily interaction with the open land and its ways of living, rural people come to be distinguishable from city people, as expressed by the commonly-held contrast of "rustic" with "urbane" (AHDEL 2000: 1526, 1892).

The following analysis will treat the first two general characteristics (*extensive land uses* and *sparsely-populated, open country*) as *primary* concepts for identifying rural populations in Alaska. They are each central to the most common meanings of "rural," and they each have measures generally available in demographic and other scientific databases. As is shown below, most Alaska populations can be identified as "rural" or "urban" using the two primary concepts. Measures related to the third general characteristic (*distinctive cultural patterns connected to country living*) are treated as *ancillary* evidence in support of classifications made with the two *primary* concepts. Information is not consistently available for ancillary factors. However, ancillary concepts may be useful as additional information for assessing particular cases, especially those not clearly identified with primary factors. In the following four subsections, information on each of the three rural dimensions is discussed, based on literature reviews and contributions of Alaska focus groups. The development of methodologies for rural determinations in Alaska follow in subsequent sections.

## Rural as "The Country"

Commonly, "rural" means of, relating to, or characteristic of *the country*, as opposed to *the city* (AHDEC 2000: 1525, 1st meaning). This is the word's core sense. The Latin root, *rur-*, means "open land" or "country," and it descends from a very old Indo-European root, *reuə*, meaning the verb, "to open" and the noun, "space" (hence, "open space") (AHDEL 2000: 2045). The "country" in this sense means an area or expanse outside cities and towns, with relatively lower human population to land densities (AHDEL 2000: 418, 4th meaning). In its common sense, "city" means a center of population, commerce, and culture, or a town of significant size and importance (AHDEL 2000: 339, 1st meaning). So the basic contrast is between *the country* and *the city*. "Urban" is a common contrast term for rural, because "urban" means of, relating to, or located in a city, from the Latin stem *urb-*, city (AHDEL 2000: 1892).

The scientific literature on rural and urban areas covers historic processes of "urbanization," urban expansion (including formation of "suburbs," "metropolitan" areas, and "rural-urban fringe" areas), and evolving relationships between rural and urban populations. Historically, cities developed as ceremonial centers, administrative centers

for public works projects (particularly large-scale irrigation systems for agriculture), and centers of politico-military power (Adams 1966; Mumford 1961). With increasing agricultural production and concentration of economic surpluses, cities became centers of trade and redistribution networks as well as centers of administration, craft specialization, finance, and culture. With industrialization and capitalism, cities have become primary centers of production and consumption of manufactured goods and services, with the urban population selling labor to capital (Casells 1977; Johnson 2000: 871).

As a consequence of industrialization, rural-to-urban demographic transitions have accompanied national economic development at a global scale (Preston 1982; Schapiro 1986). Standard measures of urbanization are now used to track changes in national populations, including "urban percentage," "urban-rural ratio," and "mean city population size" (Arriaga 1982). In developing countries, rural populations typically exceed urban populations, while in developed countries, urban populations typically exceed rural populations (for example, while China is 70 percent rural, Europe is 70 percent urban) (Korcelli 1982; China Statistical Yearbook 1998: 105; United Nations 1997). Urbanization initially occurs through net transfers of rural populations to urban areas. Most urban growth results from natural increase of city residents (excess births over deaths), with rural-urban migration and reclassification of areas from "rural" to "urban" comprising secondary components. In developed countries with urban majorities, urban areas expand and contract primarily through transfers of city residents between urbanized areas (Preston 1982; Korcelli 1982; Wardwell and Brown 1980; Wardwell and Copp 1997). The urbanized areas of Alaska primarily have grown through in-migration from other urban areas outside of Alaska (Williams 2000; Kruse and Foster 1986). In 1990, the majority of Alaska's rural residents were born in the state (about 75 percent), in contrast with 27 percent for Anchorage, 26 percent for Fairbanks, about 32 percent for the Matanuska-Susitna Borough, Kenai Peninsula Borough, and Juneau, and 34 percent for Alaska as a whole (Williams 2000:19).

"Rural sociology" developed principally within the social and political turmoil associated with the American Industrial Revolution (Summers 2000: 1686; Hay and Basran 1992). The discipline documented the revolutionary restructuring of economic, social, and political systems as American industry transformed. Sociological concepts and theories about "rural society," "modernization," "the rural-urban continuum," and other social phenomena developed within, and were colored by, evolving political power structures and economic-property relationships. Rural-urban concepts were constructed in large part to mediate the turmoil between country and city populations. Over time, political power and economic advantage became concentrated in urban areas, and urban-based interests typically interpreted the solution to "rural problems" as requiring the "modernization" and "technological transformation" of rural areas. By contrast, small-holder farmers, indigenous cultural groups, and other rural populations frequently interpreted the industrial revolution in terms of economic expropriation and destruction of traditional societies and rural agrarian systems by urban power bases (Summers 2000). Administrative approaches toward urban and rural areas were commonly constructed within policy debates over allocation of key public resources. Professional "managers" and "gatekeepers" in the state apparatus played important roles in constructing and

applying rules of access to public resources (Pahl 1975; Johnson 2000: 878; Cain et al 1990). In Alaska, similar historic processes have played out. During the most recent century, substantial political and public tensions have emerged between urban and rural populations over issues including land ownership and control, natural resource development, fish and wildlife allocation, and public funds expenditures (Berger 1985).

The demarcation of "rural" and "urban" populations vary considerably among and within government programs (Arriaga 1982). Larson (1968: 582) states, "The most general current practice is to use two demographic variables – absolute size and density of settlement – in defining 'rural'." However, he states, "although there is broad general consensus that the term 'rural' refers empirically to populations living in areas of low density and to small settlements, there are wide variations in the cutting point used operationally to distinguish rural from urban…. In most countries the dividing line between rural and urban is set at population aggregates of somewhere between 1,000 and 5,000 inhabitants." In reviewing the literature, we found rural/non-rural thresholds as high as 50,000 people used by government programs in the United States. A selection of rural standards used by government entities illustrates some of this variability.

> *U.S. Census Definition*. In 2000, the U.S. census defined "urban" as incorporated places or census designated places of 2,500 or more persons (here and elsewhere, U.S. census information derives from materials at www.census.gov). United States territory and populations not classified as "urban" constituted "rural." In 1990, 24.8 percent of the U.S. population was rural under this standard.
>
> *Statistics Canada Definition.* In 2000 in Canada, Statistics Canada defined "urban" as areas with minimum population concentrations of 1,000 persons and a population density of at least 400 persons per sq km (about 1,040 persons per sq mi) (Statistics Canada 1996). All territory outside urban areas was considered rural.
>
> *U.S. Office of Management and Budget Nonmetropolitan Areas.* In the U.S. since 1990, whole counties or county clusters have been considered urban or rural for certain federal programs based on whether they comprised a "metropolitan area" ("urban") or "nonmetropolitan area" ("rural") as defined by the U.S. Office of Management and Budget (U.S. Department of Agriculture 2001). A *metropolitan area* contained (1) core counties with one or more central cities of at least 50,000 residents or with a Census Bureau-defined urbanized area and a total area population of 100,000 or more and (2) fringe counties that were economically tied to the core counties. *Nonmetropolitan areas* were outside the boundaries of metropolitan areas and had no cities with as many as 50,000 residents. In 1990, 22.5 percent of the U.S. population lived in nonmetropolitan areas under this standard. Except for the municipality of Anchorage, all areas in Alaska were classified as "nonmetropolitan" and qualified as "rural" for most federal health programs under this standard (Ricketts et al 1998: 4).

*U.S. Administration on Aging.* Under the 1992 Amendments to the Older American Act, the U.S. Administration on Aging has defined "urban area" as (1) urbanized areas (a central place and its adjacent densely settled territories with a combined minimum population of 50,000) and (2) incorporated places or census designated places with 20,000 or more inhabitants. A "rural area" was an area that was not urban. The administration operationalized the definition using urbanized areas as defined by the Census Bureau and ZIP code areas (Ricketts et al 1998: 7).

*U.S. Department of Housing and Urban Development.* For certain housing programs, "rural" means any open country, or any place, town, village, or city which is not part of or associated with an urban area and which (1) has a population not in excess of 2,500 inhabitants, or (2) has a population between 2,500 to 10,000 if it is rural in character, or (3) has a population between 10,000 and 20,000 and is not contained within a standard metropolitan statistical area and has a serious lack of mortgage credit for lower and moderate-income families (42 U.S. Code, 8A, III Section 1490; Ricketts et al 1998: 11). In this definition, mortgage credit and other factors are used in addition to population size and density in classifying areas for HUD programs.

*U.S. Department of Health and Human Services Frontier Area Concept.* For the development of community health center service areas, "frontier" areas have been defined as areas with low density populations (6 or fewer persons per square mile), with at least 500 residents within a 25-mile radius of a health service delivery site or within a logical trade area, and with the distance to the next level of care more than 45 miles and/or 60 minutes (Ricketts 1998: 10-11).

*U.S. Department of Agriculture Urban Influence Code and Rural-Urban Continuum Code.* Adjusting the metropolitan and nonmetropolitan classification system of the U.S. Office of Management and Budget, the USDA categorizes areas into nine types, based on the population size of cities in nonmetropolitan areas (<2,500; 2,500-9,999; 10,000 or more), the population of metropolitan areas (<1 million; >1 million), and the location of nonmetropolitan areas ("adjacent" or "not adjacent" to a metropolitan area). In these two systems, adjacent areas are identified by at least two percent of the employed labor force commuting for work (Ricketts et al 1998: 8).

The complexity of some of the above classification systems results in part from the characteristics of the so-called "rural-urban fringe," zones of transition between the continuously built-up urban and suburban areas of the central city and the rural hinterland (Prior 1968; Errington 1994; Bryant et al 1982; Brown et al 1993). The rural-urban fringe commonly displays a changing mosaic of land uses and sociodemographic characteristics (Johnson 2000: 722). With improved transportation networks and commuting efficiencies, fringe areas increasingly serve as places of residence for persons with urban-centered sources of livelihood while including rural-oriented populations (Champion 1989; Larson 1968: 581; Nagata 1971). Commonly, land planning issues

involving the fringe include placement of large-scale urban facilities (such as airports and sewage works), "fringe" agriculture, land banks for later development, green belts, and commuting systems (Johnson 2000: 722). In addition, there has been a trend in some states toward the extension of city boundaries to include territory that is essentially rural in character. Rural-like populations who might otherwise qualify for federal rural programs find themselves within the boundaries of municipalities that are nominally "urban."

To provide a better separation of rural and urban populations in the vicinity of large places, the U.S. census recognizes "urbanized areas." An urbanized area is one or more places ("central place") and the adjacent densely settled surrounding territory ("urban fringe") that together have a minimum of 50,000 persons. The geographic core must have a population density of at least 1,000 people per square mile, and adjacent blocks must have at least 500 people per square mile. The U.S. census also uses the concept of an "extended place" (previously called "extended city"), defined as an incorporated place or census designated place that is partially within and partially outside of an urbanized area or urban cluster. The urban portion of an extended place is classified with the urbanized area, while the rural portion is classified as "other rural." These classification tools enable the U.S. Census to split up incorporated places (and census designated places), in order to treat a portion as "urban" and a portion as "rural," based on sprawl and other density characteristics.

Practically, classification of areas based on factors such as population size and density involve decisions about aggregation and disaggregation of populations and territories for which census information has been specifically collected. The U.S. Census utilizes a hierarchy of spatial units for collecting and reporting information, including the following: "census block group" (generally between 600 to 3,000 people with an optimum size of 1,500 persons), "census tract" (generally between 1,500 and 8,000 people with an optimum size of 4,000 people), "zip code tabulation areas" (ZCTAs) (approximate delivery area for a U.S. Postal Service five-digit or three-digit zip code), "incorporated places/census designated places" (legally-constituted cities or statistical areas without legal status, of any population size), "urbanized area" (a densely-settled territory that contains 50,000 or more people), and "metropolitan area" (a large population nucleus with at least 50,000 people and adjacent communities with a high degree of economic and social integration). Census block groups and census tracts commonly are delineated by *location participants* as part of the U.S. Census Bureau's Participant Statistical Area Program. These types of spatial units are used to aggregate and disaggregate information for calculating population size, density, commuting patterns, and other measures used in rural definitions. This topic is elaborated in later sections of this report.

## Rural as "Ways of Making a Living in the Country"

In its second common meaning, "rural" means of, or relating to *farming, agriculture, or other extensive land uses* (AHDEL 2000: 1525). In this sense, rural refers to ways of making a living in the country (as contrasted with ways of making a living in cities). Ways of making a living differ considerably in the country, depending on the culture, economy, ecology, and history of a place and its people. In addition to "agriculture," the literature identifies at least three additional general patterns that characterize country living -- hunting-gathering-fishing (foraging), pastoral herding, and horticulture (subsistence farming) (Castell 1972; Howell 1986; Langdon 1986; Meyers 1988; Nimkoff and Middleton 1960; Shaw 1988).

As stated by Larson (1968: 581), "the production of food and other raw materials is a basic function of rural societies; indeed, in modern society the survival of the urban sector is dependent upon the effective conduct of this function." While food production is commonly central to rural economies, farmers usually are intermingled with country residents engaged in non-farm occupations, and members of a farming household commonly hold non-farm occupations.

In developed countries, the percentages of rural residents engaged in farming are a relatively small minority of the rural population (DeAre et al 1989; Falk et al 1988; Frederick 1988). For instance, in Canada, only 12.9 percent of the rural population was categorized as "rural farm population" in 1996, with provincial percentages ranging from a low of 0.6 percent (Newfoundland) to a high of 38.7 percent (Saskatchewan) (Statistics Canada 2001). This cautions that, while "farming" and other "extensive land uses" are common marks of "rural," the majority of workers in rural areas in developed countries are likely not to be food producers or to live on farms. The percentages of farmers in urban areas are even smaller. In Canada's urban areas, only 0.14 percent of Canada's urban population was classified as "urban farm population" in 1996 (Statistics Canada 2001).

The variety of economic systems underlying rural areas is illustrated by economic typologies of the U.S. Department of Agriculture. The USDA classifies nonmetropolitan counties (which are treated as "rural" under some federal programs) into six non-overlapping economic types according to the primary economic activity or themes of special policy significance, including farming-dependent, mining-dependent, manufacturing-dependent, government-dependent, services-dependent, and nonspecialized counties (U.S. Department of Agriculture 2001). Most Alaska areas are classified as "government-dependent," with local economies specialized in federal, state, and local government activities. Counties also are classified into five overlapping policy types: retirement-destination counties, federal lands counties, commuting counties, persistent poverty counties, and transfers-dependent counties.

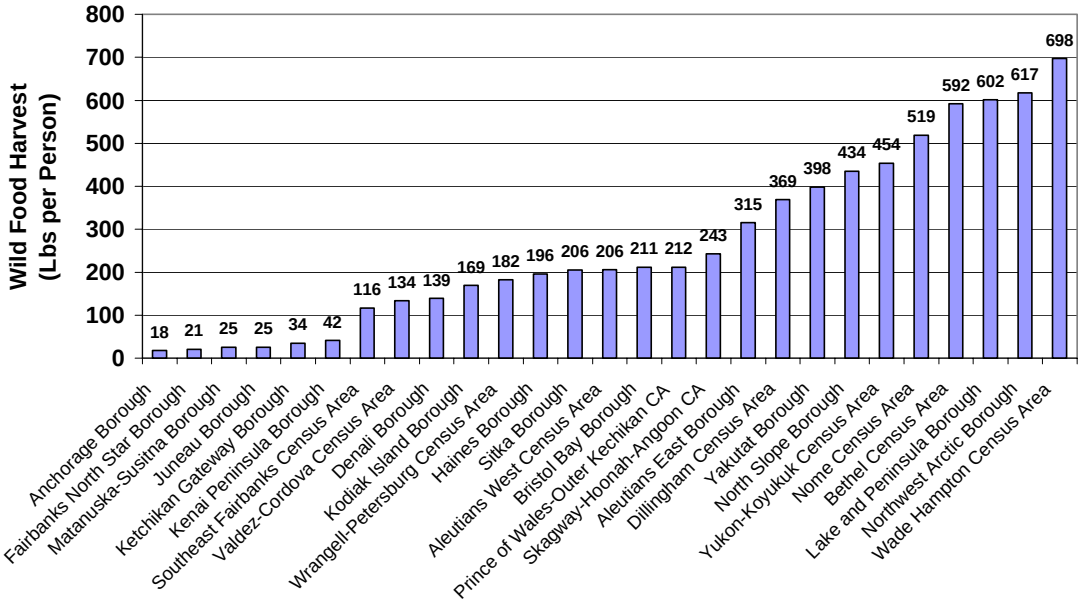
Types of extensive land uses historically found in rural Alaska include commercial fishing, commercial whaling, fur harvesting (sea otters, fur seals, furbearer trapping, and fox/mink farming), reindeer herding, commercial logging, hard-rock mining (such as

gold, silver, and zinc), oil and gas extraction, agriculture (large-scale farms have been primarily in the Matanuska-Susitna and Delta areas), and tourism. Some extensive land uses have been associated with boom-and-bust settlement cycles, such as Nome. Others have spurred the development of more permanent towns and cities, such as Juneau and Fairbanks (gold mining) and Anchorage, Kenai, and Valdez (support services for petroleum development and export) (Wolfe and Ellanna 1982; Williams 2000: 14).

Information on economic activity by community is available from the U.S. Census and the Alaska Department of Labor. Economic activity is summarized in terms of standard industrial codes (such as Services, Trades, and Finances; Utilities, Transportation, Construction, Communication; State and Local Government; and so forth). Employment also can be summarized in a similar fashion. Associations of employment/industrial categories with settlement size in Alaska were examined by Bradford Tuck as part of this project. Some industrial categories appear to be related to population size, although relationships appear complex. Information on commercial fishing activities is compiled by the Alaska Limited Entry Commission and the Alaska Department of Fish and Game. These records provide measures of commercial fishing participation and commercial fish harvests by residents of Alaska communities.

In Alaska, "ways of making a living" in the country commonly include non-commercial fishing and hunting for local consumption (Wolfe and Walker 1987). Some areas are supported by traditional economic systems which have been called "subsistence-based socioeconomic systems," characterized by factors such as substantial wild food production levels, noncommercial food distribution systems, diversity of wild foods, moderate to high household participation rates in food production, community-wide seasonal cycle of harvest activities, traditional land use areas, among other factors (Wolfe et al 1984). Harvest levels vary substantially by region, as illustrated by Fig. 1 (Wolfe 2001; see also Wolfe and Walker 1987 for a discussion of factors related to harvest levels). Alaska's large, populated census areas have relatively lower per capita harvests of wild foods – Anchorage (18 lbs), Fairbanks North Star Borough (21 lbs), Matanuska-Susitna Borough (25 lbs), Juneau Borough (25 lbs), Ketchikan Gateway Borough (34 lbs), and Kenai Peninsula Borough (42 lbs) (Fig. 1). Harvests in other census areas range from 116 lbs per capita (Southeast Fairbanks Census Area) to 698 lbs per capita (Wade Hampton Census Area). The nutritional values of wild food harvests are substantial for most census areas. In 21 of 27 census areas, wild food harvests contain 75 percent or more of the Recommended Dietary Allowance (RDA) of protein for the population (Fig. 2). In the five census areas with the lowest harvests, wild foods contain less than 25 percent of the RDA of protein (Fig. 2). A growing ethnographic literature has documented these harvest and use patterns for communities throughout the state, as is summarized in the subsequent section, *Rural Definitions and Subsistence Research in Alaska.*

**Fig. 1. Wild Food Harvests (Lbs Per Person per Year) by Residents of Alaska Census Areas**




The Map Catalog Database within the Alaska Department of Fish and Game contains maps of geographic areas used for fishing and hunting by residents of Alaska communities, collected using methodologies pioneered in Canada (cf., Caulfield and Pedersen 1981; Caulfield 1983). While many maps have been digitized, most appear as hard-copy maps in reports of the Technical Paper Series of the Division of Subsistence (*www.state.ak.us/local/akpages/FISH.GAME/subsist/subhome.htm*). The maps provide a main information base for analyzing extensive land use patterns in rural Alaska areas.

**Fig. 2. Nutritional Values of Annual Wild Food Harvests to Census Area Populations in Alaska**

| Rank | Alaska Census Area | Population (2000) | Annual Wild Food Harvest (Lbs Per Person) | Annual Wild Food Harvest (Lbs Per Census Area) | PROTEIN Percentage of Recommended Dietary Allowance of Protein (49 g/day) |
|---|---|---|---|---|---|
| 27 | Anchorage Borough | 260,283 | 18 | 4,581,730 | 11% |
| 26 | Fairbanks North Star Borough | 82,840 | 21 | 1,717,465 | 13% |
| 25 | Matanuska-Susitna Borough | 59,322 | 25 | 1,495,478 | 16% |
| 24 | Juneau Borough | 30,711 | 25 | 776,573 | 16% |
| 23 | Ketchikan Gateway Borough | 14,070 | 34 | 483,539 | 22% |
| 22 | Kenai Peninsula Borough | 49,691 | 42 | 2,058,598 | 27% |
| 21 | Southeast Fairbanks Census Area | 6,174 | 116 | 718,402 | 75% |
| 20 | Valdez-Cordova Census Area | 10,195 | 134 | 1,364,734 | 86% |
| 19 | Denali Borough | 1,893 | 139 | 263,926 | 90% |
| 18 | Kodiak Island Borough | 13,913 | 169 | 2,354,674 | 109% |
| 17 | Wrangell-Petersburg Census Area | 6,684 | 182 | 1,219,507 | 118% |
| 16 | Haines Borough | 2392 | 196 | 467,875 | 126% |
| 15 | Sitka Borough | 8,835 | 206 | 1,816,476 | 133% |
| 14 | Aleutians West Census Area | 5,465 | 206 | 1,126,420 | 133% |
| 13 | Bristol Bay Borough | 1,258 | 211 | 265,849 | 137% |
| 12 | Prince of Wales-Outer Kechikan CA | 6,146 | 212 | 1,304,287 | 137% |
| 11 | Skagway-Hoonah-Angoon CA | 3,436 | 243 | 834,802 | 157% |
| 10 | Aleutians East Borough | 2,697 | 315 | 850,155 | 204% |
| 9 | Dillingham Census Area | 4,922 | 369 | 1,816,296 | 238% |
| 8 | Yakutat Borough | 808 | 398 | 321,422 | 257% |
| 7 | North Slope Borough | 7,385 | 434 | 3,208,253 | 281% |
| 6 | Yukon-Koyukuk Census Area | 6,541 | 454 | 2,967,320 | 293% |
| 5 | Nome Census Area | 9,196 | 519 | 4,769,929 | 335% |
| 4 | Bethel Census Area | 16,016 | 592 | 9,480,402 | 382% |
| 3 | Lake and Peninsula Borough | 1,823 | 602 | 1,097,190 | 389% |
| 2 | Northwest Arctic Borough | 7,208 | 617 | 4,447,292 | 399% |
| 1 | Wade Hampton Census Area | 7,028 | 698 | 4,904,458 | 451% |

Source: Robert J. Wolfe and Associates, Subsistence Profiles of Alaska Census Areas, 2001 (Revised 7/15/02)

A *central-based use area* pattern is a common land use pattern in rural Alaska. In this pattern, residents of a central settlement regularly use surrounding commons for country food production. In regions off the Alaska road system, settlements are typically compact, with residences, services, businesses, schools, and airports occupying a central area. The surrounding commons are relatively open, with low human populations, and containing modest infrastructures such as trail systems, fishing camps, trapping cabins, and so forth. The commons typically comprise mosaics of public and private lands across which range common-property fish stocks and wildlife populations. In addition to federal and state regulations, local usufruct rules guide the access and use of the commons for noncommercial fishing and hunting. Use of fishing eddies, seasonal camps,

trapping lines, berry picking sites, and other harvest areas typically are guided by customary rules. A core use area surrounding a rural settlement generally supports most country food production. However, larger use areas extending beyond the intensively-used core are used more occasionally. Use areas of rural settlements commonly overlap those of other rural settlements at the margins.

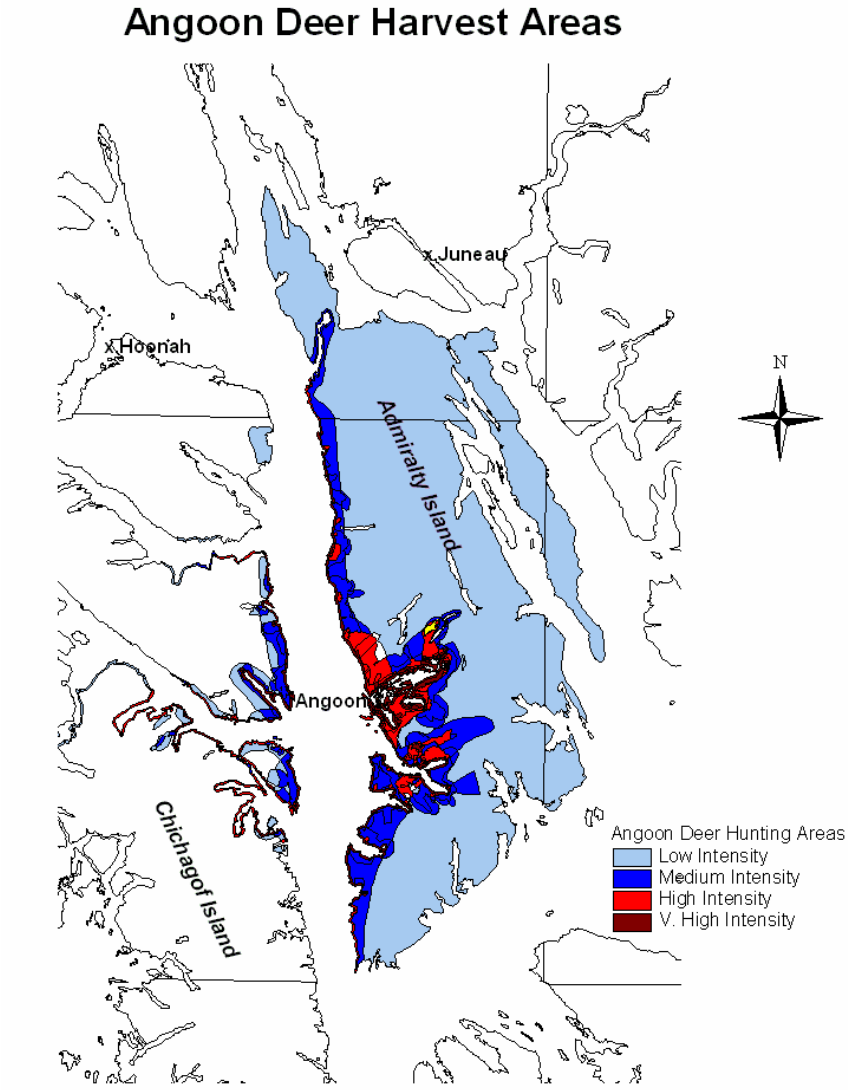


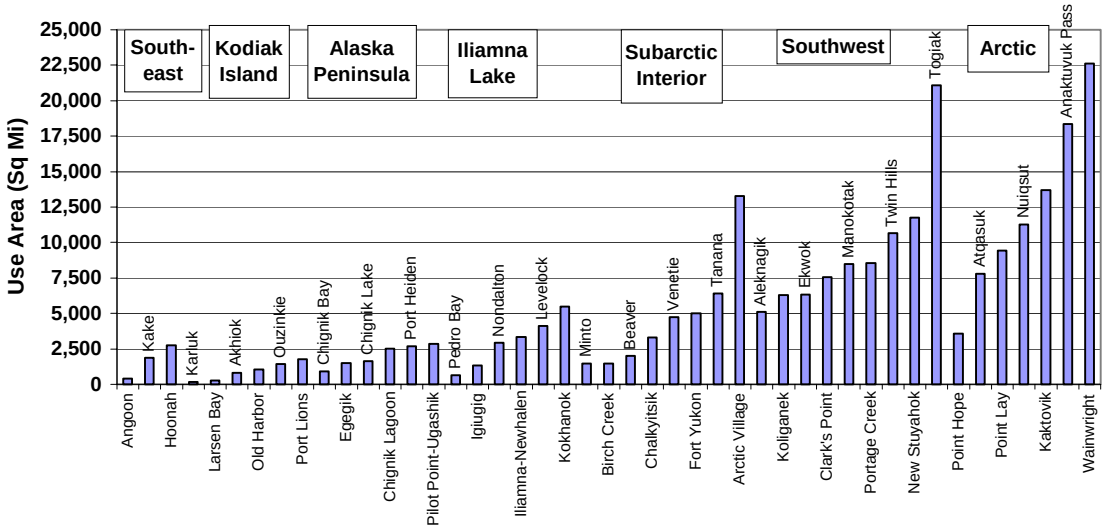

**FIG. 3. EXAMPLE OF A CENTRAL-BASED USE AREA**

The mapped use area for deer hunting by residents of Angoon illustrates a *central-based use area* pattern (Fig. 3). For Angoon residents, most deer hunting takes place in areas relatively near the settlement and along the coast of eastern Admiralty Island and portions of west Chichagof Island. Other deer hunting areas extend beyond the core use areas.

For Tlingit hunters from Angoon, customary protocols related to traditional clan and family affiliations guide the use of hunting areas. Neighboring areas are commonly used for deer hunting by residents of neighboring settlements, such as Kake, Tenakee Springs, and Hoonah.

"Low density," a primary rural characteristic, is a reflection of such rural land use patterns in Alaska. The central settlement, commonly demarcated by municipal or census designated place boundaries, is compact and densely populated. However, the surrounding commons regularly used for country food production is sparsely-populated, open country, being relatively empty of residences or other built structures. As is discussed in later sections, density measures relevant to Alaska's country food procurement patterns express the ratio of human populations to surrounding commons. Population densities reflecting a community's nearby land base provide more accurate measures of human to land area relationships than densities calculated using municipal or census unit boundaries (cf., Office of Subsistence Management 2001: 15, Table 2).

**Fig. 4. Size of Use Areas of Selected Alaska Communities**

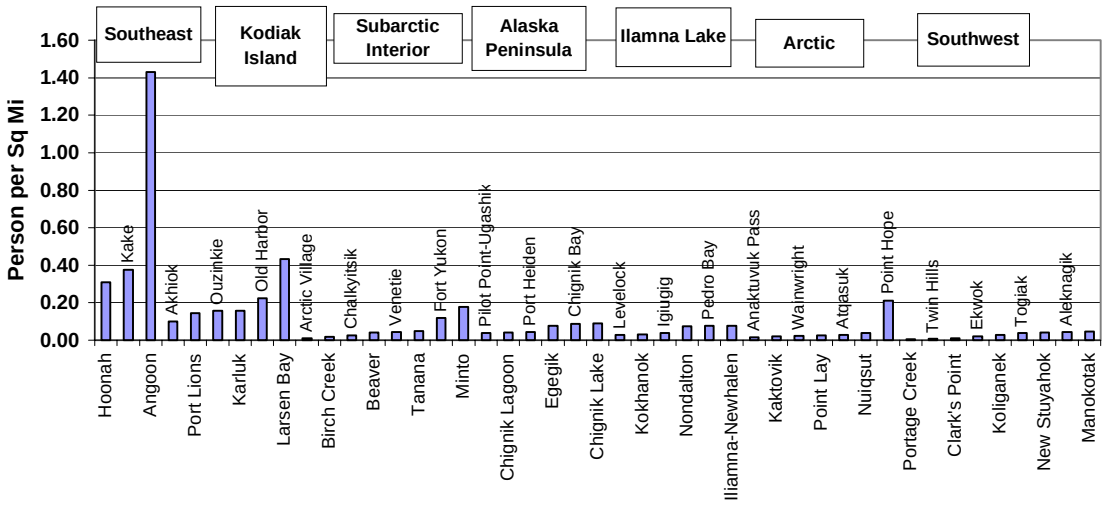



The sizes of use areas (sq miles) of a selection of Alaska settlements are illustrated in Fig. 4, ordered by subregion and size. For this selection of settlements, use areas range in size from about 400 sq mi (Angoon) to 22,609 sq mi (Wainwright). The use areas for subarctic and arctic settlements generally are larger than those of Pacific coast settlements in this sample of cases. Use areas of rural settlements also show substantial variation within a subregion, related to community size, local ecology, and other factors. In later sections, density is measured in reference to a standard area (2,826 sq mi). A standard area of this size falls within the range of use areas shown in Fig. 4, and is considerably smaller than many use areas documented for inland subarctic and coastal arctic communities.

Population densities to total use areas are illustrated in Fig. 5. These are calculated by dividing a settlement's population by the size (sq mi) of its mapped use area, uncorrected

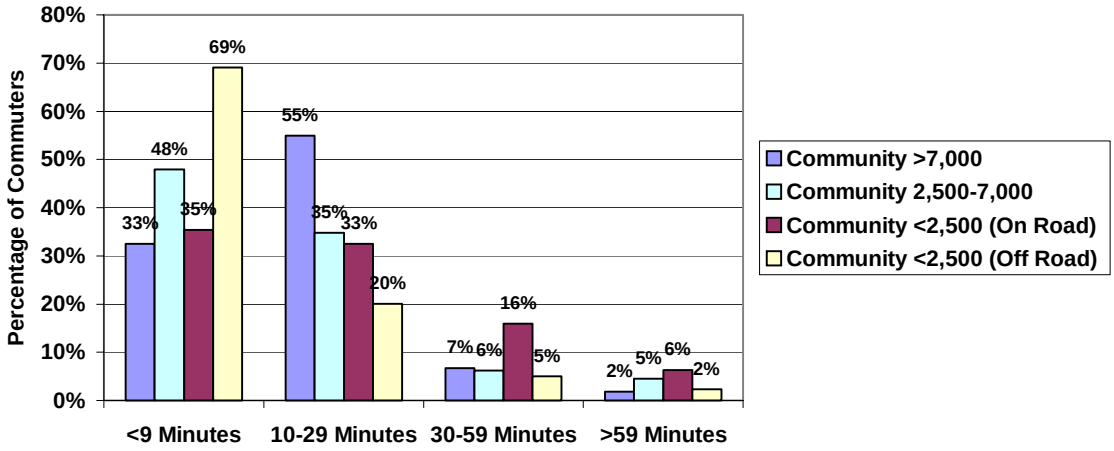
for overlap. For this set of cases, densities range from 1.43 person per sq mi (Angoon) to 0.01 persons per sq mi (Arctic Village). Most densities are below 0.5 persons per sq mi. The highest densities are found in Pacific coastal settlements, while the lowest densities are found in subarctic and arctic settlements.

**Fig. 5. Densities of Subsistence Use Areas, Selected Alaska Communities**



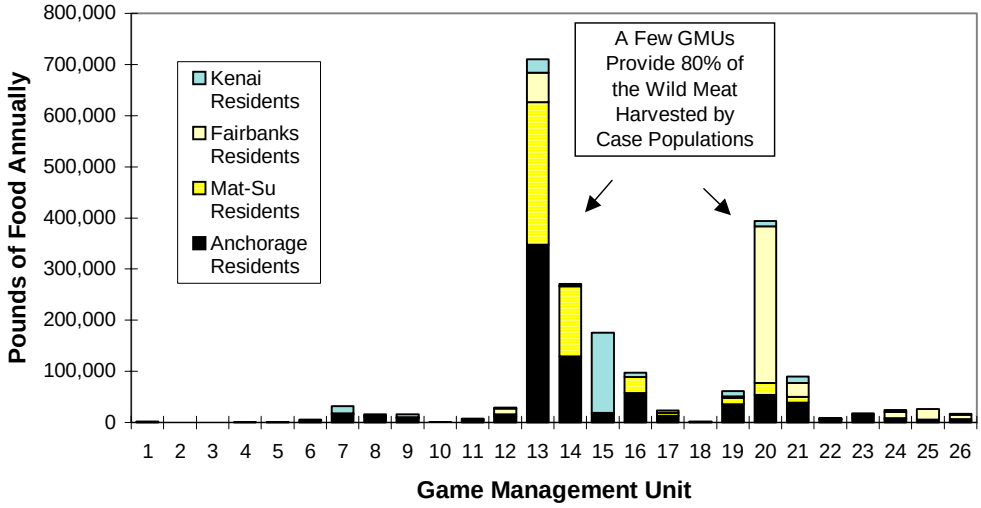

Non-rural populations in Alaska display additional types of settlement and land use patterns. A *metropolitan land use* pattern characterizes Alaska's largest, non-rural settlements, including Anchorage, Fairbanks, and the Palmer-Wasilla area. The populations of these cities are commonly dispersed along road-connected areas, rather than centralized in a single, compact location. The road-connected area is used on a daily basis for employment, commerce, schooling, and so forth. Travel times to work by Alaska residents are shown in Fig. 6, as documented by the 1990 federal census. In Alaska settlements with >7,000 people, 10-29 minutes was the most common daily work commute (55 percent of commuters). The shortest commutes (<10 minutes) were found in small (<2,500 people) off-road communities, indicating their more compact character. The longest commutes were made by some residents of Alaska settlements with <2,500 people along the road system, probably reflecting commutes to jobs located in more-distant population centers.

**Fig. 6. Travel Time to Work in Alaska**
**Percentage of Commuters by Settlement Type**
**Source: 1990 Federal Census**




In a metropolitan land use pattern, non-rural residents make use of surrounding commons, especially for periodic recreational outdoor activities, including boating, hiking, camping, sport fishing, and hunting (Wolfe and Ellanna 1982; Wolfe and Walker 1987). Most hunting and fishing occurs in areas connected by roads to the non-rural settlement, with closer areas receiving greater use than more distant areas.

**Fig. 7. Sources of Wild Meat Harvested**
**by Residents of Selected Alaska Boroughs, 1992-96**



This is illustrated in Fig. 7, which shows the Game Management Units (GMUs) where residents of selected boroughs (Anchorage Borough, Fairbanks North Star Borough, Matanuska-Sustina Borough, and Kenai Peninsula Borough) harvested big game (lbs of country food during 1992-96) (Wolfe 2000). For instance, during 1992-96, Anchorage and Mat-Su residents primarily obtained wild meat from neighboring GMU 13 (the Copper Basin), GMU 14 (Anchorage Borough), and GMU 16 (the Matanuska-Susitna Borough). Fairbanks residents primarily obtained wild meat from GMU 20 (the area including and immediately surrounding the Fairbanks North Star Borough) and neighboring GMU 13 (the Copper Basin). Kenai Borough residents primarily harvested big game in GMU 15 (the Kenai Peninsula area). Areas off the road system also were used for hunting by residents of these boroughs, but at much lower levels. Certain Alaska fish stocks and wildlife populations, particularly those accessible by road, are harvested by both rural and non-rural residents. In these cases, the use areas of non-rural residents overlap use areas of rural residents. Managing the competition between rural and non-rural populations for shared areas, fish stocks, and wildlife populations has been a central purpose of federal and state subsistence statutes.

## Rural as "Cultural Patterns of Country Peoples"

In its third common meaning, "rural" means of, or relating to, the *people who live in the country* (AHDEL 2000: 1525). In this sense, country dwellers are commonly considered to differ from city dwellers, in terms of knowledge, belief, experience, skills, value orientations, customs, and so forth. This third meaning is directly linked to the first two meanings. It is through their regular interaction with the open land and its ways of living that rural people may become distinguishable from city people. This third common meaning of rural identifies groups of people who are distinctively country in orientation. The contrast of "rustic" (of, relating to, or typical of country life or country people; a rural person; coarse, simple or unsophisticated) and "urbane" (polite, refined, and often elegant in manner) captures a commonly-held distinction between rural and urban people (AHDEL 2000: 1526, 1892).

There is considerable disagreement on the qualitative attributes that distinguish a rural from an urban community or society, such as occupational, social organizational, and cultural characteristics (Larson 1968: 582). Kinship organization of daily living has been advanced as characteristic of a rural way of life. The primary kinship basis of rural life (*Gemeinshaft*) has been contrasted with the impersonal relations of formal contracts underlying urban life (*Gesellschaft*) (Tonnies 1955, originally 1887). Various types of urban-rural continuum have been advanced, including Redfield's (1991) "folk-urban continuum," Wirth's (1938) "urbanism as a way of life," and the "traditional-modern continuum" (Lerner 1958; Larson and Rogers 1964). However, the ethnographic evidence of kinship-based living in many cities and of impersonal, "modern" social forms in many rural areas have seriously undermined these frameworks as simplistic and over-generalized (Pahl 1965; Gans 1962; Johnson and Wang 1997), arguing against the utility of any purely sociological definition of settlement types. Attributes of rural society (such as close personal primary-group relations) also may be found in cities because of the

interchange of people between rural-urban areas, the influence of mass media, and the greater interdependence of rural and urban economic activities (Larson 1968: 582).

Culturally-based systems of ideas, values, and behaviors vary substantially between human groups. Culturally-based traditions regarding use of wildlife ("sport traditions" and "indigenous cultural traditions") have been identified as factors distinguishing certain rural and urban populations in Alaska (Wolfe and Ellanna 1982; Fall et al. 2001: 136). Measurable differences have been documented in knowledge/attitudes about wildlife across subgroups in the United States, Japan, and Germany (Cartmill 1993; Kellert and Westervelt 1983, Kellert 1988, and Kellert 1993). In Kellert's studies, mean value orientations about wildlife statistically varied across respondents grouped by gender, age, education, subcultural affiliations, and rural-urban status. Value orientations (named by Kellert -- aesthetic, dominionistic, ecologistic, humanistic, moralistic, naturalistic, negativistic, scientistic, and utilitarian) were constructed from a cluster and factor analysis of closed-choice questions on self-administered surveys.

Differing systems of beliefs and values can underlie distinctive economic orientations of social groups (Vogt and Albert 1966). For example, based on religious belief systems, certain old order Anabaptist groups (Amish, Old Order Mennonite) practice traditional agricultural systems with pre-industrial technologies. Such traditional rural systems appear to be geographically integrated and sustainable within dominant, technologically-modern agrarian systems in several American states during the 20th century (Hostetler 1980; Kraybill and Bowman 2001). Comprising a social mosaic, *co-resident* Amish and non-Amish populations with distinct ways of living may intermingle and share a single geographic landscape. Ethnographic research outside of Alaska has demonstrated that multiple communities with distinct economic and cultural adaptations may develop and flourish in close geographic proximity (cf., Vogt and Albert 1966; Hostetler 1980; Castile and Kushner 1981; Jorgensen 1971). The Harvard Values Study in Five Cultures provided detailed examples of five distinct adaptive patterns (Navajo, Zuni, Mormon, Spanish American, and Texan homesteader) that coexisted in a shared geographic area. Each rural group used the region in a substantially different fashion (Vogt and Albert 1966). *Co-residency* patterns in Alaska are discussed in later sections, as well as sampling strategies that allow for documenting complex geographic, cultural, and economic patterning of this sort, where they exist in Alaska.

Rural populations commonly display higher fertility rates compared with urban populations, a pattern observed in most countries linked to rural economic patterns (Larson 1968: 586). For example, in an analysis of 25 countries in sub-Sahara Africa, urban fertility rates (4.8 children/woman) were about 30% lower than rural rates (6.6) (Shapiro and Tambashe 2000). The net benefits to parents of having large numbers of children are lower in urban places than in rural places – in rural areas children contribute to food production at relatively early ages. Factors related to higher rural rates included younger unions, higher infant mortality rates, decreased women in schools, and decreased contraceptive use by women 25-34 years of age. Information collected by the Alaska Department of Labor and the U.S. Census Bureau enable the calculation of fertility rates (live births per 1,000 people) and dependency ratios (the proportion of the population

under 18 years divided by the age group between 18 and 65) by Alaska area, which may be used to examine these characteristics as related to rural and non-rural concepts (Williams 2000: 151). In Alaska, the highest birth rates are found in areas with a higher than average Alaska Native population, and some Alaska areas display the highest fertility rates among any U.S. populations (Williams 2000: 64).

## Rural Definitions in Subsistence Management

In Alaska, "rural" has been defined specifically for subsistence management under federal and state statutes. Rural findings were initially made by the Alaska Joint Board of Fisheries and Game during the early to middle 1980s. When Alaska state law fell out of compliance with federal requirements after 1989, rural findings were made by the Federal Subsistence Board. In making rural determinations, both the federal and state programs have identified a set of factors for which information is collected and assessed. In general, the factors have been assessed as a whole, using both quantitative and qualitative information. The general standard for the classification of a population appears to be a preponderance of evidence. Findings are subject to reassessment and revision over time. Substantial public comment on rural deliberations has been encouraged through testimony and advisory bodies. Findings from subsistence research in Alaska during the late 20th century (described below) has been considered by the boards in making rural and non-rural determinations (Wolfe and Ellanna 1983; *Alaska Area and Community Socioeconomic Profiles*, Alaska Department of Fish and Game 1986).

In the federal subsistence program, ANILCA Section 803 (16 U.S.C.A. 3113) defines "subsistence uses" as "the customary and traditional uses *by rural Alaska residents* of wild, renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of non-edible byproducts of fish and wildlife resources taken fore personal or family consumption; for barter, or sharing for personal family consumption; and for customary trade" *(emphasis added)*. The rural factors and procedures used by the Federal Subsistence Board are identified in regulation (50 CFR 100.___ and 36 CFR 242.___):

> "§____.15 Rural determination process. (a) The Board shall determine if an area or community in Alaska is rural. In determining whether a specific area of Alaska is rural, the Board shall use the following guidelines:
>
> (1) A community or area with a population of 2,500 or less shall be deemed to be rural unless such a community or area possesses significant characteristics of a non-rural nature, or is considered to be socially and economically a part of an urbanized area.
> (2) Communities or areas with populations above 2,500 but not more than 7,000 will be determined to be rural or non-rural.
> (3) A community with a population of more than 7,000 shall be presumed non-rural, unless such a community or area possesses significant characteristics of a rural nature.

(4) Population data from the most recent census conducted by the United States Bureau of Census as updated by the Alaska Department of Labor shall be utilized in this process.
(5) Community or area characteristics shall be considered in evaluating a community's rural or non-rural status. The characteristics may include, but are not limited to:
    i. Use of fish and wildlife;
    ii. Development and diversity of the economy;
    iii. Community infrastructure;
    iv. Transportation; and
    v. Educational institutions
(6) Communities or areas which are economically, socially, and communally integrated shall be considered in the aggregate.

(b) The Board shall periodically review rural determinations. Rural determinations shall be reviewed on a ten year cycle, commencing with the publication of the year 2000 U.S. census. Rural determinations may be reviewed out-of-cycle in special circumstances. Once the Board makes a determination that a community has changed from rural to non-rural, a waiting period of five years shall be required before the non-rural determination becomes effective."

Current federal determinations are listed at §____.23:

"§_____.23 Rural determinations. (a) The Board has determined all communities and areas to be rural in accordance with §___.15 except the following:

Adak;
Fairbanks North Star Borough;
Homer area – including Homer, Anchor Point, Kachemak City, and Fritz Creek;
Juneau area – including Juneau, West Juneau and Douglas;
Kenai area – including Kenai, Soldotna, Sterling, Nikiski, Salamatof, Kalifornsky, Kasilof, and Clam Gulch;
Ketchikan area – including Ketchikan City, Clover Pass, North Tongass Highway, Ketchikan East, Mountain Pass, Herring Cove, Saxman East, and parts of Pennock Island;
Municipality of Anchorage;
Seward area – including Seward and Moose Pass;
Valdez; and
Wasilla area – including Palmer, Wasilla, Sutton, Big Lake, Houston, and Bodenberg Butte.

You may obtain maps delineating the boundaries of non-rural areas from the U.S. Fish and Wildlife Service.
(b) [Reserved]"

For the State program of fish and wildlife management, Alaska state statutes (AS 16.05.940(27)) define "rural area" as "a community or area of the state in which the

noncommercial, customary and traditional use of fish or game for personal or family consumption is a principal characteristic of the economy of the community or area." Prior to 1990, Alaska communities were classified as "rural" or "non-rural" by the Joint Board of Fisheries and Game. After 1990, "nonsubsistence areas" were identified by the joint board, applying factors and procedures identified in subsistence regulations (*Sec. 16.05.258(c)*):

> "The boards may not permit subsistence hunting or fishing in a nonsubsistence area. The boards, acting jointly, shall identify by regulation the boundaries of nonsubsistence areas. A nonsubsistence area is an area or community where dependence upon subsistence is not a principal characteristic of the economy, culture, and way of life of the area or community. In determining whether dependence upon subsistence is a principal characteristic of the economy, culture, and way of life of an area or community under this subsection, the boards shall jointly consider the relative importance of subsistence in the context of the totality of the following socio-economic characteristics of the area or community:
>
> (1) the social and economic structure;
>
> (2) the stability of the economy;
>
> (3) the extent and the kinds of employment for wages, including full-time, part-time, temporary, and seasonal employment;
>
> (4) the amount and distribution of cash income among those domiciled in the area or community;
>
> (5) the cost and availability of goods and services to those domiciled in the area or community;
>
> (6) the variety of fish and game species used by those domiciled in the area or community;
>
> (7) the seasonal cycle of economic activity;
>
> (8) the percentage of those domiciled in the area or community participating in hunting and fishing activities or using wild fish and game;
>
> (9) the harvest levels of fish and game by those domiciled in the area or community;
>
> (10) the cultural, social, and economic values associated with the taking and use of fish and game;
>
> (11) the geographic locations where those domiciled in the area or community hunt and fish;
>
> (12) the extent of sharing and exchange of fish and game by those domiciled in the area or community;

(13) additional similar factors the boards establish by regulation to be relevant to their determinations under this subsection."

Applying these factors, five nonsubsistence areas have been identified by the Joint Board -- Ketchikan, Juneau, Anchorage-Kenai-Matsu, Fairbanks, and Valdez (cf., 5 AAC 99.015).

In 2000, about 20 percent of Alaska's population was "rural" by federal and state subsistence standards. This compares with 24.8 percent of the general U.S. population (1990) under federal census rural standards, discussed above. In most cases, the findings for Alaska populations by federal boards and state boards have been similar. There have been divergent findings in a few cases (such as Adak). Federal subsistence boards have found certain populations to be "rural" that state joint boards have classified as "non-rural" or inside "nonsubsistence areas," including portions of the Kenai Peninsula Borough (populations in the Ninilchik, Cooper Landing, and Hope areas) and portions of the Matanuska-Susitna Borough (populations in the Willow and Talkeetna areas).

Rural definitions have evolved with understandings of subsistence patterns in Alaska. During the settlement of Alaska Native land claims, literature produced for federal planning characterized subsistence fishing and hunting as being linked to distinct patterns of living in Alaska. As an example, *Alaska Natives and the Land* was intended to be a comprehensive overview of then-current conditions of Alaska Native groups, compiled by the Federal Field Committee for Development Planning in Alaska in 1968. This report asserted that there were stark contrasts in patterns of living in Alaska. It drew a sharp distinction between the so-called "high income, moderate standard of living" of urban dwellers who "lead lives very much like those of other Americans," and the "low income and standard of living" of Alaska Native groups (1968:3). However, while the report asserted a stark contrast between the "low" and "high" standards of living in Alaska, the report's materials portrayed a more complex set of regional patterns that challenged the simple generalization. In this report, fishing and hunting patterns were presented alongside information on a broad array of social topics, including health, housing, education, economy, land use, and political institutions. The federal agency perspective in this report may be termed "eclectic," in that it covered a broad set of factors. The eclectic framework implied that social, economic, cultural, health, and ecological factors were interconnected. Subsistence patterns were discussed as interwoven in a "way of life" for groups of people. Over subsequent decades, the "way of life" perspective has been commonly used by Alaska Native organizations to conceptualize subsistence issues, as illustrated by *Does One Way of Life Have to Die So Another Can Live? A Report on Subsistence and the Conservation of the Yupik Life-Style* (Yupiktak Bista 1974), and 17 years later, *The Calista Region: A Gentle People – A Harsh Life* (Calista Corporation 1991).

In 1980, the second year of the State of Alaska's newly established subsistence research program, a report by its director entitled *Subsistence as an Economic System in Alaska: Theoretical and Policy Implications* identified "community patterns" and "systems" as fruitful theoretical and policy paradigms for subsistence research (Lonner 1980). Such an approach was firmly rooted in mainstream ethnography. While similar to a "way of life"

paradigm, the approach established a focus on the role of subsistence activities in the local economic and sociocultural patterns of communities. Citing a large number of empirical and historical studies on subsistence uses and economies in Alaska communities, Lonner asserted that "there is not one, but many, subsistence economies in Alaska" and that "in order to protect both market and nonmarket economies of both urban and rural Alaska communities, it is necessary to identify and protect the resources and the systems upon which they rely" (Lonner 1980:24). That same year, Lonner advanced a set of factors that might be used to contrast types of economic and sociocultural systems for subsistence management. His factors included time depth ("long" to "short"), community base ("rural" to "urban"), social role ("kinship" to "individual/family"), economic role ("community and regional economic and nutritional self-sufficiency" to "personal use"), social and psychological products ("extended kinship, community, intergenerational, and cultural" to "primarily individual and immediate family"), among others. Lonner presented each factor as a continuum along which the patterns of communities and areas might be measured and assessed. Such an approach (identifying sets of factors thought to co-vary for measuring and assessing communities and systems) resembled later methodologies that were used within the state and federal subsistence programs for identifying rural areas and subsistence uses.

During the late 1970s through 1980s, a substantial number of ethnographies (primarily community studies) were conducted with federal and state funds to document patterns of living in Alaska. Examples included studies funded by the National Park Service (such as *Tracks in the Wildland, A Portrayal of Koyukon and Nunamiut Subsistence* by Nelson, Mautner, and Bane 1982), the U.S. Fish and Wildlife Service (such as *Kaktovik Subsistence, Land Use Values through Time in the Arctic National Wildlife Refuge*, by Jacobson and Wentworth 1982), the Minerals Management Service (such as *Barrow: A Decade of Modernization* by Worl and Smythe 1986), and the State of Alaska (such as *Land Use and the Economy of Lime Village* by Kari 1983). Most studies represented collaborations between communities, tribes, and government-funded researchers to document contemporary subsistence patterns in an area for the first time. The studies, which frequently provided rich ethnographic descriptions of local patterns, suggested that there were remarkable similarities in contemporary village fishing and hunting patterns across regions. At the same time, significant differences in factors such as wild food harvest levels, household incomes, and employment conditions were also revealed. Important policy questions were being informed by these emergent findings, including how to distinguish rural and non-rural areas for subsistence management.

As early as 1983, there was an effort to systematically compare community patterns across regions to examine the rural/non-rural issue. In *Resource Use and Socioeconomic Systems: Case Studies of Fishing and Hunting in Alaskan Communities*, Wolfe and Ellanna (1983) attempted to systematically compare ethnographic findings from a sample of case communities, including remote villages (Yukon-Kuskokwim Delta, Nondalton), mid-sized towns (Sitka and Nome), road-connected communities on the periphery of large urban areas (Homer, Kenai, Ninilchik, Dot Lake), and large urban areas (Fairbanks). The report's conclusions on rural and non-rural patterns were tentative because of the small set of cases compared. While fishing and hunting were valued

activities in all communities, there appeared to be substantial differences in the role of fishing and hunting in the economy, culture, and way of life of the case communities. Village patterns and the Fairbanks patterns appeared to be clearly distinguishable along a number of factors (wild food harvest levels; wage income levels; the mode of production; cultural value systems; the seasonal nature of activities; the degree of sharing of wild foods; and cultural systems of land use) (p. 248ff). Mid-sized case communities like Nome appeared distinct in several respects, so a "regional center" pattern was tentatively identified. Patterns in the road-connected areas were more difficult to categorize because of substantial between-household diversity and recent rapid changes in the areas.

Other comparative efforts about that time included *Distribution and Exchange of Subsistence Resources in Alaska*, representing a literature review of subsistence sharing and exchange systems by Langdon and Worl (1981); *Subsistence-Based Economies in Coastal Communities of Southwest Alaska*, a comparative examination of money and subsistence relationships in four communities by Wolfe et al (1984); *Contemporary Subsistence Economies of Alaska*, a compilation of papers examining subsistence as parts of local economic systems (Langdon 1986); *The Role of Fish and Wildlife in the Economies of Barrow, Bethel, Dillingham, Kotzebue, and Nome*, a comparison of regional hubs by Wolfe et al (1986), and *Subsistence in Alaska: Arctic, Interior, Southcentral, Southwest, and Western Regional Summaries*, a compilation of published information on regional patterns by Schroeder et al (1987).

One shortfall of the ethnographic approach in Alaska subsistence research has been a problem in comparability. It was often difficult to find convincing statistical support for observations about similarities and differences between groups of communities. Statistical tests of relationships among variables were difficult to perform, because the community studies did not always provide measurements of similar variables. To strengthen the ability to support qualitative findings with statistical tests, the State Division of Subsistence embarked on a research effort, using federal and state funding, to systematically collect information on similar variable sets across a broader sample of communities (Fall 1990). Over the next two decades, standardized surveys were developed and applied across a larger set of communities. Information from this survey research program eventually evolved into three major databases: the Community Profile Database (information on wild food harvest and use, product sharing, household demography, and household employment), the Map Catalog Database (maps of wild food harvest areas), and the Technical Paper Series (ethnographic descriptions of seasonal rounds, harvest methods, local histories, and other topics). Time series information was collected for a small set of communities, such as Pacific Gulf communities (with Minerals Management Service funding) to assess affects of the *Exxon Valdez* oil spill after 1989 (Fall and Field 1996).

In recent years, the use of statistical modeling to understand Alaska community patterns has been advanced with additional data sets as well. During the 1990s, measures of a set of social indicators were collected for a sample of communities with funding from the Minerals Management Service. In a series of reports, Jorgensen (1995a, 1996b, 1996) analyzed the social indicators data set to support the ethnographic observations that

distinct cultural differences exist between Alaska communities with respect to belief systems and value orientations, particularly in relation to a social group's orientation toward natural resource uses. At the same time, economic databases were developed and refined within the Institute of Social and Economic Research of the University of Alaska. The databases have been used for analyzing and predicting relationships among demographic, industrial, and fiscal variables for Alaska areas (cf., Goldsmith 1998, 2000; Goldsmith and Hill 1997; Gorsuch 1994; and Colt 1999).

While these databases comprise a growing body of systematically-gathered, quantified information, statistical analyses to examine research questions still encounter difficulties. A number of communities are as yet not represented in the Community Profile Database and Map Catalog Database, particularly the population centers of Juneau, Anchorage, Ketchikan, and Fairbanks, where subsistence household surveys have not been administered. The assessment of differences between village and city is complicated by the lack of comparable measures. For these places, other State of Alaska data sets can be used to represent patterns of wild food uses, including the Division of Wildlife Conservation harvest ticket/permit database, the Division of Sport Fisheries sport fish licensing and catch databases, and the Division of Subsistence Fisheries Harvest Database, all within the Alaska Department of Fish and Game. As described below, these databases were analyzed by this project to provide measures of country food production for the larger cities. Measures of economic activity and income at the level of business, industry, and place are available in the Alaska Economic Database at ISER and CDEC. However, these variables may be missing for many smaller villages, where only household-level measures are available. Therefore, to make statistical comparisons between villages and large cities, information from these multiple databases must be combined, a procedure that is not possible for all factors.

Certain factors are not well represented in existing databases. While substantial ethnographic materials exist describing belief systems, value orientations, and other ideological systems in villages and cities, there are few systematically-gathered, quantified measures representing these systems. Qualitative analyses comparing these aspects of country and city life are difficult to support statistically because of the lack of measures. Patterns of distribution, exchange, and consumption of wild food products within villages, towns, and cities are poorly represented in the databases. Recent analyses of distribution networks by Magdanz et al (2001) suggest this is a fruitful area for future research (cf., Wenzel et al. 2000). Traditional systems of knowledge, including ecological knowledge and customary law, are not well represented in databases (SP Research Associates and LaLonde 1991; Fehr and Hurst 1996). These subject areas generally have not been the focus of household surveys. Accordingly, the development of rigorous contrasts between county life and city life along these dimensions remains difficult.

Database limitations require careful methodological considerations. For community comparisons, community sets must be drawn so as to represent a complete range of places in terms of community types and ecological regions. A statistical comparison of a restricted set of places will likely produce a different picture of community patterns than

a comparison that includes a larger set. Statistically significant contrasts are more likely to be supported with larger community sets. How communities are defined also can influence statistical findings. This is a particular issue for large urban areas, dispersed road-connected populations, and culturally-heterogeneous communities. Using census tracts and postal areas, large cities such as Anchorage and road-connected areas like the Kenai Peninsula potentially can be divided into a number of smaller populations that may be treated as independent sampling units for some comparisons. Such a sampling approach allows for more precise statistical comparisons between areas than is possible if the data are only examined as larger, aggregated populations. Using tribal membership information, some areas potentially can be divided into socially self-identified communities that may be treated as sampling units for some statistical comparisons. For example, recent survey information from the Sitka Borough, a culturally-heterogeneous area, can be disaggregated into two communities – Sitka tribe and the Sitka non-tribe – to examine similarities and differences in patterns. For relatively small communities, such methodological approaches are not required for describing community patterns. But such sampling refinements are likely to be required for the rigorous treatment of geographic areas where multiple distinct communities have developed.

# FOCUS GROUPS AND RURAL CONCEPTS

To assist in identifying rural and non-rural concepts, eight focus groups were convened as part of our project. Focus groups are interviews of a small number of participants about a common topic or experience. A facilitator using a structured discussion guide leads the interviews and a co-facilitator takes notes.

Focus group interviews are useful for a number of purposes:

1. Focus group participants have relatively homogenous background characteristics to encourage an in-depth point of view. Their common background helps to assure that the participants will not be uncomfortable or afraid to express their perceptions, beliefs, or feelings in response to the questions asked by the facilitator. As stated in Patton (1987:115), it is not necessary for the group to reach any kind of consensus; nor is it necessary for the people to disagree -- the object is to get high-quality data in a social context where people can consider their own views in the context of the views of others.

2. Focus group interviews provide some quality controls on data collection, in that participants tend to provide checks and balances on each other, weeding out false or extreme views. The group dynamics typically contribute to focusing on the most important topics and issues being discussed. It is fairly easy to assess the extent to which there is a relatively consistent, shared view of the discussion topics among the participants. (Patton 1987:115)

3. The focus group interview seeks to discover the perceptions and feelings of the participants about a particular topic or experience. Focus groups help to determine the ways that participants structure their world around the particular topic. From the focus group interview we learn how people view the particular topic or experience, in their own words and reflecting the complexities of their individual experiences. (Patton 1987:135)

4. Focus group interviews are effective for obtaining in-depth information and reactions to a few questions rather than a large number of topics. (Gredler 1995:86)

We hoped the discussion groups would tell us:

- Based upon the individual and community experience of participants - what are the characteristics of a rural place?
- What are the characteristics of an urban place?
- How is a rural way of life different from an urban way of life?
- How do you know where the edge of an urban place is? A rural place?
- What does a rural place look like compared to an urban place?
- Do rural people interact with people in their community differently than urban people?

- Do rural people have different types of knowledge and/or customs than urban people?

Focus groups were held in seven Alaska communities -- Copper Center, Deering, Fairbanks, Kenai (two sessions), Ketchikan, Kotzebue, and Saxman. The places were selected to represent geographic and community diversity in Alaska. Copper Center is a small, unincorporated community on the road system in the Copper River Basin. Deering is a small community in northwest Alaska. Kenai is a population center along the road system on the north Kenai Peninsula. Fairbanks is a large population center along the road system in central Alaska. Ketchikan is a mid-sized community in southeast Alaska. Kotzebue is a regional hub in northwest Alaska. Saxman is a small community in the Ketchikan area. We scheduled two focus groups at Kenai, one with members from the greater Kenai community and one with members from the Kenaitze tribe, located in the Kenai area.

Participants invited to the focus groups were chosen to encompass a range of views representative of their communities. Participants in each community were identified from a number of sources, including Federal Subsistence Regional Coordinators, Alaska Department of Fish and Game Advisory Committee coordinators, community planners, RAC members, non-governmental organizations, and the University of Alaska faculty. An ISER staff member contacted identified individuals to determine their interest in the issues and their willingness to participate. A minimum of five years of residency in Alaska was a requirement for participation. If someone was unable to participate, they were asked to suggest someone else who might represent their point of view.

In addition, a goal was to invite to each focus group at least three members of the area's federal subsistence Regional Advisory Council (RAC). The following table summarizes the numbers of participants in each focus group, including RAC members invited and attending. Four RAC members invited to the Kotzebue focus group were invited to either Kotzebue or Deering or to both. Two agreed to fly in to Kotzebue but one was unable to due to weather. Travel arrangements were made for two RAC members to attend the Copper Center meeting but neither person was able to make it. One member suggested a substitute who was able to attend. One RAC member made travel arrangements to attend the Kenai meeting but at the last minute had to cancel due to weather. His recommended substitute was able to attend. Two of the RAC members who attended the Ketchikan meeting also attended the tribal meeting in Saxman. The only time we were unable to meet our goal of inviting three RAC members was for the Kenai meeting. Vacant seats on the Southcentral RAC created a small selection pool. One Southcentral RAC member was out of state and two felt it was more appropriate to participate in the Copper Center meeting than in the Kenai meeting. Drawing people from the Yukon-Kuskokwim Delta area or the Bristol Bay area seemed inappropriate given the difficulty of travel time as well as a potential lack of familiarity with a selected community.

| Focus Group Community | RAC Members Invited | Attending | Total Participants |
|---|---|---|---|
| Kotzebue | 5 | 1 | 4 |
| Deering | 5 | 0 | 10 |
| Copper Center | 3 | 0 | 6 |
| Kenai (General) | 1 | 0 | 8 |
| Kenai (Kenaitze Tribe) | 1 | 0 | 5 |
| Saxman (Saxman Tribe) | 3 | 2 | 10 |
| Ketchikan | 4 | 3 | 8 |
| Fairbanks | 7 | 3 | 7 |

Focus groups usually were conducted from 12 noon to 1:30 p.m. or from 6:00 p.m. to 7:30 p.m. A light lunch or dinner was available at the start of each meeting. Participants received $50.00 compensation for their time. A discussion guide with short, open-ended questions was used to facilitate conversations about topics within the focus group. The same discussion guide was used in all eight groups.

Rural/non-rural concepts provided by the focus groups followed three general themes. First, rural communities were thought to display closer relationships between family and neighbors compared with urban areas, by virtue of their smaller sizes and greater family time depths. The personal, close-knit character of rural communities included more community-wide activities (such as ceremonies) and greater assistance between neighbors (such as sharing wild foods) compared with non-rural areas. Second, rural communities were thought to be more dependent on the natural environment for food and daily activities compared with urban areas. Some participants characterized wild food harvests as "self-sufficiency," while others viewed the harvests as carrying out long-term customs and traditions within a larger group dependent on wild foods. Third, residents of rural communities were thought to have less access to services, reasonably-priced commercial goods, and employment opportunities compared with residents of urban areas. Rural areas commonly displayed a patchwork infrastructure for water delivery, sewage disposal, electricity, and other services. These themes were offered in each of the focus groups, indicating that the rural concepts were generally held across regions and community types in Alaska. Each is summarized below.

### Family, Community Ties, and Personal History

The participants of each focus group discussed the close family relationships and friendship ties among people in rural communities. There was agreement that rural people have closer relationships with the people in their communities and make it a point to share food and information with one another. Urban residents do not share as much with one another. They do not know their neighbors well and in general have more superficial relationships with other community members. Urban residents also seem to care less about the needs of others in their community. All of the groups noted that urban areas have large ethnically diverse populations of predominantly non-Native people and many rural places have small populations of mostly Native origin.

Participants in different focus groups had different perspectives on how far their community and their sense of neighborhood extended. The participants in Deering talked about knowing everyone in their community and how it is a close-knit community, where everyone helps each other in the good times and the bad. There was a sense of a compact community that did not extend past the limits of their non-road accessible place. Copper Center participants on the other hand stated that people from sixty miles away from their home were considered neighbors. This was also somewhat reflected by participants in the Fairbanks group that lived in a village. They mentioned people coming from other villages to help when there is a death in a village and that the sense of kinship extended past the physical limits of their community.

Participants in the Copper Center group specifically mentioned getting away from the city as a reason why they live where they do. Participants at the Fairbanks, Saxman, and Ketchikan groups also mentioned moving away from large urban centers such as Los Angeles and Seattle.

> *I was raised in L.A. I wouldn't even live in Anchorage because of that [it's too urban like L.A.]. (Fairbanks, February 15, 2002)*
>
> *I went to Seattle and Anchorage but it was too fast. I couldn't stand California [when I was there]. (Saxman, February 11, 2002)*
>
> *I grew up in Southern California where the waterways are paved. My family is in L.A. My mom thinks Alaska is dirty. Dad thinks the beach would be fine if it were paved. (Ketchikan, February 12, 2002)*

## Lifestyle, Natural Environment, and Subsistence Activities

Each focus group mentioned the importance of the natural environment in a rural community. References were made to subsistence foods and activities as well as simply the existence of the natural surroundings in a rural area. Participants in Deering mentioned how close the countryside is and participants in the Ketchikan and Saxman groups noted the peace, tranquility, and foods that the ocean offers them.
Participants at all of the focus groups mentioned the desire to maintain their subsistence activities. In rural communities subsistence is survival. The Kenaitze group stated that they would always do subsistence no matter what the regulations do or do not allow them to do.

The general Kenai group strongly endorsed sport fishing and hunting. Participants felt that sport fishing or hunting was a valid means of providing food for their families and that subsistence fisheries and hunts were no longer needed on the Kenai Peninsula. Both the Kenaitze and Saxman tribal groups expressed disapproval for irresponsible sport fishing

.

> *I'm dead set against catch and release—you don't play with your food—this is what you learn first when you're a child. (Kenai, February 8, 2002)*

> *The Russian River [it] is ludicrous, all [that] they throw away; I stopped fishing and picked up all the backbones and fish heads from the beach and fed my family; I fed my family on their waste. (Saxman, February 11, 2002)*

A common theme for the communities was the idea of living a rural Alaskan lifestyle. The Alaskan lifestyle was portrayed as one where a person can harvest foods and other items from the land. Some participants characterized the harvests as "self-sufficiency," while others view the harvests as carrying out long-term customs and traditions within a larger group dependent on wild foods. The types of resources harvested vary from region to region but the reliance on natural resources and the self-enriching aspects were the same. This was mentioned from a variety of communities ranging from Deering in the arctic to Ketchikan in southeast Alaska.

The attitudes of rural and urban people were said to be different. Rural residents live a more relaxed lifestyle meandering from one day to the next, identifying their tasks based on the seasons. Urban residents lead a more hectic lifestyle that is disconnected from their community and natural cycles. They do not depend on the natural resources, family, friends or neighbors.

> *Urban is like silk, easier, smoother, everything is brought to you; rural is like cotton, rougher and harder. (Deering, January 21, 2002)*

Non-Native participants of the Fairbanks group who came to Alaska and brought with them rural agrarian traditions from other areas of the country viewed their personal lifestyles as similar to lifestyles of Alaska Natives. They shared food from their gardens with their neighbors and helped each other out if someone they knew was not able to hunt or fish. They have traditional ways of hunting, fishing and gathering, passed down from generation to generation the same way as Alaska Native traditions.

Alaska Native participants of the Fairbanks group who have lived in Alaska for many generations did not agree with this perspective. These participants maintained that the connections Native village residents have with the land and wildlife is considerably deeper than that of non-Natives. The ties with family and friends were also considered to be much stronger in the Native communities. The Native participants concluded that non-Native rural residents do not have the same depth of history, culture and tradition as Alaska Natives.

At least some participants in most of the groups asserted that non-Native residents do not have or should not have the same rights to subsistence as Alaska Natives. In Kotzebue a non-Native participant recognized this by saying:

*I'm a rural Alaskan because I live here, but I wouldn't survive out there. I don't have the same rights to harvest because I'm not part of the [Native] web. (Kotzebue, January 18, 2002)*

However, participants in other focus groups asserted that all people should share equal rights and to do otherwise is not American.

## Services, Economy, and Infrastructure

According to many participants in the focus groups, urban places have more diversified economies with specialty services and many industries. Rural locations do not have the diversified economies that urban areas do. As a result of this, job opportunities are more limited and there are fewer year-round employment opportunities in rural communities. Urban places also are said to have a greater selection of services and entertainment than rural places.

Participants at each focus group mentioned that urban residents have greater access to services and goods at more reasonable prices than rural residents. Fairbanks participants mentioned that "access to reasonably priced food in a reasonable manner [is a characteristic of urban]." Services such as bus transportation, the availability of gas for heating, shopping malls, and specialty stores were prominent themes. Water and sewer services are available at more reasonable costs in urban areas. Rural residents pay more for these utilities when they are available.

Kenai and Kenaitze participants mentioned the patchwork of goods, services, utilities and natural areas available in the Kenai area. Subdivisions that have utilities services are found within areas of "wilderness" that are void of amenities. Often water and sewer utilities may not be available and the goods available are limited and cost more than in urban settings.

*It's [an urban place] where you find anything you want in one area; you've got everything you need. Here in Kenai you still have to go to Anchorage to get your parts. We have stores here but we can't always find everything from that one store. We have just about as much as Anchorage but we don't have the variety. (Kenai, February 7, 2002)*

A number of participants considered any place on the road system to be urban. Kotzebue participants noted that places served by the ferry system would also be considered on the road system and therefore urban. Participants at the Copper Center meeting, however, specifically noted that being on the road system did not automatically make a place urban. Copper Center participants felt that it is more important to consider the costs of goods in a location rather than if it is road accessible.

*Kodiak for example is a concentrated area to have to distribute goods to but there is no road access, here everything is spread out so goods cost more than in Kodiak. (Copper Center, February 4, 2002)*

The three themes advanced by the focus groups find parallels in the literature, discussed previously. The *small, personal character of Alaska rural areas* fits with the demographic and sociological features generally associated with country settlements. The *dependency on wild food harvests in Alaska rural areas* fits with extensive land uses (particularly primary food production) generally associated with country living. And the *greater economic access in Alaska urban areas* fits with general characteristic of large cities as centers of trade, employment, services, government, and culture.

## Rural and Non-Rural Boundaries

In addition to advancing general rural/non-rural concepts, the focus groups were asked about boundaries between rural and non-rural areas. How might boundaries be established, particularly along Alaska's road networks? Overall, the focus groups were unable to provide clear answers to this question. It was apparent that participants had not had to grapple with this type of issue. Participants found it much easier to discuss the general concepts of rural and urban communities, than to define the edges separating rural and urban areas.

The Kotzebue and Deering focus group participants defined the boundaries of urban and rural places based on the geography, ethnicity, and behaviors of the people of a place.

*The edge of an urban place is where the road ends. It's where the electricity ends. The edge of a rural place is the edge of camp. The behaviors of the people say if it's a rural or urban place. If you can't hang your fish out to dry because it will get dusty from all the traffic then it's an urban place. (Deering, January 21, 2002)*

Other focus groups felt that the concept of boundaries was more abstract and was not geographic.

*There is no edge. It's a proximity thing. (Kenai, February 7,2002)*

*Urban and rural [edge] is not geographic. (Ketchikan, February 12, 2002)*

The uncertainty within focus groups about rural/non-rural boundaries is consistent with findings from the scientific literature, which indicate that rural-urban fringes are commonly areas of ambiguity, socioeconomic transition, and political/economic debate.

## Objections to Rural and Non-Rural Concepts

In many of the focus groups, particular members expressed discomfort with the rural/non-rural issue. Some participants asserted that subsistence protection was an Alaska Native issue, not a matter of rural and urban residency.

> *We're not calling a spade a spade. The issue is Native versus non-Native and if we could boil it down to this, it [subsistence eligibility] would be clear. (Kotzebue, January 18, 2002)*

Other participants in focus groups asserted that all Alaska residents should enjoy equal protection regarding fishing and hunting rights, regardless of residency status. For instance, in the general Kenai focus group, some members thought that an undesirable line was being drawn between the Native and non-Native communities by the urban/rural issue. They found the urban and rural labels to be offensive. One participant was hesitant to attend the Kenai meeting because of the discussion topic.

> *It's patently unfair for someone [to decide rural and urban] and that was part of my reservations about coming. (Kenai, February 7, 2002)*

Some Saxman participants said that it is not right to divide people by urban and rural designations. They stated that subsistence rights should be the same for all Alaska Natives, regardless of residency.

These comments echo recent political debates in Alaska about legal subsistence protections and the allocation of fishing and hunting rights through rural/non-rural designations. It was apparent that many focus group participants were knowledgeable about the recent political and legal contexts of the rural/non-rural issue.

## Discrepancies in Classifications

Certain discrepancies emerged from the focus groups regarding the classification of particular areas. In the general Kenai focus group, most members characterized the Kenai area as "non-rural" for the purpose of subsistence management. By contrast, in the Kenaitze tribe focus group, members viewed the Kenai area as "rural." In the Saxman focus group, all members viewed the community of Saxman to be "rural," an exceptional position in that Saxman is a small, one-square-mile community embedded within a larger, federal non-rural area (the Ketchikan road-connected area). In the Ketchikan focus group, most members viewed Ketchikan as more "rural" than "non-rural," contrary to its current status.

What accounts for these apparent discrepancies? Are they contradictions? Or are they potentially understandable as compatible, reasoned positions? Several possible factors can be offered to account for the apparent discrepancies expressed among focus group members.

First, it was apparent that a person's viewpoint regarding "rural" and "non-rural" areas in Alaska may be influenced by a personal residency history. In an example provided by the Ketchikan focus group, a person raised in Los Angeles may consider a place like Ketchikan to be rural. Compared with a metropolis like Los Angeles, Ketchikan is small, remote, and undeveloped. Conversely, a person raised in a small Alaska village may consider a place like Kenai to be non-rural. Compared with a small village, Kenai is large, accessible, cosmopolitan, and developed. It is clear that "rural" can be a relative concept, with a place's status hinging upon the set of places being compared. It appeared that some participants' statements regarding the "rural" character of Ketchikan were attributable to this *relativity of perception*. Some focus group members stated they had moved from large, non-Alaska cities to Ketchikan to enjoy its comparatively rural qualities. From their personal standpoint, Ketchikan was a rural place. Conversely, from the personal standpoint of a villager, the same place might appear to be non-rural.

Second, it was apparent that the "rural" or "non-rural" assessment of a place was affected by the choice of factors being applied. Some participants focused on *economic need* as a pertinent factor in rural/non-rural assessments. From this perspective, if economic development obviated the *economic need* for people to hunt or fish for food, then a place was no longer rural. Such a position focuses the assessment on factors such as availability of employment, infrastructure, income, and retail stores in an area. By contrast, some participants focused on *demography* and *land uses* as the most pertinent factors in rural/non-rural assessments. From this perspective, if communities were relatively small, close-knit, and living off the land, then they qualified as rural. *Economic need* would be tangential to the classification in this case. Therefore, depending upon the *choice of pertinent classification factors*, a place might receive a different rural or non-rural classification.

Third, it was apparent that *stakeholder interests* can influence the classification of a place as "rural" or "non-rural." A place may receive classifications that stakeholders perceive to benefit particular interests. In this case, "rural" is a concept manipulated for self-interest. For example, a rural classification for the Kenai was perceived to jeopardize the local sport fishing industry, according to some focus group members. From this perspective, a rural classification might lead to reduced salmon allocations to the sport fishery. Therefore, the Kenai might be portrayed as a "non-rural" area for fish management in order to support the sport fishing industry. At the same time, the Kenai was commonly portrayed as "rural" in sport-fishing promotions. Sport fishing advertisements to non-Alaska tourists typically feature the rural qualities of the Kenai area – its free-flowing rivers, abundant fish runs, and natural beauty. To attract tourists, the Kenai is not advertised as an urban area. These apparently discrepant portrayals are consistent with a particular stakeholder interest. "Rural" receives a different construction

for different audiences, depending upon what is perceived to benefit a stakeholder interest. In a similar vein, subsistence users may seek constructions of "rural" that benefit their stakeholder interests. If a rural classification is a federal legal requirement for continuing customary and traditional fishing practices in an area, then some subsistence interests might seek constructions and applications of the rural concept that achieve this end. This strategic use of the rural/non-rural terminology was evident in most of the focus groups. The general Kenai group also noted the desire to have both definitions applied so that the area could take advantage of having services as well as subsistence practices.

> *Seems we want it both ways [both rural and urban]. We say it's rural because we like the lifestyle but then we want the urban services. (Kenai, February 7, 2002*

Consequently, some of the discrepant classifications of areas emerging in public testimony may be reflective of competing stakeholder interests.

Fourth, discrepancies in "rural" and "non-rural" classifications may be due to the presence of *co-resident communities* in an area. As discussed below, two communities with different relationships to the land may reside in and use a common area. The area may appear to be "non-rural" or "rural" depending upon which community is considered. The land use patterns of one community may be rural in character, while their co-resident neighbor's are not. Co-residency appears to be a central factor at work in the Ketchikan and Saxman cases. Survey information indicates that the Saxman community has a different relationship to the surrounding land than the Ketchikan community. Saxman may be reasonably classified as "rural" as a co-resident population, even though it is embedded within the greater Ketchikan community and shares the area's stores, employment opportunities, hospitals, and related services. It is possible that the apparent contractions between the two Kenai focus groups also may be accountable in part by co-resident communities in the Kenai area – the Kenaitze community and the general Kenai community. However, it is difficult to assess the possibility of co-resident communities in the Kenai area with different land use patterns without better survey information. Comparative surveys of the Kenaitze community and the greater Kenai community would help to show whether the two communities differ in regard to rural/non-rural factors.

# RURAL MEASURES

A central purpose of this project is to identify factors for distinguishing rural and non-rural populations in Alaska. A number of variables were identified for inclusion in project databases for examination as potential factors, listed in Appendix A. The list contains the variable name, variable description, data source, and notes. Values of variables are contained in the PACK Database, which accompanies this report as a separate file in the documentation. The main sources of variables include the U.S. Census, 1990; U.S. Census, 2000; Community Profile Database (CPDB) of the Alaska Department of Fish and Game; the harvest ticket/permit records of the Alaska Department of Fish and Game; and the Alaska Department of Community and Economic Development (DCED).

Variables from the CPDB primarily derive from household surveys from a sample of Alaska communities and years, augmented with Alaska Department of Labor population information. Variables from the U.S. Census derive from decennial household surveys. Harvest ticket/permit records pertain to individuals or households harvesting under state licenses and permits. Variables from the DCED database derive from a variety of secondary sources. In addition to these pre-existing variable sets, new variables have been constructed for analysis from this information, as identified in Appendix A.

Because of their different sources, variables pertain to a variety of survey populations and years. For instance, while information from the CPDB pertains to *community populations* during a survey year, federal census information pertains to a hierarchy of *federal census unit populations* (tracts, census designated places, and so forth). In the construction of our databases, information was matched to a common set of population units when feasible, as discussed in a following section, *Aggregation/Disaggregation of Populations*. This was intended to allow for statistical analysis and model building with a consistent set of Alaska populations. As shown in Appendix A, there are a number of variables that serve as identifiers of population units (e.g., PACNAME, PACNOTE, and PACTYPE). The identifiers name both a population group and, in most cases, a bounded geographic area which may be located on maps.

Variables listed in Appendix A are ordered by general type – demographic (e.g., population size, population density), economic (e.g., country food procurement and use, location of economic-administrative networks, economic activity), cultural (e.g., prevalence of sport traditions, differentiation of knowledge of Nature), and landscape and community infrastructure (e.g., roads, households with full plumbing). Variables are potential measures within the general type.

According to this study's RFP (p. 8), an overriding goal is to use a minimal number of criteria that can clearly, effectively, and defensibly distinguish between rural and non-rural populations. The RFP also specifies that measures be drawn from the U.S. Census and the Alaska Department of Fish and Game harvest records, among other sources (see RFP p. 8). Building on the above general concepts, the following two measures of primary rural concepts were developed for use in identifying rural/non-rural populations:

I. Primary Rural Concept. *Extensive Land Use*

*Criterion:* Country Food Production

*Variable:* Annual per capita harvests of country food.

*Description:* This is a measure of the quantities of country foods harvested for local consumption within a population. It is an index created from multiple measurements from surveyed households or respondents. Information on harvests of individual fish and wildlife categories is collected, compiled, and combined into a single index. As such, it is a more sensitive measure of country food production than one developed from a single species or species group. Harvests within a population are converted to standard weights (usable lbs), summed, and divided by the population size. Harvests are expressed in terms of lbs and their nutritional content (percentage of the Recommended Dietary Allowance for protein). The measure is for a single year. A log transformation of the index is used in certain statistical analyses.

*Source Data:* There are two information sources for constructing the index. The Community Profile Database (CPDB) of the Alaska Department of Fish and Game (ADF&G) provides household survey information for surveyed Alaska communities. The Harvest Ticket/Permit Records of ADF&G provide harvest information from non-commercial net fisheries, hook-and-line fisheries, and hunts of large land mammals that require a permit or license.

II. Primary Rural Concept. *Sparsely-Populated, Open Country*

*Criterion:* Density of Population to a Local Commons

*Variable:* Weighted population within a standard area.

*Description:* This is a measure of the numbers of people living within a standard area surrounding a case population, weighted by distance from the origin population. In our study, the variable was assessed using three distances – 10 miles, 20 miles, and 30 miles. The 30-mile distance, representing a generous daily commute distance, was chosen as the standard. Origin and vicinity populations are measured at the level of either census tracts or census designated places, whichever unit provides a finer resolution for a population, except for a few cases where census block units of comparable size are used. The measure pertains to the year 2000. A log transformation of the measure is used in certain statistical analyses.

*Source:* The 2000 United States census is the source for information on population sizes and geographic locations (centroids) of census unit populations. The measure is calculated using a geographic information system for areas with population concentrations, or estimated without a GIS program for dispersed settlements.

The measures for these primary concepts were developed specifically for the project using federal census and ADF&G materials. As shown below, the measures were found to effectively distinguish between rural and non-rural populations. Understanding the construction of these measures is useful for understanding the rural/non-rural assessment methodologies in the next section, so each measure is highlighted here.

## Country Food Production Measures

Production of "country foods" was identified in the literature review as a central indicator of rural areas. Country food production is directly related to the core meaning of "rural" as areas of *extensive land uses*, particularly areas of *primary food production (farming, etc.).* Primary food production generally occurs in rural areas as occupations of segments of rural populations. In Alaska, country food production is a major land use in rural areas. Rural populations produce more country foods than urban populations as a general rule. Rural populations may be engaged in other extensive land uses as well, such as commercial fishing, trapping, logging, and mining.

Country food production has been systematically measured across many Alaska populations. Standard estimates of country food production for noncommercial use are available in the CPDB for residents of many small and mid-sized communities. For our project, information in the CPDB was extracted to create estimates of country food production by surveyed Alaska communities (such as ADJPCAP and PERCAP1) (Appendix A).

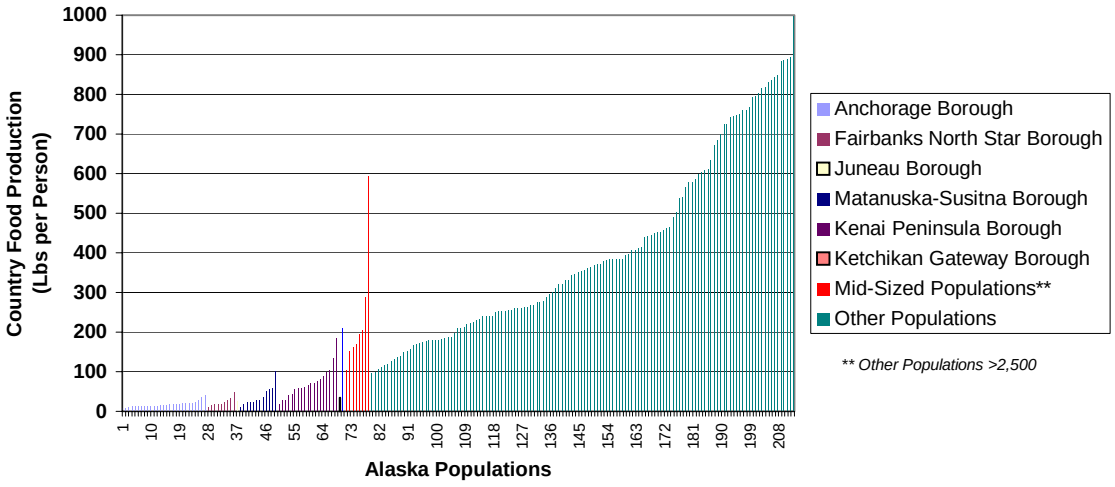
Unfortunately, the CPDB lacks harvest information for many of Alaska's large population centers. For statistical analysis comparing rural and non-rural populations, measures of country food production in the larger cities were needed from sources other than the CPDB. For this project, estimates were developed from other harvest ticket/permit records databases in ADF&G to meet this data need in the large population centers.

For this study, estimates of country food production were developed for populations in the City and Borough of Anchorage, the Matanuska-Susitna Borough, the City and Borough of Juneau, the Fairbanks North Star Borough, the Ketchikan Gateway Borough, and the Kenai Peninsula Borough. These areas contain somewhat more than three-quarter's of Alaska's population. Information on annual harvests of major food species by these populations is available in several ADF&G data sources, including the Alaska Subsistence Fisheries Database (subsistence or personal use salmon net fisheries), big game harvest ticket/permit records (bison, brown bear, black bear, caribou, deer, elk, goat, moose, musk-oxen, and sheep), and sport angler records (salmon, halibut, trout, and other sport species). These ticket/permit record systems are assumed by the State to provide a relatively complete picture of harvests of major food species in Alaska's large population centers. Participation in the ticket/permit systems is thought to be relatively good in the larger communities. Response rates on post-season mailed harvest surveys are also considered satisfactory for depicting harvests in the large population centers.

To estimate country food harvests in these areas, harvest ticket/permit records were compiled and matched to specific populations using ZIP codes (mailing address) or the community of residence. This process is described more completely in the section, *Aggregation/Disaggregation of Populations*. Harvests were converted to standard weights and divided by population size. Through these procedures, per capita wild food

production levels were estimated for tracts and CDPs in the population centers where CPDB household survey information was unavailable.

**Fig. 8. Country Food Production (Lbs per Person) by 212 Alaska Populations Grouped by Borough**

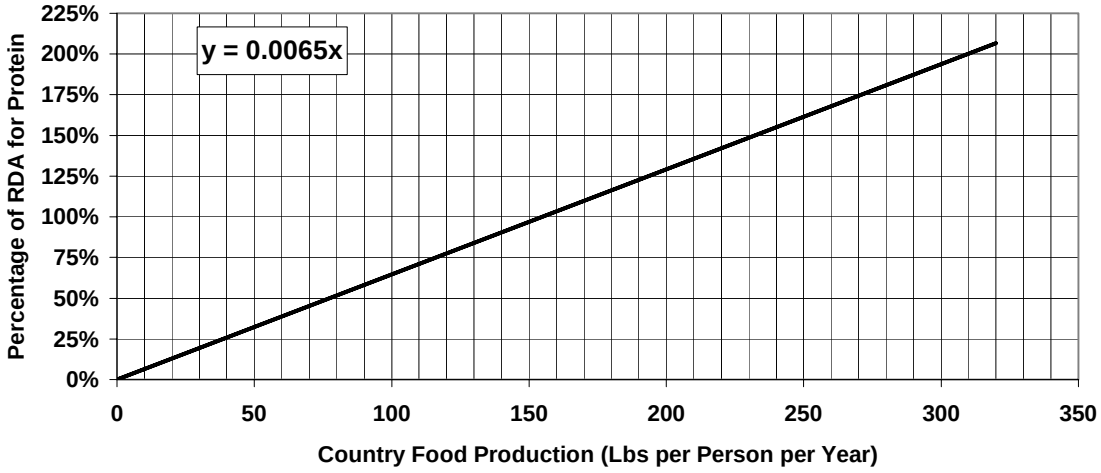



Country food production levels (lbs per person per year) are illustrated for 212 Alaska populations in Fig. 8. In this figure, populations are grouped by borough, to illustrate the variation in production levels by geographic area. The lowest production of country food (generally below 50 lbs per person) occurs in populations of the Anchorage Borough, Fairbanks North Star Borough, Juneau Borough, and Matanuska-Susitna Borough (left side of Fig. 8). Country food production by populations of the Kenai Peninsula Borough and Ketchikan Gateway Borough is generally below 75 lbs per person, but ranges as high as about 200 lbs per person in certain places. Mid-sized communities (>2,500 people) in other boroughs produce country foods at levels ranging from about 100 to 300 lbs per person. Country food production in other Alaska communities outside these areas generally are above 100 lbs per person, with levels between 200 to 600 lbs per person common.

Country food production estimates raise validity issues in certain areas. We assumed that the CPDB provided reasonable estimates of country food production for small to mid-sized communities. We also assumed that the harvest ticket/permit records provided reasonable estimates of country food production for the large population centers where CPDB surveys were unavailable (Municipality of Anchorage, Fairbanks North Star Borough, Matanuska-Susitna Borough, City and Borough of Juneau, and the Ketchikan Gateway Borough). For the Kenai Peninsula Borough, dual estimates of country food production were available for certain populations (Cooper Landing, Fritz Creek, Homer, Hope, Kenai, Nikolaevsk, Ninilchik, North Fork Road, and Vosnesenka). For these populations, estimates from household surveys in the CPDB were usually somewhat greater than estimates from the harvest ticket/permit records. Reasons for the discrepancies were uncertain. However, we suspect that sampling effects due to substantial non-response rates to face-to-face and mailed surveys by Kenai populations

may be related to differences. For populations in the Kenai area with dual harvest estimates, we conducted separate statistical runs using CPDB estimates and using harvest ticket/permit record estimates. These outcomes are compared in Appendix B. In our "best analysis," we averaged the two harvest estimates for these cases. It would be useful if future research might resolve these questions of country food measures in the Kenai Borough populations. More precise estimates for country food production in Kenai Borough populations would be useful, based on household samples without substantial non-response rates.

**Fig. 9. Country Food Production Levels and Protein Content (Percentage RDA for Protein) in Alaska**




Country food production levels were expressed as lbs per person per year in the discriminant analysis assessment. This is a standard measure found in the CPDB. In the criterion-referenced assessment, country food production levels were expressed in terms of nutritional values – the percentage of a population's Recommended Dietary Allowance (RDA) for protein contained in the country food harvest. This is also a standard measure in the CPDB. Its calculation assumes an average of 115.7 g of protein per lb of country food and an RDA for protein of 49 g per person per day for an Alaska population. For country food production in Alaska populations, the relationship between lbs and protein content is expressed by the equation, $y = 0.0065x$, where $y$ is the percentage of the RDA for protein contained in the country food harvest, and $x$ is the country food harvests expressed as lbs per person per year. The statistical relationship is illustrated in Fig. 9. This relationship was used in the definition of threshold standards for country food production, as is described below.

## Density Measures

Population density was identified in the literature review as a potential indicator of "rural." Population density is directly related to the core meaning of "rural" as *open country.* Rural areas are less dense than urban areas. The lower densities of rural areas give the sense of "open space" indicative of "the country." For some government purposes, density is used to classify areas as "rural" or "urban." For instance, the U.S. Census Bureau defines an "urbanized area" as an area consisting of a central place and adjacent territory with a population density of at least 1,000 people per sq mi of land area that together have a minimum residential population of at least 50,000 people.

What density values may distinguish between rural and non-rural Alaska areas are empirical questions. The answers are dependent in part on the types of people-to-land relationships found in Alaska, and in part on how densities are measured. Alaska populations of similar sizes, living in census units with similar geographic areas (sq mi), may exhibit substantially different densities to their land base. This is because the residents of some census units regularly use extensive unpopulated lands and waters beyond their census unit boundaries, a common village pattern for producing country foods described in the literature review. By contrast, residents of other census units regularly use populated areas outside their census unit boundaries, a common metropolitan use area pattern. The first pattern is more country-oriented than the second. These distinctions can be captured by properly-constructed density measures.

A new density variable (DNSDUA) was constructed from federal census information to provide measures of people-to-land base relationships in Alaska. DNSDUA is a variable measuring the *density of people in a standard daily use area*. It is a measure of the people living in nearby surrounding areas that are potentially used on a daily basis (a local commons). It is defined as the sum of the weighted populations within a standard distance of one's residence. That is, DNSDUA counts the people within a standard area, weighted by distance. DNSDUA was calculated for three standard distances and areas – a 10-mile distance representing a 314 sq mi area (DNSDUA10), a 20-mile distance representing a 1,256 sq mi area (DNSDUA20), and a 30-mile distance representing a 2,826 sq mi area (DNSDUA30). This was done to examine the performance of the measure at each of the three distances. In our statistical analysis, the 30-mile standard area performed best at distinguishing populations and so was chosen as our standard (DNSDUA30). However, all three variables were fairly similar to one another in relative density values and performance.

The data source for the numbers used in calculating DNSDUA was the federal census (2000). The federal census provides estimates of the numbers of people by census unit. To calculate DNSDUA, we used census tract populations or census designated place populations (CDPs), whichever provided finer resolution for an area (see the discussion of aggregation/disaggregation). Rarely, census blocks were used to achieve units of comparable size (e.g., Sitka). The federal census provides a central geographic point for each census tract or CDP, called a *centroid*, which was used to estimate the locations of

populations. Occasionally, for a few large census tracts, we adjusted the geographic centroid within the tract to better represent the actual location of a tract's population. For close, multi-tract areas, we used a computer program (ArcView GIS) to identify populations within the standard 30-mile distance from the centroid of a case population. For more remote villages, we used approximations of DNSDUA without the ArcView GIS program, because of project labor constraints. The density estimates for remote villages are close to actual values; however, these density estimates could be refined slightly by using an ArcView GIS program.

To calculate DNSDUA30, the weighted population within 30 miles of the centroid of a case population was divided by 2,826 sq mi (the area of a circle with a radius of 30 miles). For weighting, populations within 30 miles of the centroid were divided by the distance of the population from the centroid. Weighting was used to represent decreasing population influences related to distance. It factors in the declining "presence" of neighbors at greater distances. The potential degree of crowding lessens with distance.

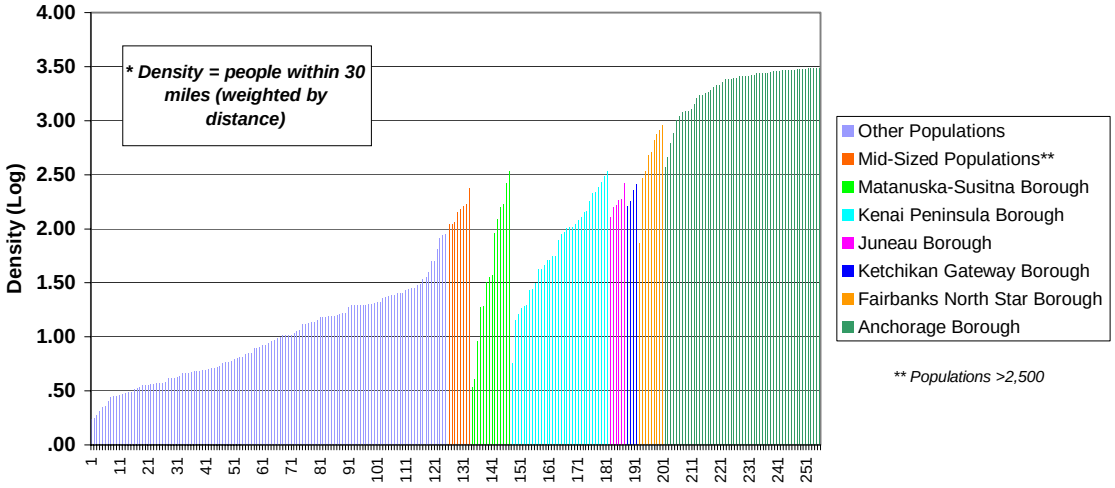
An example of this weighting procedure is illustrated in the following table, *Calculation of Tract 101 Density*. The example is for Tract 101 in the City and Borough of Anchorage (this tract contains Eklutna). The ArcView GIS identified 36 tracts within 30 miles of Tract 101, partially listed in the table with their populations and distances. To calculate weighted populations, a tract's population was divided by the distance of its centroid from the origin population's centroid. For example, Tract 102 with a population of 4,472 people was divided by 14.0 because its centroid is 14 miles away from the Tract 101's centroid, giving it a weighted population of 319.7. Tract 201 with a population of 3,060 people was divided by 20.9 because it is 20.9 miles away from Tract 101, for a weighted population of 146.5. This was done for all populations within the 30-mile standard area. The weighted populations were summed, totaling 8,068.3. This sum was added to the number of people in Tract 101 (4,805 people), which has a weighting of "one" because it is the origin, for a total of 12,903.3 weighted people. This was divided by 2,826 sq mi (the standard area) to produce a value of 4.6 weighted people per sq mi (DNSDUA30).

**Calculation of Tract 101 Density**

| Tract | Distance | Population | |
|---|---|---|---|
| | | Unweighted | Weighted |
| 102 | 14.0 | 4,472 | 319.7 |
| 201 | 20.9 | 3,060 | 146.5 |
| 202 | 19.5 | 5,924 | 303.6 |
| 203 | 18.6 | 9,165 | 492.8 |
| 204 | 9.3 | 2,461 | 264.4 |
| ↓ | ↓ | ↓ | ↓ |
| Tracts (30-Mile) | | 206,450 | 8,068.3 |
| 101 | | 4,835 | 4,835.0 |
| Total | | | 12,903.3 |
| Standard Area (30 Miles) | | | 2,826 |
| Density in 30-Mile Distance | | | 4.6 |

DNSDUA has several potential advantages as a measure of density. All populations receive consistent treatment using a standard distance (by contrast, densities within census unit boundaries show marked inconsistencies linked to variability between bounded areas). While 30 miles is selected (equivalent to a generous daily travel distance), other distances might be used for the density measure as long as they are consistently applied across populations. With DNSDUA, all populations within the standard distance are captured by the density measure (by contrast, densities within census unit boundaries ignore populations outside unit boundaries). DNSDUA has an intuitive interpretation – it is a measure of the people living within a standard distance from a person's home. As such, it is a measure of "openness" within a surrounding area (a potential daily use area, a local commons surrounding a community). Economic activities by a person generally are within a daily travel distance. The types of economic activities conducted by a person, particularly land uses, are influenced the congestion of people in the surrounding commons. As will be shown in our analysis, there is a strong statistical association between the density of people in one's standard use areas and the productivity of country foods in Alaska. This statistical association is a basis for distinguishing between rural and non-rural populations.

**Fig. 10. Densities* of Standard Use Areas of 255 Populations Grouped by Borough**




The values of DENSDUA30 for 255 populations grouped by borough are illustrated in Fig. 10, expressed as a log value (see also Fig. 18, for non-log values). By this measure, the greatest densities within a standard daily use area are found for populations in the Anchorage Borough, Fairbanks North Star Borough, Ketchikan Gateway Borough, and Juneau Borough (right side of Fig. 10). The lowest densities are displayed by Alaska village populations (left side of the Fig. 10). Densities for populations in the Matanuska-Susitna Borough and the Kenai Peninsula Borough display a substantial range, but primarily fall toward the middle of values in this selection of places.

# AGGREGATION/DISAGGREGATION OF POPULATIONS

Classification of populations into rural or non-rural categories involves decisions about the aggregation and disaggregation of people into case populations. There are two separate aggregation/disaggregation steps involved in our methodologies. In the first aggregation/disaggregation step, populations are identified for the purpose of data collection, data compilation, and measurement of rural/non-rural factors. After this step, the cases are assessed using the information, resulting in a classification of each case population into a "rural" or "non-rural" category. In the second aggregation/disaggregation step, individually-classified case populations are geographically combined into larger contiguous rural or non-rural areas. This aggregation/disaggregation step results in the identification of consolidated boundaries of rural and non-rural groups. Each of these aggregation/disaggregation steps is discussed in this section with the methods used in our analysis.

## Identifying Populations and Measuring Variables

In the approach we are taking, the basic unit of analysis is a "population." A *population* is defined as *a set of people identified by geographic* or *community boundaries*. Any identifiable population may be legitimately assessed for "rural" or "non-rural" classification under our system, subject to availability of information. A *geographic area* is a bounded space, described as lines connecting a series of geographic coordinates, and visually represented as a closed polygon on a map. A *community* is a named human population forming a distinct segment of society by virtue of a common government, common interests, a pattern of sharing, participation, fellowship, or other factors (American Heritage Dictionary of the English Language, 4th Edition 2000: 374). Community boundaries commonly are defined by governmental jurisdictions, such municipal borders or local tribal membership roles. Communities also may be indicated by measures of economic or social integration, such as commuting patterns for work. For our purposes, a *society* is a group of people broadly distinguished from other groups by mutual interests, participation in characteristic relationships, shared institutions, and a common culture (AHDEL 2000: 1650). *Culture* may be defined as the socially-transmitted behavior patterns, arts, beliefs, institutions, and other products of human work and thought shared within a particular period, class, community, or population (AHDEL 2000: 442).

*Population* is a flexible concept. Innumerable populations are potentially definable in Alaska. As stated above, the general rule of aggregation/disaggregation for initial assessment is that any identifiable population may be legitimately assessed for "rural" or "non-rural" designation, subject to availability of information. While this is the general rule, in the identification of initial case populations there will be constraints placed by *public acceptability*, *administrative rules*, and *data availability*.

In terms of *public acceptability*, large population aggregates likely will be unacceptable to stakeholders if perceived to hide real, meaningful differences among constituent populations. Stakeholders may object that potentially-distinguishable populations are being wrongly classified by being grouped within unreasonably large or arbitrary population aggregates. In this event, there are likely to be requests for disaggregation and reassessment with smaller or reconfigured groupings. As discussed in our literature review, entire boroughs in Alaska are classified as "rural" or "non-rural" for federal health programs. For subsistence management, such an approach is likely to be considered too broad-brushed by public stakeholders, because it ignores potentially significant differences between constituent populations within Alaska's boroughs. Public acceptability requires assessed population units to be smaller.

Administrative rules may establish limits to disaggregation. Both state and federal regulations refer to *community* and *area* in their procedures for determining areas and groups eligible for subsistence. Under federal subsistence regulations, "The Board shall determine if an *area* or *community* in Alaska is rural" (50 CFR 100.___ and 36 CFR 242.___ , §____.15 ). Under State subsistence regulations, "A nonsubsistence area is an *area* or *community* where dependence upon subsistence is not a principal characteristic of the economy, culture, and way of life of the area or community" (AS 16.05.258(c)). In applying these procedural rules, federal and state boards have considered *communities* or *areas* as starting points for assessment. This means individual households generally have not been considered as legitimate units for rural/non-rural determinations. Households have been considered as part of some larger *community* or *area*. When geographically distinct, relatively small groups of surveyed households have been treated as communities or areas (examples include Meyers Chuck with 21 people and Petersville CDP with 27 people). Small, less distinct household groups tend to be aggregated with neighbors when assessed. Federal regulations state that "communities or areas that are economically, socially, and communally integrated shall be treated in the aggregate" (50 CFR 100.___ and 36 CFR 242.___ §15(6)). This rule allows for the aggregation of households into larger units when economic, social, or communal integration is observed.

The *availability of data* is a major third constraint on the identification of populations. If data have not been collected for a particular population, it is difficult to assess it as an individual case. If one is to use federal census information and ADF&G information in rural/non-rural methodologies (as was required in this study), populations are constrained by the units for which the data were gathered. As stated in the literature review, the U.S. Census Bureau collects information from households clustered by census block, and makes the information available in increasingly larger hierarchically-arranged groups (block group, tracts, census designated places/municipalities, metropolitan/nonmetropolitan areas, counties/boroughs, and so forth). It is difficult to assess populations that cross-cut census blocks, if census information is to be used.

ADF&G's harvest information is collected at several different levels. In the Community Profile Database (CPDB), measurements are at the level of *community*, which refers to a systematically-sampled set of households representing a population, as defined above. To disaggregate to smaller population units, one must assume that mean values of

measured variables are equivalent for each of the smaller units. To aggregate communities, one must arithmetically compute new averages for the higher-order populations. In the Division of Wildlife Conservation harvest ticket/permit record databases, measurements are for individuals linked to a mailing address (ZIP code) or community of residence (a named place). These potentially can be aggregated to case populations through a set of rules linking ZIP codes or named places to the case populations. In the Division of Sport Fish database on sport and personal use harvests, information is collected by a mailed survey of a sample of households with license holders. This information is potentially linked to ZIP code and community of residence, like the harvest ticket/permit record data sets. In the Alaska Subsistence Fisheries Database (ASFDB), information on net-caught salmon is at the level of named community. Linking the harvest databases and federal census database to a common set of populations requires a complex set of steps, which potentially constrains the size and boundaries of case populations.

In our analysis, for populations off Alaska's road system, case populations were identified by linking information at the level of *community*, *census designated place*, and *municipality*. For off-road areas, there usually is a fairly direct correspondence between *community* in the CPDB and *census designated place* or *municipality* in the federal census. Therefore, linking measures for these case populations from databases was fairly straightforward.

For populations along Alaska's road system, the linking of measures to populations entailed more complex procedures. Our analysis sought population groupings that provided fine resolution and valid measurement of key rural/non-rural factors (density variables and harvest variables) along road systems. Information at a relatively fine resolution would be more likely to reveal boundaries in rural-urban fringes, an issue raised in the literature review. To achieve this goal, information was linked through *census tracts*, *tract groupings*, *census designated places*, and *community of residence*. Case populations identified through this procedure are listed in the first column of Fig.11. The detailed procedural steps are provided in the final report's documentation.

As shown in the second column of Fig. 11, the 2000 federal census divided the Municipality of Anchorage (260,283 people) into 55 census tracts. Anchorage's census tracts had an average size of 4,732 people, with a range of 1,458 people (anc1100, in the downtown area) to 9,165 people (anc0203, a tract in the Eagle River vicinity) (see Fig. 8). Tracts were used for measuring density. For measuring country food harvests, the finest resolution achieved with ADF&G databases was 27 populations, representing merged census tracts sharing common ZIP codes (the first column in Fig. 11). We named each of these merged tracts after a feature in its area. The density for each merged tract group was estimated taking the mean of the constituent tract densities.

**Fig. 11. Selected Case Populations and Components (Tracts or CDPs), with Population, Density, and Harvest Estimates**

| CASE POPULATIONS | COMPONENTS | POP2000 | DNSDUA30 | PERCAP3 |
|---|---|---|---|---|
| **Municipality of Anchorage** | | | | |
| 1 Lake Otis | anc1500 | 5,275 | 30.71 | 12.19 |
| 2 Russian Jack | anc0802 | 4,084 | 30.14 | 12.15 |
| 3 Midtown | | 12,687 | 29.82 | 13.61 |
| | anc1400 | 5,083 | 29.10 | 13.61 |
| | anc1900 | 4,181 | 30.19 | 13.61 |
| | anc2000 | 3,423 | 30.16 | 13.61 |
| 4 University | anc1602 | 4,633 | 29.64 | 12.26 |
| 5 Merrill Field | anc0901 | 4,128 | 29.14 | 10.16 |
| 6 Northfork | anc1802 | 4,324 | 29.13 | 13.74 |
| 7 MidFork-RusJack | | 10,105 | 29.00 | 12.12 |
| | anc0801 | 6,404 | 27.54 | 12.12 |
| | anc1601 | 3,701 | 30.46 | 12.12 |
| 8 Delaney Lake | anc2400 | 2,917 | 28.73 | 12.99 |
| 9 Campbell Creek | | 9,245 | 28.05 | 15.48 |
| | anc2501 | 4,926 | 27.65 | 15.48 |
| | anc2502 | 4,319 | 28.45 | 15.48 |
| 10 Little Campbell Creek | | 23,581 | 27.08 | 15.09 |
| | anc1801 | 3,919 | 29.95 | 15.09 |
| | anc2601 | 3,540 | 28.07 | 15.09 |
| | anc2602 | 4,734 | 27.56 | 15.09 |
| | anc2603 | 5,598 | 25.77 | 15.09 |
| | anc2811 | 5,790 | 24.03 | 15.09 |
| 11 Spenard | | 14,939 | 25.89 | 12.59 |
| | anc1300 | 3,255 | 20.28 | 12.59 |
| | anc2100 | 3,761 | 30.04 | 12.59 |
| | anc2201 | 4,874 | 24.02 | 12.59 |
| | anc2202 | 3,049 | 29.23 | 12.59 |
| 12 Downtown | anc1100 | 1,458 | 25.86 | 8.04 |
| 13 Muldoon | | 36,961 | 25.73 | 16.64 |
| | anc0701 | 4,356 | 27.50 | 16.64 |
| | anc0702 | 4,432 | 25.40 | 16.64 |
| | anc0703 | 4,922 | 21.34 | 16.64 |
| | anc1701 | 6,553 | 27.20 | 16.64 |
| | anc1702 | 5,198 | 28.97 | 16.64 |
| | anc1731 | 5,354 | 25.48 | 16.64 |
| | anc1732 | 6,146 | 24.20 | 16.64 |
| 14 Avenue Fifteen | | 12,288 | 25.70 | 8.77 |
| | anc0500 | 1,948 | 19.06 | 8.77 |
| | anc0902 | 3,029 | 30.61 | 8.77 |
| | anc1000 | 3,404 | 28.44 | 8.77 |
| 15 Ship Creek | anc0600 | 6,727 | 25.56 | 11.96 |
| 16 Airport | | 18,626 | 22.63 | 18.30 |
| | anc2301 | 5,394 | 17.10 | 18.30 |
| | anc2302 | 4,737 | 26.17 | 18.30 |
| | anc2303 | 8,495 | 24.63 | 18.30 |
| | anc1200 | 3,907 | 24.70 | 8.77 |
| 17 OMalley | anc2812 | 6,000 | 21.18 | 21.34 |
| 18 Lower OMalley-Cambell Lk | | 12,697 | 20.26 | 21.35 |
| | anc2711 | 5,804 | 17.91 | 21.35 |
| | anc2712 | 6,893 | 22.61 | 21.35 |
| 19 Coastal Refuge | anc2702 | 8,612 | 16.98 | 21.35 |
| 20 Rabbit Creek | | 12,318 | 14.69 | 22.64 |
| | anc2821 | 4,875 | 18.13 | 22.64 |
| | anc2822 | 4,020 | 16.01 | 22.64 |
| | anc2823 | 3,423 | 9.94 | 22.64 |
| 21 Elmendorf | anc0400 | 6,626 | 14.17 | 18.01 |
| 22 Fort Richardson | anc0300 | 5,470 | 12.81 | 15.14 |
| 23 Upper OMalley | anc2813 | 4,574 | 12.18 | 22.06 |
| 24 Eagle River | | 20,610 | 10.26 | 27.34 |
| | anc0201 | 3,060 | 10.96 | 27.34 |
| | anc0202 | 5,924 | 11.83 | 27.34 |
| | anc0203 | 9,165 | 12.07 | 27.34 |
| | anc0204 | 2,461 | 6.20 | 27.34 |
| 25 Chugiak | anc0102 | 4,472 | 7.55 | 36.67 |
| 26 Eklutna | anc0101 | 4,835 | 4.57 | 41.97 |
| 27 Girdwood | anc2900 | 2,091 | 3.66 | 18.39 |

**Fig. 11. Selected Case Populations and Components (Tracts or CDPs), with Population, Density, and Harvest Estimates (p. 2)**

| | | | | |
|---|---|---|---|---|
| **Fairbanks North Star Borough** | | | | |
| 28 Central Fairbanks | | 16,788 | 9.00 | 17.09 |
| | fai01 | 1,732 | 9.44 | 17.09 |
| | fai02 | 3,379 | 8.88 | 17.09 |
| | fai03 | 4,296 | 8.25 | 17.09 |
| | fai04 | 4,496 | 7.17 | 17.09 |
| | fai05 | 2,885 | 8.39 | 17.09 |
| 29 Southwest Fairbanks | | 17,574 | 8.18 | 19.31 |
| | fai06 | 3,632 | 7.86 | 19.31 |
| | fai07 | 4,203 | 7.29 | 19.31 |
| | fai08 | 4,766 | 5.95 | 19.31 |
| | fai09 | 3,512 | 3.36 | 19.31 |
| | fai10 | 1,461 | 5.82 | 19.31 |
| 30 North Pole Area | | 16,295 | 7.39 | 27.48 |
| | fai14 | 5,396 | 4.47 | 27.48 |
| | fai15 | 7,152 | 4.46 | 27.48 |
| | fai16 | 3,747 | 3.92 | 27.48 |
| 31 Fort Wainwright | fai11 | 7,381 | 6.56 | 19.09 |
| 32 Northwest Fairbanks | fai13 | 5,127 | 5.05 | 15.90 |
| 33 Northeast Fairbanks | fai12 | 4,894 | 4.75 | 33.22 |
| 34 Eielson AFB | fai18 | 5,400 | 3.41 | 22.59 |
| 35 North Fairbanks | fai19 | 8,253 | 2.92 | 10.05 |
| 36 Salcha-Harding | fai17 | 1,128 | .73 | 47.38 |
| **Juneau City and Borough** | | | | |
| 37 Juneau City and Borough | | 30,711 | 3.11 | 24.61 |
| Auk Bay-Lynn Canal | jun0100 | 4,468 | 1.95 | 24.61 |
| Mendenhall East | jun0200 | 7,445 | 4.78 | 24.61 |
| Mendenhall West | jun0300 | 5,135 | 4.65 | 24.61 |
| Lemon Creek | jun0400 | 4,722 | 2.97 | 24.61 |
| Downtown-Thane | jun0500 | 3,644 | 1.68 | 24.61 |
| Douglas Island | jun0600 | 5,297 | 2.65 | 24.61 |
| **Matanuska-Susitna Borough (Case Populations)** | | | | |
| 38 Big Lake | | 2,635 | 1.69 | 19.88 |
| 95 Chickaloon CDP | | 213 | .37 | 223.58 |
| 39 Glacier View CDP | | 249 | .09 | 35.78 |
| 40 Houston | | 1,202 | 1.58 | 11.56 |
| 153 Lake Louise | | 88 | .03 | 179.18 |
| 41 Palmer (group) | | 15,000 | 2.65 | 26.95 |
| | Buffalo Soapstone CDP | 699 | 1.78 | 26.95 |
| | Butte CDP | 2,561 | 2.73 | 26.95 |
| | Farm Loop CDP | 1,067 | 2.79 | 26.95 |
| | Fishhook CDP | 2,030 | 2.08 | 26.95 |
| | Gateway CDP | 2,952 | 3.59 | 26.95 |
| | Lazy Mountain CDP | 1,158 | 2.00 | 26.95 |
| | Palmer CDP | 4,533 | 3.58 | 26.95 |
| 43 Petersville CDP | | 27 | .04 | 27.68 |
| 315 Point MacKenzie CDP | | 111 | .35 | 14.97 |
| 44 Skwentna (group) | | 148 | .04 | 100.85 |
| | Skwentna CDP | 111 | .04 | 100.85 |
| | Susitna CDP | 37 | .07 | 100.85 |
| 45 Sutton-Alpine | | 1,080 | 1.21 | 24.06 |
| 46 Talkeetna (group) | | 813 | .19 | 55.38 |
| | Chase CDP | 41 | .06 | 209.21 |
| | Talkeetna CDP | 772 | .32 | 55.04 |
| 48 Trapper Creek CDP | | 423 | .19 | 65.38 |
| 49 Wasilla (group) | | 29,618 | 3.44 | 24.10 |
| | Knik-Fairview CDP | 7,049 | 3.49 | 24.10 |
| | Knik River CDP | 582 | 1.75 | 24.10 |
| | Lakes CDP | 6,706 | 4.54 | 24.10 |
| | Meadow Lakes CDP | 4,819 | 3.35 | 24.10 |
| | Tanaina CDP | 4,993 | 3.63 | 24.10 |
| | Wasilla CDP | 5,469 | 3.86 | 24.10 |
| 50 Willow (group) | | 2,614 | .90 | 23.24 |
| | Willow CDP | 1,658 | 1.40 | 23.24 |
| | Y CDP | 956 | .39 | 23.24 |
| **Lower Order Mat-Su Borough Populations** | | | | |
| 42 Parks Highway South | | 367 | | 58.01 |

**Fig. 11. Selected Case Populations and Components (Tracts or CDPs), with Population, Density, and Harvest Estimates (p. 3)**

| | | | | |
|---|---|---|---|---|
| **Kenai Peninsula Borough** | | | | |
| 51 Anchor Point (group) | | 2,334 | .74 | 55.19 |
| | Anchor Point CDP | 1,845 | 1.03 | 55.19 |
| | Happy Valley CDP | 489 | .45 | 55.19 |
| 52 Clam Gulch | | 173 | .51 | 99.48 |
| 53 Cooper Landing | | 369 | .16 | 77.29 |
| 54 Fritz Creek CDP | | 1,603 | .88 | 72.14 |
| 55 Halibut Cove | | 35 | .31 | 29.62 |
| 57 Homer (group) | | 8,472 | 1.08 | 39.12 |
| | Diamond Ridge CDP | 1,802 | 1.29 | 39.12 |
| | Fox River CDP | 616 | .42 | 39.12 |
| | Homer CDP | 3,946 | 1.78 | 66.18 |
| | Kachemak City CDP | 431 | .93 | 39.12 |
| | Miller Landing CDP | 74 | 1.18 | 39.12 |
| 59 Hope (group) | | 155 | .04 | 60.97 |
| | Hope CDP | 137 | .06 | 60.97 |
| | Sunrise CDP | 18 | .02 | 11.24 |
| 60 Kasilof (group) | | 1,639 | 1.02 | 60.46 |
| | Cohoe CDP | 1,168 | 1.01 | 60.46 |
| | Kasilof CDP | 471 | 1.03 | 60.46 |
| 62 Kenai (group) | | 9,828 | 2.35 | 60.07 |
| | Kenai CDP | 6,942 | 3.40 | 60.07 |
| | Ridgeway CDP | 1,932 | 2.18 | 36.54 |
| | Salamatof CDP | 954 | 1.46 | 36.54 |
| 64 Moose Pass (group) | | 374 | .16 | 37.72 |
| | Crown Point CDP | 75 | .14 | 37.72 |
| | Moose Pass CDP | 206 | .16 | 37.72 |
| | Primrose CDP | 93 | .18 | 37.72 |
| 165 Nanwalek | | 177 | .19 | 253.93 |
| 65 Nikiski | | 4,327 | 2.14 | 16.83 |
| 66 Nikolaevsk | | 345 | .55 | 88.55 |
| 67 Ninilchik | | 772 | .51 | 134.85 |
| 189 Port Graham | | 171 | .20 | 253.41 |
| 70 Seldovia (group) | | 430 | .30 | 183.55 |
| | Seldovia CDP | 286 | .31 | 183.55 |
| | Seldovia Village CDP | 144 | .29 | 183.55 |
| 71 Seward (group) | | 4,670 | .72 | 28.53 |
| 323 | Bear Creek CDP | 1,748 | .78 | 28.53 |
| 334 | Lowell Point CDP | 92 | .28 | 28.53 |
| 341 | Seward CDP | 2,830 | 1.11 | 28.53 |
| 72 Soldotna (group) | | 14,946 | 2.39 | 42.00 |
| 329 | Funny River CDP | 636 | 1.42 | 42.00 |
| 332 | Kalifonsky CDP | 5,846 | 3.04 | 42.00 |
| 342 | Soldotna CDP | 3,759 | 2.68 | 42.00 |
| 343 | Sterling CDP | 4,705 | 2.40 | 42.00 |
| 215 Tyonek | | 193 | .13 | 259.95 |
| **Other Lower Order Kenai Borough Populations** | | | | |
| 68 North Fork Road | Part of Nikolaevsk | 467 | .55 | 71.06 |
| 73 Voznesenka | Part of Fox River CDP (Homer Group) | 327 | .42 | 103.23 |
| **Ketchikan Gateway Borough** | | | | |
| 76 Ketchikan | | 7,922 | 2.07 | 31.11 |
| | ket0100 | 3,811 | 1.81 | 31.11 |
| | ket0200 | 4,898 | 2.60 | 31.11 |
| | ket0300 | 3,024 | 2.27 | 31.11 |
| | ket0400 | 2,337 | 1.62 | 31.11 |
| 77 Saxman | | 431 | 1.62 | 210.54 |

The Fairbanks North Star Borough (82,840 people) was divided by the federal census into 19 census tracts, shown in Fig. 11. The census tracts had an average size of 4,360 people, with a range of 1,128 people (Tract Fai17) to 8,253 people (Tract Fai19). Tracts were used for measuring density. For measuring country food harvests, the finest resolution achieved was nine populations of merged tracts sharing common zip codes or community of residence. Each population was named according to general location, including Central Fairbanks (Tracts Fai01 to Fai05, 16,788 people), Southwest Fairbanks (Tracts Fai06 to Fai10, 17,574 people), and the North Pole Area (Tracts Fai14 to Fai16, 16,295 people). The remaining populations were single tracts, including Fort Wainwright (Tract Fai11, 7,381 people), Northeast Fairbanks (Tract Fai12, 4,894 people), Northwest Fairbanks (Tract Fai13, 5,127 people), Salcha-Harding (Tract Fai17, 1,128 people), Eielson Airforce Base (Tract Fai18, 5,400 people), and North Fairbanks (Tract Fai19, 8,253 people).

The Matanuska-Susitna Borough (59,322 people) was divided by the federal census into 28 census designated places (CDPs), census units which provided finer resolution than census tracts. The CDPs had an average size of 1,936 people, with a range of 27 people (Petersville CDP) to 7,049 people (Knik-Fairview CDP). CDPs were used for measuring density. For measuring country food harvests with harvest ticket/permit records, the finest resolution achieved was 14 populations, representing CDPs sharing common ZIP codes or community of residence (places in the ADF&G databases). Each population was named after its principal place, as shown in Fig. 11.

The Kenai Peninsula Borough (49,691 people) was divided by the federal census into 35 CDPs, census units which provided finer resolution than census tracts. The CDPs had an average size of 1,373 people, with a range of 18 people (Sunrise CDP) to 6,942 people (Kenai CDP). CDPs were used for measuring density. For measuring country food harvests with harvest ticket/permit records, the finest resolution achieved was 19 populations, representing CDPs sharing common ZIP codes or community of residence (places in the ADF&G databases). Each population was named after its principal place, as shown in Fig. 11.

The City and Borough of Juneau (30,711 people) was divided by the federal census into six census tracts with an average size of 5,118 people and a range of 3,644 to 7,445 people. The Ketchikan Gateway Borough was divided by the federal census into four census tracts, with an average size of 3,518 people and a range of 2,337 to 4,898 people. Tracts were used for measuring density. For measuring country food harvests with harvest ticket/permit records, the finest resolution achieved was to treat Juneau and Ketchikan as single entities.

For the areas listed in Fig. 11, the CPDB provided harvest estimates for certain *communities*, including Fritz Creek, Homer, Hope, Kenai, Nanwalek, North Fork Road, Parks Highway South, Port Graham, Saxman, Seldovia, Vosnesenka, and Talkeetna. As discussed above, if data exist, units like these can be treated as case populations in analysis. In our best analysis, Saxman and the Ketchikan community were treated as distinct cases (an example of co-resident populations). For the Kenai area, separate

discriminant analysis runs were conducted to assess outcomes using different sets of case populations and data sources, as discussed in Appendix B. A central issue was which data sources provided the best estimates of country food harvests for Kenai Peninsula populations. Our best analysis used an average of harvest estimates for case populations with dual data sources, as discussed in Appendix B.

In discriminant analysis, we used the populations listed in the first column of Fig. 11 as cases. This was a statistical choice. It was done to analyze case populations whose values on variables were independent of other cases. Such a selection criterion for case populations (independent measures) helps to minimize potential bias introduced by the statistical interaction of non-independent cases. As stated above, it is possible that stakeholders might request separate assessments for components of merged tracts or CDPs. In this event, values like those listed for component tracts or CDPs (the second column in Fig. 11) could be used in an assessment of a particular case. Whether such disaggregation would result in a different classification for a case would depend on the values of key variables. As the values of component tracts/CDPs are in general similar to values of merged tracts/CDPs in Fig. 11, it is unlikely that classifications of individually-assessed components would be changed.

## Identifying Rural and Non-Rural Boundaries

A second aggregation/disaggregation step occurs after case populations are categorized as "rural" or "non-rural." Using a mapping procedure, individually-classified case populations are geographically combined into contiguous rural or non-rural areas. The general rule for aggregation into final groupings is the following: (1) case populations that are classified "rural" are grouped, and (2) case populations that are classified "non-rural" are grouped. Depending upon their geographic locations, case populations may be aggregated into final rural or non-rural groupings that are larger than the initial case populations. The aggregated areas may be named in regulation and shown as areas on a map.

This aggregation/disaggregation step results in the potential identification of larger rural and non-rural groupings, based on the consolidation of individual cases. The consolidation step may be used for simplifying descriptions of classification outcomes. For example, if all case populations in the Anchorage area were found qualify as "non-rural" populations, the outcome might be described simply in regulation as, "residents of the Anchorage Borough are 'non-rural' for subsistence management." Even though the findings were based on an assessment of disaggregated populations, each individually-assessed case population would not need to be listed in regulation.

This aggregation step has been common in federal and State procedures. In some cases, individual communities are classified and named in regulation. For example, *Adak* and *Valdez* were individually named as "non-rural" in federal regulations. But more commonly, classifications have been made for an area defined to include a set of communities. For example, the *Wasilla area, including Palmer, Wasilla, Sutton, Big*

*Lake, Houston, and Bodenberg Butte* was named a non-rural area in federal regulations. Rural populations in federal regulations include *all Alaskans residing in areas not named as non-rural areas*.

It is possible that the second aggregation step may reveal a relatively complex mosaic of populations in some areas of Alaska. That is, rural populations and non-rural populations may be found in close proximity. This would not be an unexpected outcome, especially in urban-rural fringe areas. If the mosaic is due to real and meaningful distinctions between populations, it is reasonable to retain them. The second aggregation step may enable boundaries of populations to be more precisely defined with additional information, such as input from stakeholders during a public process.

It is also possible that the second aggregation step may reveal that some case populations with tentative (uncertain) classifications lie on the fringe of a larger area with a different classification. Or, some case populations with tentative classifications may appear as geographic isolates, embedded within a larger area with a different classification. Such mosaic patterns may represent borderline or ambiguous case populations. If this is the situation, one may look to see if the borderline cases may represent variant extensions of a neighboring rural or non-rural pattern. The additional information about the geographic patterning of cases may provide a reason for additional assessment of tentative classifications. Using ancillary information, cases with tentative classifications on a fringe might be assessed to be part of the larger neighboring population. Tentative cases that appear to be geographic isolates also might be assessed to be part of the larger population. If so, this reassessment may be used as a basis for combining case populations and simplifying a mosaic. If the simplified map of areas has not distorted real population distinctions, refinement of boundaries should not raise significant public objections.

Work commuting patterns might be used as one variable for assessing if a fringe area is an extension of a rural or non-rural pattern. Commuting information in the federal census might be one basis for linking fringe cases or geographic isolates. The 1990 federal census provides travel time to work (< 5 minutes, 5 to 9 minutes, 10 to 14 minutes, etc.) for workers 16 years and over living in a census designated place. Travel time provides a general picture of the extent of daily travel by workers, but not with respect to destination.

The Economic Research Service (ERS) of the U.S. Department of Agriculture has developed a more detailed classification scheme to identify commuting patterns, referred to as the Rural-Urban Commuting Area Codes (RUCA). The system classified 1990 federal census tracts based on the percentage of tract residents finding work within or outside the tract, by type of origin and destination place. See Appendix C for a listing and description of the codes. In general, the code identifies the percentage of workers in a specific tract who are working outside their home tract and the type of place to which they are commuting, e.g., neighboring rural areas, towns (small, large), or metropolitan areas. Revisions of the RUCAs based on the federal 2000 census will be available in

2003. This information may be useful for identifying fringe populations that are extensions of an urban or rural area.

The board may find other information to link areas in addition to these. In clarifying boundaries at this assessment step, a board should be careful weighing the economic patterns of a segment of a case population (such as a measure like work commutes) with patterns established by other segments of a case population (such as extensive land uses).

Finally, it must be stated that the identification of areas open to fishing and hunting for subsistence represents a step separate from the identification of rural and non-rural populations. Our analysis defines populations based on residency (a geographic area or community in which people live). The places where rural residents fish and hunt commonly lie outside the boundaries of their places of residency. Determining fishing and hunting areas is another procedure, using information on customary and traditional use areas and the locations of wild fish stocks and wildlife populations.

## Co-Resident Communities

Aggregation/disaggregation decisions may be affected by *co-residence*, a demographic phenomenon occasionally found in Alaska. *Co-residence* means "residence together" (Oxford English Dictionary 2nd Edition, v. III, p. 931, Clarendon Press, Oxford, J.A. Simpson and E.S.C. Weiner, eds.). *Co-resident communities (*or *co-resident populations)* may be defined as distinguishable communities (or populations) residing in the same geographic area. Old order Anabaptists (such as the Amish and Old Order Mennonites) and the greater Pennsylvania population provide clear examples of co-resident populations, as discussed in previous sections. The old order groups are organized into communities with distinctive rural economies. Yet they are not geographically distinct, being interspersed among dominant, mainstream populations. As stated above, a *community* is a named human population forming a distinct segment of society by virtue of a common government, common interests, a pattern of sharing, participation, fellowship, or other factors (American Heritage Dictionary of the English Language, 4th Edition 2000: 374). The old order groups qualify as communities because of their common faith-based practices, including distinct rural land uses. In practical terms, Anabaptist communities are identifiable by membership lists of people who reside in a local area.

The concept of co-resident communities is germane for understanding land use patterns in certain parts of Alaska. There are areas in Alaska supporting co-resident communities with distinctly different patterns of land use. That is, co-resident communities share a "place" of residence, but may use the *commons* (surrounding public lands and waters) in substantially different ways. In some cases, one community's land use pattern may display rural characteristics, while the other community's land use pattern may display non-rural characteristics. In these instances, it is not the common area that is "rural" or "non-rural" – the commons in fact supports each type of land use. It is the community-

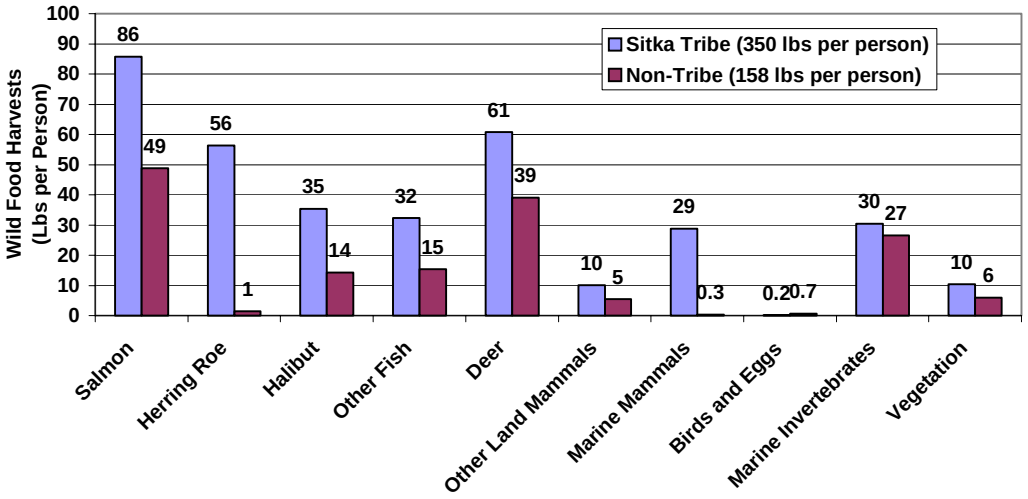
land use pattern that is "rural" or "non-rural." In these cases, a single geographic area has co-resident rural and non-rural communities.

As previously noted, one Alaska example of co-resident rural and non-rural communities is Saxman and the greater Ketchikan community. A relatively complex mosaic of governmental jurisdictions and federal rural classifications occur near downtown Ketchikan. Traveling southeast by road from downtown Ketchikan, one passes through Ketchikan City ("non-rural"), then through the unincorporated Ketchikan Gateway Borough ("non-rural"), then (about three miles from downtown) through Saxman City ("rural"), and then again through the unincorporated Ketchikan Gateway Borough ("non-rural"). There are residential neighborhoods all along the way. Currently, Saxman is a relatively small community (431 people, one-square-mile area) embedded in the greater Ketchikan community. While once geographically removed, the Ketchikan community has grown to surround Saxman. Yet, Saxman has persisted as a distinct, rural community surrounded by a non-rural community. Saxman's rural status has been supported by the community's continued distinctive relationship to the commons, rather than the geographic location of its houses (surrounded by the greater Ketchikan community) or its accessibility to employment and stores (which is the same as the greater Ketchikan community). The level of production of country foods by Saxman (211 lbs per capita in 1999) resembles a rural adaptation. The land use pattern appears to be distinct from the pattern of the greater Ketchikan community (31 lbs per capita) within the same commons. (As a caveat, comparable complete harvest surveys have not as yet been administered in the greater Ketchikan community. Such a survey of Ketchikan households would allow a more direct comparison with Saxman's harvest pattern.)

Another example of co-resident communities in Alaska is found in the City and Borough of Sitka. This area is home to the local Sitka tribe and the greater Sitka community. Tribal land near the heart of Sitka contains the tribal offices and tribal services. But unlike the Saxman case, the houses of Sitka tribal members are dispersed throughout the City and Borough, rather than concentrated on tribal holdings. The uses of the surrounding commons by each community for food production are distinctive, as shown by per capita harvests documented by household surveys administered by the State Division of Subsistence in 1996 (Fig. 12). For instance, Sitka Sound supports the largest non-commercial herring roe fishery in Alaska. The local Sitka tribe produces almost all of the non-commercial herring roe harvested from the fishery – 117,826 lbs of herring roe in 1996 (equivalent to 56 lbs per tribal member). Although the local Sitka tribe and the greater Sitka community share the commons for herring, the roe fishery is principally an endeavor of the tribal community (Schroeder and Kookesh 1990). A significant portion of the non-commercial herring roe harvest is distributed in the southeast region along traditional sharing networks. The local harbor seal fishery also is principally an endeavor of the tribal community, as shown in Fig. 12. A portion of the local tribe's annual non-commercial country food harvest goes to a tribal food program for redistribution to the elderly in Sitka and for use at tribal ceremonies. Overall, the Sitka tribal community produced twice as much country foods on a per capita basis as the non-tribal population – 350 lbs compared with 158 lbs (the mean for the Sitka area population in aggregate was 205 lbs). The local Sitka tribal community is identifiable as

those persons on tribal roles and living in the City and Borough of Sitka. Thus, in addition to geography (residency in a definable area), the community is defined by a governmental jurisdiction (a tribal role). Unlike the Saxman and greater Ketchikan example, both the greater Sitka community and local Sitka tribal community exhibit rural characteristics, according to federal and State assessments. It appears to represent an example of co-resident rural communities.

**Fig. 12. Wild Food Harvests (Lbs per Capita) in Sitka, by Sitka Tribe and Non-Tribe Populations, 1996**




Co-resident communities may develop in rural/urban fringe areas, which commonly contain a mosaic of land use patterns. Co-resident communities also may develop when population growth by in-migration envelops pre-existing populations. The pre-existing populations may continue a traditional land use pattern, while the in-migrants do not. In this case, the communities reside in the same area, with distinguishable land uses. A *rural isolate* is a community with rural characteristics in a predominately urban area, distinguishable by factors of history, culture, and land uses. A *non-rural isolate* is a community with non-rural characteristics in a predominately rural area. One example of a non-rural isolate was the airforce station at Galena. The Alaska Joint Board classified the airforce station as "non-rural" and the greater Galena community as "rural," making the airforce community a non-rural isolate with a larger rural area.

Co-residency presents additional choices in aggregation and disaggregation. If distinctive co-resident communities are found to exist, there are at least three choices. Each community might be analyzed separately for separate classifications (disaggregated). The co-resident communities might be analyzed as a single population for a single classification (aggregated). Or, the co-resident communities might be analyzed as separate populations, but with the entire area given a single classification based on the assessment of one or the other co-resident community. To illustrate these possibilities in our analysis, we have treated Saxman as a distinct community from the greater Ketchikan community and we have treated the local Sitka Tribe as a distinct

community from the greater Sitka community. This is possible because good information exists for each community. Without this type of information, the co-resident communities likely would be aggregated. The disaggregation allows for testing of the rural or non-rural characteristics of each co-resident community. As shown below, in the Saxman-Ketchikan pair, the methodologies classify Saxman community as "rural" and the greater Ketchikan community as "non-rural." In the Sitka-Sitka Tribe pair, the methodologies classify the Sitka community as "rural" and the Sitka Tribe community as "rural."

As discussed in the Focus Group section, co-resident communities with different land use patterns may exist in the Kenai-Soldotna area. Additional research on co-resident communities in that area might examine questions raised by the Kenai focus groups, where the perceptions of rural/non-rural classifications of the Kenai area diverged between the two focus groups. Research documenting land use patterns for the local Kenaitze tribe and the greater Kenai-Soldotna community would provide information that could be used to examine co-residency as a possible basis for the discrepant assessments.

# METHODOLOGIES FOR IDENTIFYING RURAL AND NON-RURAL POPULATIONS

Two alternative methodologies for determining the rural and non-rural character of Alaska populations were developed during this project. The two alternative methodologies are called *Discriminant Analysis Assessment* and *Criterion-Referenced Assessment*. Each approach is described in this section, along with a detailed application of each methodology to a test set of 195 case populations. Based on the outcomes from the tests, both methodologies were found to produce similar classifications of case populations. Because of its comparative simplicity, *Criterion-Referenced Assessment* might be considered a preferred method for identifying rural and non-rural populations for federal subsistence management. The *Discriminant Analysis Assessment* also might be considered a useful approach because it provides a quantitative measure of the closeness of each community to a rural or non-rural class. The validity of either approach receives support by the similar outcomes in the test analyses.

## Methodology 1. Discriminant Analysis Assessment

*Discriminant analysis* (also called *discriminant function analysis*) is a statistical method designed to distinguish between one or more groups. It is a type of multivariate modeling that relies on correlation and multiple regression of variables measured with interval data (or near interval data). For this assessment, we have used the discriminant analysis program in the *Statistical Package for the Social Sciences (SPSS)*, a commonly-used social science statistical software.

Using discriminant analysis, variables are identified that distinguish between groups of cases (the groups are called the *dependents*). The variables found to statistically distinguish between groups are called *discriminating variables* (also called *predictors* or *independents*). The discriminating variables are statistically combined into numeric equations called *discriminant functions* (also called *canonical roots*). A discriminant function can be treated as a *criterion* for distinguishing among groups. Depending upon the data and cases analyzed, one criterion or several criteria may emerge through discriminant analysis for distinguishing between groups.

The discriminant functions can be used to classify uncertain cases into the groups of cases. For case populations, discriminating variables are measured and the values entered into the numeric equations (the discriminant functions). The case population's score indicates its group. The case is classified with the group to which its numeric value is closest to the numeric *centroid* of each group. The nearness of the case population's score to the group's centroid indicates the clarity or ambiguity of the classification.

Discriminant analysis was conducted with a selection of Alaska populations comprising the set of cases, while the dependents (groups) were "rural" or "non-rural." In this test of

the methodology, case populations were included in the analysis if they had greater than 49 people, country food harvests of less than 1,000 lbs per capita, and information on discriminating variables. There were 195 populations meeting the selection criteria in the data set. The selection was done to reduce the number of potential case outliers (cases with very small or large values), which can confound statistical correlations. Very small populations (<50 people) are likely to be classed as "rural" under most standards and may display unusual traits linked to their size. Populations with exceptionally large annual productions of country foods (such as those with harvests greater than 1,000 lbs per year) also are likely to be classed as "rural," regardless of any other characteristic they may display.

Two *discriminating variables* were identified in analysis: (1) the annual per capita harvest of country foods by the population – log transformed (LGPCAP3); and (2) the density of population to a standard area – log transformed (LGDEN30). These variables are measures of primary rural concepts, as described above. Before analysis, log transformations of per capita harvests and density were made because the frequency distributions of their values were asymmetric (skewed) and the two variables appeared to have a curvilinear relationship. Discriminant analysis works better with normally distributed values and linear relationships. The log transformations produce values with greater symmetry and linearity.

Fourteen separate discriminant function analyses were conducted with the two discriminating variables to test the methodology. Each analysis was conducted with slightly different starting conditions, variable measurements, or case population definitions. A summary of the fourteen separate analyses is presented as Appendix B. A discussion of the fourteen analyses also is presented in the appendix. In this section, the "best analysis" from these fourteen runs is presented in detail (shown as *Run A* in Appendix B Table). This best analysis discriminated the greatest amount of the variability among case values, as measured by the *canonical correlation.* The model discriminated 82.3% of the variability in the two discriminating variables among the 195 case populations, which is a very high value (a canonical correlation of .907). It was the highest among the fourteen analyses. The analysis provided excellent discrimination between groups, as described below.

In discriminant analysis, initial groupings of cases are advanced to focus the analysis on appropriate discriminating variables and separation points. In the "best analysis," cases were assigned to initial groups based on classifications of the Federal Subsistence Board and the State Joint Board of Fisheries and Game. Case populations classed as "rural" by both boards were initially labeled "rural" (132 populations). Case populations labeled as "non-rural" by both boards were initially labeled "non-rural" (54 populations). Case populations for which the federal and state board classifications differed were left unclassified (9 populations).

Initial groupings based on *population thresholds* ("rural" <2,500 people, "unclassified" 2,500-7,000 people, and "non-rural" >7,000 people) also were examined in seven runs (Runs B and 7-12 in Appendix B). Runs with initial groupings based on population

thresholds produced discriminant functions with reduced discriminating capabilities (shown by canonical correlations ranging from .863 to .888). As these runs performed less well in separating rural and non-rural groups, this approach was not chosen as a "best analysis."

In the "best analysis," density was measured using the weighted populations within a *30-mile standard area*. Other runs using 10-mile and 20-mile standard areas for measuring density produced only slightly different outcomes, as discussed in Appendix B. Country food harvests for case populations with dual harvest estimates (certain Kenai Peninsula Borough populations) were estimated with the average of two per capita values (Country Food Harvest = Community Profile Database estimate + Harvest Ticket/Permit Record estimate / 2). Outcomes of runs separately using CPDB harvest estimates or using the Harvest Ticket/Permit Record estimates were also run, presented in Appendix B. The following discussion describes the "best analysis" in detail.

In discriminant analysis, the mean values of discriminating variables are calculated. In the "best analysis," the mean values of discriminating variables differed substantially between the initial groupings of cases, as shown in the following table entitled *Group Statistics* (1.00 = non-rural group; 2.00 = rural group; Total = pooled cases).

**Group Statistics**

| TESTRUR | | Mean | Std. Deviation | Valid N (listwise) Unweighted | Valid N (listwise) Weighted |
|---|---|---|---|---|---|
| 1 | LGDEN30 | 2.7938 | .59461 | 54 | 54.000 |
| | LGPCAP3 | 1.3436 | .25789 | 54 | 54.000 |
| 2 | LGDEN30 | 1.0549 | .49540 | 132 | 132.000 |
| | LGPCAP3 | 2.5142 | .27518 | 132 | 132.000 |
| Total | LGDEN30 | 1.5597 | .94945 | 186 | 186.000 |
| | LGPCAP3 | 2.1744 | .59711 | 186 | 186.000 |

The group of 54 case populations initially labeled "non-rural" has a mean country food production (LGPCAP3) of 1.3436 (equivalent to 22.1 lbs per capita), while the group of 132 case populations initially labeled "rural" has a mean of 2.5142 (equivalent to 326.7 lbs per capita). The non-rural group has a mean density (LGDEN30) of 2.7938 (equivalent to 6.2 weighted persons per sq mi), while the rural group has a mean of 1.0549 (equivalent to 0.1 weighted persons per sq mi). The differences between rural and non-rural groups are statistically significant (sig. < .000). The nine unclassified cases do not figure into the discriminant analysis at this stage.

The *covariances* of discriminating variables are calculated for the pool of 195 case populations, and for the rural and non-rural groups separately (1.00 = non-rural group; 2.00 = rural group; Total = pooled cases), as shown in the following two matrices. Covariance is the sum of squared distances of each case population from the group mean (show in the Group Statistics table, above). For example, the covariance of LGPCAP3

with LGDEN30 is -0.0507 in the pooled group. The *correlations* of variables with one another are also shown in the pooled matrix.

**Pooled Within-Groups Matrices[a]**

| | | LGDEN30 | LGPCAP3 |
|---|---|---|---|
| Covariance | LGDEN30 | .277 | -5.07E-02 |
| | LGPCAP3 | -5.07E-02 | 7.307E-02 |
| Correlation | LGDEN30 | 1.000 | -.357 |
| | LGPCAP3 | -.357 | 1.000 |

a. The covariance matrix has 184 degrees of freedom.

**Covariance Matrices[a]**

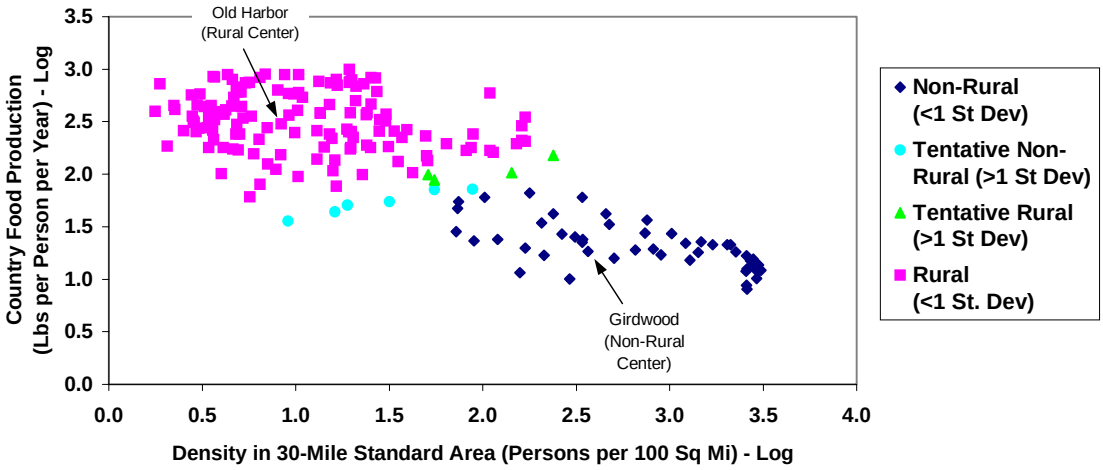
| TESTRUR | | LGDEN30 | LGPCAP3 |
|---|---|---|---|
| 1 | LGDEN30 | .354 | -.107 |
| | LGPCAP3 | -.107 | 6.651E-02 |
| 2 | LGDEN30 | .245 | -2.78E-02 |
| | LGPCAP3 | -2.78E-02 | 7.573E-02 |
| Total | LGDEN30 | .901 | -.472 |
| | LGPCAP3 | -.472 | .357 |

a. The total covariance matrix has 185 degrees of freedom.

In this analysis, the two *discriminating variables* were inserted into the equation together (an alternative for analysis with more than two variables is to use a step-wise insertion method, where the best-distinguishing variables are inserted in order). The analysis assesses the extent to which the two variables (country food production and density), considered jointly, separate cases into two distinct groups (rural and non-rural).

One way to visually represent the relationship between country food production (LGPCAP3) and density (LGDEN30) for the 195 case populations is shown in Fig. 13. Each symbol is a case population. There is a clear linear relationship between the two variables (the correlation coefficient is -0.357, as shown in the *Pooled Within Group Matrices* table above). Also, the scatter plot illustrates a cluster of case populations toward the upper left quadrant (rural) and a cluster toward the lower right quadrant (non-rural) with a noticeable separation. The two variables appear to separate case populations into fairly distinct clusters in the upper left and lower right quadrants. The lower left and upper right quadrants are empty of cases. Although cases with those values can be imagined (that is, low density-low production populations and high density-high production populations), they apparently are not common in Alaska (at least as shown by this test sample of 195 Alaska populations).

**Fig. 13. Alaska Populations (N = 195) Categorized into Rural or Non-Rural Groups by two Primary Factors (Density and Country Food Production), With Standard Deviations from Group Centers**




The relationships displayed in Fig. 13 are expected, based on the theoretical propositions in *Rural Measures*. That is, it is expected that relatively lower levels of country food production occur in higher density populations, while relatively higher levels of country food production occur in lower density populations.

The next step of the discriminant analysis is to calculate the *discriminant function*, which is a latent variable (statistically-constructed variable) created as a linear combination of discriminating variables, taking the form of an equation $L = b_1x_1 + b_2x_2 + \ldots b_nx_n + c$. In this equation, the *b*'s are *discriminant coefficients*, the *x*'s represent the values of discriminating variables, and *c* is some constant number. The discriminant function equation is analogous to a multiple regression equation, except that the *b*'s are discriminant coefficients. The discriminant function is estimated using ordinary least-squares.

The discriminant function can be described through several summary statistics. The *canonical correlation* indicates the percent of variation in the *dependent variable* (rural or non-rural) discriminated by the *independent variables* (country food production, population density) in discriminant analysis. In this case, a square of the canonical correlation (0.907), shown in the *Eigenvalues* table below, indicates that 82.3% of the variation is discriminated (a high value).

**Eigenvalues**

| Function | Eigenvalue | % of Variance | Cumulative % | Canonical Correlation |
|---|---|---|---|---|
| 1 | 4.646[a] | 100.0 | 100.0 | .907 |

a. First 1 canonical discriminant functions were used in the analysis.

The *standardized coefficients* indicate the relative importance of each discriminating variable in predicting the dependent. In this example, country food production (LGPCAP3) at 0.764 is a somewhat more important discriminating variable than population density (LGDEN30) at –0.427, as shown in the Standardized Canonical Discriminant Function Coefficients table. But both are important contributors to the discriminating function.

**Standardized Canonical Discriminant Function Coefficients**

| | Function |
|---|---|
| | 1 |
| LGDEN30 | -.427 |
| LGPCAP3 | .764 |

The *canonical discriminant function coefficients* are the values inserted for *b*'s in the discriminant function equation. In this example, the discriminant function equation is *L = 2.828(LGPCAP3) - .812(LGDEN30) – 4.882*, as indicated in the *Canonical Discriminant Function Coefficients* table.

**Canonical Discriminant Function Coefficients**

| | Function |
|---|---|
| | 1 |
| LGDEN30 | -.812 |
| LGPCAP3 | 2.828 |
| (Constant) | -4.882 |

Unstandardized coefficients

By entering the values for each case population into this equation, one calculates a case population's score on the discriminant function. A listing of each case population's score is shown in the following table, *Outcome Scores and Classifications from Discriminant Analysis Assessment*.

## Outcome Scores and Classifications from Discriminant Analysis Assessment

| | Population | Density (Log) | Country Food Production (Log) | Initial Classification | Discriminant Analysis Outcome Classification | Score | Distance From Non-Rural Center | Distance From Rural Center |
|---|---|---|---|---|---|---|---|---|
| 1 | Girdwood | 2.56 | 1.26 | Non-Rural | Non-Rural | -3.39 | 0.04 | 4.76 |
| 2 | Nikiski | 2.33 | 1.23 | Non-Rural | Non-Rural | -3.31 | 0.04 | 4.68 |
| 3 | Eagle River | 3.01 | 1.44 | Non-Rural | Non-Rural | -3.26 | 0.09 | 4.64 |
| 4 | Fort Wainwright | 2.82 | 1.28 | Non-Rural | Non-Rural | -3.55 | 0.20 | 4.92 |
| 5 | North Pole Area | 2.87 | 1.44 | Non-Rural | Non-Rural | -3.14 | 0.21 | 4.51 |
| 6 | Upper OMalley | 3.09 | 1.34 | Non-Rural | Non-Rural | -3.59 | 0.24 | 4.96 |
| 7 | Eielson AFB | 2.53 | 1.35 | Non-Rural | Non-Rural | -3.11 | 0.24 | 4.48 |
| 8 | Southwest Fairbanks | 2.91 | 1.29 | Non-Rural | Non-Rural | -3.61 | 0.26 | 4.98 |
| 9 | Rabbit Creek | 3.17 | 1.35 | Non-Rural | Non-Rural | -3.62 | 0.27 | 4.99 |
| 10 | Houston | 2.20 | 1.06 | Non-Rural | Non-Rural | -3.66 | 0.31 | 5.03 |
| 11 | Wasilla (group) | 2.54 | 1.38 | Non-Rural | Non-Rural | -3.03 | 0.32 | 4.40 |
| 12 | Northwest Fairbanks | 2.70 | 1.20 | Non-Rural | Non-Rural | -3.68 | 0.33 | 5.05 |
| 13 | Big Lake | 2.23 | 1.30 | Non-Rural | Non-Rural | -3.02 | 0.33 | 4.39 |
| 14 | Coastal Refuge | 3.23 | 1.33 | Non-Rural | Non-Rural | -3.75 | 0.39 | 5.12 |
| 15 | Juneau City and Borougl | 2.49 | 1.40 | Non-Rural | Non-Rural | -2.94 | 0.41 | 4.31 |
| 16 | Central Fairbanks | 2.95 | 1.23 | Non-Rural | Non-Rural | -3.80 | 0.44 | 5.17 |
| 17 | Lower OMalley-Cambell | 3.31 | 1.33 | Non-Rural | Non-Rural | -3.81 | 0.46 | 5.18 |
| 18 | OMalley | 3.33 | 1.33 | Non-Rural | Non-Rural | -3.82 | 0.47 | 5.20 |
| 19 | Elmendorf | 3.15 | 1.26 | Non-Rural | Non-Rural | -3.89 | 0.54 | 5.26 |
| 20 | Palmer (group) | 2.42 | 1.43 | Non-Rural | Non-Rural | -2.81 | 0.55 | 4.18 |
| 21 | Chugiak | 2.88 | 1.56 | Non-Rural | Non-Rural | -2.80 | 0.56 | 4.17 |
| 22 | Northeast Fairbanks | 2.68 | 1.52 | Non-Rural | Non-Rural | -2.75 | 0.60 | 4.13 |
| 23 | Airport | 3.35 | 1.26 | Non-Rural | Non-Rural | -4.04 | 0.69 | 5.41 |
| 24 | Sutton-Alpine | 2.08 | 1.38 | Non-Rural | Non-Rural | -2.67 | 0.69 | 4.04 |
| 25 | North Fairbanks | 2.47 | 1.00 | Non-Rural | Non-Rural | -4.05 | 0.70 | 5.42 |
| 26 | Fort Richardson | 3.11 | 1.18 | Non-Rural | Non-Rural | -4.07 | 0.72 | 5.44 |
| 27 | Willow (group) | 1.95 | 1.37 | Non-Rural | Non-Rural | -2.60 | 0.75 | 3.98 |
| 28 | Muldoon | 3.41 | 1.22 | Non-Rural | Non-Rural | -4.20 | 0.85 | 5.57 |
| 29 | Eklutna | 2.66 | 1.62 | Non-Rural | Non-Rural | -2.45 | 0.90 | 3.82 |
| 30 | Ketchikan | 2.32 | 1.54 | Non-Rural | Non-Rural | -2.42 | 0.93 | 3.79 |
| 31 | Campbell Creek | 3.45 | 1.19 | Non-Rural | Non-Rural | -4.32 | 0.97 | 5.69 |
| 32 | Little Campbell Creek | 3.43 | 1.18 | Non-Rural | Non-Rural | -4.34 | 0.99 | 5.71 |
| 33 | Seward (group) | 1.86 | 1.45 | Non-Rural | Non-Rural | -2.28 | 1.07 | 3.65 |
| 34 | Northfork | 3.46 | 1.14 | Non-Rural | Non-Rural | -4.48 | 1.13 | 5.85 |
| 35 | Soldotna (group) | 2.38 | 1.62 | Non-Rural | Non-Rural | -2.22 | 1.13 | 3.59 |
| 36 | Midtown | 3.47 | 1.13 | Non-Rural | Non-Rural | -4.50 | 1.15 | 5.87 |
| 37 | Delaney Lake | 3.46 | 1.11 | Non-Rural | Non-Rural | -4.54 | 1.19 | 5.91 |
| 38 | Spenard | 3.41 | 1.10 | Non-Rural | Non-Rural | -4.54 | 1.19 | 5.91 |
| 39 | Ship Creek | 3.41 | 1.08 | Non-Rural | Non-Rural | -4.60 | 1.25 | 5.97 |
| 40 | University | 3.47 | 1.09 | Non-Rural | Non-Rural | -4.62 | 1.27 | 6.00 |
| 41 | MidFork-RusJack | 3.46 | 1.08 | Non-Rural | Non-Rural | -4.63 | 1.28 | 6.00 |
| 42 | Russian Jack | 3.48 | 1.08 | Non-Rural | Non-Rural | -4.64 | 1.29 | 6.01 |
| 43 | Lake Otis | 3.49 | 1.09 | Non-Rural | Non-Rural | -4.64 | 1.29 | 6.02 |
| 44 | Kenai | 2.53 | 1.78 | Non-Rural | Non-Rural | -1.91 | 1.44 | 3.28 |
| 45 | Merrill Field | 3.46 | 1.01 | Non-Rural | Non-Rural | -4.85 | 1.50 | 6.22 |
| 46 | Avenue Fifteen | 3.41 | .94 | Non-Rural | Non-Rural | -4.98 | 1.63 | 6.36 |
| 47 | Salcha-Harding | 1.86 | 1.68 | Non-Rural | Non-Rural | -1.66 | 1.69 | 3.03 |
| 48 | Downtown | 3.41 | .91 | Non-Rural | Non-Rural | -5.09 | 1.74 | 6.47 |
| 49 | Homer | 2.25 | 1.82 | Non-Rural | Non-Rural | -1.56 | 1.79 | 2.93 |
| 50 | Kasilof (group) | 2.01 | 1.78 | Non-Rural | Non-Rural | -1.48 | 1.87 | 2.85 |
| 51 | Anchor Point (group) | 1.87 | 1.74 | Non-Rural | Non-Rural | -1.48 | 1.87 | 2.85 |
| 52 | Glacier View CDP | .96 | 1.55 | Rural | Tentative Non-Rural | -1.27 | 2.09 | 2.64 |
| 53 | Moose Pass (group) | 1.21 | 1.64 | Non-Rural | Tentative Non-Rural | -1.22 | 2.14 | 2.59 |
| 54 | Fritz Creek CDP | 1.94 | 1.86 | Uncertain | Tentative Non-Rural | -1.21 | 2.14 | 2.58 |
| 55 | Talkeetna | 1.50 | 1.74 | Uncertain | Tentative Non-Rural | -1.18 | 2.17 | 2.55 |
| 56 | Trapper Creek | 1.28 | 1.71 | Uncertain | Tentative Non-Rural | -1.10 | 2.26 | 2.47 |
| 57 | North Fork Road | 1.74 | 1.85 | Uncertain | Tentative Non-Rural | -1.06 | 2.29 | 2.43 |
| 58 | Old Harbor | .92 | 2.48 | Rural | Rural | 1.37 | 0.00 | 4.73 |
| 59 | Manokotak | 1.29 | 2.58 | Rural | Rural | 1.38 | 0.01 | 4.73 |
| 60 | Coffman Cove | .85 | 2.44 | Rural | Rural | 1.33 | 0.04 | 4.68 |
| 61 | Yakutat | 1.38 | 2.59 | Rural | Rural | 1.31 | 0.06 | 4.66 |
| 62 | Naukati Bay | .68 | 2.38 | Rural | Rural | 1.31 | 0.07 | 4.66 |
| 63 | Kotzebue | 2.04 | 2.77 | Rural | Rural | 1.30 | 0.07 | 4.66 |
| 64 | McKinley Park Village | .70 | 2.38 | Rural | Rural | 1.29 | 0.08 | 4.64 |
| 65 | Whale Pass | .31 | 2.27 | Rural | Rural | 1.28 | 0.10 | 4.63 |

## Outcome Scores and Classifications from Discriminant Analysis Assessment (p. 2)

| | Population | Density (Log) | Country Food Production (Log) | Initial Classification | Discriminant Analysis Outcome Classification | Score | Distance From Non-Rural Center | Distance From Rural Center |
|---|---|---|---|---|---|---|---|---|
| 66 | Galena | 1.38 | 2.57 | Rural | Rural | 1.25 | 0.12 | 4.61 |
| 67 | Aleknagik | 1.13 | 2.58 | Rural | Rural | 1.49 | 0.12 | 4.84 |
| 68 | Chistochina | .56 | 2.42 | Rural | Rural | 1.50 | 0.13 | 4.86 |
| 69 | Chignik Lagoon | .56 | 2.33 | Rural | Rural | 1.24 | 0.13 | 4.59 |
| 70 | Hydaburg | 1.13 | 2.58 | Rural | Rural | 1.51 | 0.14 | 4.86 |
| 71 | Akutan | 1.40 | 2.67 | Rural | Rural | 1.53 | 0.15 | 4.88 |
| 72 | Nelson Lagoon | .47 | 2.40 | Rural | Rural | 1.54 | 0.17 | 4.89 |
| 73 | South Naknek | .69 | 2.47 | Rural | Rural | 1.55 | 0.18 | 4.91 |
| 74 | Hoonah | 1.48 | 2.57 | Rural | Rural | 1.18 | 0.19 | 4.53 |
| 75 | Clark's Point | .96 | 2.56 | Rural | Rural | 1.57 | 0.20 | 4.93 |
| 76 | Northway | .53 | 2.44 | Rural | Rural | 1.60 | 0.23 | 4.95 |
| 77 | Bettles-Evansville | .40 | 2.42 | Rural | Rural | 1.62 | 0.25 | 4.97 |
| 78 | Chenega Bay | .48 | 2.44 | Rural | Rural | 1.62 | 0.25 | 4.98 |
| 79 | Tanacross | .99 | 2.40 | Rural | Rural | 1.09 | 0.28 | 4.44 |
| 80 | Tatitlek | 1.01 | 2.61 | Rural | Rural | 1.67 | 0.30 | 5.03 |
| 81 | Port Lions | 1.45 | 2.52 | Rural | Rural | 1.07 | 0.30 | 4.42 |
| 82 | Kotlik | 1.32 | 2.70 | Rural | Rural | 1.68 | 0.31 | 5.04 |
| 83 | Lake Louise | .53 | 2.25 | Rural | Rural | 1.06 | 0.31 | 4.41 |
| 84 | Tetlin | .80 | 2.33 | Rural | Rural | 1.05 | 0.32 | 4.41 |
| 85 | Noatak | 1.18 | 2.66 | Rural | Rural | 1.69 | 0.32 | 5.04 |
| 86 | Tyonek | 1.11 | 2.41 | Rural | Rural | 1.04 | 0.33 | 4.39 |
| 87 | Chitina | .72 | 2.53 | Rural | Rural | 1.70 | 0.33 | 5.05 |
| 88 | Pelican | .76 | 2.55 | Rural | Rural | 1.71 | 0.34 | 5.06 |
| 89 | Klawock | 1.48 | 2.51 | Rural | Rural | 1.00 | 0.37 | 4.35 |
| 90 | Whitestone Logging Can | .61 | 2.25 | Rural | Rural | 0.99 | 0.38 | 4.34 |
| 91 | Tenakee Springs | .57 | 2.52 | Rural | Rural | 1.78 | 0.41 | 5.13 |
| 92 | Saint Paul | 1.27 | 2.43 | Rural | Rural | 0.95 | 0.42 | 4.30 |
| 93 | Port Alexander | .46 | 2.49 | Rural | Rural | 1.80 | 0.43 | 5.15 |
| 94 | Slana | .66 | 2.24 | Rural | Rural | 0.91 | 0.46 | 4.26 |
| 95 | Emmonak | 1.43 | 2.79 | Rural | Rural | 1.83 | 0.46 | 5.19 |
| 96 | Akhiok | .45 | 2.51 | Rural | Rural | 1.84 | 0.47 | 5.19 |
| 97 | Gustavus | 1.18 | 2.38 | Rural | Rural | 0.89 | 0.48 | 4.25 |
| 98 | Hyder | .54 | 2.54 | Rural | Rural | 1.86 | 0.49 | 5.21 |
| 99 | Nanwalek | 1.28 | 2.40 | Rural | Rural | 0.88 | 0.50 | 4.23 |
| 100 | Port Graham | 1.30 | 2.40 | Rural | Rural | 0.86 | 0.51 | 4.21 |
| 101 | Larsen Bay | .62 | 2.57 | Rural | Rural | 1.88 | 0.51 | 5.23 |
| 102 | Hollis | .69 | 2.23 | Rural | Rural | 0.86 | 0.51 | 4.21 |
| 103 | Port Alsworth | .57 | 2.56 | Rural | Rural | 1.89 | 0.52 | 5.24 |
| 104 | Egegik | .61 | 2.58 | Rural | Rural | 1.93 | 0.56 | 5.28 |
| 105 | King Salmon | 1.19 | 2.34 | Rural | Rural | 0.77 | 0.60 | 4.13 |
| 106 | Chignik Bay | .45 | 2.55 | Rural | Rural | 1.98 | 0.60 | 5.33 |
| 107 | Pilot Point | .55 | 2.58 | Rural | Rural | 1.98 | 0.61 | 5.33 |
| 108 | Perryville | .58 | 2.60 | Rural | Rural | 1.99 | 0.62 | 5.34 |
| 109 | King Cove | 1.45 | 2.41 | Rural | Rural | 0.75 | 0.62 | 4.10 |
| 110 | Port Heiden | .62 | 2.61 | Rural | Rural | 1.99 | 0.62 | 5.34 |
| 111 | Tanana | 1.04 | 2.73 | Rural | Rural | 2.00 | 0.63 | 5.35 |
| 112 | Chignik Lake | .71 | 2.65 | Rural | Rural | 2.02 | 0.65 | 5.38 |
| 113 | Angoon | 1.31 | 2.35 | Rural | Rural | 0.71 | 0.67 | 4.06 |
| 114 | Tonsina | .78 | 2.19 | Rural | Rural | 0.69 | 0.68 | 4.04 |
| 115 | Sand Point | 1.53 | 2.41 | Rural | Rural | 0.69 | 0.69 | 4.04 |
| 116 | Fort Yukon | 1.32 | 2.84 | Rural | Rural | 2.06 | 0.69 | 5.41 |
| 117 | Ouzinkie | 1.59 | 2.42 | Rural | Rural | 0.67 | 0.70 | 4.02 |
| 118 | Shageluk | .66 | 2.65 | Rural | Rural | 2.07 | 0.70 | 5.42 |
| 119 | Alakanuk | 1.36 | 2.86 | Rural | Rural | 2.10 | 0.73 | 5.45 |
| 120 | Brevig Mission | .99 | 2.76 | Rural | Rural | 2.13 | 0.76 | 5.48 |
| 121 | Huslia | 1.02 | 2.78 | Rural | Rural | 2.15 | 0.77 | 5.50 |
| 122 | Minto | .96 | 2.77 | Rural | Rural | 2.16 | 0.79 | 5.52 |
| 123 | McGrath | 1.15 | 2.26 | Rural | Rural | 0.57 | 0.80 | 3.92 |
| 124 | New Stuyahok | 1.22 | 2.85 | Rural | Rural | 2.17 | 0.80 | 5.52 |
| 125 | Atka | .51 | 2.64 | Rural | Rural | 2.18 | 0.80 | 5.53 |
| 126 | Nikolai | .55 | 2.65 | Rural | Rural | 2.18 | 0.80 | 5.53 |
| 127 | Gulkana | .92 | 2.18 | Rural | Rural | 0.55 | 0.83 | 3.90 |
| 128 | Mountain Village | 1.43 | 2.91 | Rural | Rural | 2.20 | 0.83 | 5.55 |
| 129 | Wainwright | 1.29 | 2.88 | Rural | Rural | 2.20 | 0.83 | 5.56 |
| 130 | False Pass | .36 | 2.62 | Rural | Rural | 2.23 | 0.86 | 5.58 |

## Outcome Scores and Classifications from Discriminant Analysis Assessment (p. 3)

| | Population | Density (Log) | Country Food Production (Log) | Initial Classification | Discriminant Analysis Outcome Classification | Score | Distance From Non-Rural Center | Distance From Rural Center |
|---|---|---|---|---|---|---|---|---|
| 131 | Quinhagak | 1.29 | 2.89 | Rural | Rural | 2.23 | 0.86 | 5.58 |
| 132 | Sitka Tribe | 2.23 | 2.54 | Rural | Rural | 0.50 | 0.87 | 3.86 |
| 133 | Kwethluk | 1.40 | 2.92 | Rural | Rural | 2.24 | 0.87 | 5.59 |
| 134 | Chickaloon | 1.57 | 2.35 | Rural | Rural | 0.49 | 0.88 | 3.84 |
| 135 | Beaver | .47 | 2.66 | Rural | Rural | 2.26 | 0.88 | 5.61 |
| 136 | Shishmaref | 1.30 | 2.90 | Rural | Rural | 2.26 | 0.89 | 5.61 |
| 137 | Pedro Bay | .25 | 2.60 | Rural | Rural | 2.27 | 0.89 | 5.62 |
| 138 | Nuiqsut | 1.19 | 2.87 | Rural | Rural | 2.27 | 0.90 | 5.62 |
| 139 | Allakaket/Alatna | .67 | 2.73 | Rural | Rural | 2.30 | 0.93 | 5.65 |
| 140 | Thorne Bay | 1.29 | 2.25 | Rural | Rural | 0.44 | 0.93 | 3.79 |
| 141 | Holy Cross | .90 | 2.80 | Rural | Rural | 2.31 | 0.94 | 5.66 |
| 142 | Craig | 1.69 | 2.37 | Rural | Rural | 0.43 | 0.94 | 3.78 |
| 143 | Naknek | 1.38 | 2.27 | Rural | Rural | 0.43 | 0.94 | 3.78 |
| 144 | Copper Center | 1.29 | 2.24 | Rural | Rural | 0.41 | 0.96 | 3.76 |
| 145 | Port Protection | .35 | 2.65 | Rural | Rural | 2.34 | 0.97 | 5.69 |
| 146 | Nunapitchuk | 1.22 | 2.90 | Rural | Rural | 2.34 | 0.97 | 5.69 |
| 147 | Kivalina | 1.13 | 2.88 | Rural | Rural | 2.35 | 0.98 | 5.70 |
| 148 | Mentasta Lake | .85 | 2.10 | Rural | Rural | 0.36 | 1.01 | 3.71 |
| 149 | Kake | 1.40 | 2.25 | Rural | Rural | 0.35 | 1.02 | 3.70 |
| 150 | Golovin | .71 | 2.78 | Rural | Rural | 2.41 | 1.04 | 5.76 |
| 151 | Klukwan | .69 | 2.78 | Rural | Rural | 2.43 | 1.06 | 5.78 |
| 152 | Seldovia | 1.50 | 2.26 | Rural | Rural | 0.30 | 1.07 | 3.66 |
| 153 | Skwentna (group) | .60 | 2.00 | Rural | Rural | 0.30 | 1.08 | 3.65 |
| 154 | Barrow | 2.21 | 2.46 | Rural | Rural | 0.28 | 1.09 | 3.63 |
| 155 | Dillingham | 1.95 | 2.38 | Rural | Rural | 0.28 | 1.09 | 3.63 |
| 156 | Anderson | 1.11 | 2.14 | Rural | Rural | 0.28 | 1.10 | 3.63 |
| 157 | Stevens Village | .49 | 2.76 | Rural | Rural | 2.53 | 1.16 | 5.88 |
| 158 | Hughes | .44 | 2.75 | Rural | Rural | 2.55 | 1.18 | 5.90 |
| 159 | Stebbins | 1.29 | 3.00 | Rural | Rural | 2.55 | 1.18 | 5.90 |
| 160 | Deering | .68 | 2.83 | Rural | Rural | 2.56 | 1.19 | 5.91 |
| 161 | Cantwell | .90 | 2.05 | Rural | Rural | 0.18 | 1.19 | 3.53 |
| 162 | Kenny Lake | 1.21 | 2.13 | Rural | Rural | 0.17 | 1.20 | 3.52 |
| 163 | Haines | 1.81 | 2.29 | Rural | Rural | 0.13 | 1.24 | 3.48 |
| 164 | Kaktovik | 1.02 | 2.95 | Rural | Rural | 2.63 | 1.26 | 5.98 |
| 165 | Newhalen | .75 | 2.87 | Rural | Rural | 2.63 | 1.26 | 5.98 |
| 166 | Wales | .73 | 2.87 | Rural | Rural | 2.65 | 1.27 | 6.00 |
| 167 | Point Lay | .94 | 2.95 | Rural | Rural | 2.69 | 1.32 | 6.05 |
| 168 | Koliganek | .81 | 2.92 | Rural | Rural | 2.72 | 1.35 | 6.07 |
| 169 | Grayling | .84 | 2.95 | Rural | Rural | 2.78 | 1.41 | 6.14 |
| 170 | Ekwok | .66 | 2.90 | Rural | Rural | 2.78 | 1.41 | 6.14 |
| 171 | Cordova | 1.94 | 2.25 | Rural | Rural | -0.09 | 1.46 | 3.27 |
| 172 | Saxman | 2.21 | 2.32 | Rural | Rural | -0.11 | 1.48 | 3.25 |
| 173 | Gakona | 1.01 | 1.98 | Rural | Rural | -0.11 | 1.48 | 3.24 |
| 174 | Tazlina | 1.20 | 2.03 | Rural | Rural | -0.11 | 1.48 | 3.24 |
| 175 | Tok | 1.70 | 2.17 | Rural | Rural | -0.12 | 1.49 | 3.24 |
| 176 | Healy | 1.55 | 2.12 | Rural | Rural | -0.14 | 1.51 | 3.21 |
| 177 | Wrangell | 1.91 | 2.22 | Rural | Rural | -0.15 | 1.52 | 3.21 |
| 178 | Sitka | 2.23 | 2.31 | Rural | Rural | -0.15 | 1.53 | 3.20 |
| 179 | Whittier | .81 | 1.90 | Rural | Rural | -0.16 | 1.53 | 3.19 |
| 180 | Unalaska | 2.18 | 2.29 | Rural | Rural | -0.18 | 1.55 | 3.17 |
| 181 | Anvik | .57 | 2.93 | Rural | Rural | 2.93 | 1.56 | 6.28 |
| 182 | Levelock | .64 | 2.95 | Rural | Rural | 2.93 | 1.56 | 6.29 |
| 183 | Iliamna | .56 | 2.93 | Rural | Rural | 2.95 | 1.57 | 6.30 |
| 184 | Igiugig | .27 | 2.86 | Rural | Rural | 2.98 | 1.61 | 6.34 |
| 185 | Kodiak Road | 2.04 | 2.23 | Rural | Rural | -0.24 | 1.62 | 3.11 |
| 186 | Ninilchik | 1.71 | 2.13 | Uncertain | Rural | -0.25 | 1.62 | 3.10 |
| 187 | Petersburg | 2.06 | 2.21 | Rural | Rural | -0.31 | 1.68 | 3.04 |
| 188 | Glennallen | 1.36 | 2.00 | Rural | Rural | -0.33 | 1.71 | 3.02 |
| 189 | Hope | .75 | 1.79 | Uncertain | Rural | -0.45 | 1.82 | 2.91 |
| 190 | Voznesenka | 1.63 | 2.01 | Uncertain | Rural | -0.51 | 1.88 | 2.84 |
| 191 | Cooper Landing | 1.22 | 1.89 | Uncertain | Rural | -0.53 | 1.90 | 2.82 |
| 192 | Clam Gulch | 1.71 | 2.00 | Non-Rural | Tentative Rural | -0.62 | 2.00 | 2.73 |
| 193 | Kodiak City | 2.38 | 2.18 | Rural | Tentative Rural | -0.65 | 2.02 | 2.70 |
| 194 | Nikolaevsk | 1.74 | 1.95 | Uncertain | Tentative Rural | -0.79 | 2.16 | 2.56 |
| 195 | Valdez | 2.16 | 2.01 | Non-Rural | Tentative Rural | -0.94 | 2.31 | 2.42 |

The mean value for the discriminant scores for each group (rural or non-rural) is called a *group centroid*. In this example, the group centroid is *–3.352* for the non-rural group and *1.371* for the rural group, as shown in the *Functions at Group Centroids* table.

**Functions at Group Centroids**

| | Function |
|---|---|
| TESTRUR | 1 |
| 1 | -3.352 |
| 2 | 1.371 |

Unstandardized canonical discriminant functions evaluated at group means

The group centroids can be used to calculate a threshold between rural and non-rural groups. The mean of the group centroids is used to define the threshold (*cutoff* ) between groups. In this example, the cutoff is *-0.9905*, mid-way between centroids. If a discriminant function score is above the cutoff, the case population is nearer the rural group. If a score is below the cutoff, the population is nearer in the non-rural group.

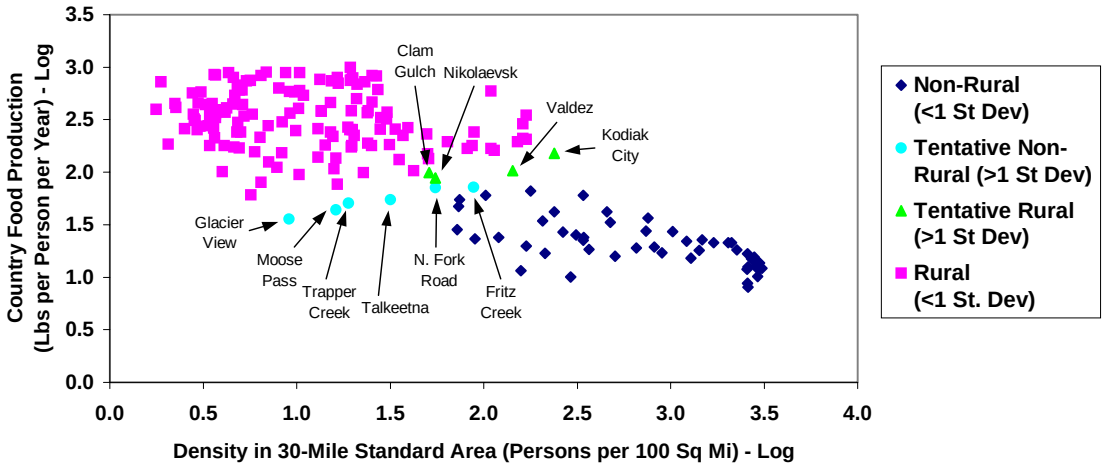
When used to classify cases, the discriminant function serves as a *criterion* for distinguishing rural and non-rural populations. In this example, the criterion is composed of a combination of two variables, country food production and density within a 30-mile standard area. As stated above, to classify case populations, the values of each case are inserted into the discriminant function equation to calculate the case population's score. The score can be compared with the threshold value separating groups, and also with the centroid value of each group. The distance between the score and the centroid is represented by a measure called the Mahalanobis distance, which is equivalent to a z-score for a normal population distribution. A Mahalanobis distance of 1.96 represents one standard deviation away from the group's center, within which 95% of cases fall under a normal curve.

In the *Outcome Scores and Classifications from Discriminant Analysis Assessment* table above, outcome scores and classifications are made for each case population. The classifications are made with the following rules. Cases with scores closer than one standard deviation from a group's centroid are classified into that group. Cases with scores greater than one standard deviation from a group centroid are *tentatively classified* in the group with the closest centroid.

Using these rules to assess the 195 case populations, 185 cases (95%) were categorized with a fair degree of certainty, defined as case scores closer than one standard deviation from the center of each group. Of these, 134 cases were categorized as "rural" and 51 cases were categorized as "non-rural." Ten case populations were given tentative classifications, defined as having scores greater than one standard deviation from the center of each group. Of the tentative cases, four were tentatively classified as "rural" and six were tentatively classified as "non-rural," representing the group to which its score was closest. A graphic depiction of these classifications is shown in Fig. 14, where cases are color-coded by the degree of certainty of their classification. As shown in Fig.

14, the tentative cases included eight populations along roads in a rural/non-rural fringe (Clam Gulch, Fritz Creek, Glacier View, Nikolaevsk CDP, North Fork Road, Talkeetna, and Trapper Creek) and two mid-sized, geographically separate populations (Kodiak City and Valdez).

**Fig. 14. Alaska Populations (N = 195) Categorized into Rural or Non-Rural Groups by two Primary Factors (Density and Country Food Production), With Tentative Case Classifications Identified**




A second assessment step could be taken for reviewing the classification of tentative cases, using a set of *ancillary variables* (such as other extensive land uses, specialized production, and other rural factors), drawn from existing data sets, case method materials, public comment, and additional data collection. Examples of ancillary variables are provided in the next section on *Criterion-Referenced Assessment.*

In a two-variable model, the threshold separating cases can be represented as a line, illustrated in Fig. 15. The line is defined by combinations of values of the two variables corresponding to the midpoint between group centroids. Cases to the left side of the line are closer to the "rural" group, while cases to the right side are closer to the "non-rural" group. In Fig. 15, the distances representing one standard deviation from each group's center are also depicted as lines. Cases with scores falling within this area of the graph (greater than one standard deviation) received tentative rural or non-rural classifications, following the above classification rules.

The classification of cases uses the log transformed values of the primary discriminants – *country food production* and *density.* Transforming the discriminant functions to non-log values is a relatively simple mathematical step, allowing for another interpretation of the model. Fig. 16 provides the discriminant analysis outcome with non-log values. It shows how a case population would be classified given any combination of country food production or density (weighted population within a 30-mile distance). Cases falling above the line $y = 23.774x^{0.2874}$ are "rural," while cases falling below are "non-rural."

The lines $y = 17.147x^{0.2874}$ and $y = 32.953x^{0.2874}$ identify the certainty of the classifications, with cases falling between them classified as "tentative."

**Fig. 15. Alaska Populations (N = 195) Categorized into Rural or Non-Rural Groups by two Primary Factors (Density and Country Food Production), With Threshold Lines at One Standard Deviation from Each Group Center**

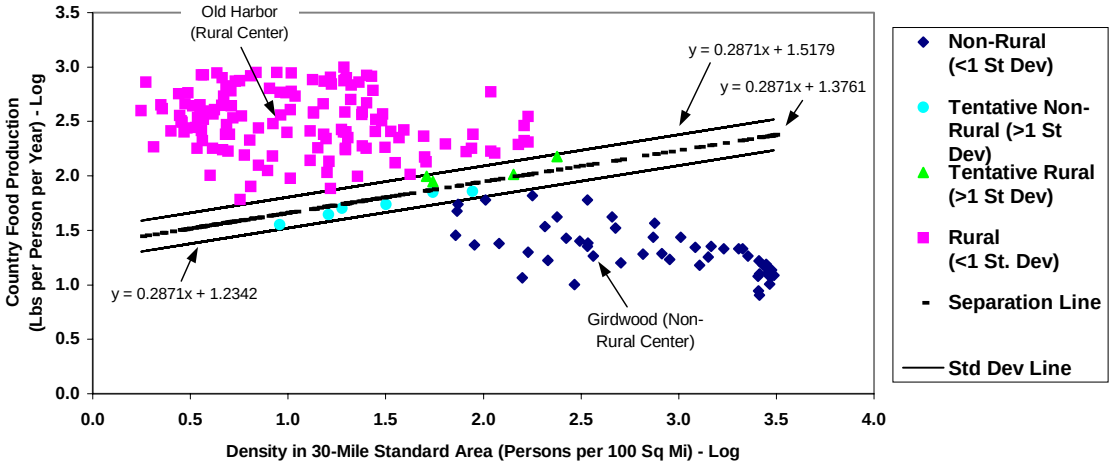
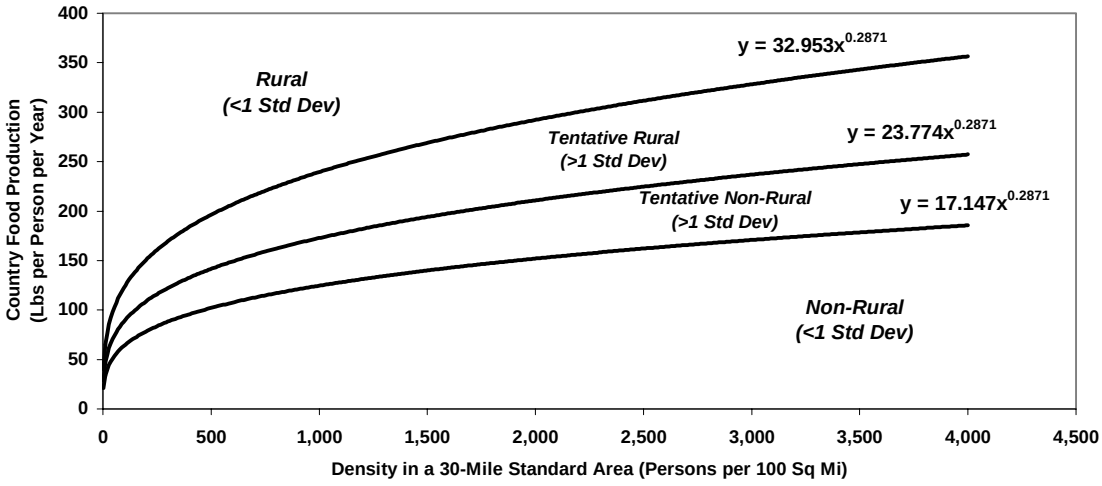
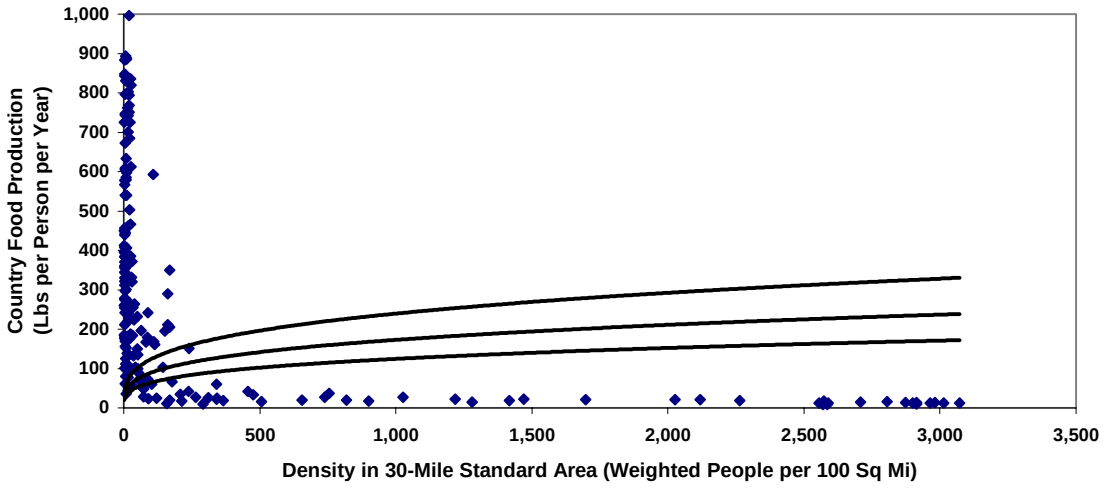



**Fig. 16. General Model for Categorizing Alaska Populations into Rural or Non-Rural Groups by Two Primary Factors (Density and Country Food Production)**



The actual dispersion of the 195 case populations in relation to the general classification model is shown as Fig. 17. The scatter of cases clearly reflects the bifurcated character of Alaska populations. Most of the chart (where cases might appear) is empty. Case populations appear either scattered along the y-axis (lower densities and substantial country food harvests) or along the x-axis (higher densities and insubstantial country food harvests). Ambiguous cases are relatively few, located in the interstices of the threshold lines. The ability of the discriminant function model to successfully separate cases into rural and non-rural groups results from the basic bifurcation of Alaska populations along the two measures.

**Fig. 17. Relationship of Density and Country Food Production in 195 Alaska Populations, and General Classification Model**



## Methodology 2. Criterion-Referenced Assessment

*Criterion-Referenced Assessment* is a general methodology for classifying cases into categories. Criterion-referenced assessments compare cases against absolute standards established as classification thresholds. If a case meets or exceeds standards, it receives one classification. If it falls below standards, it receives a different classification.

Criterion-Referenced Assessment is commonly used in educational testing, where student performances are the cases and grades are classification categories (such as *"A", "B", etc*.). Student performance is measured through test questions designed to reflect proficiency levels. The measured performance is compared with standards. Criterion-referenced assessment also is commonly used by government agencies for awarding entitlements and other benefits. Applicants are scored and compared with standards to identify those qualified.

A criterion-referenced assessment is developed through several steps:

- identification of criteria associated with the classification categories;
- development of variables that measure the criteria;
- establishment of threshold standards for variables;
- development of an assessment using the variables;
- development of a scoring system (or procedure) for the assessment;
- measuring cases along the variables;
- scoring cases; and
- classifying cases.

For the classification of "rural residents" and "non-rural residents," the cases are populations of Alaska residents. In our criterion-referenced assessment, two *primary criteria* and three *ancillary criteria* are identified for distinguishing between rural and non-rural populations. Variables and standards measuring the criteria are defined as the following:

Criterion 1. Country Food Production
*Variable*: Annual per capita harvest (lbs) of country food.
*General Standards*:
"Very High (VH)" >115 lbs (>75% RDA for protein)
"Moderately High (MH)" 75-114 lbs (50%-74% RDA for protein)
"Moderately Low (ML)" 40-74 lbs (25%-49% RDA for protein)
"Very Low (VL)" <39 lbs (<24% RDA for protein)

Criterion 2. Sparsely-Populated, Open Country
*Variable:* Weighted population in a 30-mile standard area.
*General Standards:*
"Yes (Y)" <100 people/100 sq mi
"No (N)" >100 people/100 sq mi

Criterion 3. Other Extensive Land Uses
*Variable:* Regular employment in commercial fisheries, forestry, etc.
*General Standards:*
"Yes (Y)"
"No (N)"

Criterion 4. Noncommercial Fishery or Hunt Center
*Variable:* Substantial harvest and distribution of specialty country food products.
*General Standards:*
"Yes (Y)"
"No (N)"

Criterion 5. Preponderance of Other Rural Features
*Variables:* (a) Diversity of Resources Used; (b) Diversity of Resources Shared; (c) Country-Oriented Knowledge and Values; (d) Geographic Isolation.
*General Standards:*
"Yes (Y)"
"No (N)"

Using the above criteria and variables, the rules for categorizing cases as "rural" or "non-rural" with the standards are presented in the following matrix.

**Rules for Classifying "Rural" and "Non-rural" Populations with Criteria**

| | | ***Criterion 2. Sparsely-Populated (Open) Country*** | |
|---|---|---|---|
| | | **No** | **Yes** |
| ***Criterion 1. Country Food Production*** | **Very Low** | "Non-rural" | "Non-rural" |
| | **Moderately Low** | "Non-rural" | *(a)* |
| | **Moderately High** | *(a)* | "Rural" |
| | **Very High** | "Rural" | "Rural" |

*(a) "Non-rural" unless one other rural feature (Criteria 3, 4, 5)*

As shown in the above matrix, the two *primary criteria* are Criterion 1 (Country Food Production) and Criterion 2 (Sparsely-Populated, Open Country). Three additional criteria are used as *ancillary criteria* for categorizing uncertain cases following the application of the primary criteria, if necessary. The threshold standards for categorizing cases are designed to result in the following classification outcomes, based on definitions of rural populations and non-rural populations:

**Definitions of "Rural" and "Non-Rural" Populations**

**Rural Populations are populations…**

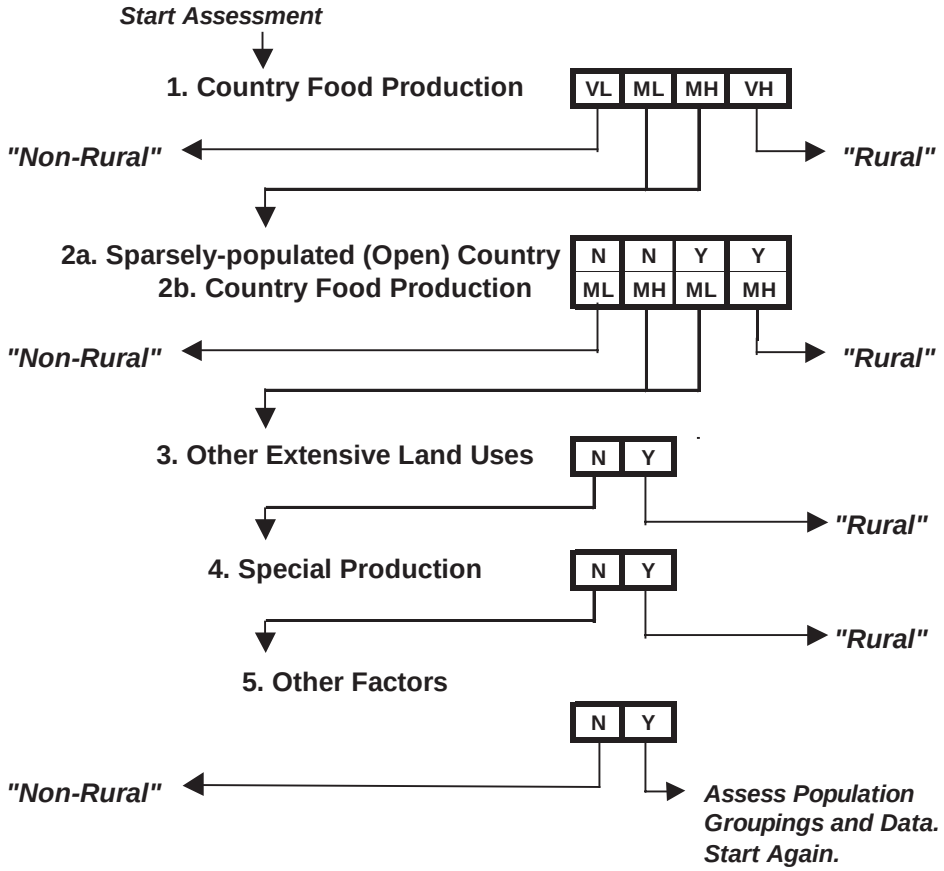
1. with very high production of country foods; or
2. with moderately-high production of country foods and in sparsely-populated (open) country; or
3. with moderately-low production of country foods and in sparsely-populated (open) country, or with moderately-high production of country foods and in other than sparsely-populated (open) country, and having one other rural feature:
   A. regular employment in extensive land uses, or
   B. a center for a special or distinctive non-commercial fishery or hunt, or
   C. a preponderance of other factors of a rural nature, such as diversity of resources used, diversity of resources shared, country-oriented knowledge and values, and geographic isolation.

**Non-Rural Populations are populations…**

1. with very low production of country foods; or
2. with moderately-low production of country foods and in other than sparsely-populated (open) country; or
3. with moderately-low production of country foods and in sparsely-populated (open) country, or with moderately-high production of country foods and in other than sparsely-populated (open) country, and having no other rural feature:
   A. no regular employment in extensive land uses, and
   B. no center for a special or distinctive non-commercial fishery or hunt, and
   C. no preponderance of other factors of a rural nature, such as diversity of resources used, diversity of resources shared, country-oriented knowledge and values, and geographic isolation.

Case populations are assessed with the criteria following a set procedure (decision tree) and series of questions:

**Assessment Procedure (Decision Tree)**



**Assessment Procedure (Question Series)**

1. Is the production of country food "very high," "moderately high," "moderately low," or "very low"?
   *Measured by the per capita production of country food for local use.*
   a. *very high (>115 lbs) = "Rural"*
   b. *moderately high (75-114 lbs) = "Uncertain" (continue)*
   c. *moderately low (40-74 lbs) = "Uncertain" (continue)*
   d. *very low (< 39 lbs) = "Non-rural"*

2a. Is the population in "sparsely-populated (open) country"?
   *Measured by the weighted population in a 30-mile standard area.*

AND

2b. Is the production of country food "moderately high" or "moderately low"?
   *Measured by the per capita production of country food for local use.*
   a. *yes (< 100 people/100 sq mi) and moderately high (75-114 lbs) = "Rural"*
   b. *yes (< 100 people/100 sq mi) and moderately low (40-75 lbs) = "Uncertain" (continue)*
   c. *no (> 100 people/100 sq mi) and moderately high (75-114 lbs) = "Uncertain" (continue)*
   d. *no (> 100 people/100 sq mi) and moderately low (40-75 lbs) = "Non-rural"*

3. Is the population regularly supported by (employed in) extensive land uses, such as commercial fishing or forestry?
   a. *yes = "Rural"*
   b. *no = "Uncertain" (continue)*

4. Is the population a center for a special or distinctive noncommercial fishery or hunt for non-local distribution and local use?
   a. *yes = "Rural"*
   b. *no = "Uncertain" (continue)*

5. Is there a preponderance of other factors of a rural nature, such as diversity of resources used, diversity of resources shared, country-oriented knowledge and values, and geographic isolation?
   a. *yes = "Rural"*
   b. *no = "Uncertain" (continue)*

6. Are there potential populations or communities whose land use patterns have not been adequately documented?
   a. *yes = Assess population groupings and data. Start again.*
   b. *no = "Non-Rural"*

## Application of Criterion-Referenced Assessment to 195 Case Populations (p.1)

| No. | Population Name | Characteristics | | | 1. Country Food | | 2. Open (a) and Country Food (b) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | People | Density | Harvests | Score | Class | 2a Score | 2b Score | Class |
| 1 | Anchor Point (group) | 2,334 | 74 | 55 | **ML** | Uncertain | **Yes** | **ML** | Uncertain |
| 2 | Fritz Creek CDP | 1,603 | 88 | 72 | **ML** | Uncertain | **Yes** | **ML** | Uncertain |
| 3 | Hope | 137 | 6 | 61 | **ML** | Uncertain | **Yes** | **ML** | Uncertain |
| 4 | Moose Pass (group) | 374 | 16 | 44 | **ML** | Uncertain | **Yes** | **ML** | Uncertain |
| 5 | North Fork Road | 467 | 55 | 71 | **ML** | Uncertain | **Yes** | **ML** | Uncertain |
| 6 | Trapper Creek | 423 | 19 | 51 | **ML** | Uncertain | **Yes** | **ML** | Uncertain |
| 7 | Salcha-Harding | 1,128 | 73 | 47 | **ML** | Uncertain | **Yes** | **ML** | Uncertain |
| 8 | Talkeetna (group) | 813 | 19 | 55 | **ML** | Uncertain | **Yes** | **ML** | Uncertain |
| 9 | Valdez | 4,036 | 143 | 103 | **MH** | Uncertain | **No** | **MH** | Uncertain |
| 10 | Eklutna | 4,835 | 457 | 42 | **ML** | Uncertain | **No** | **ML** | Non-rural |
| 11 | Homer | 3,946 | 178 | 66 | **ML** | Uncertain | **No** | **ML** | Non-rural |
| 12 | Kasilof (group) | 1,639 | 102 | 60 | **ML** | Uncertain | **No** | **ML** | Non-rural |
| 13 | Kenai | 6,942 | 340 | 60 | **ML** | Uncertain | **No** | **ML** | Non-rural |
| 14 | Soldotna (group) | 14,946 | 239 | 42 | **ML** | Uncertain | **No** | **ML** | Non-rural |
| 15 | Cantwell | 222 | 8 | 112 | **MH** | Uncertain | **Yes** | **MH** | Rural |
| 16 | Clam Gulch | 173 | 51 | 99 | **MH** | Uncertain | **Yes** | **MH** | Rural |
| 17 | Cooper Landing | 369 | 16 | 77 | **MH** | Uncertain | **Yes** | **MH** | Rural |
| 18 | Gakona | 215 | 10 | 95 | **MH** | Uncertain | **Yes** | **MH** | Rural |
| 19 | Glennallen | 554 | 23 | 100 | **MH** | Uncertain | **Yes** | **MH** | Rural |
| 20 | Nikolaevsk | 345 | 55 | 89 | **MH** | Uncertain | **Yes** | **MH** | Rural |
| 21 | Skwentna (group) | 148 | 4 | 101 | **MH** | Uncertain | **Yes** | **MH** | Rural |
| 22 | Tazlina | 149 | 16 | 107 | **MH** | Uncertain | **Yes** | **MH** | Rural |
| 23 | Voznesenka | 327 | 42 | 103 | **MH** | Uncertain | **Yes** | **MH** | Rural |
| 24 | Whittier | 182 | 6 | 80 | **MH** | Uncertain | **Yes** | **MH** | Rural |
| 25 | Airport | 18,626 | 2263 | 18 | **VL** | Non-rural | | | |
| 26 | Avenue Fifteen | 12,288 | 2570 | 9 | **VL** | Non-rural | | | |
| 27 | Big Lake | 2,635 | 169 | 20 | **VL** | Non-rural | | | |
| 28 | Campbell Creek | 9,245 | 2805 | 15 | **VL** | Non-rural | | | |
| 29 | Central Fairbanks | 16,788 | 900 | 17 | **VL** | Non-rural | | | |
| 30 | Chugiak | 4,472 | 755 | 37 | **VL** | Non-rural | | | |
| 31 | Coastal Refuge | 8,612 | 1698 | 21 | **VL** | Non-rural | | | |
| 32 | Delaney Lake | 2,917 | 2873 | 13 | **VL** | Non-rural | | | |
| 33 | Downtown | 1,458 | 2586 | 8 | **VL** | Non-rural | | | |
| 34 | Eagle River | 20,610 | 1026 | 27 | **VL** | Non-rural | | | |
| 35 | Eielson AFB | 5,400 | 341 | 23 | **VL** | Non-rural | | | |
| 36 | Elmendorf | 6,626 | 1417 | 18 | **VL** | Non-rural | | | |
| 37 | Fort Richardson | 5,470 | 1281 | 15 | **VL** | Non-rural | | | |
| 38 | Fort Wainwright | 7,381 | 656 | 19 | **VL** | Non-rural | | | |
| 39 | Girdwood | 2,091 | 366 | 18 | **VL** | Non-rural | | | |
| 40 | Glacier View CDP | 249 | 9 | 36 | **VL** | Non-rural | | | |
| 41 | Houston | 1,202 | 158 | 12 | **VL** | Non-rural | | | |
| 42 | Juneau City and Boroug | 30,711 | 311 | 25 | **VL** | Non-rural | | | |
| 43 | Ketchikan | 7,922 | 207 | 34 | **VL** | Non-rural | | | |
| 44 | Lake Otis | 5,275 | 3071 | 12 | **VL** | Non-rural | | | |
| 45 | Little Campbell Creek | 23,581 | 2708 | 15 | **VL** | Non-rural | | | |
| 46 | Lower OMalley-Cambell | 12,697 | 2026 | 21 | **VL** | Non-rural | | | |
| 47 | Merrill Field | 4,128 | 2914 | 10 | **VL** | Non-rural | | | |
| 48 | MidFork-RusJack | 10,105 | 2900 | 12 | **VL** | Non-rural | | | |
| 49 | Midtown | 12,687 | 2982 | 14 | **VL** | Non-rural | | | |
| 50 | Muldoon | 36,961 | 2573 | 17 | **VL** | Non-rural | | | |
| 51 | Nikiski | 4,327 | 214 | 17 | **VL** | Non-rural | | | |
| 52 | North Fairbanks | 8,253 | 292 | 10 | **VL** | Non-rural | | | |
| 53 | North Pole Area | 16,295 | 739 | 27 | **VL** | Non-rural | | | |
| 54 | Northeast Fairbanks | 4,894 | 475 | 33 | **VL** | Non-rural | | | |
| 55 | Northfork | 4,324 | 2913 | 14 | **VL** | Non-rural | | | |
| 56 | Northwest Fairbanks | 5,127 | 505 | 16 | **VL** | Non-rural | | | |
| 57 | OMalley | 6,000 | 2118 | 21 | **VL** | Non-rural | | | |
| 58 | Palmer (group) | 15,000 | 265 | 27 | **VL** | Non-rural | | | |
| 59 | Rabbit Creek | 12,318 | 1469 | 23 | **VL** | Non-rural | | | |
| 60 | Russian Jack | 4,084 | 3014 | 12 | **VL** | Non-rural | | | |
| 61 | Seward (group) | 4,670 | 72 | 28 | **VL** | Non-rural | | | |
| 62 | Ship Creek | 6,727 | 2556 | 12 | **VL** | Non-rural | | | |
| 63 | Southwest Fairbanks | 17,574 | 818 | 19 | **VL** | Non-rural | | | |
| 64 | Spenard | 14,939 | 2589 | 13 | **VL** | Non-rural | | | |
| 65 | Sutton-Alpine | 1,080 | 121 | 24 | **VL** | Non-rural | | | |

**Application of Criterion-Referenced Assessment Method (p. 2)**

| | | Characteristics | | | 1. Country Food | |
|---|---|---|---|---|---|---|
| No. | Population Name | People | Density | Harvests | Score | Class |
| 66 | University | 4,633 | 2964 | 12 | **VL** | Non-rural |
| 67 | Upper OMalley | 4,574 | 1218 | 22 | **VL** | Non-rural |
| 68 | Wasilla (group) | 29,618 | 344 | 24 | **VL** | Non-rural |
| 69 | Willow (group) | 2,614 | 90 | 23 | **VL** | Non-rural |
| 70 | Akhiok | 80 | 3 | 322 | **VH** | Rural |
| 71 | Akutan | 713 | 25 | 466 | **VH** | Rural |
| 72 | Alakanuk | 652 | 23 | 725 | **VH** | Rural |
| 73 | Aleknagik | 221 | 14 | 379 | **VH** | Rural |
| 74 | Allakaket/Alatna | 132 | 5 | 540 | **VH** | Rural |
| 75 | Anderson | 367 | 13 | 139 | **VH** | Rural |
| 76 | Angoon | 572 | 20 | 224 | **VH** | Rural |
| 77 | Anvik | 104 | 4 | 843 | **VH** | Rural |
| 78 | Atka | 92 | 3 | 439 | **VH** | Rural |
| 79 | Barrow | 4,581 | 162 | 289 | **VH** | Rural |
| 80 | Beaver | 84 | 3 | 457 | **VH** | Rural |
| 81 | Bettles-Evansville | 71 | 3 | 260 | **VH** | Rural |
| 82 | Brevig Mission | 276 | 10 | 579 | **VH** | Rural |
| 83 | Chenega Bay | 86 | 3 | 275 | **VH** | Rural |
| 84 | Chickaloon | 213 | 37 | 224 | **VH** | Rural |
| 85 | Chignik Bay | 79 | 3 | 358 | **VH** | Rural |
| 86 | Chignik Lagoon | 103 | 4 | 211 | **VH** | Rural |
| 87 | Chignik Lake | 145 | 5 | 442 | **VH** | Rural |
| 88 | Chistochina | 93 | 4 | 262 | **VH** | Rural |
| 89 | Chitina | 123 | 5 | 342 | **VH** | Rural |
| 90 | Clark's Point | 75 | 9 | 363 | **VH** | Rural |
| 91 | Coffman Cove | 199 | 7 | 276 | **VH** | Rural |
| 92 | Copper Center | 362 | 20 | 174 | **VH** | Rural |
| 93 | Cordova | 2,454 | 87 | 179 | **VH** | Rural |
| 94 | Craig | 1,397 | 49 | 232 | **VH** | Rural |
| 95 | Deering | 136 | 5 | 672 | **VH** | Rural |
| 96 | Dillingham | 2,466 | 89 | 242 | **VH** | Rural |
| 97 | Egegik | 116 | 4 | 384 | **VH** | Rural |
| 98 | Ekwok | 130 | 5 | 797 | **VH** | Rural |
| 99 | Emmonak | 767 | 27 | 612 | **VH** | Rural |
| 100 | False Pass | 64 | 2 | 413 | **VH** | Rural |
| 101 | Fort Yukon | 595 | 21 | 685 | **VH** | Rural |
| 102 | Galena | 675 | 24 | 368 | **VH** | Rural |
| 103 | Golovin | 144 | 5 | 605 | **VH** | Rural |
| 104 | Grayling | 194 | 7 | 894 | **VH** | Rural |
| 105 | Gulkana | 88 | 8 | 153 | **VH** | Rural |
| 106 | Gustavus | 429 | 15 | 241 | **VH** | Rural |
| 107 | Haines | 1,811 | 64 | 196 | **VH** | Rural |
| 108 | Healy | 1,000 | 35 | 132 | **VH** | Rural |
| 109 | Hollis | 139 | 5 | 169 | **VH** | Rural |
| 110 | Holy Cross | 227 | 8 | 634 | **VH** | Rural |
| 111 | Hoonah | 860 | 30 | 372 | **VH** | Rural |
| 112 | Hughes | 78 | 3 | 567 | **VH** | Rural |
| 113 | Huslia | 293 | 10 | 598 | **VH** | Rural |
| 114 | Hydaburg | 382 | 14 | 384 | **VH** | Rural |
| 115 | Hyder | 97 | 3 | 345 | **VH** | Rural |
| 116 | Igiugig | 53 | 2 | 725 | **VH** | Rural |
| 117 | Iliamna | 102 | 4 | 847 | **VH** | Rural |
| 118 | Kake | 710 | 25 | 179 | **VH** | Rural |
| 119 | Kaktovik | 293 | 10 | 886 | **VH** | Rural |
| 120 | Kenny Lake | 410 | 16 | 136 | **VH** | Rural |
| 121 | King Cove | 792 | 28 | 256 | **VH** | Rural |
| 122 | King Salmon | 442 | 16 | 220 | **VH** | Rural |
| 123 | Kivalina | 377 | 13 | 761 | **VH** | Rural |
| 124 | Klawock | 854 | 30 | 320 | **VH** | Rural |
| 125 | Klukwan | 139 | 5 | 608 | **VH** | Rural |
| 126 | Kodiak City | 6,334 | 239 | 151 | **VH** | Rural |
| 127 | Kodiak Road | 3,991 | 109 | 168 | **VH** | Rural |
| 128 | Koliganek | 182 | 6 | 830 | **VH** | Rural |
| 129 | Kotlik | 591 | 21 | 503 | **VH** | Rural |
| 130 | Kotzebue | 3,082 | 109 | 593 | **VH** | Rural |

**Application of Criterion-Referenced Assessment Method (p. 3)**

| | | Characteristics | | | 1. Country Food | |
|---|---|---|---|---|---|---|
| No. | Population Name | People | Density | Harvests | Score | Class |
| 131 | Kwethluk | 713 | 25 | 836 | **VH** | Rural |
| 132 | Lake Louise | 88 | 3 | 179 | **VH** | Rural |
| 133 | Larsen Bay | 115 | 4 | 370 | **VH** | Rural |
| 134 | Levelock | 122 | 4 | 884 | **VH** | Rural |
| 135 | Manokotak | 399 | 20 | 384 | **VH** | Rural |
| 136 | McGrath | 401 | 14 | 182 | **VH** | Rural |
| 137 | McKinley Park Village | 142 | 5 | 242 | **VH** | Rural |
| 138 | Mentasta Lake | 142 | 7 | 125 | **VH** | Rural |
| 139 | Minto | 258 | 9 | 585 | **VH** | Rural |
| 140 | Mountain Village | 755 | 27 | 820 | **VH** | Rural |
| 141 | Naknek | 678 | 24 | 188 | **VH** | Rural |
| 142 | Nanwalek | 177 | 19 | 254 | **VH** | Rural |
| 143 | Naukati Bay | 135 | 5 | 242 | **VH** | Rural |
| 144 | Nelson Lagoon | 83 | 3 | 254 | **VH** | Rural |
| 145 | New Stuyahok | 471 | 17 | 700 | **VH** | Rural |
| 146 | Newhalen | 160 | 6 | 747 | **VH** | Rural |
| 147 | Nikolai | 100 | 4 | 450 | **VH** | Rural |
| 148 | Ninilchik | 772 | 51 | 135 | **VH** | Rural |
| 149 | Noatak | 428 | 15 | 461 | **VH** | Rural |
| 150 | Northway | 95 | 3 | 278 | **VH** | Rural |
| 151 | Nuiqsut | 433 | 15 | 742 | **VH** | Rural |
| 152 | Nunapitchuk | 466 | 16 | 802 | **VH** | Rural |
| 153 | Old Harbor | 237 | 8 | 300 | **VH** | Rural |
| 154 | Ouzinkie | 225 | 39 | 264 | **VH** | Rural |
| 155 | Pedro Bay | 50 | 2 | 397 | **VH** | Rural |
| 156 | Pelican | 163 | 6 | 355 | **VH** | Rural |
| 157 | Perryville | 107 | 4 | 394 | **VH** | Rural |
| 158 | Petersburg | 3,224 | 114 | 161 | **VH** | Rural |
| 159 | Pilot Point | 100 | 4 | 384 | **VH** | Rural |
| 160 | Point Lay | 247 | 9 | 890 | **VH** | Rural |
| 161 | Port Alexander | 81 | 3 | 312 | **VH** | Rural |
| 162 | Port Alsworth | 104 | 4 | 361 | **VH** | Rural |
| 163 | Port Graham | 171 | 20 | 253 | **VH** | Rural |
| 164 | Port Heiden | 119 | 4 | 408 | **VH** | Rural |
| 165 | Port Lions | 256 | 28 | 331 | **VH** | Rural |
| 166 | Port Protection | 63 | 2 | 451 | **VH** | Rural |
| 167 | Quinhagak | 555 | 20 | 768 | **VH** | Rural |
| 168 | Saint Paul | 532 | 19 | 267 | **VH** | Rural |
| 169 | Sand Point | 952 | 34 | 256 | **VH** | Rural |
| 170 | Saxman | 431 | 162 | 211 | **VH** | Rural |
| 171 | Seldovia | 286 | 31 | 184 | **VH** | Rural |
| 172 | Shageluk | 129 | 5 | 445 | **VH** | Rural |
| 173 | Shishmaref | 562 | 20 | 794 | **VH** | Rural |
| 174 | Sitka | 8,835 | 169 | 205 | **VH** | Rural |
| 175 | Sitka Tribe | 2,095 | 169 | 350 | **VH** | Rural |
| 176 | Slana | 124 | 5 | 174 | **VH** | Rural |
| 177 | South Naknek | 137 | 5 | 297 | **VH** | Rural |
| 178 | Stebbins | 547 | 19 | 997 | **VH** | Rural |
| 179 | Stevens Village | 87 | 3 | 578 | **VH** | Rural |
| 180 | Tanacross | 140 | 10 | 250 | **VH** | Rural |
| 181 | Tanana | 308 | 11 | 539 | **VH** | Rural |
| 182 | Tatitlek | 107 | 10 | 406 | **VH** | Rural |
| 183 | Tenakee Springs | 104 | 4 | 330 | **VH** | Rural |
| 184 | Tetlin | 117 | 6 | 214 | **VH** | Rural |
| 185 | Thorne Bay | 557 | 20 | 179 | **VH** | Rural |
| 186 | Tok | 1,393 | 50 | 149 | **VH** | Rural |
| 187 | Tonsina | 92 | 6 | 156 | **VH** | Rural |
| 188 | Tyonek | 193 | 13 | 260 | **VH** | Rural |
| 189 | Unalaska | 4,283 | 152 | 195 | **VH** | Rural |
| 190 | Wainwright | 546 | 19 | 751 | **VH** | Rural |
| 191 | Wales | 152 | 5 | 744 | **VH** | Rural |
| 192 | Whale Pass | 58 | 2 | 185 | **VH** | Rural |
| 193 | Whitestone Logging Car | 116 | 4 | 178 | **VH** | Rural |
| 194 | Wrangell | 2,308 | 82 | 167 | **VH** | Rural |
| 195 | Yakutat | 680 | 24 | 386 | **VH** | Rural |

**Application of Criterion-Referenced Assessment Method (p. 4)**

| No. | Population Name | 3. Extensive Land Use | | 4. Special Production | | 5. Other Factors | |
|---|---|---|---|---|---|---|---|
| | | Score | Class | Score | Class | Score | Class |
| 1 | Anchor Point (group) | ? | Uncertain | **No** | Uncertain | ? | ? |
| 2 | Fritz Creek CDP | ? | Uncertain | **No** | Uncertain | ? | ? |
| 3 | Hope | ? | Uncertain | **No** | Uncertain | ? | ? |
| 4 | Moose Pass (group) | ? | Uncertain | **No** | Uncertain | ? | ? |
| 5 | North Fork Road | ? | Uncertain | **No** | Uncertain | ? | ? |
| 6 | Trapper Creek | ? | Uncertain | **No** | Uncertain | ? | ? |
| 7 | Salcha-Harding | ? | Uncertain | **No** | Uncertain | ? | ? |
| 8 | Talkeetna (group) | ? | Uncertain | **No** | Uncertain | ? | ? |
| 9 | Valdez | ? | Uncertain | **No** | Uncertain | ? | ? |

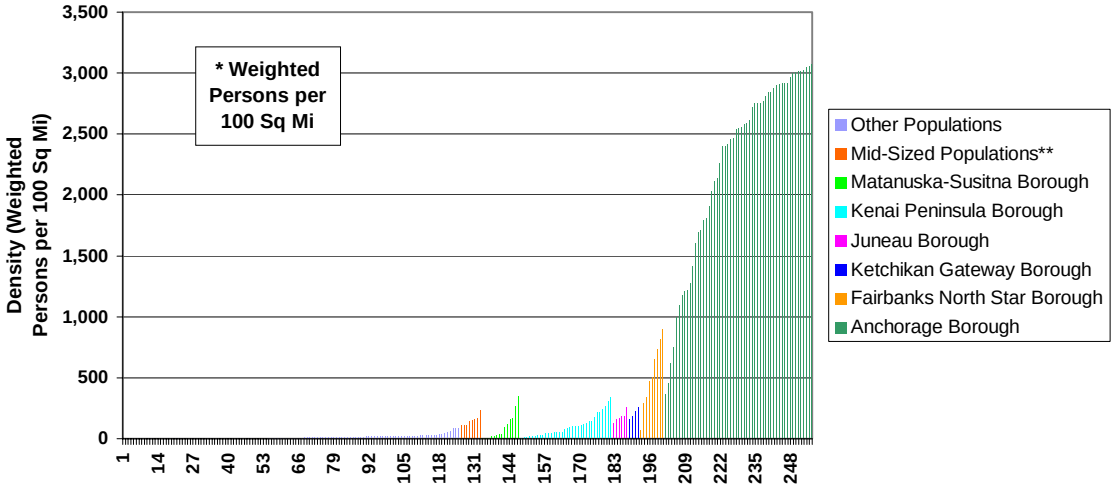
The above criterion-referenced assessment method was applied in the assessment of 195 case populations in Alaska. The case populations comprised the same set as previously described in the *Discriminant Analysis Assessment* section. The outcomes of the criterion-referenced assessment are presented in the table, *Application of Criterion-Referenced Assessment Method*.

As shown in the above table, case populations were initially assessed with the first of the two *primary criteria* – country food production (lbs per person), divided into four threshold levels ("very high," "moderately high," "moderately low," or "very low"). Following classification rules, case populations with "very high" country food production were classified "rural" and cases with "very low" country food production were classified "non-rural." "Very high" was defined as country food production containing 75% or more of a population's recommended dietary allowance (RDA) for protein (>115 lbs per person per year), while "very low" was defined as country food production containing less than 25% of a population's RDA for protein (<39 lbs per person per year). Of 195 case populations, 171 cases (88%) were categorized using the first standard. Of these, 126 cases were classified as "rural" and 45 cases were classified as "non-rural." Of the 24 uncertain cases, 13 had "moderately low" country food production (25-49% RDA for protein; between 40-74 lbs per person per year) and 11 had "moderately high" country food production (50-74% RDA for protein; between 75-114 lbs per person per year).

In accordance with the established procedure, the 24 unclassified cases were jointly assessed with two primary criteria: *country food production* and *sparsely-populated, open country*. "Sparsely-populated, open country" was defined as < 100 persons (weighted) per 100 sq miles in a local commons, as measured by the variable DENS30 (this variable was described in the previous *Discriminant Analysis* section). Conceptually, the standard for sparsely-populated, open country is equivalent to a community of about 2,500 people whose neighboring 30-mile standard area contains a small number of other people. The standard 30-mile area (a circle with a radius of 30 miles) comprises 2,826 sq miles. Therefore, 2,500 people / 2,826 sq mi = 88 people per 100 sq mi. An additional small number of people (326 weighted people more) within the community's 30-mile standard area raises the total to 100 people per 100 sq mi. This represents a fairly strict, though reasonable, standard for "sparsely-populated, open country." Such a cutting point can be directly related to the *rural presumption standard* in current federal subsistence regulations (populations no greater than 2,500 people). The measure represents a

"presumed" rural community (<2,500 people) surrounded by a relatively unpopulated open area. The location of this cut-point can be seen in Fig. 18, which shows density values (DENS30) of 255 case populations in Alaska. The same information set is shown in Fig. 10, but as log transformed data.

**Fig. 18. Densities* of Standard Use Areas of 255 Populations Grouped by Borough**




Following classification rules, case populations with "sparsely-populated, open country" and "moderately high" country food production were categorized as "rural." Cases without "sparsely-populated, open country" and "moderately low" country food production were categorized as "non-rural." As shown in the assessment table above, 10 of the 24 unclassified cases were categorized as "rural" and five were classified as "non-rural" by this procedure. There remained only nine cases unclassified – eight cases with moderately low country food production in sparsely-populated, open country, and one case (Valdez) with moderately high country food production and without sparsely-populated, open country. The unclassified cases included six populations along roads near a rural/non-rural fringe (Anchor Point, Trapper Creek, Talkeetna, North Fork Road, Fritz Creek, and Salcha-Harding), one mid-sized, geographically-separate population (Valdez), and two small communities (Hope and Moose Pass).

Following the established procedure, the nine unclassified cases would be assessed using three *ancillary criteria* (*other extensive land uses*, *noncommercial fishery or hunt center*, and a *preponderance of other rural features*). A case meeting one or more of the ancillary criteria would be classified as "rural." A case having no other rural feature would be classified as "non-rural." The ancillary criteria likely would be examined by the Federal Subsistence Board using existing data sets, case method materials, and public comment.

In the evaluation of *Other Extensive Land Uses* (Criterion 3), COMMFISH (a variable in the PACK database) measures the percentage of households with members involved in commercial fishing, derived from the CPDB. Statistics on commercial fishing permits (number and percentage fished) and annual commercial fish harvests (numbers and lbs of fish) by Alaska communities are available through the Alaska Commercial Fisheries Entry Commission or the Alaska Department of Community and Economic Development. These measures can be used to assess the relative involvement of community residents in commercial fisheries. An illustration of this information is presented the following table, *Example of Information on Commercial Fisheries by Case Population.* In addition, economic summaries of case communities are generally available from the Alaska Department of Community and Economic Development's website (www.dced.state.ak.us/cbd/commdb/CF_COMDB.htm). For instance, for Valdez, the DCED summary states, "In 2000, gross fishing revenues of residents exceeded $1.6 million… three fish processing plants operate in Valdez, including Peter Pan and Seahawk Seafoods." A recent history of commercial fishing in the Pacific Gulf of Alaska, states "Valdez became a participant in [Pacific Gulf] commercial fisheries during this period [1975-1995], but oil transport was and remains the primary economic engine of this community" (Fall et al 2001:52ff). Annual fish sales ranged between $1.0-2.5 million during the 1990s (Fall et al 2001:56). The per capita income from commercial fishing at Valdez was the lowest among surveyed Pacific Gulf communities (Fall et al 2001:131). Such information can be used by the federal board to assess if a community is regularly supported by (employed in) extensive land uses.

**Example of Information on Commercial Fisheries by Case Population**

| Case Population | Residents (2000) | Residents with Commercial Fishing Permits (DCED) | Percentage of Residents with Commercial Fishing Permits (DCED) | Percentage of Households with Members Employed in Commercial Fisheries (CPDB) |
|---|---|---|---|---|
| Anchor Point | 1,845 | 80 | 4% | -- |
| Fritz Creek CDP | 1,603 | 13 | 1% | 15.0% (1999) |
| Hope | 137 | 2 | 1% | 2.9% (1990) |
| Moose Pass | 206 | 2 | 1% | -- |
| North Fork Road | 467 | -- | -- | 10.2% (1998) |
| Salcha-Harding | 854 | 4 | 0.5% | -- |
| Talkeetna | 772 | 10 | 1% | 0% (1985) |
| Trapper Creek | 423 | 7 | 2% | 0% (1985) |
| Valdez | 4,336 | 42 | 1% | 9.6% (1992) |

*Noncommercial Fishery or Hunt Center* (Criterion 4) refers to communities with special noncommercial fisheries or hunts that exist in a few locations in Alaska. Examples of noncommercial fishery centers include the herring roe-on-hemlock fishery in Sitka Sound (Robert F. Schroeder and Matt Kookesh, *Subsistence Harvest of Herring Eggs in Sitka Sound*, Technical Paper No. 173, Division of Subsistence, ADF&G, 1990) and the hooligan fishery for oil production on the Chilkat and Chilkoot rivers in southeast Alaska (Martha F. Betts, *The Subsistence Eulachon Fishery of the Chilkat and Chilkoot Rivers,*

*Southeast Alaska*, Technical Paper No. 213, Division of Subsistence, ADF&G, 1994). During the 1990s, production of herring roe-on-hemlock and hooligan oil for regional distribution occurred in a few special locations like these in southeast Alaska. Barrow provides an example of a major hunt center for bowhead whale (Rosita Worl and Charles W. Smythe, *Barrow: A Decade of Modernization,* Technical Report No. 125, Minerals Management Service, Alaska OCS Socioeconomic Studies Program, 1986). The rural or non-rural designation of a fishery center or hunt center potentially impacts the production and distribution of specialty country food products over a wider area. This potential impact warrants the consideration of this feature as a rural criterion.

*A Preponderance of Other Rural Features* (Criterion 5) is a general criterion that allows for a wide number of factors to be considered in assessing a borderline case, such as *Diversity of Resources Used, Diversity of Resources Shared, Country-Orientated Knowledge and Values,* and *Geographic Isolation*. The *Diversity of Resources Used* in a community is indicated by variables such as SPECOUNT, USECOUNT, NUSED50, HRVCOUNT, and NHARV50 in the PACK Database (see Appendix A). The *Diversity of Resources Shared* in a community is indicated by variables such as PCTGVALL, PCTRCALL, PCTGVSLM, PCTRCSLM, PCTGVLML, PCTRCLML, GIVECOUNT, RECCOIUNT, PCTGIVEN, PCTRECVD, NGIV25, NREC25, PCTGIV1, PCTREC1, PCTGIV2, and PCTREC2. *Country-Oriented Knowledge and Values* are qualitative variables. They may be indicated by measures such as INDIGNDX (a measure of the extent that traditional food items are used in a population) and RRFISH1 and RRFISH2 (the percentage of a community's fish harvested with rod and reel gear) in the PACK Database. For particular case populations, predominant value orientations may be pertinent to its rural or non-rural classification. Areas where country foods are primarily derived by sport fishing and sport hunting may be more similar to non-rural Alaska areas than rural Alaska areas. *Geographic Isolation* refers to the place of a community in relation to other populations. COLAVG, the cost of imported food in an area, indicates whether a community is toward the periphery of commercial food trade networks. Lower food costs are usually found in population centers, while higher food costs are typical of peripheral populations.

Because measures for ancillary variables may be unavailable for many Alaska populations, rigorous statistical comparisons of cases may not be possible for certain ancillary measures. Instead, ancillary variables may be assessed through a procedure called *Case Method Assessment.* In Case Method Assessment, detailed information is gathered on a set of case populations, commonly across a range of key variables. The purpose is to describe a few cases in substantial detail so as to understand relationships among variables specific to that set of cases. The case histories provide background to contemporary information. Both qualitative and quantitative information is usually analyzed together. The information on cases is presented as a narrative accompanied with charts, graphs, maps, and other exhibits.

Case Method Assessment allows for a fuller understanding of land and resource use patterns in Alaska than can be portrayed in statistical approaches focused on a few variables. The depth of information clarifies relationships among a range of factors.

The case analysis helps to explain why relationships are or are not seen. Case Method is particularly useful for understanding populations that may be relatively unique. Populations that deviate from normative patterns may not be adequately accounted for in general statistical models. The Case Method approach allows for information to be collected and analyzed on such unique populations, so that "exceptions to the rule" are understood and reasonably assessed.

Case examples of resource use systems are commonly presented in the form of regional profiles, community profiles, or household cases. The technical report series from the *Division of Subsistence, Alaska Department of Fish and Game* is a major source of case materials (www.state.ak.us/local/akpages/FISH.GAME/subsist/geninfo/publctns/subabs.htm). The community profile website of the *Alaska Department of Community and Economic Development* is another source of information (www.dced.state.ak.us/cbd/commdb/CF_COMDB.htm). Information provided by members of regional advisory groups and expert stakeholders is a third potential source. Collectively, these materials offer important information for making decisions on subsistence uses in Alaska, whatever rural assessment approach is utilized.

## Comparison of Outcomes

The two assessment methods (*Discriminant Analysis Assessment* and *Criterion-Referenced Assessment*) applied similar criteria in substantially different fashions. The one approach involved multivariate modeling with interval scaled data, where the contribution of variables to defining groups emerged through relatively complex inductive statistics. The other approach was a "top-down" deductive method, applying relatively simple standards ("very high," "moderately high," "moderately low," "very low"; "yes," "no") defined through a mix of logic, reason, and empirical evidence.

While differing in approach, each method produced similar classification outcomes. Out of 195 case populations, there were no cases with divergent classifications. That is, no case was classified "rural" by one method and "non-rural" by the other method. For 182 of 195 cases (93%), the two methods provided identical classifications. For the remaining 13 cases, the methods presented some differences in the degree of certainty of classifications, as shown in the following summary, *Tentative or Uncertain Classifications*. The discriminant analysis gave tentative classifications to four rural cases and six non-rural cases; of these ten cases, the criterion-referenced assessment gave uncertain classifications to one of the rural cases and five of the non-rural cases. The criterion-referenced assessment gave uncertain classifications to three cases that received certain classifications by the discriminant analysis assessment (two non-rural cases and one rural case), as shown in the summary.

| Tentative or Uncertain Case Classifications | | |
|---|---|---|
| Population | Discriminant Analysis | Criterion-Referenced Assessment |
| Anchor Point (group) | Non-rural | Uncertain |
| Salcha-Harding | Non-rural | Uncertain |
| Fritz Creek CDP | Tentative Non-rural | Uncertain |
| Glacier View CDP | Tentative Non-rural | Non-rural |
| Moose Pass (group) | Tentative Non-rural | Uncertain |
| North Fork Road | Tentative Non-rural | Uncertain |
| Talkeetna (group) | Tentative Non-rural | Uncertain |
| Trapper Creek | Tentative Non-rural | Uncertain |
| Clam Gulch | Tentative Rural | Rural |
| Kodiak City | Tentative Rural | Rural |
| Nikolaevsk | Tentative Rural | Rural |
| Valdez | Tentative Rural | Uncertain |
| Hope | Rural | Uncertain |

The substantial similarity in classification outcomes suggests the two methodologies are making similar differentiations between rural populations and non-rural populations in Alaska, using the rural/non-rural criteria. Using two very different approaches (inductive statistics and deductive reasoning), rural and non-rural groups are distinguishable by country food production levels (a type of extensive land use) and sparsely-populated, open country (measured by weighted population within standard areas). The consistency in the groupings of case populations between the two approaches provides cross validation of the methods and factors. Because of the consistency of outcomes, one may feel more secure in the choice of one or the other methods in classifying case populations.

The classifications of the two methodologies can be compared with the current rural and non-rural classifications in federal regulations. As described above, the federal findings were made using a third, substantially-different methodology. The federal findings were made by the Federal Subsistence Board applying information pertaining to a set of factors, including but not limited to *use of fish and wildlife*, *development and diversity of the economy*, *community infrastructure*, *transportation*, and *educational institutions*. There are initial presumption levels based on population size, with communities less than 2,500 people presumed "rural" and greater than 7,000 presumed "non-rural." The findings are made in a public process, commonly including substantial testimony of regional advisory councils and other stakeholders. A qualitative assessment is made considering the weight of information, rather than a quantitative assessment. The federal approach resembles approaches used by the Alaska State Joint Board of Fisheries and Game in making rural and nonsubsistence area determinations, as described above.

The outcomes from the two tested methodologies (*Discriminant Analysis Assessment* and *Criterion-Referenced Assessment*) are substantially similar to the current rural and non-rural classifications in federal regulations. With a few exceptions, the communities and areas designated as "rural" and "non-rural" in federal regulations are similarly designated under the two quantitative approaches. The outcomes of the *Discriminant Analysis Assessment* are consistent with current federal findings except for Valdez ("tentative

rural"), Clam Gulch ("tentative rural"), and three populations on the fringe of the Wasilla area -- Glacier View, Talkeetna, and Trapper Creek ("tentative non-rural"). The classifications of these places by the *Discriminant Analysis Assessment* were tentative, indicating that the populations' scores were greater than one standard deviation from their closest group. Such tentative classifications might be reasonably changed in light of information from additional *ancillary factors.* The outcomes of the *Criterion-Referenced Assessment* applying the two primary criteria were consistent with current federal findings, except for Glacier View ("non-rural"). However, nine places were left unclassified in the test of the *Criterion-Referenced Assessment* – Anchor Point, Salcha-Harding, Fritz Creek, Moose Pass, North Fork Road, Talkeetna, Trapper Creek, Valdez, and Hope – pending the application of *ancillary factors* through a case method approach. The final classifications using the ancillary criteria may or may not be entirely consistent with current federal findings.

The comparison of outcomes can be viewed as a test of validity. If one assumes that the current federal classifications are substantially correct for subsistence management purposes, their consistency with the outcomes of the two tested methodologies can be interpreted as a validation of the new, quantitative approaches. That is, the two new methodologies appear to be making distinctions among Alaska populations that are similar to those made by the current Federal Subsistence Board procedure. The three methodologies appear to be finding consistent contrasts between rural and non-rural groups in Alaska.

Consistency in outcomes is not too surprising. The two new methodologies are applying information on country food harvests and demography similar to information used by the Federal Subsistence Program in making the current rural classifications. So one might anticipant some similarity in outcomes through the use of similar assessment factors. Further, the *Discriminant Analysis Assessment* employs federal and state classifications as initial guides to rural and non-rural groups in Alaska, which assists locating statistical breaking points between groups. Similarly, the density standard used in the *Criterion-Referenced Assessment* is linked to presumption levels found in federal regulation. These similar features would lead to some convergence of outcomes.

However, the two new methodologies also apply new information and substantially different approaches in reaching its outcomes. The country food harvest information for Alaska's large population centers is essentially new. Demographic information is applied in an essentially new fashion through the density criterion. The information on populations and geographic areas, derived from the 2000 federal census, is more recent than information used in past rural/non-rural findings. A new approach for aggregating and disaggregating populations in certain road-connected areas is used. Further, the application of the information in the two new quantitative assessments differs substantially from the more qualitative approaches used by the federal and state programs. Considering these kinds of differences in information and assessment approaches, it also would not have been surprising if the two new methodologies had produced substantially different outcomes compared with past assessments.

# CONCLUSIONS AND RECOMMENDATIONS

Two primary factors separating communities into "rural" and "non-rural" groups were identified by the review of rural concepts and examination of more than two hundred variables: (1) *country food production for local consumption*, also referred to as *wild food production*, and (2) s*parsely-populated, open country in the local commons*. Each factor is consistent with general and scientific meanings of "rural." A population regularly supported by country food production within sparsely-populated, open country meets both criteria and is "rural." Conversely, a population not supported by country food production in a relatively densely-populated area is "non-rural," failing the two primary features. Populations displaying a mix of features are of less certain classification and may need additional assessment with *ancillary factors*.

Two alternative methodologies for distinguishing between rural and non-rural communities for subsistence management were developed and tested in this project. One methodology, called *Discriminant Analysis Assessment*, identified factors that statistically separate communities into two discrete groups. Using these factors, an Alaska population can be classified into the group it most closely resembles. The second methodology, called *Criterion-Referenced Assessment*, established rural/non-rural standards for a set of factors. By applying these factors, an Alaska population can be categorized based on its characteristics relative to the standards.

*Discriminant Analysis Assessment* is a complex statistical method that results in precision of classification. It classifies every case as "rural" or "non-rural" using the two primary criteria in a robust statistical approach. Steps in assessment, such as calculating *canonical roots, Mahalanobis distances*, and *curvilinear thresholds*, are complex operations using computerized statistical programs. It also statistically characterizes the confidence of the classification using a type of z-score (the Mahalanobis distance). Borderline cases can be clearly identified using this procedure. The distances of cases from the centroids of the rural or non-rural groups indicates how far the case falls from the norm.

In the *Criterion-Referenced Assessment*, classifications follow relatively simple evaluative steps. A series of either-or questions is used to assess a case population. A classification results at the end of the question series. A case is classified depending on how its characteristics compare with standards established for factors. This procedure is easy to illustrate with a flow diagram, as shown in this report. The method applies a few simple standards for the two primary factors. For *country food production*, the categories would be "very high," "moderately high," "moderately low," or "very low". With respect to *sparsely populated, open country*, the determination would be "yes" or "no". The standards have a reasoned basis. For country food production, the standards arrived at in the report are linked to nutritional requirements -- Recommended Dietary Allowance (RDAs) of protein. For sparsely populated, open country, the standard is based on the numbers and distances of neighbors from a case community, with a threshold linked to federal census definitions of "rural" as places less than 2,500 people. Cases with both

rural and non-rural features are identified as borderline (uncertain) cases that require additional assessment with ancillary criteria.

The two methodologies (*Discriminant Analysis Assessment* and *Criterion-Referenced Assessment*) were tested on 195 case populations. The tests were conducted only to examine whether the methods worked and how results from each compared to the other. They were not meant to and do not indicate which communities should actually be determined to be rural and non-rural. That requires further decisions as to methodology and implementation by the federal subsistence program.

Classification outcomes under the tested methodologies were similar. Under each methodology, the two primary factors (*country food production for local consumption* and s*parsely-populated, open country in the local commons*) separated most Alaska populations into distinct rural or non-rural groups. With a few exceptions, the test classifications were consistent with rural/non-rural classifications in current federal regulations. The relative consistency among the outcomes of the three methods provides confidence in the use of any one of the methodologies.

The *Discriminant Analysis Assessment* method worked effectively in applying its two-step procedure, under which rural and non-rural classes are first statistically established, and then cases are classified into its nearest group. However, the reflexivity of groups and cases and its changeable discriminant functions, which adjust depending upon the starting set of cases and statistical conditions, may make the approach appear less stable in comparison with the absolute standards applied in *Criterion-Referenced Assessment.*

*Discriminant Analysis Assessment* uses statistically complex procedures that are less likely to be understood by interested parties, for it requires statistical knowledge not possessed by the general public. As a result, the methodology's complexity creates potential barriers for its acceptance as a way to categorize communities for subsistence eligibility.

*Criterion-Referenced Assessment*, on the other hand, resembles approaches commonly used to determine eligibility in other government programs. A set of absolute standards for eligibility is defined and applied on a case-by-case basis to applicants (in this instance, case populations). It is an approach that is relatively easy to understand because of its simplicity. Overall, the assessment method is reasoned, straightforward, and familiar.

In comparison with *Discriminant Analysis Assessment* methodology, *Criterion-Referenced Assessment* may appear to be a coarser classification approach, with cases sorted into a few general types. Some cases with both rural and non-rural features are identified as borderline (uncertain) cases requiring additional assessment with ancillary criteria. This step is potentially costly and contentious, as ancillary criteria are applied in a case method approach. Some may count the additional step of using ancillary criteria and case method as a disadvantage of *Criterion-Referenced Assessment.* For purposes of subsistence determinations, however, this approach is actually a benefit, appropriately

focusing additional resources and public involvement on difficult cases that warrant special consideration.

In conclusion, both *Criterion-Referenced Assessment* and *Discriminant Analysis Assessment* show promise as methods for distinguishing rural and non-rural populations for subsistence management in Alaska. The two systems apply rural factors that are firmly grounded in common meanings and the scientific literature. Under each approach, a population regularly supported by country food production within a sparsely-populated, open country is considered "rural." The two assessments are relatively methodical, quantitative classification systems, drawing on additional qualitative information when assessing uncertain cases. Each approach produced similar outcomes with a test of 195 case populations. Outcome classifications of test cases are mostly consistent with those in current federal regulations. Based on this comparison, neither methodology, if adopted by the federal subsistence program, would likely result in substantial changes in the ways that communities and areas are currently classified. Of the two methods, the *Criterion-Referenced Assessment* is preferred because of its simplicity. The *Discriminant Analysis Assessment* may be used to provide additional confirmation of the validity of the primary factors used by the *Criterion-Reference Assessment* in separating rural and non-rural groups.

The following policy and implementation recommendations emerge from the analysis of methodologies for rural/non-rural determinations for subsistence management in Alaska.

> **Recommendation 1. *Criterion-Referenced Assessment* is recommended as the preferred methodology for identifying rural and non-rural populations for subsistence management, over *Discriminant Analysis Assessment*.**

Because of its simplicity, *Criterion-Referenced Assessment* is the preferred methodology over *Discriminant Analysis Assessment* for distinguishing rural and non-rural populations for subsistence management in Alaska. Since the two methods produce similar outcomes, the simpler approach is preferable for a government program. Stakeholders will be able to readily comprehend the basis of classifications that affect them. Stakeholders are more likely to trust a system that is easily understood than one that is not.

> **Recommendation 2. *Discriminant Function Analysis* should be used periodically to validate the standards applied in the *Criterion-Referenced Assessment* method.**

A potentially contentious aspect of *Criterion-Referenced Assessment* could be the setting of rural/non-rural standards for primary factors. Depending on how strict or loose the standards, the classification into groups may become more or less inclusive or exclusive. One way to periodically evaluate the performance of the standards used in a *Criterion-Referenced Assessment* system is with a discriminant function analysis. As shown in this report, if primary factors are identifying truly distinct groups, the classification outcomes of a Criterion-Reference Assessment and discriminant function analysis should be

similar. Periodically, the case classifications from a criterion-referenced assessment may be used to form the initial groups in a discriminant function analysis. The end classifications from the discriminant function analysis compared with the initial classifications can be used to assess the relative validity of the rural and non-rural groups. Substantial differences between classifications may indicate a need for adjustments of threshold standards for primary factors.

Effective implementation of the recommended and alternative methodologies calls for the following policies and actions.

> **Recommendation 3. Population densities used in rural/non-rural assessment should be calculated for 30-mile standard areas using units comparable to census tracts or CDP census units, whichever provides finer resolution in an area.**

Using information in the 2000 federal census, s*parsely-populated, open country in the local commons* was measured for test purposes by population density (population weighted by distance within a standard area). Densities calculated with 30-mile areas surrounding census tracts or CDP census units produced discriminant analysis runs with the best statistical performance, as indicated by the largest canonical correlations among 14 discriminant analysis runs (shown in Appendix B).

> **Recommendation 4. Population densities should be calculated for case populations using a GIS program.**

In our analysis of methodologies, some population densities were calculated without a GIS program. Calculating densities with a GIS program, such as ArcView GIS, will provide more precise measures for this factor across all Alaska populations. This is particularly important for cases where uncertainty exists as to rural/non-rural classification.

> **Recommendation 5. For road-connected populations of the Kenai Peninsula, harvest estimates from Alaska state harvest tickets/permit records and the Community Profile Database should be validated with systematic surveys with higher response rates.**

Using information from Alaska state harvest ticket/permit records, we measured *country food production* by annual per capita harvests within a population, expressed as usable weights (lbs) or as the percentage of the RDA for protein contained in the annual harvest. Existing harvest data appear to be affected by substantial non-response rates for some areas, such as Kenai Peninsula populations. Several Kenai Peninsula populations lie on the fringes of rural and non-rural areas. In this region, more precise harvest estimates would help in clarifying boundaries between rural and non-rural areas.

**<u>Recommendation 6.</u> For unsurveyed populations off the road network in Alaska, country food production should be estimated using information from nearby surveyed communities.**

Country food production has not been documented for a substantial number of Alaska communities. Where information is missing, country food production levels from nearby surveyed communities may provide adequate estimates for making rural and non-rural assessments in off-road areas. Lists of unsurveyed communities and nearby surveyed communities with harvest estimates are provided by Table 4, *Alaska Communities by Region and Nearby Surveyed Population in the CPDB*, in Wolfe and Utermohle (2000).

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# APPENDIX A
# VARIABLES LIST

| Variable Name | Variable Description | Data Source | Notes |
|---|---|---|---|
| ***POPULATION UNIT VARIABLES*** | | | |
| CASE | Case Identification Number | Urban/Rural | Basic ordering of cases |
| PACNAME | PAC name | Computed variable | Name of population, area, or community in the PACK database |
| COMMNAME | Community name as it appears in the CPDB | CPDB | |
| CEN2000N | Community name as it appears in the 2000 U.S. Census | U.S. Census 2000 | |
| COMMCODE | Community code | CPDB | |
| PLFIPS | Place Code from the U.S. Census 2000 Tables | U.S. Census 2000 | |
| PACTYPE | PAC type | Urban/Rural | 1 = Household surveys<br>2 = Harvest tickets-permits<br>3 = Density/Census data only<br>4 = Boroughs<br>5 = Overlapping PACs |
| GROUP | Basic Group Code | Urban/Rural | Basic ordering of cases |
| GRPNAME | Basic Group Name | Urban/Rural | Basic ordering of cases |
| URFAREA | Urban and Fringe Area Code | Urban/Rural | 1 = Anchorage Municipality<br>2 = Kenai Peninsula Borough<br>3 = Matanuska-Susitna Borough<br>4. = Fairbanks North Star Borough<br>5 = Ketchikan Gateway Borough<br>6 = Juneau City and Borough<br>7 = SE Fairbanks Census Area |
| URFCODE | A unique identifier for each Urban or Fringe PAC (PACTYPE = 2) | Urban/Rural | |
| PACNOTE | Notes pertaining to the construction of the PAC | Urban/Rural | |
| FEDRUR | Federal Subsistence Board determination of rural/nonrural status | Computed variable | 1=non-rural, 2=rural; current designations |
| STRUR | State Joint Board determination of rural/nonrural status | Computed variable | 1=non-rural, 2=rural; "rural" are areas outside the boundaries of nonsubsistence areas. |
| TESTRUR | Rural/nonrural status, Federal and State determinations comparison | Computed variable | 1=non-rural (agree); 2=rural (agree); blank=uncertain (disagree) |
| SIZEGRP10 | Presumed rural/nonrural status based on population within 10 miles | Computed variable | 1=non-rural (>7,000); 2=rural (<2,500); blank=uncertain (2,500-7,000) |
| SIZEGRP20 | Presumed rural/nonrural status based on population within 20 miles | Computed variable | 1=non-rural (>7,000); 2=rural (<2,500); blank=uncertain (2,500-7,000) |
| SIZEGRP30 | Presumed rural/nonrural status based on population within 30 miles | Computed variable | 1=non-rural (>7,000); 2=rural (<2,500); blank=uncertain (2,500-7,000) |
| TRACT | U.S. 2000 Census Tract | U.S. Census 2000 | |
| REGION | Region (Borough) Code | U.S. Census 2000 | |
| CENAREA | Census Area | U.S. Census 2000 | |
| BIANAT | BIA Recognized Place | U.S. Census 2000 | |
| REGIONCD | ADFG Division of Subsistence region (code) | CPDB | |
| REGION | ADFG Division of Subsistence region | CPDB | |
| SUBREGCD | ADFG Division of Subsistence sub-region (code) | CPDB | |
| SUBREG | Name of the subregion where the community is located. | CPDB | |
| GPSRGCD | ADFG Division of Subsistence geopolitical sub-region (code) | CPDB | |
| GEOPSREG | ADFG Division of Subsistence geopolitical sub-region | CPDB | |
| FEDREGN | Federal Subsistence Management Region (code) | CPDB | |
| FEDREGNA | Federal Subsistence Management Region | CPDB | |

## Appendix A. Variables List (p. 2)

| Variable Name | Variable Description | Data Source | Notes |
|---|---|---|---|
| CENSARCD | Census area and sub-area code | CPDB | |
| CENSAREA | Census area and sub-area | CPDB | |
| ECOULTCD | Ecological/cultural zone code | CPDB | |
| ECOCULT | Ecological/cultural zone name | CPDB | |
| QUADCODE | Abbreviation of USGS quad in which the community is located | CPDB | |
| QUAD | USGS quad in which the community is located | CPDB | |
| ZIPMIN | Zipcode (minimum) | CPDB | |
| ZIPMAX | Zipcode (maximum) | CPDB | |
| LATDEG | Latitude of community in degrees. | CPDB | |
| LATMIN | Latitude of community in minutes. | CPDB | |
| LATDEC | Latitude in decimal degrees. | CPDB | |
| LONGDEG | Longitude of community in degrees. | CPDB | |
| LONGMIN | Longitude of community in minutes. | CPDB | |
| LONGDEC | Longitude in decimal degrees. | CPDB | |
| YEAR | Study year (if not a calendar year, year during which the first month of the study period falls) | CPDB | This variable does not apply to PAC's in this data set where a baseline harvest survey was not conducted. |
| USABLE1 | Is this study usable for analysis using CPDB data as best estimates? | Computed (Urban/Rural) | 0=no, 1=yes |
| USABLE2 | Is this study usable for analysis using harvest tickets/permit records as best estimates? | Computed (Urban/Rural) | 0=no, 1=yes |
| ***DEMOGRAPHIC VARIABLES -- POPULATION SIZE AND CHARACTERISTICS*** | | | |
| COMMPOP | Estimate of number of people residing in the PAC during the harvest study year | CPDB | |
| POP2000 | Estimate of number of people residing in the PAC in 2000 | U.S. Census 2000 | |
| ANALPOP | Estimate of number of people residing in the PAC (based on 2000 Census data) | Computed (Urban/Rural) | These pop's are assigned to tracts, CDP's or CDP groups, depending on the methodology and may have "balance of borough" populations added. |
| BOROPOP | Borough Population | U.S. Census 2000 | |
| TRACTPOP | Census Tract Population | U.S. Census 2000 | |
| POP1990 | Estimate of number of people residing in the PAC in 1990 | U.S. Census 1990 | |
| POPDR | The population dependency ratio | U.S. Census 2000 | The number of people less than 18 years of age divided by the number of people 18 years or older. |
| NATSURV | Estimate of percentage Alaska Native residents during the harvest study year | CPDB | If available, this number derives from the CPDB harvest survey and so is linked to the study year. In cases where it was not asked, the census estimate closest temporally to the study year (1990 or 2000) was used. |
| NAT2000 | Estimate of percentage of Alaska Native residents in 2000 | U.S. Census 2000 | In cases where a PAC did not have a direct census match, an estimate was made based using a near-equivalent area. |
| NAT1990 | Estimate of percentage of Alaska Native residents in 1990 | U.S. Census 1990 | |
| HHSIZE | Average household size during the harvest study year | CPDB | |
| BORNLOCA | Percentage of household heads born locally | CPDB | "Local" means the study community, an abandoned antecedent to the present community, any associated camps where residents reside seasonally, or places considered by residents to belong to the local tribal/social group). |
| AVGRES | Average years of local residency of all household heads | CPDB | |

## Appendix A. Variables List (p. 3)

| Variable Name | Variable Description | Data Source | Notes |
|---|---|---|---|
| CENHOU90 | 1990 U.S. census number of occupied housing units | U.S. Census 1990 | |
| TOTPOP2 | Total Population, 2000 | U.S. Census 2000 | |
| WPOP2 | White Population, 2000 | U.S. Census 2000 | |
| BPOP2 | Black Population, 2000 | U.S. Census 2000 | |
| NATPOP2 | Native Population, 2000 | U.S. Census 2000 | |
| ASPOP2 | Asian Population, 2000 | U.S. Census 2000 | |
| HAWPOP2 | Hawaian Population, 2000 | U.S. Census 2000 | |
| OTHPOP2 | Other Population, 2000 | U.S. Census 2000 | |
| TWORPOP2 | Two or More Races Population, 2000 | U.S. Census 2000 | |
| PCTNAT2 | Percent Native, 2000 | U.S. Census 2000 | |
| MALPOP2 | Male Population, 2000 | U.S. Census 2000 | |
| FEMPOP2 | Female Population, 2000 | U.S. Census 2000 | |
| MEDAGE2 | Median Age of Population, 2000 | U.S. Census 2000 | |
| POP18O2 | Population 19 and Over, 2000 | U.S. Census 2000 | |
| POP62O2 | Population 62 and Over, 2000 | U.S. Census 2000 | |
| HUTOT2 | Total Housing Units, 2000 | U.S. Census 2000 | |
| HUOCC2 | Housing Units Occupied, 2000 | U.S. Census 2000 | |
| HUVAC2 | Housing Units Vacant, 2000 | U.S. Census 2000 | |
| HUVSEAS2 | Housing Units Vacant Seasonal Use, 2000 | U.S. Census 2000 | |
| AGE16O9 | Age 16 and Over, 1990 | U.S. Census 1990 | |
| ***DEMOGRAPHIC VARIABLES -- POPULATION DENSITY*** | | | |
| DNSDUA30 | The density of weighted population in a 30 mi. "standard daily use" area (per sq mi) | Computed variable | Defined as the sum of the weighted populations within 30 miles of a census tract's centroid divided by 2,826 sq mi. |
| DNSDUA20 | The density of weighted population in a 20 mi. "standard daily use" area (per sq mi) | Computed variable | Defined as the sum of the weighted populations within 20 miles of a census tract's centroid divided by 1,256 sq mi. |
| DNSDUA10 | The density of weighted population in a 10 mi. "standard daily use" area (per sq mi) | Computed variable | Defined as the sum of the weighted populations within 10 miles of a census tract's centroid divided by 314 sq mi. |
| LGDEN30 | Log of the weighted density of population in a "standard daily use" area (per 100 sq mi) | Computed variable | Log (Base 10) of DENSDUA30 times 100 |
| LGDEN20 | Log of the weighted density of population in a "standard daily use" area (per 100 sq mi) | Computed variable | Log (Base 10) of DENSDUA20 times 100 |
| LGDEN10 | Log of the weighted density of population in a "standard daily use" area (per 100 sq mi) | Computed variable | Log (Base 10) of DENSDUA10 times 100 |
| WDENS30 | The weighted population in a 30 mi. "standard daily use" area | Computed variable | The sum of the weighted populations within 30 miles of a census tract's centroid |
| WDENS20 | The weighted population in a 20 mi. "standard daily use" area | Computed variable | The sum of the weighted populations within 20 miles of a census tract's centroid |
| WDENS10 | The weighted population in a 10 mi. "standard daily use" area | Computed variable | The sum of the weighted populations within 10 miles of a census tract's centroid |
| POPMI30 | The unweighted population within 30 miles of a PAC | Computed variable | The sum of the unweighted populations within 30 miles of a census tract's centroid |
| POPMI20 | The unweighted population within 20 miles of a PAC | Computed variable | The sum of the unweighted populations within 20 miles of a census tract's centroid |
| POPMI10 | The unweighted population within 10 miles of a PAC | Computed variable | The sum of the un weighted populations within 10 miles of a census tract's centroid |

## Appendix A. Variables List (p. 4)

| Variable Name | Variable Description | Data Source | Notes |
|---|---|---|---|
| DNASDUA | The density of population in an "adjusted standard daily use" area, adjusted to remove unused areas. | Computed variable | The sum of the weighted populations within 30 miles of a census tract's centroid divided by 2,826 sq mi minus unused areas (such as glaciers and unused waters). |
| LANDSMI | Total Square Miles of Land in the PAC | U.S. Census 2000 | |
| ***ECONOMIC VARIABLES -- COUNTRY FOOD PROCUREMENT AND USE*** | | | |
| CPDBPCAP | Per capita wild food harvest - lbs | CPDB (ADF&G Harvest Survey) | |
| ADJPCAP | Adjusted per capita wild food harvest - lbs (dog food removed) | Computed variable (CPDB) | 9 communities out of 177 baseline surveys have an adjusted per capita harvest. |
| HTPRPCAP | Per capita wild food harvest generated from harvest tickets, permit records, and sport license surveys. | Computed (Urban/Rural) | |
| PERCAP1 | Per capita wild food harvests (lbs) - combined estimate 1 | Computed (Urban/Rural) | Information from ADJCAP and HTPRPCAP (ADJCAP estimate takes priority over HTPRPCAP). |
| LGPCAP1 | Log of per capita wild food harvests (lbs) - combined estimate 1 (Base 10) | Computed (Urban/Rural) | Log of PERCAP1 |
| PERCAP2 | Per capita wild food harvests (lbs) - combined estimate 2 | Computed (Urban/Rural) | Information from ADJCAP and HTPRPCAP (HTPRPCAP takes priority over ADJCAP). |
| LGPCAP2 | Log of per capita wild food harvests (lbs) - combined estimate 2 (Base 10) | Computed (Urban/Rural) | Log of PERCAP2 |
| PERCAP3 | Per capita wild food harvests (lbs) - combined estimate 3 | Computed (Urban/Rural) | Information from ADJCAP and HTPRPCAP (Mean of HTPRPCAP and ADJCAP). |
| LGPCAP3 | Log of per capita wild food harvests (lbs) - combined estimate 3 (Base 10) | Computed (Urban/Rural) | Log of PERCAP3 |
| SPECOUNT | Count of resources used or harvested by any household during the study year | Computed variable (CPDB) | |
| USECOUNT | Count of resources used by any household during the study year | Computed variable (CPDB) | |
| NUSED50 | Count of resources used by 50% or more of households during the study year | Computed variable (CPDB) | 23 communities with missing data and 7 communities where "used" was asked inconsistently received estimated values based on Wolfe's knowledge of use patterns. |
| GIVECOUNT | Count of resources harvested by any given during study year | | |
| RECCOUNT | Count of resources received by any household during study year | | |
| PCTGIVEN | Percentage of available resources given by 1 or more households | Computed variable (CPDB) | GIVECOUNT / UNIQRES |
| PCTRECVD | Percentage of available resources received by 1 or more households | Computed variable (CPDB) | RECCOUNT / UNIQRES |
| NGIV25 | Count of resources given by 25% or more households during study year | Computed variable (CPDB) | |
| NREC25 | Count of resources received by 25% or more households during study year | Computed variable (CPDB) | |
| PCTGIV1 | Percentage of harvested resources given by 1 or more households | Computed variable (CPDB) | GIVECOUNT / HRVCOUNT |
| PCTREC1 | Percentage of harvested resources received by 1 or more households | Computed variable (CPDB) | RECCOUNT / HRVCOUNT |
| PCTGIV2 | Percentage of harvested or used resources given by 1 or more households | Computed variable (CPDB) | GIVECOUNT / SPECOUNT |
| PCTREC2 | Percentage of harvested or used resources received by 1 or more households | Computed variable (CPDB) | RECCOUNT / SPECOUNT |
| PCTGVALL | Percentage of households giving any resource | CPDB | |
| PCTGVSLM | Percentage of households giving salmon | CPDB | |
| PCTGVLML | Percentage of households giving land mammals | CPDB | |
| PCTRCALL | Percentage of households receiving any resource | CPDB | |

## Appendix A. Variables List (p. 5)

| Variable Name | Variable Description | Data Source | Notes |
|---|---|---|---|
| PCTRCSLM | Percentage of households receiving salmon | CPDB | |
| PCTRCLML | Percentage of households receiving land mammals | CPDB | |
| HRVCOUNT | Count of resources harvested by any household during study year | Computed variable (CPDB) | |
| NHARV50 | Count of resources harvested by 50% or more of households during the study year | Computed variable (CPDB) | |
| ***ECONOMIC VARIABLES -- LOCATION IN ECONOMIC NETWORKS*** | | | |
| COLSUB1 | Cost of living region/subregion code | CPDB (AK Cooperative Extension Service) | |
| COLSUBRE | Cost of living region/subregion | CPDB (AK Cooperative Extension Service) | |
| COLAVG | Cost of food at home index | CPDB (AK Cooperative Extension Service) | Index is relative to Anchorage calendar year average (or 5 yr avg) extrapolated from surveyed communities similarly situated with regard to transportation and distribution systems. |
| ***ECONOMIC VARIABLES -- ECONOMIC ACTIVITY*** | | | |
| COMMFISH | Percentage of households with members employed in commercial fishing | CPDB | |
| FSHNTRAP | Percentage of households with members employed in fishing, hunting, or trapping | CPDB | |
| HUNTTRAP | Percentage of households with members employed in hunting or trapping | CPDB | |
| EMPTOT9 | Total Employment, 1990 | U.S. Census 1990 | |
| EMPAF9 | Armed Forces Employment, 1990 | U.S. Census 1990 | |
| EMPPVT9 | Private Sector Employment, 1990 | U.S. Census 1990 | |
| EMPLG9 | Local Government Employment, 1990 | U.S. Census 1990 | |
| EMPST9 | Sate Government Employment, 1990 | U.S. Census 1990 | |
| EMPFED9 | Federal Government Employment, 1990 | U.S. Census 1990 | |
| EMPSELF | Self Employed, 1990 | U.S. Census 1990 | |
| UNEMP9 | Unemployed and Seeking Work, 1990 | U.S. Census 1990 | |
| NOTSEEK9 | Not Seeking Employment, 1990 | U.S. Census 1990 | |
| PADNWK | Percentage Adults Not Working | U.S. Census 2000 | |
| EMPED | Employment in Educational Services | DCED | |
| CFPERMIT1 | Number of Commercial Fishing Permits | DCED | |
| CFPERMIT2 | Pecentage Population with Commercial Fishing Permits | Computed from DCED | |
| HHINCM9 | Median Household Income, 1990 | U.S. Census 1990 | |
| FAMINCM9 | Median Family Income, 1990 | U.S. Census 1990 | |
| PCTPOV9 | Percent in Poverty Status, 1990 | U.S. Census 1990 | |
| PCTUNEM9 | Percent Unemployed, 1990 | U.S. Census 1990 | |
| PCTADNWK | Percent Adults Not Working and Not Seeking Work, Not in Labor Force | U.S. Census 1990 | |
| CENINC90 | 1990 U.S. census average household income | U.S. Census 1990 | |
| LOCREV | Local Government Revenues | DCED | |
| OREVNOE | Outside Revenues Excluding Education | DCED | |

## Appendix A. Variables List (p. 6)

| Variable Name | Variable Description | Data Source | Notes |
|---|---|---|---|
| SFREVED | State-Federal Education Funding | DCED | |
| OREV | Outside Revenues (Subtotal) | DCED | |
| TOTREV | Operation Capital | DCED | |
| CPREV | Capital Projects Revenue | DCED | |
| EXPGEN | General Government Expenditures | DCED | |
| EXPPOL | Police Expenditures | DCED | |
| EXPFR | Fire Expenditures | DCED | |
| EXPPSA | Public Safety (Subtotal) | DCED | |
| EXPPSNE | Public Services Excluding Education | DCED | |
| EXPED | Education Expenditures | DCED | |
| EXPDBR | Debt Retirement Expenditures | DCED | |
| EXPTOTOP | Total Operating Expenditures | DCED | |
| EXPCAP | Capital Projects Expenditures | DCED | |
| EXPTOT | Total All Expenditures | DCED | |
| ***CULTURAL FACTORS -- KNOWLEDGE SYSTEMS REGARDING NATURE*** | | | |
| RRFISH1 | Percentage of a community's fish harvested with rod and reel gear | Computed variable (CPDB) | The value for this variable derives from CPDB repyear=1 study year, except for 3 PAC's where the repyear did not provide gear data, but another baseline survey with gear data was available. |
| RRFISH2 | Percentage of a community's fish harvested with rod and reel gear | Computed variable (CPDB) | See RRFISH1 note, except that for PACs with duplicate surveys, the value is computed from fish permit and license records. |
| RODFISH | Percentage of households harvesting fish with rod and reel gear | CPDB | |
| RRLIC99 | Per capita number of Sport Fish licenses purchased during 1999 | ADF&G Sport Fish License Files | |
| INDIGNDX | Indigenous Food Index: the mean percentage of households using six locally available types of wild foods. | Computed variable (CPDB) | Prevalence of Alaska Native food traditions. |
| IFINO | Indigenous Food Index Number | Computed variable | This variable identifies which set of species is the basis for the INDIGNDX: 1. Southern (chitons, gull eggs, harbor seals, octopus, clams, deer/caribou) 2. Aleutians (same as Southern except sealions replace deer/caribou) 3. Northern (ducks, whitefish/cisco, pike/lake trout, caribou/moose/seal, beaver/porqupine/parka squirrel, grouse/ptarmigan) 4. Other (unique - used for Norton Sound up and the Pribilofs) |
| UNIQRES | Number of unique resources available within the community's GEOPSREG | Computed variable (CPDB) | Used to compute PCTAVAIL and PCTAVL50 |
| PCTAVAIL | Percentage of available species (UNIQRES) used by HHs in the community during the study year | Computed variable (CPDB) | Local resources treated as "edible". |
| PCTAVL50 | Percentage of available species (UNIQRES) used by 50% or more of HHs in the community during the study year | Computed variable (CPDB) | Local resources treated as "edible". |
| CHITONS | Percentage of housholds using chitons | CPDB | A component of the INDIGNDX |
| GULLEGGS | Percentage of households using gull eggs | CPDB | A component of the INDIGNDX |
| HARBSEAL | Percentage of households using harbor seals | CPDB | A component of the INDIGNDX |
| OCTOPUS | Percentage of households using octopus | CPDB | A component of the INDIGNDX |
| CLAMS | Percentage of households using clams | CPDB | A component of the INDIGNDX |
| DEERCARI | Percentage of households using deer or caribou | CPDB | A component of the INDIGNDX |
| SEALION | Percentage of households using sea lion | CPDB | A component of the INDIGNDX |
| BEAPORSQ | Percentage of households using beaver, porcupine, or parka squirrel | CPDB | A component of the INDIGNDX |
| DUCKS | Percentage of households using ducks | CPDB | A component of the INDIGNDX |
| WHITECIS | Percentage of households using whitefish or cisco | CPDB | A component of the INDIGNDX |
| PIKETROU | Percentage of households using pike or trout | CPDB | A component of the INDIGNDX |

## Appendix A. Variables List (p. 7)

| Variable Name | Variable Description | Data Source | Notes |
|---|---|---|---|
| CARMOSL | Percentage of households using caribou, moose, or seal | CPDB | A component of the INDIGNDX |
| GROUPTAR | Percentage of households using grouse or ptarmigan | CPDB | A component of the INDIGNDX |
| ***LANDSCAPE AND COMMUNITY INFRASTRUCTURE*** | | | |
| INCTYPE | Incorporated as (1st Class City, etc.) | DCED | |
| INCDATE | Incorporation Date | DCED | |
| ROADCON | Connected to Road System | DCED | |
| STFERRY | Connected to Ferry System | DCED | |
| ROAD | Is community road connected? | CPDB | 1=yes, 2=no; road connected includes the Alaska Marine Highway System |
| HUOC | Housing Units Occupied | U.S. Census 2000 | |
| HUOOC | Owner Occupied Housing Units | U.S. Census 2000 | |
| HUSFAM | Single Family Housing Units | U.S. Census 2000 | |
| HHFAM | Family Households | U.S. Census 2000 | |
| HHPPL | Percentage Households Without Full Plumbing | U.S. Census 2000 | |
| HHPKIT | Percentage Households Without Full Kitchens | U.S. Census 2000 | |
| HHPPW | Percentage Households on Public Water | U.S. Census 2000 | |
| HHPWW | Percentage Households on Well Water | U.S. Census 2000 | |
| HHPOW | Percentage Households on Other Water | U.S. Census 2000 | |
| HHPPS | Percentage Households on Public Sewer | U.S. Census 2000 | |
| HHPSEP | Percentage Households on Individual Septic System | U.S. Census 2000 | |
| HHPOS | Percentage Households on Other Sewage Disposal | U.S. Census 2000 | |
| HHPHOL | Percentage Households Heating with Oil/Kerosene | U.S. Census 2000 | |
| HHPHWD | Percentage Households Heating with Wood | U.S. Census 2000 | |
| HHPNPH | Percentage Households Without Phone Service | U.S. Census 2000 | |
| PIPH2O | Piped Water Distribution System for Community | DCED | |
| PIPSEW | Piped Sewage System for Community | DCED | |
| COMSEP | Community Septic System | DCED | |
| OUTHS | Outhouses | DCED | |
| REFUSED | Refuse Service | DCED | |
| PCESUBD | Power Cost Equilization Subsidy | DCED | |
| HOSPIT | Hospital | DCED | |
| CLINIC | Clinic | DCED | |
| POLICE | Paid Commissioned Police Department | DCED | |
| FIRE | Paid Fire Department | DCED | |
| ALTHCR? | Alternative Health Care | DCED | |
| SCHDIST | School District Type | DCED | |
| NUMSCH | Number Schools | DCED | |
| NUMSTU | Number Students | DCED | |

# APPENDIX B

# DISCRIMINANT ANALYSIS RUNS SUMMARY

Fourteen separate discriminant analyses were performed examining statistical models for separating case populations into distinct clusters. The runs were conducted to examine the outcomes of alternative approaches in their treatment of: (1) initial group classifications; (2) source of data; and (3) measurement of density. The outcomes of the fourteen analyses are summarized in Appendix B Table. Each column in the table represents a discriminant analysis run. The conditions underlying each run are listed in the column headings. The first four pages of the table (p. 1-4) present outcomes for Runs 1-6 and Run A, which use as initial groupings of case populations Federal and State board findings. The second four pages of the table (p. 5-8) present outcomes for Runs 7-12 and Run B, which use threshold populations to initially group cases.

Several outcomes are presented for each run. The *canonical correlation* and the *squared canonical correlation* measure the extent that the model's independent variables (the discriminants) account for the variation in the dependents (the grouped cases). For instance, in Run A with a canonical correlation of 0.907, 82.3% of the variation is explained by the discriminants. These are measures of the overall performance of the model. Run A was selected as the "best analysis" because it displayed the highest canonical correlation, indicating it was most successful at separating cases into distinct groups.

The discriminant equation (criterion) resulting from each run can be constructed from the Variable 1 coefficient, Variable 2 coefficient, and the constant, as described in the main report. For instance, the equation for Run A is *L = 2.828(LGPCAP3) - .812(LGDEN30) – 4.828*. The Group 1 centroid and Group 2 centroid provide the center score of each group for the discriminant function. The classification rate indicates the extent to which the final classification of cases using the discriminant score matched the classification of cases in the initial groupings.

Final classifications of case populations ("rural" or "non-rural") are listed for each run. A case was classified into the group with the nearest centroid, as measured by the Mahalanobis distances (these are not presented in the summary). Non-rural classifications are indicated by a *U*, while rural classifications are indicated by an *R*. Rural cells are shaded to assist in comparison across runs.

Overall, the fourteen discriminant analyses resulted in similar classifications for most case populations. Variations in initial groupings, data sources, and density measures produced little change in the clustering of the majority of cases. This probably results from an empirical fact that most rural and non-rural cases cluster into distinct groups that are measured by the discriminants and are identifiable using any of the models.

The models produced some differing classifications for populations near urban fringes, for a few mid-sized communities, and for the roaded areas of the Kenai Peninsula. This probably reflects the complexities presented by the mosaic of populations commonly found in rural-urban fringe areas. It also reflects the unique characteristics of a few mid-sized populations that differ from most other Alaska cases clustered by the discriminant analysis. A brief discussion comparing runs follows.

Initial Groups

In discriminant analysis, initial groupings of cases are advanced to focus the analysis on appropriate discriminating variables and separation points. Initial groupings of case populations were identified using two alternative approaches. In one approach, cases were assigned to initial groups based on population thresholds. Populations less than 2,500 were initially labeled "rural," populations greater than 7,000 were initially labeled "non-rural," and populations 2,500 to 7,000 were not classified. The population thresholds are similar to initial presumption standards in federal subsistence regulations (50 CFR 100.___ and 36 CFR 242.___). Runs conducted with initial groups based on population thresholds are summarized in the Appendix as Runs 7 to 12 and Run B.

An inherent ambiguity using population thresholds is the basis for calculating a case population's size. Should population size be based on the people within a case population's boundaries, which are defined by the federal census? Or is it based on the population within a standard distance from a case population? This is an issue of using consistent rules for measuring population size. For our assessments, we defined a case's population using a standard distance applied to all cases consistently. Three distances were used to define the size of case's population (10 miles, 20 miles, and 30 miles). That is, under a 10-mile standard, a case's threshold status is measured by counting all the people living within ten miles of the case population's centroid. Under a 20-mile standard, it is all the people living within 20 miles of case population's centroid. Under a 30-mile standard, it is all people living within 30 miles of a case population's centroid. Separate runs examining outcomes under each assumption were conducted, as shown by comparing Runs 7, 8, and 9 with each other, or by comparing Runs 10, 11, and 12 with each other.

As an alternative approach for defining initial groupings, cases were assigned to initial groups based on classifications of the Federal Subsistence Board and the State Joint Board of Fisheries and Game. Case populations classed as "rural" by both boards were initially labeled "rural," while case populations labeled as "non-rural" by both boards were initially labeled "non-rural." Case populations for which the federal and state board classifications differed were left unclassified. Runs conducted with initial groups defined by board classifications are summarized in the Appendix as Runs 1 to 6 and Run A.

Overall, the runs using population thresholds for initial groupings performed less well in separating cases into distinct groups than runs using board classifications for initial groupings. This is indicated by the squared canonical correlation. Starting with population thresholds, the discriminant functions were able to discriminant about 75% to 79% of the variability in the dependents (cases) (canonical correlations of 0.863 to

0.888). By comparison, runs using board classifications as starting points were able to discriminant about 81%-82% of the variability in the dependents (cases) (canonical correlations of 0.902 to 0.907). A good comparison is Run A (82.3%, 0.907) and Run B (78.1%, 0.884), both using equivalent conditions except for initial groupings.

Overall, the initial groupings also affected the classification of a few mid-sized cases (Kodiak City, Petersburg, Sitka, Unalaska, and Valdez). The initial presumption that cases above 7,000 people are "non-rural" appears to lead the discriminant function to classify mid-sized populations into the "non-rural" cluster, while an initial presumption that places like Kodiak City and Sitka are "rural" leads to a different outcome. Such mid-sized places appear to be relatively unique communities that differ from the main two clusters of cases. The presumption that a 7,000 cut-point has some significance is sufficient to push the classification of these mid-sized places into the "non-rural" group.

The initial groupings also appear to affect the classification of Saxman, a co-resident community. For example, comparing Runs A and B, Saxman is "non-rural" in Run B but "rural" in Run A. A second co-resident community (Sitka Tribe) is classified as "rural" in both Runs A and B.

Measurement of Density

Runs were conducted to examine the potential effects of measuring density by standard distances of 10 miles, 20 miles, or 30 miles from the origin population. A comparison of Runs 1, 2, and 3, or a comparison of Runs 4, 5, and 6, allows for an isolation of this factor. Such comparisons show that the classification of cases appears unaffected by the choice of distances. This suggests that there is substantial stability in the density measure across these variant distances. As long as a consistent distance is applied across all cases, the choice of 10 miles, 20 miles, or 30 miles is irrelevant for most outcomes. The 30-mile distance was chosen because the squared canonical correlation was higher for that distance than the others. A more detailed discussion of the density measure will be provided in the final report.

Source of Harvest Data

One problematic issue is how to estimate *country food production* for case populations with dual (duplicate) harvest estimates from the Community Profile Database and Harvest Ticket/Permit Records. For a few case populations, estimates are available from both sources. Dual estimates are available for certain cases in the Kenai Peninsula Borough and the Matanuska-Susitna Borough. In most instances, the estimated harvests from the CPDB are higher than the estimated harvests from the Harvest Ticket/Permit Records. The discrepancies may be due to different sampling biases connected to low sampling fractions and high non-response rates within certain surveyed populations. Our runs assessed the potential differences in outcomes associated with the harvest measure used in the analysis.

An assessment of effects of the *source of harvest estimates* can be made by comparing Run 1 with Run 4, Run 2 with Run 5, and Run 3 with Run 6 (these are runs with equivalent conditions except for source of harvest estimates). Overall, it appears that a

few cases with dual data sources change classification depending upon the data source used (Talkeetna, Fritz Creek, Hope, Nikolaevsk). The choice of data has no apparent affect on the canonical correlations of the outcomes. To deal with these difficulties, in the "best run" (Run A), a decision was made to average harvest estimates for the few cases where dual estimates were available, as described in the main report. Under this assumption, Run A classified Talkeetna and Fritz Creek "non-rural" and Hope and Nikolaevsk "rural." However, as discussed in the main report, these were "tentative" classifications because of their distances from the group centroid (except for Hope). Tentative classifications would be subjected to additional assessments with ancillary criteria.

## Appendix B Table (p.1) Summary of Discriminant Analysis Runs A and 1 - 6

| INITIAL GROUPINGS | Initial Groups: Federal and State Subsistence Findings | | | | | | |
|---|---|---|---|---|---|---|---|
| HARVEST DATA FOR DUPLICATES | Means | CPDB Harvests for Duplicates | | | Tickets/Permits for Duplicates | | |
| DENSITY USED | Dens30 | Dens30 | Dens20 | Dens10 | Dens30 | Dens20 | Dens10 |
| AGGREGATE USED | ** | ** | ** | ** | ** | ** | ** |
| RUN ANALYSIS ID | A | 1 | 2 | 3 | 4 | 5 | 6 |
| Canonical Correlation | 0.907 | 0.905 | 0.904 | 0.902 | 0.906 | 0.905 | 0.903 |
| Canonical Correlation (Sq) | **82.3%** | **81.9%** | **81.7%** | **81.4%** | **82.1%** | **81.9%** | **81.5%** |
| V1 Coefficient | -0.812 | -0.833 | -0.763 | -0.689 | -0.805 | -0.738 | -0.672 |
| V2 Coefficient | 2.828 | 2.765 | 2.847 | 2.935 | 2.809 | 2.888 | 2.972 |
| Constant | -4.882 | -4.718 | -4.756 | -4.696 | -4.839 | -4.875 | -4.800 |
| G1 Centroid | -3.352 | -3.314 | -3.282 | -3.244 | -3.332 | -3.301 | -3.271 |
| G2 Centroid | 1.371 | 1.356 | 1.342 | 1.327 | 1.363 | 1.351 | 1.338 |
| *Classification Rate* | *98.4%* | *98.4%* | *98.4%* | *98.4%* | *97.8%* | *97.8%* | *98.4%* |
| 1 Lake Otis | U | U | U | U | U | U | U |
| 2 Russian Jack | U | U | U | U | U | U | U |
| 3 Midtown | U | U | U | U | U | U | U |
| 4 University | U | U | U | U | U | U | U |
| 5 Merrill Field | U | U | U | U | U | U | U |
| 6 Northfork | U | U | U | U | U | U | U |
| 7 MidFork-RusJack | U | U | U | U | U | U | U |
| 8 Delaney Lake | U | U | U | U | U | U | U |
| 9 Campbell Creek | U | U | U | U | U | U | U |
| 10 Little Campbell Creek | U | U | U | U | U | U | U |
| 11 Spenard | U | U | U | U | U | U | U |
| 12 Downtown | U | U | U | U | U | U | U |
| 13 Muldoon | U | U | U | U | U | U | U |
| 14 Avenue Fifteen | U | ` | U | U | U | U | U |
| 15 Ship Creek | U | U | U | U | U | U | U |
| 16 Airport | U | U | U | U | U | U | U |
| 17 OMalley | U | U | U | U | U | U | U |
| 18 Lower OMalley-Cambell Lk | U | U | U | U | U | U | U |
| 19 Coastal Refuge | U | U | U | U | U | U | U |
| 20 Rabbit Creek | U | U | U | U | U | U | U |
| 21 Elmendorf | U | U | U | U | U | U | U |
| 22 Fort Richardson | U | U | U | U | U | U | U |
| 23 Upper OMalley | U | U | U | U | U | U | U |
| 24 Eagle River | U | U | U | U | U | U | U |
| 25 Chugiak | U | U | U | U | U | U | U |
| 26 Eklutna | U | U | U | U | U | U | U |
| 27 Girdwood | U | U | U | U | U | U | U |
| 28 Central Fairbanks | U | U | U | U | U | U | U |
| 29 Southwest Fairbanks | U | U | U | U | U | U | U |
| 30 North Pole Area | U | U | U | U | U | U | U |
| 31 Fort Wainwright | U | U | U | U | U | U | U |
| 32 Northwest Fairbanks | U | U | U | U | U | U | U |
| 33 Northeast Fairbanks | U | U | U | U | U | U | U |
| 34 Eielson AFB | U | U | U | U | U | U | U |
| 35 North Fairbanks | U | U | U | U | U | U | U |
| 36 Salcha-Harding | U | U | U | U | U | U | U |
| 37 Juneau City and Borough | U | U | U | U | U | U | U |
| 38 Big Lake | U | U | U | U | U | U | U |
| 39 Glacier View CDP | U | U | U | U | U | U | U |
| 40 Houston | U | U | U | U | U | U | U |
| 41 Palmer (group) | U | U | U | U | U | U | U |
| 44 Skwentna (group) | R | R | R | R | R | R | R |
| 45 Sutton-Alpine | U | U | U | U | U | U | U |
| 46, 47 Talkeetna | U | U | U | U | R | U | U |
| 48 Trapper Creek | U | R | R | R | U | U | U |
| 49 Wasilla (group) | U | U | U | U | U | U | U |
| 50 Willow (group) | U | U | U | U | U | U | U |
| 51 Anchor Point (group) | U | U | U | U | U | U | U |
| 52 Clam Gulch | R | R | R | R | R | R | R |
| 53 Cooper Landing | R | R | R | R | R | R | R |

## Appendix B Table (p.2). Summary of Discriminant Analysis Runs A and 1 - 6

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| INITIAL GROUPINGS | Initial Groups: Federal and State Subsistence Findings | | | | | | |
| HARVEST DATA FOR DUPLICATES | Means | CPDB Harvests for Duplicates | | | Tickets/Permits for Duplicates | | |
| DENSITY USED | Dens30 | Dens30 | Dens20 | Dens10 | Dens30 | Dens20 | Dens10 |
| AGGREGATE USED | ** | ** | ** | ** | ** | ** | ** |
| RUN ANALYSIS ID | A | 1 | 2 | 3 | 4 | 5 | 6 |
| 54 Fritz Creek CDP | U | R | R | R | U | U | U |
| 56, 57 Homer | U | U | U | U | U | U | U |
| 58, 59 Hope | R | R | R | R | U | U | U |
| 60 Kasilof (group) | U | U | U | U | U | U | U |
| 61, 62 Kenai | U | U | U | U | U | U | U |
| 64 Moose Pass (group) | U | U | U | U | U | U | U |
| 65 Nikiski | U | U | U | U | U | U | U |
| 66 Nikolaevsk | R | R | R | R | U | U | U |
| 67 Ninilchik | R | R | R | R | R | R | R |
| 68 North Fork Road | U | R | R | R | | | |
| 69, 70 Seldovia | R | R | R | R | U | U | R |
| 71 Seward (group) | U | U | U | U | U | U | U |
| 72 Soldotna (group) | U | U | U | U | U | U | U |
| 73 Voznesenka | R | R | R | R | | | |
| 74 Whittier | R | R | R | R | R | R | R |
| 75 Valdez | R | R | R | R | R | R | R |
| 76 Ketchikan | U | U | U | U | U | U | U |
| 77 Saxman | R | R | R | R | R | R | R |
| 78 Akhiok | R | R | R | R | R | R | R |
| 80 Akutan | R | R | R | R | R | R | R |
| 81 Alakanuk | R | R | R | R | R | R | R |
| 82 Aleknagik | R | R | R | R | R | R | R |
| 83 Allakaket/Alatna | R | R | R | R | R | R | R |
| 84 Anderson | R | R | R | R | R | R | R |
| 85 Angoon | R | R | R | R | R | R | R |
| 86 Anvik | R | R | R | R | R | R | R |
| 87 Atka | R | R | R | R | R | R | R |
| 88 Barrow | R | R | R | R | R | R | R |
| 89 Beaver | R | R | R | R | R | R | R |
| 90 Bettles-Evansville | R | R | R | R | R | R | R |
| 91 Brevig Mission | R | R | R | R | R | R | R |
| 92 Cantwell | R | R | R | R | R | R | R |
| 94 Chenega Bay | R | R | R | R | R | R | R |
| 95 Chickaloon | R | R | R | R | R | R | R |
| 96 Chignik Bay | R | R | R | R | R | R | R |
| 97 Chignik Lagoon | R | R | R | R | R | R | R |
| 98 Chignik Lake | R | R | R | R | R | R | R |
| 99 Chistochina | R | R | R | R | R | R | R |
| 100 Chitina | R | R | R | R | R | R | R |
| 101 Clark's Point | R | R | R | R | R | R | R |
| 102 Coffman Cove | R | R | R | R | R | R | R |
| 103 Copper Center | R | R | R | R | R | R | R |
| 104 Cordova | R | R | R | R | R | R | R |
| 105 Craig | R | R | R | R | R | R | R |
| 106 Deering | R | R | R | R | R | R | R |
| 107 Dillingham | R | R | R | R | R | R | R |
| 110 Egegik | R | R | R | R | R | R | R |
| 111 Ekwok | R | R | R | R | R | R | R |
| 113 Emmonak | R | R | R | R | R | R | R |
| 114 False Pass | R | R | R | R | R | R | R |

## Appendix B Table (p.3). Summary of Discriminant Analysis Runs A and 1 - 6

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| INITIAL GROUPINGS | Initial Groups: Federal and State Subsistence Findings | | | | | | |
| HARVEST DATA FOR DUPLICATES | Means | CPDB Harvests for Duplicates | | | Tickets/Permits for Duplicates | | |
| DENSITY USED | Dens30 | Dens30 | Dens20 | Dens10 | Dens30 | Dens20 | Dens10 |
| AGGREGATE USED | ** | ** | ** | ** | ** | ** | ** |
| RUN ANALYSIS ID | A | 1 | 2 | 3 | 4 | 5 | 6 |
| 115 Fort Yukon | R | R | R | R | R | R | R |
| 116 Gakona | R | R | R | R | R | R | R |
| 117 Galena | R | R | R | R | R | R | R |
| 119 Glennallen | R | R | R | R | R | R | R |
| 120 Golovin | R | R | R | R | R | R | R |
| 121 Grayling | R | R | R | R | R | R | R |
| 122 Gulkana | R | R | R | R | R | R | R |
| 123 Gustavus | R | R | R | R | R | R | R |
| 124 Haines | R | R | R | R | R | R | R |
| 125 Healy | R | R | R | R | R | R | R |
| 126 Hollis | R | R | R | R | R | R | R |
| 127 Holy Cross | R | R | R | R | R | R | R |
| 128 Hoonah | R | R | R | R | R | R | R |
| 129 Hughes | R | R | R | R | R | R | R |
| 130 Huslia | R | R | R | R | R | R | R |
| 131 Hydaburg | R | R | R | R | R | R | R |
| 132 Hyder | R | R | R | R | R | R | R |
| 133 Igiugig | R | R | R | R | R | R | R |
| 134 Iliamna | R | R | R | R | R | R | R |
| 136 Kake | R | R | R | R | R | R | R |
| 137 Kaktovik | R | R | R | R | R | R | R |
| 140 Kenny Lake | R | R | R | R | R | R | R |
| 141 King Cove | R | R | R | R | R | R | R |
| 142 King Salmon | R | R | R | R | R | R | R |
| 143 Kivalina | R | R | R | R | R | R | R |
| 144 Klawock | R | R | R | R | R | R | R |
| 145 Klukwan | R | R | R | R | R | R | R |
| 146 Kodiak | R | R | R | R | R | R | R |
| 147 Kodiak Road | R | R | R | R | R | R | R |
| 149 Koliganek | R | R | R | R | R | R | R |
| 150 Kotlik | R | R | R | R | R | R | R |
| 151 Kotzebue | R | R | R | R | R | R | R |
| 152 Kwethluk | R | R | R | R | R | R | R |
| 153 Lake Louise | R | R | R | R | R | R | R |
| 154 Larsen Bay | R | R | R | R | R | R | R |
| 155 Levelock | R | R | R | R | R | R | R |
| 156 Manokotak | R | R | R | R | R | R | R |
| 158 McGrath | R | R | R | R | R | R | R |
| 159 McKinley Park Village | R | R | R | R | R | R | R |
| 160 Mentasta Lake | R | R | R | R | R | R | R |
| 162 Minto | R | R | R | R | R | R | R |
| 163 Mountain Village | R | R | R | R | R | R | R |
| 164 Naknek | R | R | R | R | R | R | R |
| 165 Nanwalek | R | R | R | R | R | R | R |
| 166 Naukati Bay | R | R | R | R | R | R | R |
| 167 Nelson Lagoon | R | R | R | R | R | R | R |
| 168 New Stuyahok | R | R | R | R | R | R | R |
| 169 Newhalen | R | R | R | R | R | R | R |
| 170 Nikolai | R | R | R | R | R | R | R |
| 172 Noatak | R | R | R | R | R | R | R |

## Appendix B Table (p.4). Summary of Discriminant Analysis Runs A and 1 - 6

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| INITIAL GROUPINGS | Initial Groups: Federal and State Subsistence Findings | | | | | | |
| HARVEST DATA FOR DUPLICATES | Means | CPDB Harvests for Duplicates | | | Tickets/Permits for Duplicates | | |
| DENSITY USED | Dens30 | Dens30 | Dens20 | Dens10 | Dens30 | Dens20 | Dens10 |
| AGGREGATE USED | ** | ** | ** | ** | ** | ** | ** |
| RUN ANALYSIS ID | A | 1 | 2 | 3 | 4 | 5 | 6 |
| 174 Northway | R | R | R | R | R | R | R |
| 175 Nuiqsut | R | R | R | R | R | R | R |
| 176 Nunapitchuk | R | R | R | R | R | R | R |
| 177 Old Harbor | R | R | R | R | R | R | R |
| 178 Ouzinkie | R | R | R | R | R | R | R |
| 180 Pedro Bay | R | R | R | R | R | R | R |
| 181 Pelican | R | R | R | R | R | R | R |
| 182 Perryville | R | R | R | R | R | R | R |
| 183 Petersburg | R | R | R | R | R | R | R |
| 184 Pilot Point | R | R | R | R | R | R | R |
| 186 Point Lay | R | R | R | R | R | R | R |
| 187 Port Alexander | R | R | R | R | R | R | R |
| 188 Port Alsworth | R | R | R | R | R | R | R |
| 189 Port Graham | R | R | R | R | R | R | R |
| 190 Port Heiden | R | R | R | R | R | R | R |
| 191 Port Lions | R | R | R | R | R | R | R |
| 192 Port Protection | R | R | R | R | R | R | R |
| 193 Quinhagak | R | R | R | R | R | R | R |
| 194 Saint Paul | R | R | R | R | R | R | R |
| 195 Sand Point | R | R | R | R | R | R | R |
| 196 Shageluk | R | R | R | R | R | R | R |
| 198 Shishmaref | R | R | R | R | R | R | R |
| 199 Sitka | R | R | R | R | R | R | R |
| 200 Sitka Tribe | R | R | R | R | R | R | R |
| 201 Slana | R | R | R | R | R | R | R |
| 202 South Naknek | R | R | R | R | R | R | R |
| 203 Stebbins | R | R | R | R | R | R | R |
| 204 Stevens Village | R | R | R | R | R | R | R |
| 205 Tanacross | R | R | R | R | R | R | R |
| 206 Tanana | R | R | R | R | R | R | R |
| 207 Tatitlek | R | R | R | R | R | R | R |
| 208 Tazlina | R | R | R | R | R | R | R |
| 209 Tenakee Springs | R | R | R | R | R | R | R |
| 210 Tetlin | R | R | R | R | R | R | R |
| 211 Thorne Bay | R | R | R | R | R | R | R |
| 212 Tok | R | R | R | R | R | R | R |
| 213 Tonsina | R | R | R | R | R | R | R |
| 215 Tyonek | R | R | R | R | R | R | R |
| 217 Unalaska | R | R | R | R | R | R | R |
| 218 Wainwright | R | R | R | R | R | R | R |
| 219 Wales | R | R | R | R | R | R | R |
| 220 Whale Pass | R | R | R | R | R | R | R |
| 221 Whitestone Logging Camp | R | R | R | R | R | R | R |
| 222 Wrangell | R | R | R | R | R | R | R |
| 223 Yakutat | R | R | R | R | R | R | R |

## Appendix B Table (p.5) Summary of Discriminant Analysis Runs B and 7 - 12

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| INITIAL GROUPINGS | Initial Groups: <2,500; 2,500-7000; >7,000 | | | | | | |
| HARVEST DATA FOR DUPLICATES | Means | CPDB Harvests for Duplicates | | | Tickets/Permits for Duplicates | | |
| DENSITY USED | Dens30 | Dens30 | Dens30 | Dens30 | Dens30 | Dens30 | Dens30 |
| AGGREGATE USED | 30-Miles | 30-Miles | 20-Miles | 10-Miles | 30-Miles | 20-Miles | 10-Miles |
| RUN ANALYSIS ID | B | 7 | 8 | 9 | 10 | 11 | 12 |
| Canonical Correlation | 0.884 | 0.863 | 0.883 | 0.884 | 0.876 | 0.888 | 0.885 |
| Canonical Correlation (Sq) | **78.1%** | **74.5%** | **78.0%** | **78.1%** | **76.7%** | **78.9%** | **78.3%** |
| V1 Coefficient | 1.464 | 1.413 | 1.485 | 1.691 | 1.391 | 1.507 | 1.771 |
| V2 Coefficient | -1.356 | -1.152 | -1.293 | -1.000 | -1.329 | -1.332 | -0.852 |
| Constant | 0.665 | 0.286 | 0.505 | -0.406 | 0.684 | 0.543 | -0.851 |
| G1 Centroid | 2.699 | 2.281 | 2.672 | 3.193 | 2.463 | 2.778 | 3.226 |
| G2 Centroid | -1.316 | -1.269 | 1.303 | -1.112 | -1.328 | -1.332 | -1.107 |
| *Classification Rate* | *97.2%* | *95.0%* | *96.7%* | *96.7%* | *96.0%* | *97.8%* | *97.2%* |
| 1 Lake Otis | U | U | U | U | U | U | U |
| 2 Russian Jack | U | U | U | U | U | U | U |
| 3 Midtown | U | U | U | U | U | U | U |
| 4 University | U | U | U | U | U | U | U |
| 5 Merrill Field | U | U | U | U | U | U | U |
| 6 Northfork | U | U | U | U | U | U | U |
| 7 MidFork-RusJack | U | U | U | U | U | U | U |
| 8 Delaney Lake | U | U | U | U | U | U | U |
| 9 Campbell Creek | U | U | U | U | U | U | U |
| 10 Little Campbell Creek | U | U | U | U | U | U | U |
| 11 Spenard | U | U | U | U | U | U | U |
| 12 Downtown | U | U | U | U | U | U | U |
| 13 Muldoon | U | U | U | U | U | U | U |
| 14 Avenue Fifteen | U | U | U | U | U | U | U |
| 15 Ship Creek | U | U | U | U | U | U | U |
| 16 Airport | U | U | U | U | U | U | U |
| 17 OMalley | U | U | U | U | U | U | U |
| 18 Lower OMalley-Cambell Lk | U | U | U | U | U | U | U |
| 19 Coastal Refuge | U | U | U | U | U | U | U |
| 20 Rabbit Creek | U | U | U | U | U | U | U |
| 21 Elmendorf | U | U | U | U | U | U | U |
| 22 Fort Richardson | U | U | U | U | U | U | U |
| 23 Upper OMalley | U | U | U | U | U | U | U |
| 24 Eagle River | U | U | U | U | U | U | U |
| 25 Chugiak | U | U | U | U | U | U | U |
| 26 Eklutna | U | U | U | U | U | U | U |
| 27 Girdwood | U | U | U | U | U | U | U |
| 28 Central Fairbanks | U | U | U | U | U | U | U |
| 29 Southwest Fairbanks | U | U | U | U | U | U | U |
| 30 North Pole Area | U | U | U | U | U | U | U |
| 31 Fort Wainwright | U | U | U | U | U | U | U |
| 32 Northwest Fairbanks | U | U | U | U | U | U | U |
| 33 Northeast Fairbanks | U | U | U | U | U | U | U |
| 34 Eielson AFB | U | U | U | U | U | U | U |
| 35 North Fairbanks | U | U | U | U | U | U | U |
| 36 Salcha-Harding | U | U | U | U | U | U | R |
| 37 Juneau City and Borough | U | U | U | U | U | U | U |
| 38 Big Lake | U | U | U | U | U | U | U |
| 39 Glacier View CDP | R | R | R | R | R | R | R |
| 40 Houston | U | U | U | U | U | U | U |
| 41 Palmer (group) | U | U | U | U | U | U | U |
| 44 Skwentna (group) | R | R | R | R | R | R | R |
| 45 Sutton-Alpine | U | U | U | U | U | U | U |
| 46, 47 Talkeetna | R | R | R | R | R | R | R |
| 48 Trapper Creek | R | R | R | R | R | R | R |
| 49 Wasilla (group) | U | U | U | U | U | U | U |
| 50 Willow (group) | U | U | U | U | U | U | U |
| 51 Anchor Point (group) | U | U | U | R | U | U | R |
| 52 Clam Gulch | R | R | R | R | R | R | R |
| 53 Cooper Landing | R | R | R | R | R | R | R |

## Appendix B Table (p.6) Summary of Discriminant Analysis Runs B and 7 - 12

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| INITIAL GROUPINGS | Initial Groups: <2,500; 2,500-7000; >7,000 | | | | | | |
| HARVEST DATA FOR DUPLICATES | Means | CPDB Harvests for Duplicates | | | Tickets/Permits for Duplicates | | |
| DENSITY USED | Dens30 | Dens30 | Dens30 | Dens30 | Dens30 | Dens30 | Dens30 |
| AGGREGATE USED | 30-Miles | 30-Miles | 20-Miles | 10-Miles | 30-Miles | 20-Miles | 10-Miles |
| RUN ANALYSIS ID | B | 7 | 8 | 9 | 10 | 11 | 12 |
| 54 Fritz Creek CDP | U | U | U | R | U | U | U |
| 56, 57 Homer | U | U | U | U | U | U | U |
| 58, 59 Hope | R | R | R | R | R | R | R |
| 60 Kasilof (group) | U | U | U | U | U | U | U |
| 61, 62 Kenai | U | U | U | U | U | U | U |
| 64 Moose Pass (group) | R | R | R | R | R | R | R |
| 65 Nikiski | U | U | U | U | U | U | U |
| 66 Nikolaevsk | R | R | R | R | U | U | R |
| 67 Ninilchik | R | R | R | R | R | R | R |
| 68 North Fork Road | U | R | R | R | | | |
| 69, 70 Seldovia | R | R | R | R | R | R | R |
| 71 Seward (group) | U | U | U | U | U | U | U |
| 72 Soldotna (group) | U | U | U | U | U | U | U |
| 73 Voznesenka | R | R | R | R | | | |
| 74 Whittier | R | R | R | R | R | R | R |
| 75 Valdez | U | U | U | U | U | U | U |
| 76 Ketchikan | U | U | U | U | U | U | U |
| 77 Saxman | U | U | U | R | U | U | U |
| 78 Akhiok | R | R | R | R | R | R | R |
| 80 Akutan | R | R | R | R | R | R | R |
| 81 Alakanuk | R | R | R | R | R | R | R |
| 82 Aleknagik | R | R | R | R | R | R | R |
| 83 Allakaket/Alatna | R | R | R | R | R | R | R |
| 84 Anderson | R | R | R | R | R | R | R |
| 85 Angoon | R | R | R | R | R | R | R |
| 86 Anvik | R | R | R | R | R | R | R |
| 87 Atka | R | R | R | R | R | R | R |
| 88 Barrow | R | U | R | R | R | R | R |
| 89 Beaver | R | R | R | R | R | R | R |
| 90 Bettles-Evansville | R | R | R | R | R | R | R |
| 91 Brevig Mission | R | R | R | R | R | R | R |
| 92 Cantwell | R | R | R | R | R | R | R |
| 94 Chenega Bay | R | R | R | R | R | R | R |
| 95 Chickaloon | R | R | R | R | R | R | R |
| 96 Chignik Bay | R | R | R | R | R | R | R |
| 97 Chignik Lagoon | R | R | R | R | R | R | R |
| 98 Chignik Lake | R | R | R | R | R | R | R |
| 99 Chistochina | R | R | R | R | R | R | R |
| 100 Chitina | R | R | R | R | R | R | R |
| 101 Clark's Point | R | R | R | R | R | R | R |
| 102 Coffman Cove | R | R | R | R | R | R | R |
| 103 Copper Center | R | R | R | R | R | R | R |
| 104 Cordova | R | R | R | R | R | R | R |
| 105 Craig | R | R | R | R | R | R | R |
| 106 Deering | R | R | R | R | R | R | R |
| 107 Dillingham | R | R | R | R | R | R | R |
| 110 Egegik | R | R | R | R | R | R | R |
| 111 Ekwok | R | R | R | R | R | R | R |
| 113 Emmonak | R | R | R | R | R | R | R |
| 114 False Pass | R | R | R | R | R | R | R |

## Appendix B Table (p.7) Summary of Discriminant Analysis Runs B and 7 - 12

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| INITIAL GROUPINGS | Initial Groups: <2,500; 2,500-7000; >7,000 | | | | | | |
| HARVEST DATA FOR DUPLICATES | Means | CPDB Harvests for Duplicates | | | Tickets/Permits for Duplicates | | |
| DENSITY USED | Dens30 | Dens30 | Dens30 | Dens30 | Dens30 | Dens30 | Dens30 |
| AGGREGATE USED | 30-Miles | 30-Miles | 20-Miles | 10-Miles | 30-Miles | 20-Miles | 10-Miles |
| RUN ANALYSIS ID | B | 7 | 8 | 9 | 10 | 11 | 12 |
| 115 Fort Yukon | R | R | R | R | R | R | R |
| 116 Gakona | R | R | R | R | R | R | R |
| 117 Galena | R | R | R | R | R | R | R |
| 119 Glennallen | R | R | R | R | R | R | R |
| 120 Golovin | R | R | R | R | R | R | R |
| 121 Grayling | R | R | R | R | R | R | R |
| 122 Gulkana | R | R | R | R | R | R | R |
| 123 Gustavus | R | R | R | R | R | R | R |
| 124 Haines | R | R | R | R | R | R | R |
| 125 Healy | R | R | R | R | R | R | R |
| 126 Hollis | R | R | R | R | R | R | R |
| 127 Holy Cross | R | R | R | R | R | R | R |
| 128 Hoonah | R | R | R | R | R | R | R |
| 129 Hughes | R | R | R | R | R | R | R |
| 130 Huslia | R | R | R | R | R | R | R |
| 131 Hydaburg | R | R | R | R | R | R | R |
| 132 Hyder | R | R | R | R | R | R | R |
| 133 Igiugig | R | R | R | R | R | R | R |
| 134 Iliamna | R | R | R | R | R | R | R |
| 136 Kake | R | R | R | R | R | R | R |
| 137 Kaktovik | R | R | R | R | R | R | R |
| 140 Kenny Lake | R | R | R | R | R | R | R |
| 141 King Cove | R | R | R | R | R | R | R |
| 142 King Salmon | R | R | R | R | R | R | R |
| 143 Kivalina | R | R | R | R | R | R | R |
| 144 Klawock | R | R | R | R | R | R | R |
| 145 Klukwan | R | R | R | R | R | R | R |
| 146 Kodiak | U | U | U | U | U | U | U |
| 147 Kodiak Road | R | U | R | R | R | R | R |
| 149 Koliganek | R | R | R | R | R | R | R |
| 150 Kotlik | R | R | R | R | R | R | R |
| 151 Kotzebue | R | R | R | R | R | R | R |
| 152 Kwethluk | R | R | R | R | R | R | R |
| 153 Lake Louise | R | R | R | R | R | R | R |
| 154 Larsen Bay | R | R | R | R | R | R | R |
| 155 Levelock | R | R | R | R | R | R | R |
| 156 Manokotak | R | R | R | R | R | R | R |
| 158 McGrath | R | R | R | R | R | R | R |
| 159 McKinley Park Village | R | R | R | R | R | R | R |
| 160 Mentasta Lake | R | R | R | R | R | R | R |
| 162 Minto | R | R | R | R | R | R | R |
| 163 Mountain Village | R | R | R | R | R | R | R |
| 164 Naknek | R | R | R | R | R | R | R |
| 165 Nanwalek | R | R | R | R | R | R | R |
| 166 Naukati Bay | R | R | R | R | R | R | R |
| 167 Nelson Lagoon | R | R | R | R | R | R | R |
| 168 New Stuyahok | R | R | R | R | R | R | R |
| 169 Newhalen | R | R | R | R | R | R | R |
| 170 Nikolai | R | R | R | R | R | R | R |
| 172 Noatak | R | R | R | R | R | R | R |

## Appendix B Table (p.8) Summary of Discriminant Analysis Runs B and 7 - 12

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| INITIAL GROUPINGS | Initial Groups: <2,500; 2,500-7000; >7,000 | | | | | | |
| HARVEST DATA FOR DUPLICATES | Means | CPDB Harvests for Duplicates | | | Tickets/Permits for Duplicates | | |
| DENSITY USED | Dens30 | Dens30 | Dens30 | Dens30 | Dens30 | Dens30 | Dens30 |
| AGGREGATE USED | 30-Miles | 30-Miles | 20-Miles | 10-Miles | 30-Miles | 20-Miles | 10-Miles |
| RUN ANALYSIS ID | B | 7 | 8 | 9 | 10 | 11 | 12 |
| 174 Northway | R | R | R | R | R | R | R |
| 175 Nuiqsut | R | R | R | R | R | R | R |
| 176 Nunapitchuk | R | R | R | R | R | R | R |
| 177 Old Harbor | R | R | R | R | R | R | R |
| 178 Ouzinkie | R | R | R | R | R | R | R |
| 180 Pedro Bay | R | R | R | R | R | R | R |
| 181 Pelican | R | R | R | R | R | R | R |
| 182 Perryville | R | R | R | R | R | R | R |
| 183 Petersburg | U | U | U | R | U | R | R |
| 184 Pilot Point | R | R | R | R | R | R | R |
| 186 Point Lay | R | R | R | R | R | R | R |
| 187 Port Alexander | R | R | R | R | R | R | R |
| 188 Port Alsworth | R | R | R | R | R | R | R |
| 189 Port Graham | R | R | R | R | R | R | R |
| 190 Port Heiden | R | R | R | R | R | R | R |
| 191 Port Lions | R | R | R | R | R | R | R |
| 192 Port Protection | R | R | R | R | R | R | R |
| 193 Quinhagak | R | R | R | R | R | R | R |
| 194 Saint Paul | R | R | R | R | R | R | R |
| 195 Sand Point | R | R | R | R | R | R | R |
| 196 Shageluk | R | R | R | R | R | R | R |
| 198 Shishmaref | R | R | R | R | R | R | R |
| 199 Sitka | U | U | U | U | U | U | U |
| 200 Sitka Tribe | R | R | R | R | R | R | R |
| 201 Slana | R | R | R | R | R | R | R |
| 202 South Naknek | R | R | R | R | R | R | R |
| 203 Stebbins | R | R | R | R | R | R | R |
| 204 Stevens Village | R | R | R | R | R | R | R |
| 205 Tanacross | R | R | R | R | R | R | R |
| 206 Tanana | R | R | R | R | R | R | R |
| 207 Tatitlek | R | R | R | R | R | R | R |
| 208 Tazlina | R | R | R | R | R | R | R |
| 209 Tenakee Springs | R | R | R | R | R | R | R |
| 210 Tetlin | R | R | R | R | R | R | R |
| 211 Thorne Bay | R | R | R | R | R | R | R |
| 212 Tok | R | R | R | R | R | R | R |
| 213 Tonsina | R | R | R | R | R | R | R |
| 215 Tyonek | R | R | R | R | R | R | R |
| 217 Unalaska | U | U | U | R | U | U | U |
| 218 Wainwright | R | R | R | R | R | R | R |
| 219 Wales | R | R | R | R | R | R | R |
| 220 Whale Pass | R | R | R | R | R | R | R |
| 221 Whitestone Logging Camp | R | R | R | R | R | R | R |
| 222 Wrangell | R | R | R | R | R | R | R |
| 223 Yakutat | R | R | R | R | R | R | R |

# APPENDIX C

## 1990 RURAL-URBAN COMMUTING AREA CODES

**Source: http://ers.usda.gov/Briefing/Rural/Data/desc.htm**

A flexible approach to delineating components of the U.S. settlement system has been developed using census tracts instead of counties. Like the widely used metropolitan areas, the rural-urban commuting area code is based on measures of urbanization, population density, and daily commuting. Metro areas are defined by Office of Management and Budget for purposes of collecting, tabulating, and publishing Federal data. They have been used from early on for analyzing societal needs and for developing programs to address those needs. However, they are not adequate for many current applications, for two reasons. First, the system is limited to identifying cities of 50,000 or more and their outlying suburbs, leaving the remaining nonmetro component undifferentiated. Second, metro areas are identified using counties as the basic building blocks. The inconsistent size of counties sometimes creates a mismatch between the defined areas and actual research or programmatic needs.

The particular system presented here is specifically designed to address these shortcomings and to highlight nonmetro settlement diversity. Census tracts are used because they are the smallest geographic building block for which reliable commuting data are available. The classification contains 10 primary and 30 secondary codes. Few if any applications need the full set of codes. Rather, the system allows for the selective combination of codes to meet varying definitional needs.

The 10 whole numbers shown in Table 1 below refer to the primary or single largest commuting share (an additional code, 99, is used for tracts with little or no population and no commuting flows). Metro area cores (code 1) are not defined by incorporated place boundaries but instead are a census tract equivalent to the census-defined urbanized area. Tracts are included if more than 20 percent of the tract's population is in the urbanized area. For nonmetro cities and towns, the cores similarly include census tracts with more than 20 percent of the population in places that make up the agglomeration—either an incorporated town or an unincorporated (census designated) place.

High commuting (codes 2, 5, and 8) means that the largest commuting share was at least 30 percent to an urbanized area, large town, or small town core. Large or small town cores (and even a few urbanized areas) can have high enough out-commuting to be coded 2, 5, or 8; typically these areas are not job centers themselves but depend on this commuting to a nearby, larger place. Low commuting (codes 3, 6, and 9) refers to cases where the single largest flow is to a core, but is less than 30 percent. These codes identify "influence areas" of metro, large town, and small town cores, respectively, and are similar in concept to the "nonmetropolitan adjacent" codes found in other ERS classification

schemes (Rural-Urban Continuum Code, Urban Influence Code). The last of the general classification codes (10) identifies rural tracts where the primary flow is local.

These 10 codes offer a relatively straightforward and complete delineation of metropolitan and nonmetropolitan settlement based on the size and direction of primary commuting flows. However, the settlement world is not that simple. One confounding factor is "hierarchical relations" or semiautonomous relations of a place to another place. The 10 broad classification codes are subdivided to identify areas where the primary flow is local, but over 30 percent commute in a secondary flow to a larger area core. For example, 1.1 and 2.1 codes identify urbanized areas and their outlying commuter zones where the primary flow is within or to the urbanized area, but another 30 percent or more commute to a larger urbanized area. Similarly, 10.1, 10.2, and 10.3 identify rural tracts for which the primary commuting share is local but more than 30 percent also commute to a metro, large town, or small town core, respectively.

Influence areas for metropolitan and large town cores extend far beyond the relatively small number identified on the basis of primary flows (codes 3 and 6). Codes 7 to 10 were subdivided to identify small town and rural tracts with primary local flows but secondary flows of 5 to 30 percent, either to a metropolitan or large town core. These areas identify important, potentially metropolitanizing zones within current nonmetropolitan territory.

Finally, examination of States with fairly closely spaced metropolitan areas reveals examples of tracts for which no single urbanized area commuting share exceeds 30 percent, but for which shares to multiple metropolitan areas may be quite high. We code these areas as 2.2. Similarly, a small number of tracts coded 4.1, 7.1, 7.2, 10.1, or 10.2 (secondary flow 30% to 50% to a UA or large town) are based on shares to multiple cores.

The codes are many, but permit stricter or looser delimitation of metropolitan, large town, and small town commuting areas. This scheme replaces the county-based, default nonmetropolitan category with a subcounty settlement system, including areas of metropolitan influence and an urban-rural hierarchy, thus providing an exhaustive system of statistical areas for the country.

**Table 1. Rural-Urban Commuting Areas (RUCAs)**

1 Metropolitan-area core: primary flow within an urbanized area (UA)
- 1.0 No additional code
- 1.1 Secondary flow 30% to 50% to a larger UA

2 Metropolitan-area high commuting: primary flow 30% or more to a UA
- 2.0 Primary flow to a 1.0 UA
- 2.1 Primary flow to a 1.1 UA
- 2.2 Combined flows to two or more UAs adding to 30% or more

3 Metropolitan-area low commuting: primary flow 5% to 30% to a UA
3.0 No additional code

4 Large town core: primary flow within a place of 10,000 to 49,999
4.0 No additional code
4.1 Secondary flow 30% to 50% to a UA

5 Large town high commuting: primary flow 30% or more to a place of 10,000 to 49,999
5.0 Primary flow to a 4.0 large town
5.1 Primary flow to a 4.1 large town

6 Large town low commuting: primary flow 5% to 30% to a place of 10,000 to 49,999
6.0 No additional code

7 Small town core: primary flow within a place of 2,500 to 9,999 7.0 No additional code
7.0 No additional code
7.1 Secondary flow 30% to 50% to a UA
7.2 Secondary flow 30% to 50% to a large town
7.3 Secondary flow 5% to 30% to a UA
7.4 Secondary flow 5% to 30% to a large town

8 Small town high commuting: primary flow 30% or more to a place of 2,500 to 9,999
8.0 Primary flow to a 7.0 small town
8.1 Primary flow to a 7.1 small town
8.2 Primary flow to a 7.2 small town
8.3 Primary flow to a 7.3 small town
8.4 Primary flow to a 7.4 small town

9 Small town low commuting: primary flow 5% to 30% to a place of 2,500 to 9,999
9.0 No additional code
9.1 Secondary flow 5% to 30% to a UA
9.2 Secondary flow 5% to 30% to a large town

10 Rural areas: primary flow to a tract without a place of 2,500 or more
10.0 No additional code
10.1 Secondary flow 30% to 50% to a UA
10.2 Secondary flow 30% to 50% to a large town
10.3 Secondary flow 30% to 50% to a small town
10.4 Secondary flow 5% to 30% to a UA
10.5 Secondary flow 5% to 30% to a large town

99 Not coded: Tracts with little or no population and no commuting flows

A ZIP code approximation of the RUCA codes is also available. It is based on a ZIP/Census tract crosswalk and not on a separate analysis of population and commuting data unique to the ZIP code geographic unit.