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# Hunter Demand for Deer on Prince of Wales Island, Alaska: An Analysis of Influencing Factors

Rhonda Mazza



**Author**

**Rhonda Mazza** was a graduate student, forest resources, Oregon State University, Corvallis, OR 97331. She is now a science editor, Pacific Northwest Research Station, Forestry Sciences Laboratory, P.O. Box 3890, Portland, OR 97208.

## **Abstract**

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Overall hunter demand for deer on Prince of Wales Island, Alaska, has not changed significantly in the last 10 years, although demand has increased in five communities on the island. These five communities each experienced a decline in household median income between 1989 and 1999. In communities with a smaller percentage of Native Alaskans, deer was a larger component of their subsistence harvest. The cash-based market economy on Prince of Wales Island is in transition as the dependence on logging and commercial fishing declines. The subsistence economy in Alaska has traditionally provided security to residents during lulls or downturns in the market economy. Overall employment opportunities in southeast Alaska are projected to decline between 2000 and 2010. An area of projected growth, however, is in tourism and recreation-based employment, from which residents on the island may be able to benefit. Change in employment opportunities may change demand for deer.

Keywords: Hunting, subsistence, southeast Alaska, Prince of Wales Island, Sitka black-tailed deer.

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## Introduction

Subsistence in Alaska has been defined as a culture, a lifestyle, and an economy. It is an activity engaged in by both Native and non-Native Alaskans. The average annual harvest of subsistence food is 375 pounds per person in rural areas of the state and 22 pounds per person in urban areas (Wolfe 2000). Subsistence harvests provide 35 percent of the caloric requirements for rural residents, and many rural communities are able to meet their protein requirement through subsistence harvests of salmon, caribou, deer, and other resources, depending on the area (Wolfe 2000). In addition to meeting nutritional needs, many Native Alaskans value the harvest and preparation of subsistence resources as a way to maintain their cultural identity (Newton and Moss 1993). Subsistence harvests are traditionally shared among kinship groups, thus strengthening the sense of community among subsistence users. Many non-Native Alaskans value the subsistence lifestyle as well; the ability to be self-sufficient and live off the land is part of the attraction of living in Alaska (Glass et al. 1990a).

From an economic basis, subsistence strives for security rather than an accumulation of material goods (Lonner 1980). The subsistence economy in Alaska accommodated the introduction of a market economy and has buffered the booms and busts that have historically characterized the cash-based market (Glass and Muth 1989). Subsistence fishing and hunting have sustained families through economically depressed times when commercial timber, mining, and fishing industries have faltered. When these industries flourish, the cash income has enabled families to buy snowmobiles and boats, which increase the efficiency of subsistence harvesting (Glass et al. 1990b).

Subsistence is also a federally protected right. It is legally defined in the Alaska National Interest Lands Conservation Act (ANILCA) 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 nonedible byproducts of fish and wildlife resources taken for personal or family consumption, for barter, or sharing for personal or family consumption; and for customary trade.<sup>1</sup>

The ANILCA provides a harvest priority for subsistence users living in rural parts of the state. This means that if a resource becomes scarce, recreational and commercial users are the first to face harvest restrictions. The federal distinction between rural and urban users is contrary to the state's constitution, which guarantees all residents equal access to the state's fish and wildlife. Although ANILCA does not require Alaska to amend its constitution, the act maintains that if the state wants to manage its subsistence resources, the rural priority must be enforced. When the act was passed, the state attempted to comply; however, in 1989, the Alaska Supreme Court ruled harvest priority based on place of residence was unconstitutional.<sup>2</sup> Because the Alaska State Legislature has been unable to agree on an amendment that brings the state constitution into compliance with federal law, the federal government has managed subsistence harvest of game on federal land since 1990.

Rural priority and federal management of subsistence resources are contentious issues in Alaska and have been a topic for political debate since 1980. The prospect of managing their own fish and wildlife was one of the issues that rallied Alaskans to

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<sup>1</sup> ANILCA, Title VIII section 803 (1980).

<sup>2</sup> *McDowell v. Alaska*, 785 P.2d (Alaska Supreme Court): 1989.

support statehood in 1959 (Haycox, n.d.; Hull and Leask 2000). Some Alaskans see the federal government's renewed management of fish and wildlife on federal land (59 percent of the state) as an attack on the state's sovereignty. When Governor Tony Knowles declined to appeal a Ninth Circuit Court ruling that increased the federal subsistence jurisdiction,<sup>3</sup> there were calls for his impeachment (McAllister 2001).

Because of Alaska's late entry into the Union, its land has been dispersed under laws different than those used in other states. At the time of statehood, Alaska was permitted to select about 104 million acres of federal land that was vacant, unappropriated, or unreserved. Native Alaskans contested nearly all the acreage selected by the state by claiming aboriginal title to the same parcels. The discovery of oil in Prudhoe Bay encouraged Congress to resolve the land dispute quickly (Nockles 1996). The solution was the Alaska Native Claims Settlement Act (ANCSA) of 1971. The ANCSA extinguished all aboriginal claims, including hunting and fishing rights, and in return, nearly \$1 billion and 44 million acres in fee title were given to Alaskan Natives and the newly created Native corporations. This settlement allowed the state to select its 104 million acres of land.

Congressional records reveal that Congress assumed the U.S. Department of the Interior would protect fishing and hunting rights for Native Alaskans by making land withdrawals for that purpose (Alaska Native Commission 2002). When it became evident that was not happening, Congress passed ANILCA and thus created the rural priority for subsistence users. "Rural" is not defined in the act, and attempts to define it have been argued in the courts. In 1986, the state defined "rural" as areas "where hunting and fishing for food were principal characteristics of the economy" (Alaska Native Commission 2002). The Kenaitze Indian Tribe disputed this definition, and in 1988, the Ninth Circuit Court ruled in the tribe's favor.<sup>4</sup> Since that ruling, the federal definition of rural has been used. A geographic area with less than 2,500 residents is considered rural, although an area with 7,000 residents may qualify depending on the community's subsistence use of fish and wildlife, its economic diversity, and amount of infrastructure (Alaska Native Commission 2002).

In southeast Alaska, deer are the most used land mammal, generally making up about 18 percent of the total subsistence harvest, by weight (ADF&G 2001). As a land-based resource, deer populations have been affected by the level of commercial logging on Prince of Wales (POW) Island. This history of timber harvests along with demographic changes in various human communities have raised questions about the management of deer hunting on POW. This study uses the idea of demand and supply as an organizing framework to look at change in deer harvests on POW between 1984 and 2002. Changes in the human populations (both in number and income) in the region influence demand for deer on the island, whereas changes in deer habitat influence the supply of deer on the island.

The impetus for this study arose from a conversation with the Alaska Department of Fish and Game (ADF&G), Division of Subsistence. Employment associated with commercial timber and fishing industries in southeast Alaska has declined in the last 5 years. During that period, reported harvest levels of deer have remained fairly

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<sup>3</sup> *Katie John v. United States of America*. 247 F.3d 1032 (Ninth Circuit Court of Appeals): 2001.

<sup>4</sup> *Kenaitze Indian Tribe v. Alaska*. 860 F.2d.312 (Ninth Circuit Court of Appeals): 1998.

constant, although some POW residents have expressed concern that it is now more difficult to get the deer they need. The question that arose from this conversation was, Is there a connection between demand for deer and cash employment opportunities on the POW? Because Department of Labor data are not collected at the community level, I examine several other factors that can influence demand for deer and reflect the availability of cash wages. For example, I examine change in human population between 1990 and 2000, as well as median household income, and employment data for the island's communities. I also review change in percentage of Native Alaskans living in POW communities.

Factors affecting the supply of deer also are reviewed. Deer populations are projected to decline as their winter habitat declines (Porter 2001, USDA Forest Service 1997). The factors affecting supply provide a basis for discussing the implications a change in demand may have for the communities on POW.

Most deer harvests on POW take place on federal land and, consequently, are regulated by the Federal Subsistence Board. Effective regulations are based on understanding the motives for participating in the regulated activity. The factors I have chosen for this analysis partially explain hunter demand for deer on POW. Economic conditions and employment opportunities do not address the less tangible aspects of hunting such as lifestyle choice and desire for cultural preservation. However, inferences based on change in demand for deer can help discern some of the motives behind deer hunting on POW. From a regulatory standpoint, the objectives behind a management program differ if the goal is to meet demands of a subsistence community rather than individual recreational demand (McCorquodale 1997). This study contributes background concerning subsistence harvests that may be helpful to policymakers crafting deer hunting regulations.

## **Background**

Most of the land on POW is part of the Tongass National Forest (fig. 1). The island is part of the Alexander Archipelago and is the third largest island in the United States following Kodiak and the main island of Hawaii. It is about 140 miles long, north to south and 30 miles wide, with mountains 2,000 to 3,000 feet high (POW Chamber of Commerce, n.d.). All the communities on POW are federally classified as rural, meaning the residents have priority to subsistence resources.

Commercial logging has taken place on the island since the 1960s. Along with altering deer habitat, the construction of logging roads fundamentally changed the way deer are harvested in the region. Before roads, most deer hunting was done by boat along the beaches (Ellanna and Sherrod 1987). The nearly 3,000 miles of road currently on the island increased hunter access to deer. Wolfe and Walker (1987) found that with greater access often comes greater competition from other users after the same resource. Road access attracts off-island hunters who use the ferry service from Ketchikan to Hollis to bring their vehicles to the island. Roads also may foster competition for deer among island residents who now can travel easily to other parts of the island to pursue deer and may converge on hunting areas traditionally used by another community. However, the increased access provided by the roads may reduce competition by spreading hunters out on the island (USDA Forest Service 1997).

Some hunters on POW perceive that it now takes more effort to harvest the same number of deer than it did in the past (Turek et al. 1998). In 2001, several communities on POW proposed changes for subsistence hunting regulations "to ensure local residents are getting what they need for subsistence" (USFWS 2001). The community

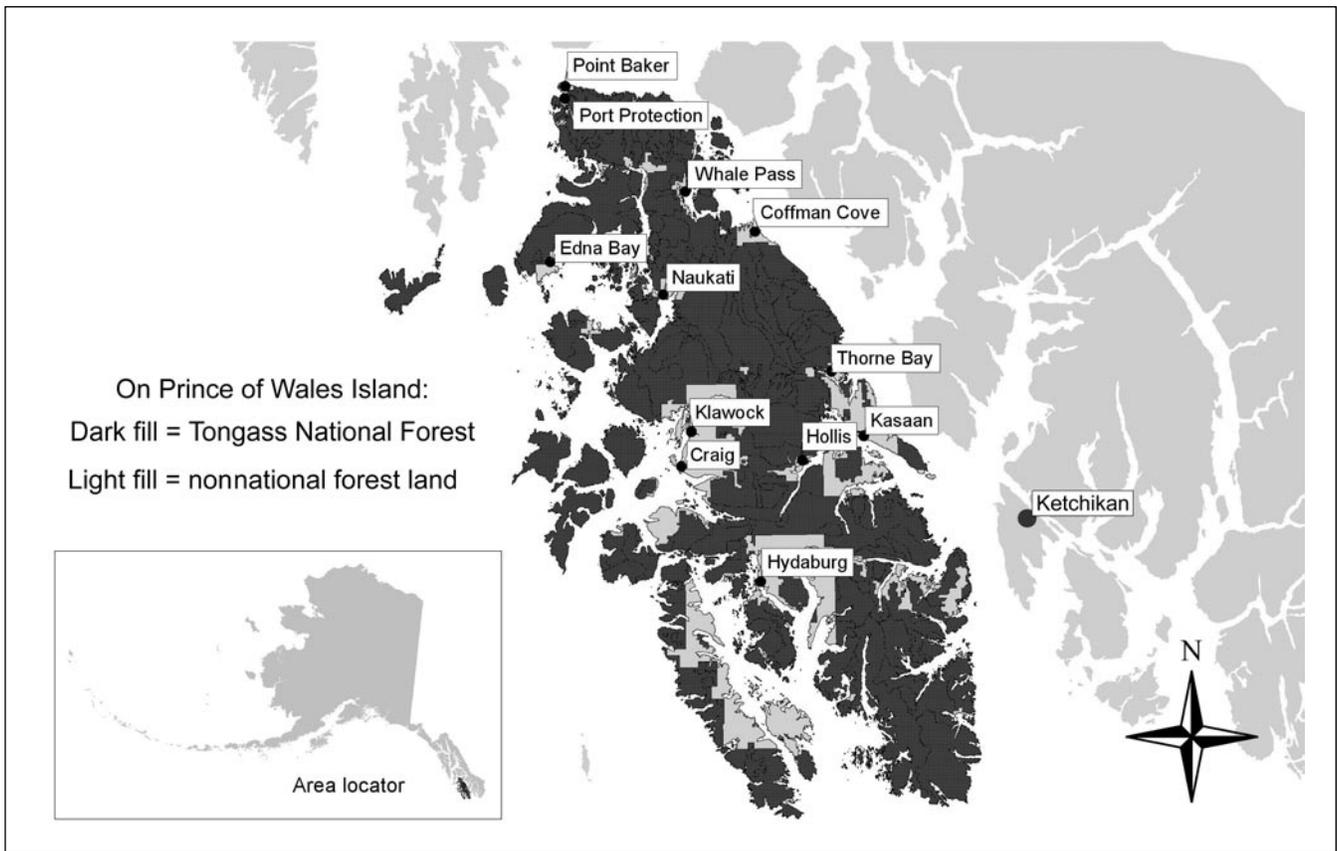


Figure 1—Prince of Wales Island, southeast Alaska.

associations of Craig and Hydaburg and the village of Kasaan submitted a joint proposal to the Federal Subsistence Management Program to shorten the deer hunting season on POW for urban hunters. In a second proposal, the Craig community association, the city of Craig, and the organized village of Kasaan suggest increasing the allowable harvest for residents, and decreasing the allowable harvest for nonresidents of game management unit 2. Unit 2 includes all of POW and some surrounding islands; it does not include Ketchikan.

There are different opinions for this perceived increased effort; some presume increases in demand, whereas others presume a decrease in supply (Turek et al. 1998). Some residents think that off-island hunters, primarily those who live in Ketchikan, take a disproportionate number of deer. A few noted that bear and wolves also contribute to the demand for deer, but wolves, in particular, are not seen as taking an increasing amount of deer. Some residents feel the federal doe season, which started in 1987, is inappropriate and is depleting deer numbers. Some residents think commercial logging is suppressing deer population because many old-growth stands, typically the winter habitat for deer, have been cut. Other residents, however, see the increased summer foliage in recent clearcuts as benefiting deer populations. Roads are viewed as an asset for local hunters, but some residents think there would be less competition from off-island hunters if there were fewer roads (Turek et al. 1998).

## Methods

The present analysis is structured around a supply-and-demand framework. The primary questions I examined were (1) Has hunter demand for deer on POW increased between 1984 and 2001?, and (2) Has the supply of deer decreased? I addressed these questions by breaking them into smaller components. On the supply side, I examined change in number of hunters on POW and per capita use of deer in POW communities. Data compiled by the ADF&G Division of Wildlife Conservation and Division of Subsistence enabled this initial analysis. I then used data from the 1990 and 2000 U.S. census, as well as the Alaska Department of Labor to examine factors that may influence change in hunter numbers and use of deer. The factors I considered are listed below:

- Economic conditions in the hunters' community of residence as measured by median household income and percentage of individuals living in poverty
- Cash employment opportunities in the region as measured by employment status

I addressed the question of supply by examining data compiled by ADF&G, Division of Wildlife Conservation regarding deer pellet-group counts and change in percentage of successful hunters. The following section briefly describes the data sets used in my analysis.

The ADF&G, Division of Subsistence compiled and maintains the community profile database (CPDB). The CPDB contains subsistence, economic, and demographic data for rural communities in southeast Alaska. For most of these communities, the first set of data was compiled in 1987 as part of the Tongass Resource Use Cooperative Survey. The second set of data was gathered between 1996 and 1998. The information is collected through retrospective interviews with harvesters from sample households. A year-round household list for each community was compiled with the help of the city planner, Native association, or residents. During interviews, respondents were asked about the use of wild resources in their household during the past 12 months, including the distribution and exchange of resources. A complete review of the subsistence survey method is available online with the database at <http://www.state.ak.us/adfg/subsist/geninfo/publctns/cpdb.htm>.

I identified 11 profile communities on POW Island that were listed in the CPDB and selected the data for average household harvest, in weight, of all subsistence resources, average household harvest of deer, in pounds, and per capita harvest of deer. Although not everyone in a community is a hunter, the retrospective interviews revealed that nearly all people in the community used subsistence resources, indicating that sharing of resources is still common. Some of these profile communities have less than 50 residents. In these small communities, a change in harvest level can be affected by a change in behavior of just a few residents. In my analysis, I noted situations where this may have been a factor. I used sample data from the long form of the U.S. 1990 and 2000 census to compile demographic, economic, and employment profiles for the POW communities.

Although the Federal Subsistence Board regulates subsistence hunting, subsistence hunters obtain their hunting permits from the ADF&G. The ADF&G, Division of Wildlife Conservation compiles annual hunter statistics by surveying approximately 30 percent of hunters holding permits. The mail survey asks hunters to report the number of deer they killed that season, the location of the hunt, and time spent hunting. The data

are organized by community of residence, wildlife analysis area, and game management unit. I used this information in conjunction with census data to analyze change in hunter demand for deer on POW.

Deer populations in southeast Alaska are monitored through annual pellet-group surveys conducted by the ADF&G, Division of Wildlife Conservation. Kirchhoff and Pitcher (1988) provide a detailed method for this ongoing research. In short, transect lines have been established in study areas within the assumed winter habitat for deer. Pellet-group counts are conducted along these transects in spring after the snow has melted but before shrub and herb cover have grown too dense for accurate sampling. The ruggedness and variation in the terrain make it precarious to extrapolate the pellet-group count from a particular transect to the entire game management unit (Porter 2002). However, the counts are useful in identifying trends in the deer population, and these trends served as a basis for my analysis of the deer supply on POW.

## Results

I examined demand for deer on POW by looking at the island's human population and that of nearby Ketchikan, home to many of those who hunt on POW. There are many ways to analyze change in a human population, so as mentioned earlier, I analyzed population growth and the economic conditions in the hunters' communities of residence to see how these factors influence demand for deer on POW. I posed the following questions to structure my analysis:

- Has demand for deer changed on POW Island?
- Have hunters from Ketchikan or elsewhere increased disproportionately to on-island hunters?
- Has per capita use of deer changed on POW Island?
- How have economic conditions changed in the hunters' communities of residence?
- What changed in the five communities where deer harvest per capita increased?
- Has the supply of deer changed?

### Has Demand for Deer Changed on Prince of Wales Island?

One way to address this question is to look at total population on POW. The cumulative increase from 1990 to 2000 was one person, but the intervening years were not static (table 1). The population high was in 1995 with 5,145 people. Since then, the population has declined to 4,653 (Gilbertsen and Robinson 2001). The deer hunter data collected by ADF&G show that the estimated number of hunters on POW for the 1999–2000 season was 1 percent less than in the 1990–91 season (a difference of 35 hunters). The 1995–96 season had the most estimated hunters; however, the difference between 1995–96 and 1990–91 is only 24 hunters (Hicks 2001).

Looking at the entire game management unit for a slightly longer timeframe reveals similar moderate fluctuations. From 1984 to 2001, demand for deer in unit 2, which includes POW, appears fairly constant (fig. 2). There have been some dips and peaks but not a distinct trend. A linear regression reveals no significant trend when the number of hunters is regressed on years ( $R^2 = 0.023$ ). The reported number of hunters (2,149) in 2000–2001 falls 10 percent below the reported high (2,481 hunters in 1987–88) and 34 percent above the reported low (1,664 hunters in 1991–92). Table 2 shows the number of hunters on POW, exclusive of the other islands in unit 2, for hunting seasons from 1997 to 2002. The numbers of hunters and successful hunters have varied among communities in the past 5 years, but the island totals shadow those for the unit (Paul and Straugh 1997–2001).

**Table 1—Population in communities of interest, 1990 to 2000**

Geographic area	1990	1995	2000
	<i>Number of people</i>		
Coffman Cove	191	254	199
Craig	1,260	1,946 <sup>a</sup>	1,397
Edna Bay	91	79	49
Hollis	118	106	139
Hydaburg	388	406	382
Kasaan	54	41	39
Ketchikan city <sup>b</sup>	8,252	8,616	7,922
Klawock	705	759	854
Naukati Bay	103	147	135
Point Baker	40	62	35
Port Protection	57	64	63
Thorne Bay city	571	650	577
Whale Pass	72	92	58
Prince of Wales Island	4,652	5,145	4,653

<sup>a</sup>A change in boundary artificially inflates this figure.

<sup>b</sup>Not on Prince of Wales Island.

Source: USDC Bureau of the Census 1990, 2000 and ADOL 2001.

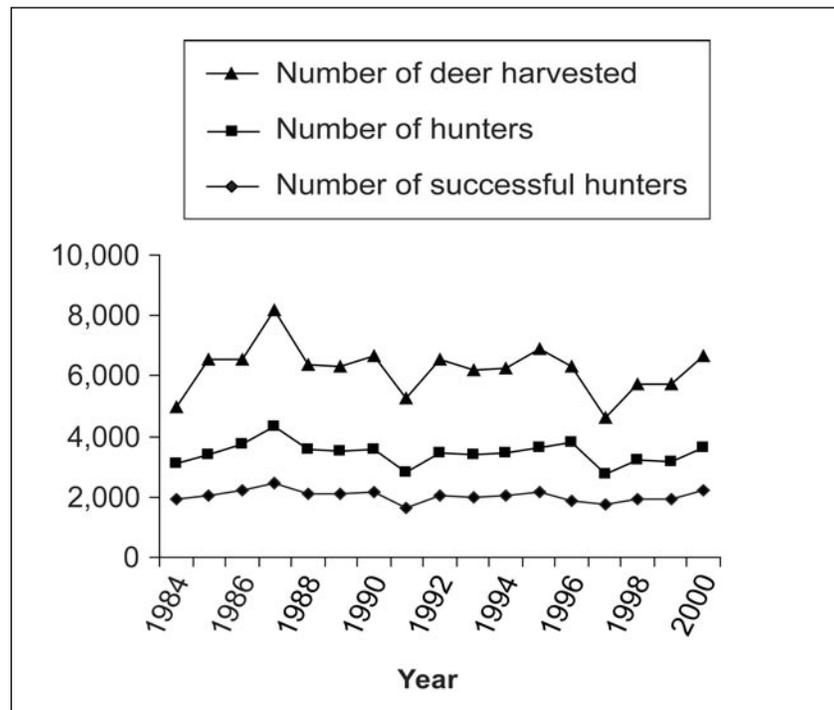


Figure 2—Reported deer harvest and hunters in unit 2 (Hicks 2001).

**Table 2—Hunters on Prince of Wales Island, 1997 to 2000**

Community of residence	1997–98	1998–99	1999–2000	2000–2001	2001–2002
	<i>Number of hunters</i>				
Coffman Cove	93	91	79	56	72
Craig	250	415	411	546	425
Edna Bay	15	10	0	NA	8
Hollis	19	27	23	35	16
Hydaburg	11	21	NA	34	28
Kasaan	5	4	6	NA	NA
Ketchikan city	615	640	471	597	621
Klawock	90	194	199	228	196
Naukati Bay	48	38	71	64	37
Point Baker	6	4	5	17	11
Port Protection	21	3	NA	NA	5
Thorne Bay city	189	182	229	234	182
Whale Pass	28	12	13	33	7
Other Alaska	188	189	208	192	208
Outside Alaska	75	42	117	115	94
<b>Total</b>	<b>1,711</b>	<b>1,863</b>	<b>1,833</b>	<b>2,149</b>	<b>1,907</b>

NA = not available.

Source: Paul and Straugh 1997–2001.

### **Have Hunters From Ketchikan or Elsewhere Increased Disproportionately to On-Island Hunters?**

Because Ketchikan is classified as an urban area, its residents do not have harvest priority for subsistence resources. If the residents of POW were unable to meet their subsistence needs, the first likely regulatory measure would restrict the deer harvest by urban hunters. Table 2 shows that although hunters from Ketchikan compose the largest group, there has not been a significant change in numbers between 1997 and 2001 ( $R^2 = 0.0009$ ).

The number of hunters on POW who live elsewhere in the state also has increased in the last 6 years. As a group, successful hunters living elsewhere in Alaska but hunting in POW have increased by 9 percent from 1996–97 to 2000–2001. During that period, they have averaged 10 percent of the total successful hunters on the island. Most of these are people living in other rural parts of Alaska; however, some are from the urban centers such as Juneau.

Hunters from outside Alaska also compose a small but growing percentage of hunters on POW. In 1997–98, this group was 4 percent of total hunters (1 percent were successful) and had increased to 5 percent by 2000–2001 (3 percent were successful). Demand from this segment may increase in the future if the recreation and tourism economic sector increases as predicted.

### **Has Per Capita Use of Deer Changed on Prince of Wales Island?**

I addressed this question by comparing reported deer harvests data with data in the CPDP collected in 1987 and 1996–98 subsistence use surveys. Data on 11 communities on POW indicate there were increases and decreases in per capita deer harvest, depending on the community (fig. 3). In six of the communities (Coffman Cove, Edna Bay, Hollis, Hydaburg, Point Baker, and Whale Pass), the per capita deer harvest, as measured in pounds, declined (table 3). In Coffman Cove and Whale Pass, however,

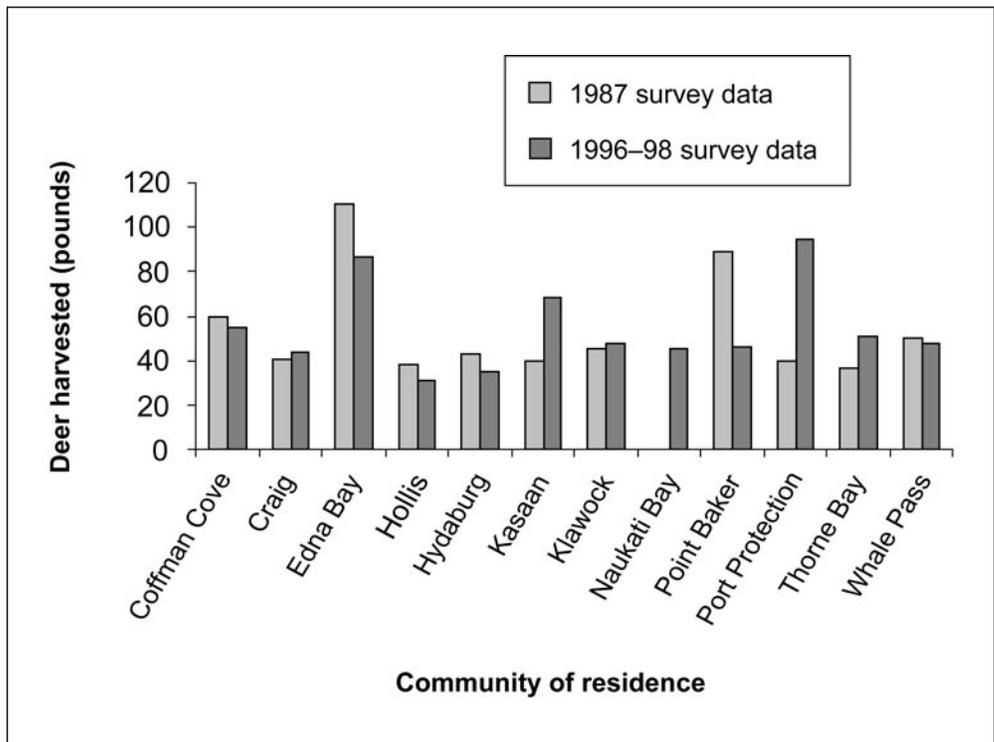


Figure 3—Per capita deer harvest on Prince of Wales Island, based on data from the Alaska Department of Fish and Game community profile database (Alaska Department of Fish and Game 2001).

Table 3—Subsistence use on Prince of Wales Island, 1987 to 1997

Geographic area	Per capita deer harvest	Per capita deer harvest	Percentage of change in per capita deer harvest
	1987	1997 <sup>a</sup>	
	<i>Pounds</i>		
Coffman Cove	59.62	54.65	-8
Craig	40.61	43.67	8
Edna Bay	110.30	86.49	-22
Hollis	37.88	31.07	-18
Hydaburg	42.80	34.65	-19
Kasaan	40.00	68.24	71
Klawock	45.03	47.57	6
Naukati Bay	NA	45.41	NA
Point Baker	89.14	46.00	-48
Port Protection	40.00	94.43	136
Thorne Bay city	36.73	50.73	38
Whale Pass	50.20	47.57	-5

NA = not available.

<sup>a</sup>These data were collected from 1996 through 1998.

Source: Alaska Department of Fish and Game 2001.

**Table 4—Poverty on Prince of Wales Island, 1989 and 1999**

Geographic area	Individuals living below the poverty line	
	1989	1999
	<i>Percent</i>	
Coffman Cove	5	5
Craig	4	10
Edna Bay	64	23
Hollis	15	9
Hydaburg	26	24
Kasaan	0	0
Klawock	8	14
Naukati Bay	5	9
Point Baker	0	5
Port Protection	46	58
Thorne Bay city	5	8
Whale Pass	0	0

Source: USDC Bureau of the Census 1990, 2000.

the percentage change in per capita deer harvest was less than 10 percent. These are both small communities, which means harvest statistics at this level are influenced by the behavior change of a few residents. The other shared characteristic among five of these communities was a decline in poverty (table 4). From 1989 to 1999, the percentage of individuals living below the federal poverty level decreased or remained at zero in Coffman Cove, Edna Bay, Hollis, Hydaburg, and Whale Pass (such a comparison is not available for Point Baker) (USDC Bureau of the Census 1990, 2000).

In Craig, Kasaan, Klawock, Port Protection, and Thorne Bay, the per capita harvest of deer, as measured in pounds, increased. In Craig and Klawock, the percentage of increase was less than 10 percent, but the larger size of these communities may make this trend more definite than in the smaller communities. Other than Kasaan, the communities with an increase in per capita deer harvest also had more people living below the poverty level in 1999 than in 1989 (table 4).

Average household harvest of all subsistence resources increased or remained about the same in all but two of the communities surveyed on POW (fig. 4). Port Protection, however, was the only community where deer as a percentage of total subsistence harvest actually increased (from 13 to 21 percent).

The most recent data suggest a strong negative linear relation exists between the percentage of Native Alaskans in a community and deer as a percentage of total subsistence harvest ( $R = -0.79$ ). Deer is likely to compose a larger percentage of total subsistence harvest in a community with a smaller percentage of Native Alaskans than in a community with a larger percentage of Native Alaskans (table 5). Earlier data from the 1990 census and 1987 subsistence surveys also suggest a negative linear relation between these two variables ( $R = -0.48$ ). Other research has found that total harvest of subsistence resources has remained constant between surveys, but the particular resources harvested may differ (Schroeder and Mazza, n.d.). The correlation between

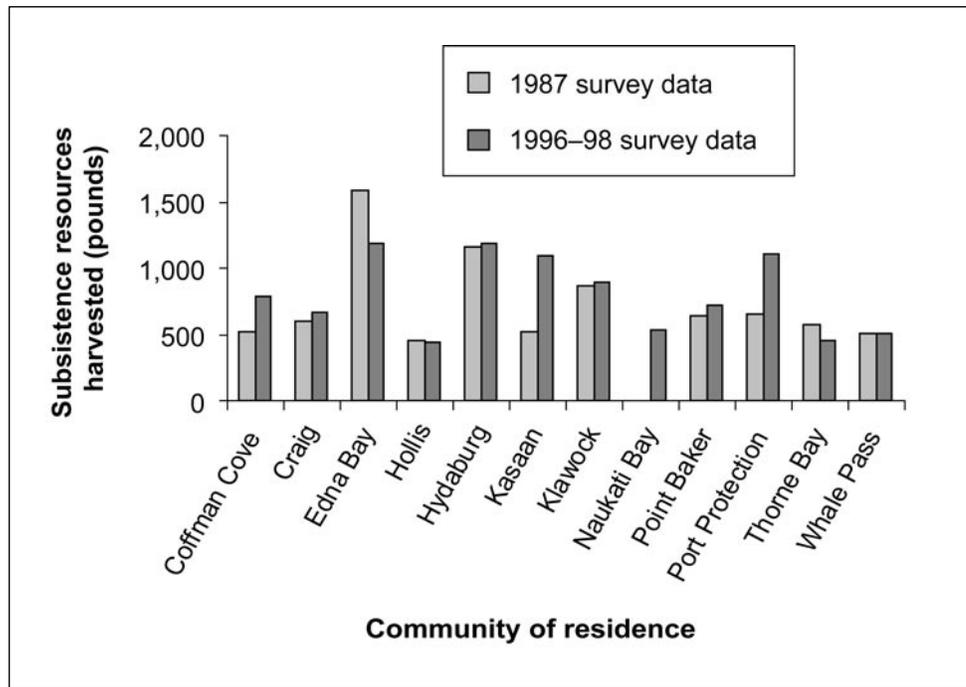


Figure 4—Average household harvest of all subsistence resources based on data from the Alaska Department of Fish and Game community profile database (Alaska Department of Fish and Game 2001).

**Table 5—Deer as a percentage of total subsistence harvests, and percentage of Native Alaskans, 1999**

Geographic area	Percentage of deer of total harvest	Percentage of Native Alaskans
Coffman Cove	19.79	2.5
Craig	18.93	21.7
Edna Bay	22.56	0
Hollis	18.36	5
Hydaburg	9.02	85.1
Kasaan	15.10	38.5
Klawock	14.85	50.9
Naukati Bay	18.80	9.6
Point Baker	15.94	2.9
Port Protection	20.94	0
Thorne Bay	17.97	2.9
Whale Pass	27.43	1.7

Source: Alaska Department of Fish and Game 2001 and USDC Bureau of the Census 2000.

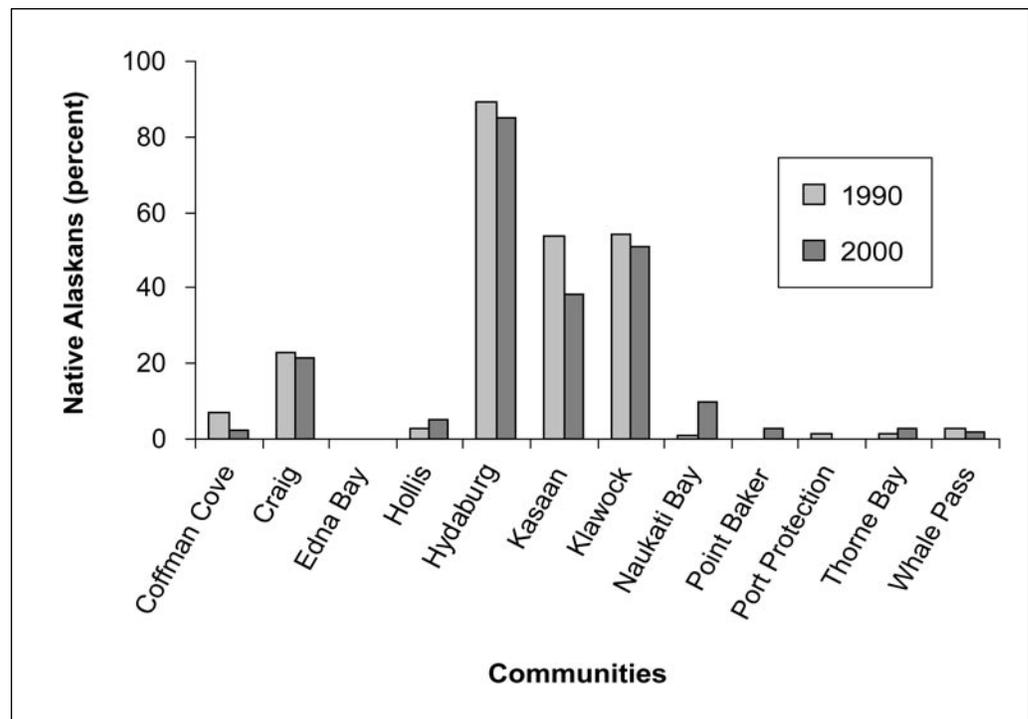


Figure 5—Percentage of Native Alaskans in Prince of Wales communities (USDC Bureau of the Census 1990, 2000).

percentage of Native Alaskans and deer as a percentage of total subsistence harvests may indicate that non-Native Alaskans draw from a smaller pool of subsistence resources and depend more on a particular species.

Of the five communities where per capita deer harvest increased, Kasaan and Klawock have some of the highest percentages of Native Alaskans on the island, whereas Port Protection and Thorne Bay have some of the lowest (fig. 5).

### How Have Economic Conditions Changed?

Between 1990 and 2000, there was a net loss of 229 jobs on POW (Gilbertsen and Robinson 2001). Timber harvested from the Tongass National Forest has declined by 75 percent since 1990. Consequently, manufacturing, most of which is related to the timber industry, was the sector showing the biggest decline on POW. However, the trade, services, and government sectors all grew (Gilbertsen and Robinson 2001). This is consistent with overall trends for southeast Alaska (Cordova et al. 2002). These data from the Alaska Department of Labor do not account for self-employed workers. Therefore, it is interesting to compare these employment data with the self-reported data in the U.S. census (table 6). Fewer POW residents classified themselves as unemployed in 1999 than in 1989. This is juxtaposed with the decline in median household income during the same period. The decline in median incomes on the island (table 7) may indicate that employment opportunities in 1999 paid less than those in 1989.

Thirty-six percent of U.S. adults, age 16 and older, are outside the labor force (USDC Bureau of the Census 2000). This component of the population includes students, homemakers, retirees, and seasonal workers surveyed during their off-season. In rural

**Table 6—Unemployment statistics for Prince of Wales Island and Ketchikan city, 1989 to 1999**

Geographic area	Percentage of unemployed residents	
	1989	1999
Coffman Cove	14.7	7.8
Craig	8.4	6.9
Edna Bay	25.0	—
Hollis	8.3	2.1
Hydaburg	21.8	15.4
Kasaan	64.5	11.8
Ketchikan city	8.6	5.7
Klawock	17.3	11.2
Naukati Bay	9.1	16.3
Point Baker	—	—
Port Protection	75.0	—
Thorne Bay	18.6	10.1
Whale Pass	35.7	37.8

— = zero or rounds to zero.

Source: USDC Bureau of the Census 1990, 2000.

**Table 7—Median household income and percentage of individuals below the poverty line, 1989 to 1999**

Geographic area	1989		1999	
	Median household income (1999\$) <sup>a</sup>	Percentage of individuals living below the poverty line	Median household income	Percentage of individuals living below the poverty line
Coffman Cove	\$55,079	5	\$43,750	5
Craig	\$59,063	4	\$45,298	10
Edna Bay	\$15,313	64	\$44,583	23
Hollis	\$39,063	15	\$43,750	9
Hydaburg	\$25,174	26	\$31,625	24
Kasaan	\$58,334	0	\$43,500	0
Klawock	\$49,479	8	\$35,000	14
Point Baker	\$15,104	0	\$28,000	5
Port Protection	\$12,500	46	\$10,938	58
Thorne Bay	\$49,610	5	\$45,625	8
Whale Pass	\$61,979	0	\$62,083	0

<sup>a</sup>Median household incomes were converted to year 1999 dollars by using the Anchorage Municipality Consumer Price Index.

Source: USDC Bureau of the Census 1990, 2000.

Alaska, the average percentage of adults outside the labor force is often higher. Given a historically lower than average percentage of retirees in Alaska, the labor force statistic has been interpreted as a reflection of the time and effort rural Alaskans direct toward subsistence activities (Alaska Department of Community and Economic Development 2002). On POW, the percentage of adults outside the labor force ranges from 22.8 percent in Craig to 62.2 percent in Whale Pass (table 8).

Table 9 highlights some of the economic indicators for the five communities where deer harvests per capita increased. These communities all show a decline in median household income. Four of these five communities (Craig, Klawock, Port Protection, and Thorne Bay) also show a larger percentage of residents living in poverty in 1999 than in 1989. Of the remaining communities on POW where per capita deer use declined, five had an increase in median household income and a decline in poverty (table 7). Coffman Cove and Point Baker are exceptions. Although both communities had less per capita deer use, the median household income declined in Coffman Cove, but the percentage of residents living in poverty did not change. In Point Baker, the median household income increased, but so did poverty.

The change in percentage of individuals outside the labor force did not correlate with change in deer harvests. The percentage of individuals outside the labor force increased in Craig, Kasaan, and Thorne Bay between 1989 and 1999, while it decreased in Klawock and Port Protection (tables 7 and 8).

### **Has the Supply of Deer Changed?**

The exact number of deer living in unit 2 is unknown and likely will remain so, given the difficulty of counting animals in a forested area. The size of the population—the supply in this analysis—is estimated through hunter and pellet-group surveys.

The percentage of successful hunters and the number of deer killed are two indicators for deer supply. On average, 67 percent of hunters were successful in unit 2 between 1984 and 2000 (Hicks 2001). Figure 2 shows there has been some fluctuation in these indicators, but a linear regression reveals that there is not a trend in either the number of successful hunters or number of deer killed ( $R^2 = 0.02$  and  $0.09$ , respectively).

Reported deer harvests are based on the deer hunter survey summary statistics compiled by the ADF&G, Division of Wildlife Conservation. For the 2000–2002 southeast deer survey, 3,730 surveys were delivered and 2,261 were returned (60.6-percent response). Unit 2 is suspected to have the highest number of illegal or unreported harvests in the region. Based on the number of radio-tagged deer and documented and anecdotal accounts of found deer remains, unreported harvest or illegal harvest is estimated to be 100 percent of reported harvest in unit 2 (Porter 2001).

Biologists have determined that winter habitat is a significant factor influencing deer populations in southeast Alaska (Kirchhoff and Schoen 1987, Schoen and Kirchhoff 1990, Wallmo and Schoen 1980). Ideal winter habitat for Sitka black-tailed deer (*Odocoileus hemionus sitkensis*) is a high-volume old-growth forest below 1,500 feet with 65 to 95 percent canopy cover. These types of stands typically provide good thermal cover, and they intercept much of the snow, leaving forage in the understory exposed (Schoen and Kirchhoff 1990, Wallmo and Schoen 1980). High snow volume in a clearcut adjacent to a winter refuge may trap the deer in that area. Therefore, the overwintering habitat should be large enough to prevent overbrowsing (Kirchhoff and Schoen 1987).

**Table 8—Labor force statistics for Prince of Wales Island, 1989 to 1999**

Geographic area	Percentage of residents not in the labor force	
	1989	1999
Coffman Cove	17.7	25.7
Craig	19.1	22.8
Edna Bay	56.2	48.6
Hollis	39.2	32.3
Hydaburg	49.4	50.9
Kasaan	26.2	41.2
Klawock	37.5	28.4
Naukati Bay	19.5	43.9
Point Baker	15.7	31.1
Port Protection	81.4	58.3
Thorne Bay	24.3	44.3
Whale Pass	36.4	62.2

Source: USDC Bureau of the Census 1990, 2000.

**Table 9—Communities with an increase in per capita deer use, 1987 to 1997<sup>a</sup>**

Geographic area	Percentage of change in per capita deer harvest	Percentage point change in poverty	Percentage of change in household median income	Percentage point change in unemployment	Percentage point change in individuals outside labor force
Craig	8	6	-23	-1.5	3.7
Kasaan	71	0	-25	-52.7	15.0
Klawock	6	6	-29	-6.1	-9.1
Port Protection	136	12	-13	-75.0	-23.1
Thorne Bay	38	3	-8	-8.5	20.0

<sup>a</sup> These data were collected from 1996 through 1998.

Source: Alaska Department of Fish and Game 2001.

Deer densities fluctuate within and between the different monitoring sites in unit 2. Based on pellet-group counts conducted in 1999 and 2000, ADF&G wildlife biologists concluded the counts fell within the 10-year mean and were within the historical average for the past 14 years (Porter 2001). In two of the monitoring sites, the count was similar to the highest count ever recorded for those areas.

The pellet-group densities were lower in 2001 along some transects on POW despite the mild winter (Paul and Straugh 2001). This decline may be interpreted as suggesting there were fewer deer the previous fall. A mild season should mean less winter-kill and consequently higher pellet-group densities. Another interpretation is that the later and lighter snowfall provided deer with a larger range and, thus, they did not concentrate around the transect as they would in a year with higher snowfall.

Regardless of differences in short-term interpretation of deer supply, there is agreement that in the long term, deer populations will decline as old-growth winter habitat is lost and second-growth forests are not able to provide a substitute. It is predicted that the forest will lose 50 to 60 percent of its deer-carrying capacity by the end of the logging rotation in 2054 (Porter 2001).

A 2002 draft supplemental environmental impact statement reviews several new management alternatives for the Tongass National Forest. Although each alternative reduces the acreage designated for timber harvest, the short-term effect on deer habitat remains about the same, a legacy of past harvests. In the long term, the alternatives that reduce acreage designated for timber harvest the most suggest the least risk for deer populations (USDA Forest Service 2002: 3-144).

## Discussion

Demand for deer appears to have increased in some communities on POW. The subsistence data for Craig, Kasaan, Klawock, Port Protection, and Thorne Bay indicate an increase in pounds of deer used per capita between 1987 and 1996-98 household surveys. All these communities experienced a decline in median household income, and other than Kasaan, they all had an increase in percentage of residents living below the poverty line between 1989 and 1999. These factors indicate a correlation between cash employment opportunities and hunter demand for deer.

The negative correlation between percentage of Native Alaskans in a community and the percentage that deer contributes to total subsistence harvest is interesting. On a regional level, subsistence harvests by weight have not changed much in the past 20 years. Evidence suggests the contribution a particular species makes to total subsistence harvest may vary from year to year. (Schroeder and Mazza, n.d.). A usually heavy eulachon (*Thaleichthys pacificus* (Richardson)) harvest in one community may be distributed through kinship networks that extend into other communities. The next season, a different resource, such as halibut, may skew the subsistence harvest data for a community, but the total subsistence harvest, by weight remains fairly constant (Turek 2003). The population on POW grew during the late 1980s and early 1990s as people followed jobs in the timber industry. Many of the newcomers were from Washington and Oregon where jobs in the timber industry had begun to decrease. It may be that as a group, these "newcomers" rely more heavily on deer as a component of their subsistence harvests than residents who have spent more time in the region.

The similarities and differences between Port Protection and Whale Pass are interesting. Both communities are similar in size, and in 1999, less than 2 percent of the population was Native Alaskan. However, in 1997, the average harvest of subsistence resources in Port Protection was double that in Whale Pass. Whale Pass is a logging town and is accessible by road, whereas Port Protection has no roads and is primarily a fishing community. The 1999 median household income in Whale Pass was six times that of Port Protection. Whale Pass also had the largest increase in people outside the labor force, increasing from 36.4 percent in 1989 to the all-island high of 62.2 percent in 1999. Wolfe and Walker (1987) found an inverse relation between the average personal income in a community and subsistence productivity; the correlation in this study between increased deer harvests and increased poverty supports their finding.

Logging jobs are projected to decline in Whale Pass as less logging is done in that part of the island. The revised Tongass land management plan predicts, "Residents who want to remain with the logging industry would either have to relocate or travel to

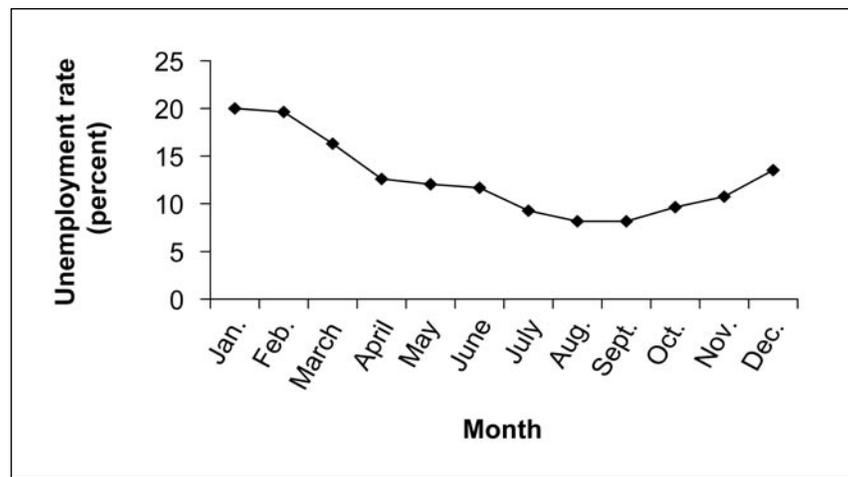


Figure 6—Unemployment in Prince of Wales-Outer Ketchikan census area (ADOL 2001).

remote logging camps elsewhere during the week for employment. If these individuals choose to relocate, the loss of their income would affect others in the community” (USDA Forest Service 1997). The population in Whale Pass decreased by 23 percent between 1989 and 1999. This may indicate that residents who came to the area primarily for employment are leaving as jobs disappear. Ellanna and Sherrod (1987) identified a similar population trend in Klawock between 1930 and 1950 that corresponded with the decline in commercial fishing. Whale Pass may be a good candidate for a case study that examines the flux between the market and subsistence economies. Will Whale Pass still report zero unemployment and the highest median income on the island by 2010? The lifestyle choices made by Whale Pass residents will determine if the community becomes a tourist attraction, a subsistence community, or a ghost town.

Unemployment in the POW–Outer Ketchikan census area follows a seasonal trend, with the highest rate in winter and the lowest in September. The lowest period of unemployment corresponds with the deer hunting season (fig. 6). Behnke (1989) points out that subsistence lifestyles change either through choice or loss of choice. If the time commitment required for wage employment and subsistence activity conflict with each other, an individual must choose between the two. This choice exists only if the person feels that either option offers a viable way to meet individual or community needs.

The speculation that illegal or unreported deer harvest equals 100 percent of the reported harvest suggests that current regulations are too limiting for hunters to meet their needs legally. Current harvest regulations for unit 2 allow four deer to be killed between August 1 and December 31. Of these four deer, no more than one may be antlerless (a doe). Lonner (1980) writes that “under ideal conditions, people may accurately report harvests but, if increasing restrictions result, they will not do so very long.” Conditions may never be “ideal,” but 100 percent underreporting makes it difficult to develop policy based on supply. The demand for deer on POW does not appear to match the regulated supply.

Subsistence versus recreational hunting can be distinguished in several ways. The elemental distinction is that subsistence hunting is done to fulfill one's basic needs, whereas recreational hunting is done during times of leisure, after one's basic needs have been met. This distinction overlooks the psychological and social importance of subsistence in Alaska. In an area where there is sufficient income to buy other food, however, the psychological and social importance of hunting may be quite similar between subsistence and recreational hunters (Glass et al. 1990a). The data analyzed in this study do not address these less tangible aspects of hunting demand. However, some inferences from the economic and employment data can be drawn: based on declining employment opportunities, the number of people not in the labor force, and the estimated number of unreported or illegal harvest, it seems likely that many hunters on POW are hunting to meet their nutritional needs.

The short-term supply of deer is a product of past forest management actions. It appears deer populations will decline unless current and future management actions manage second-growth stands so they are adequate for winter habitat (Hicks 2001, USDA FS 2002: 3–144).

## Implications

Debate over subsistence in Alaska is framed by the requirements of federal law. As it stands, the federal government manages subsistence resources on federal land because the state's constitution does not allow a harvest priority for rural residence. For the state to regain management of fish and wildlife on federal land, either the rural priority must be removed from ANILCA, or the state's constitution must be amended. A state constitutional amendment requires a two-thirds vote from the legislature and approval from the voters. Despite six special legislative sessions in 12 years, the state legislature has not been able to agree on an amendment. Newly elected Governor Frank Murkowski has said he intends to take up the subsistence issue and wants Alaska to manage its own resources (Spiess 2002).

The political wrangling over state and federal management of subsistence resources is irrelevant to the economic factors influencing demand for subsistence resources. Hunter demand for deer on POW appears to be negatively correlated with cash employment opportunities. This may temper overall demand as some families may move to urban areas to find cash employment. If population continues to decline on POW, this will likely affect employment opportunities on the island. Public services, such as schools, may be closed because of declining enrollment and thus spur more outmigration. Employment opportunities in southeast Alaska are projected to decline by 0.5 percent between 2000 and 2010 (Cordova et al. 2002) and likely will decrease more in rural areas (Gilbertsen 2002). Therefore, it is likely some outmigration will continue. Those who decide to stay may become more dependent on subsistence resources. With less cash available to buy food, subsistence hunting and fishing will be essential for meeting nutritional needs.

Jobs in tourism and recreation are expected to increase in southeast Alaska (Gilbertsen 2002). On POW, the road network and ferry service are assets that can be used to develop a tourism market on the island. Tourism-related jobs are often seasonal and pay less than service jobs related to timber and commercial fishing industries, so it seems unlikely the population on the island would grow as it did when logging jobs became available in the 1980s and early 1990s. If the population on POW remains about the same but tourism becomes a larger component of the local economy, demand for deer may increase. The main tourist season is during summer, leaving October, November, and December for hunting. A possible scenario is that tourist

employment would provide enough income opportunities to keep people on the island but not enough cash to supplant the need for subsistence harvests. The seasonal timing of a job can influence the amount of time that is spent hunting or fishing (Lonner 1980).

The most recent population projections for the Prince of Wales-Outer Ketchikan census area were compiled in 1998 by ADOL. Modest increases are projected for the census area by 2013. Comparing these projections to the reported population in 2000, the low projection yields an increase of 518 residents, whereas the high projection yields an increase of 2,516 residents (ADOL 2001). The Ketchikan Gateway census area also is projected to increase by 2013 (low projection is an increase of 3,085 residents, whereas high projection is an increase of 5,578 residents) (ADOL 2001). It is possible these population increases may mean more hunters on POW.

Gilbertsen and Robinson (2001) describe the market economy on POW as being in a “transitional period.” The subsistence economy has typically stabilized many Alaskan communities during these economic transitions. The results of this study suggest this is happening on POW; in most communities where poverty increased, per capita use of deer increased. Based on this, it appears that deer hunting by many POW residents has not become recreational but remains a subsistence activity.

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## Metric Equivalents

When you know:	Multiply by:	To find:
Acres	0.40	Hectares
Miles	1.61	Kilometers
Feet	.305	Meters
Pounds	.45	Kilograms

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