ECONOMICS OF SPORT FISHING IN ALASKA

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ALASKA DEPARTMENT OF FISH AND GAME

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Executive Summary: Economics of Sport Fishing in Alaska

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This executive summary is based on the full report, *Economics of Sport Fishing*. That report is 450 pages and is available from ISER for a $25.00 copying fee, plus postage if ordered by mail. For information, call ISER at 907-786-7710 or e-mail us at ayiser@uaa.alaska.edu.

Executive Summary
Economics of Sport Fishing

Sport anglers reeling in salmon, halibut, and other fish generated—both directly and indirectly—an estimated three percent of jobs and payroll in Alaska in 1993. This is one of the findings of a study of the economics of sport fishing that ISER did for the Alaska Department of Fish and Game.

Sport fishing is enormously popular with residents and visitors. The Department of Fish and Game estimates that nearly half a million anglers fished in Alaska in 1997, with numbers of visiting anglers slightly edging Alaskan anglers. Seven out of ten Alaska households have at least one sport angler. Nearly half of Alaska's households rate hunting and fishing opportunities as important reasons why they live where they do.

The department contracted with ISER to do this study because the economics of sport fishing in Alaska is an important consideration for resource managers allocating fish stocks, evaluating fishery projects, and making decisions about land and water management. The analysis is based largely on information we collected in surveys of sport anglers and guide and charter businesses in 1993 and 1994.

It's not entirely clear how sport fishing has changed since 1993. The Department of Fish and Game reports that the number of resident licenses stayed roughly the same, while the number issued to nonresidents grew about 25 percent. But at the same time, the department also reports that measures of fishing pressure—angler-days fished and numbers of fishing trips—have not changed substantially since 1993. There is some evidence that the growing number of visiting anglers may be mostly casual anglers, who fish once or twice while they're in Alaska. Numbers of sport charters operating in Southcentral and Southeast Alaska increased sharply in the 1990s, and many customers of those charters are tourists who buy single-day licenses.

So the overall economic contribution of sport fishing may not have changed substantially since our survey. In any case, patterns of sport fishing—what people buy for sport fishing and how they travel to sport fishing locations, for instance—don't change quickly. We believe the broad picture of the economics of sport fishing in Alaska that we present here is valid. Below we first describe how we assessed the economics of sport fishing, then profile resident and visiting sport anglers, and conclude with our estimates of the economic value of sport fishing and its contribution to the economy.

Methods of Analysis

At the heart of our analysis is what Alaskans and visitors spend to go sport fishing. Sport anglers spend money for food, lodging, fuel, bait, and guide and charter services for specific fishing trips, but also for campers, boats, cabins, camping gear, and other items they use partly for sport fishing.

We collected information on what anglers spend for sport fishing—as well as information about how many trips they take, what they fish for, and other things—in three surveys. In 1993 and 1994 we did a telephone survey of 1,355 resident sport anglers, a mail survey of 4,278 nonresident sport anglers, and a mail survey (with follow up by telephone) of 331 guide and charter businesses. Table 1 shows survey response rates and margins of error. We divided the state into 11 regions; Table 2 shows how the share of households with sport anglers varied among the regions in 1993.

Table 1. ISER Sport Angler and Guide Surveys, 1993-1994

Survey Respondents	When	Method	Number of Responses	Response Rate	Margin of Error[a]
Sport Anglers Alaska Statewide	June 1993	phone	1,355	83%	±4%
Sport Anglers Alaska Statewide Follow-up[b]	Fall 1993	phone/panel	918	68%	±5%
Non-resident sport anglers	Winter 1993/94	mail	4,278	61%	±2%
Guide and charter businesses[c]	Winter 1993/94	mail/ phone follow-up	331	29%[c]	±11%

[a]This is a standard measure of sampling error representing the 95 percent confidence interval on a yes/no question with 50 percent of respondents answering yes. Confidence intervals for our actual survey estimates are discussed in Appendix G.

[b]ADF&G conducted follow-up interviews with the same respondents interviewed in June.

[c]73 percent of the major firms and 27 percent of the smaller firms responded.

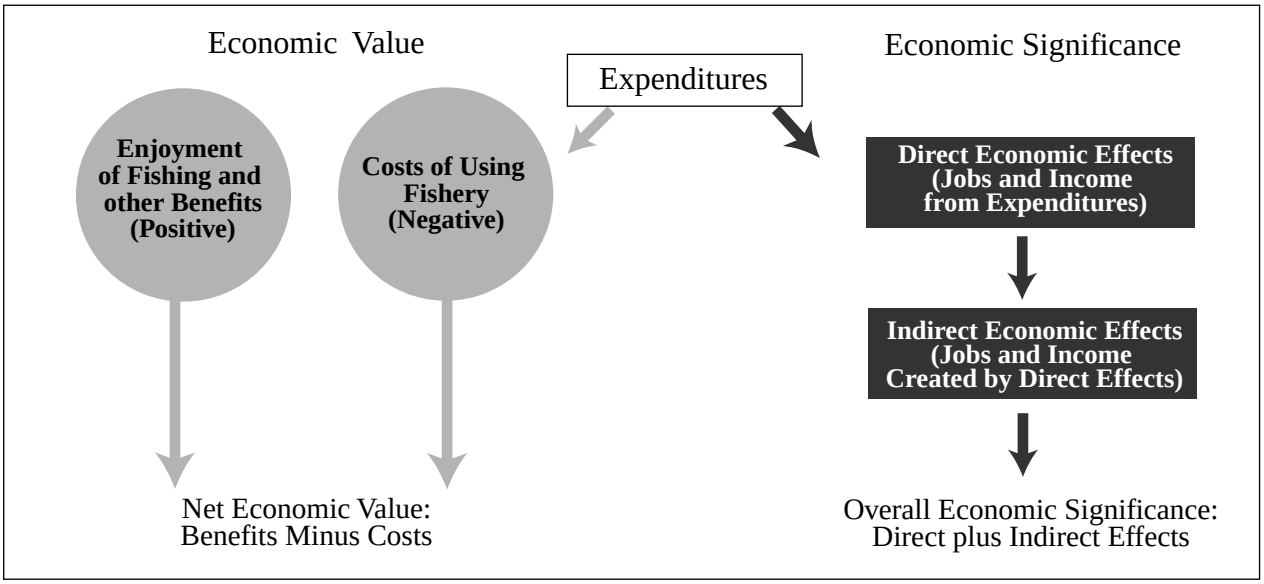
Table 2. Number of Alaska Households with Anglers, by Survey Region, 1993

Region	Total Households*	Households fished previous 3 years	Percent HH fished previous 3 years	Households fished 1993	Percent HH fished 1993
Anchorage	90,725	62,738	69%	43,410	48%
Fairbanks	28,310	18,783	66%	12,209	43%
Kenai	15,510	12,425	80%	9,111	59%
Mat-Su	15,505	12,294	79%	8,156	53%
Kodiak	4,605	3,154	68%	1,532	33%
Remote SC	5,977	4,980	83%	3,096	52%
Juneau	10,669	8,092	76%	4,991	47%
Ketchikan	5,428	3,710	68%	2,474	46%
Sitka	3,098	2,470	80%	1,673	54%
Remote SE	7,291	4,954	68%	2,904	40%
Remote SW&AYK	18,761	10,383	55%	5,290	28%
Total	205,878	143,983	70%	94,846	46%

** Based on 1990 U.S. census household size and 1993 Alaska Department of Labor estimates.*

With information from our surveys and from other sources, we estimated the economics of sport fishing in Alaska. We looked at: (1) economic significance and (2) net economic value. Economic significance measures sport fishing's contributions to economic activity—in jobs, income, and sales. Economic value is an estimate of the overall value anglers place on sport fishing, including both what they actually pay to go fishing and how much more they would be willing to pay. *Net* economic value is that additional "willingness to pay"—a measure of the additional benefits (both monetary and less tangible) that people get from an activity, beyond their out-of-pocket costs. Both are useful measures and both start with expenditures for sport angling—but they measure economic effects in quite different ways, as Figure 1 shows.

Figure 1. Measuring the Economics of Sport Fishing



To calculate the economic significance of sport fishing, we consider expenditures as a means of generating jobs and income both directly (for guides and others in the sport fishing industry) and indirectly (for people who benefit from expenditures of the sport fishing industry). If expenditures drop, then jobs, income, and economic activity drop; if expenditures increase, jobs, income and economic activity increase.

To calculate the net economic value of sport fishing, we consider expenditures as the costs of using the fishery. For instance, if a sport angler hires a fishing guide, that is a cost of using the fishery. People pay such costs in the hope of getting the benefits of the fishery. For sport anglers, the benefits are the pleasures of fishing—catching fish but also less tangible benefits like spending time on a scenic river. After estimating costs and benefits, we subtract costs from benefits. That difference between costs and benefits is the net value.

To do our analyses, we built economic models, using survey and other information. To estimate the economic significance of sport fishing, we created the Alaska input-output model. That model relates changes in spending in a particular industry to total changes in jobs and income in the Alaska economy. It is custom designed to take account of unique characteristics of the state's economy.

Our estimate of economic significance includes jobs, payroll, and sales resulting from sport angler spending in 1993—calculated from projections of spending for sport fishing, based on our surveys of resident and nonresident anglers. The input-output model calculates direct, indirect, and induced effects on total payroll, employment, and sales by industry.

To estimate the net economic value of sport fishing, we built travel cost models—four models for resident anglers and three models for visiting anglers. The travel cost method *indirectly* estimates net value by analyzing anglers' behavior. It predicts the likelihood that an angler will visit a fishing site, based on angler characteristics, measures of fishing quality, and the cost of getting to the site.

Profile of Sport Anglers

As we said at the outset, sport fishing is very important to a lot of Alaskans. Table 3 shows that two-thirds of Alaska households with anglers (which equals nearly half of all Alaska households) describe hunting and fishing opportunities as "very" or "somewhat" important reasons why they live where they do. The importance of sport fishing is also reflected in what angling households own. Among Alaskan households with sport anglers, nearly 40 percent own boats, 4 percent own planes, 6 percent own campers, and 8 percent own cabins they use at least partly for sport fishing trips.

Table 3. Importance of Hunting and Fishing in Why Alaskan Anglers Live in Communities

Importance of Hunting/Fishing Opportunities	Number of Households with Anglers	Percent of Households with Anglers
Very Important	51,750	36%
Somewhat Important	45,284	32%
Not Very Important	45,920	32%
Total	142,954	100%

Figure 2 profiles summer sport fishing among Alaskans. Households with anglers take an average of 4.5 trips per summer, almost entirely on their own; resident anglers report using guide or charter services for only about 6 percent of their summer fishing trips. More than half of fishing trips are within an hour of anglers' homes, and only about one in five trips require more than three hours travel time. The biggest share of trips (57 percent) involve either vehicles and boats or just boats. More than a third of trips involve only cars or other vehicles. Just a very small share (2 percent) involve airplanes.

Sport fishing is concentrated in Southcentral Alaska, with nearly 60 percent of trips to the Kenai Peninsula, the Anchorage area, or the Mat-Su area north of Anchorage. More than a third of all the summer fishing trips Alaskans take are just to the Kenai Peninsula. Southeast Alaska is the next most popular region (19 percent of trips), closely followed by the Mat-Su area north of Anchorage.

More than 40 percent of all sport fishing trips are to the ten most popular sites. As will come as no surprise to those who live in Southcentral Alaska, the most popular individual sites are the Kenai and Russian rivers (14 percent of all trips), followed by sites near Homer and then Resurrection Bay at Seward. The Juneau and Ketchikan areas and Prince of Wales Island in Southeast Alaska also draw many anglers.

The most prized sport fish is king salmon, with nearly a quarter of summer trips targeting that species. Silver and red salmon each draw about 13 percent of trips and trout and halibut around 8 percent each.

Figure 2. Profile of 1993 Summer Sport Fishing Among Alaskans

How Many Households have Anglers?*

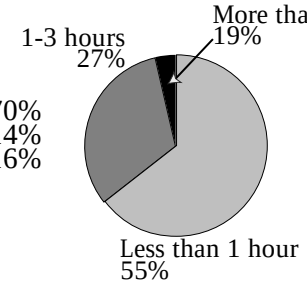
*At least one household member who fished in the previous 3 years.

Trips Using Charter Service
Yes—6%
No—94%

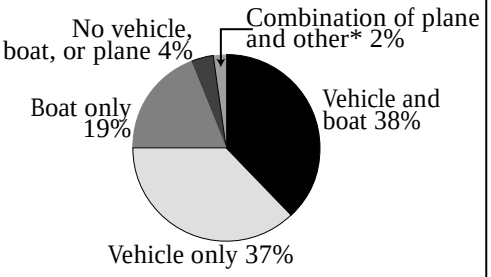
Average # of Fishing Trips Per Summer — 4.5

Length of Trips
1 day — 70%
2 days — 14%
Longer — 16%

Travel Time to Fishing Site
(In Percentage of Trips)

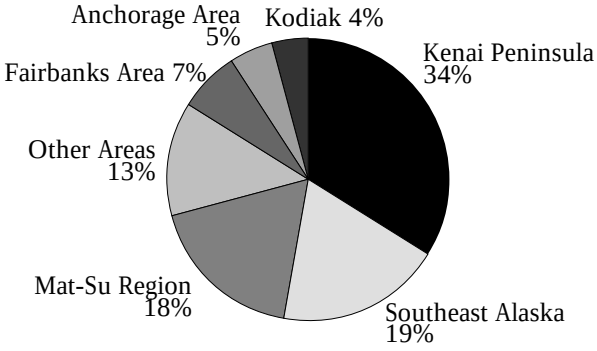


Transportation to Fishing Site
(In Percentage of Trips)



* Plane and boat or vehicle or all three.

Where Do Alaskans Fish?
(Percentage of Total Trips)

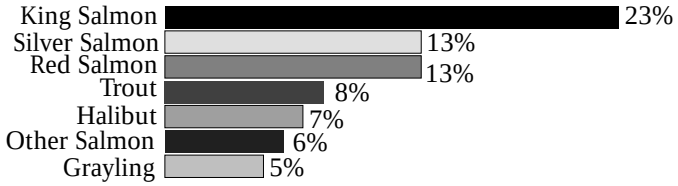


10 Most Popular Sites
(Percentage of Total Trips)

1.	Kenai and Russian Rivers (Southcentral)	14%
2.	Homer area* (Southcentral)	7%
3.	Seward (Resurrection Bay) (Southcentral)	5%
4.	Juneau area (Southeast)	3.5%
5.	Prince of Wales Island area (Southeast)	3%
6.	Delta/Clearwater area (Interior)	2.5%
7.	Little Susitna River (Mat-Su area)	2.5%
8.	Willow Creek (Mat-Su area)	2.5%
9.	Naknek River (Southwest)	2%
10.	Ketchikan area (Southeast)	2%

*Includes Kachemak Bay, Deep Creek, Anchor and Ninilchik Rivers.

Most Popular Target Species
(Percentage of Trips Targeting*)



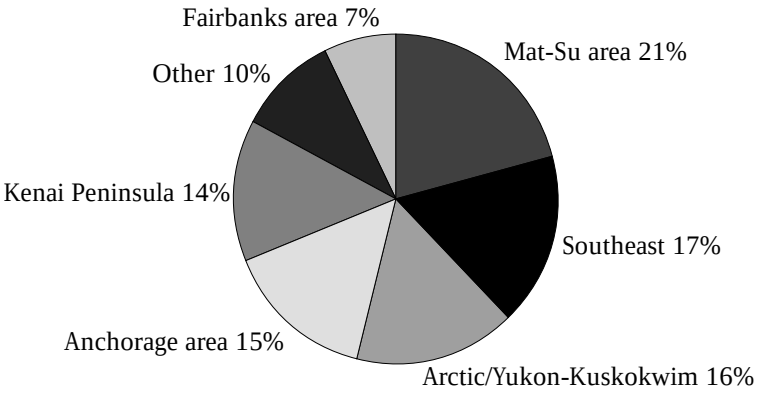
*Not what anglers actually caught, but what they went after. For 25 percent of trips, anglers did not specify targets.

Note: Summer is defined as May through October.

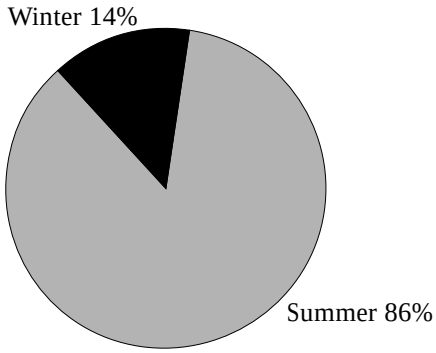
Figure 3 profiles winter sport fishing among Alaskans. Only about 14 percent of trips are during the winter (defined as November through April), and most trips are close to home, requiring less than an hour of travel time. Winter trips are much less concentrated than summer trips, with a much bigger share in the Arctic-Yukon Kuskokwim region. Trout and Dolly Varden are the main species targeted.

Figure 3. Profile of 1993 Winter Sport Fishing Among Alaskans

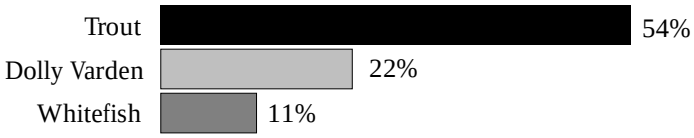
Where Do Alaskans Fish?



What Share of Fishing Trips are in Winter?

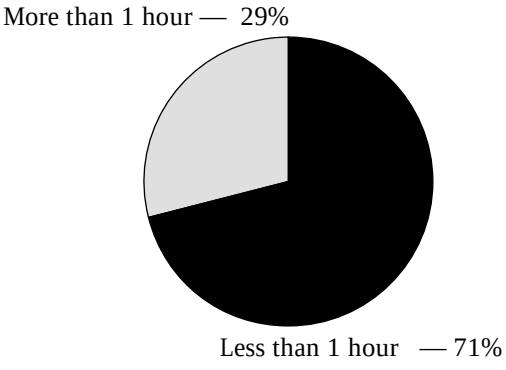


Most Popular Target Species
(Percentages of Trips Targeting)



*What anglers hope to catch,
not necessarily what they do catch.

Travel Time to Fishing Site
(In Percentage of Trips)



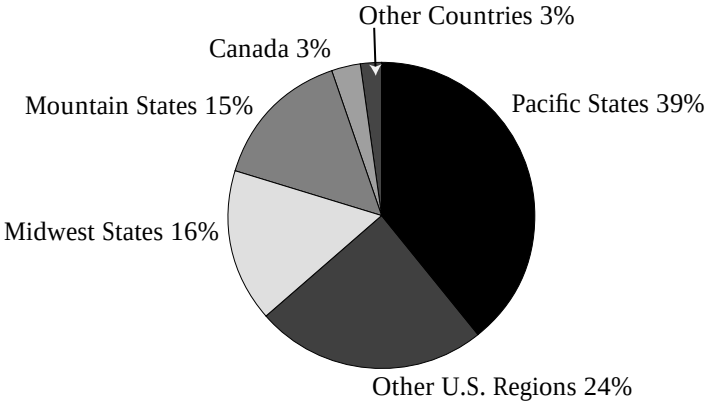
Note: Winter is defined as November through April.

Figure 4 profiles visiting sport anglers. Close to 40 percent of visiting anglers come from the Pacific states and another 30 percent from the Midwest and Mountain states. About 6 percent come from other countries—half of those from Canada. Most visiting "households" are just one or two persons who most typically stay either 8 to 14 days or 5 to 7 days. The most popular month to fish is July.

The Kenai Peninsula is even more popular among visitors than residents, with visiting anglers heading to the Kenai Peninsula for nearly half their trips. The next most popular region is Southeast Alaska, with nearly a quarter of trips by visiting anglers. Visiting anglers most often go after silver salmon and halibut.

Figure 4. Profile of 1993 Visiting Sport Anglers

Where Are Visitors From?
(Percentages of Visiting Households)



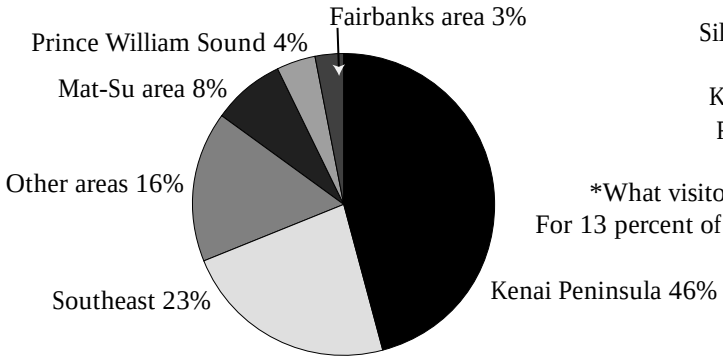
How Long Do Visitors Stay?
(Percentages of Angler Households)

Less than 5 days — 9%
5 -7 days — 29%
8 -14 days — 37%
15 or more — 25%

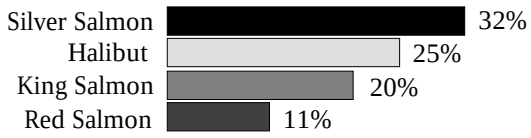
How Many From Household Traveling?

1 person — 43%
2 persons — 42%
More ——— 15%

Where Do Visitors Fish?
(Percentages of Trips)

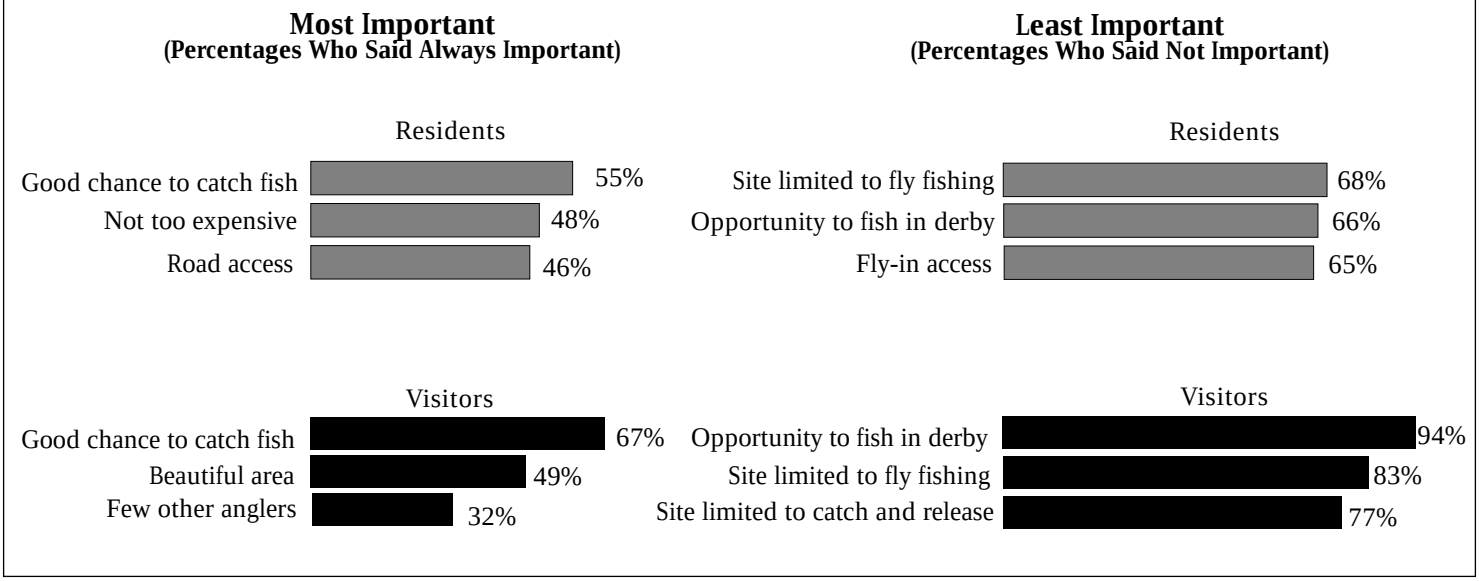


Most Popular Target Species
(Percentages of Trips Targeting*)



*What visitors hope to catch, not necessarily what they do catch.
For 13 percent of trips, anglers cited "salmon" without specifying a species.

Figure 5. Most and Least Important Reasons Why Anglers Choose Sites



How do anglers decide where to fish? Figure 5 shows the most and least important reasons cited by resident and visiting anglers. Not surprisingly, anglers go where they think they have the best chance to catch fish. But interestingly, a bigger share of visiting than resident anglers cited "a good chance" to catch fish as the most important reason they pick sites—67 percent of visitors as compared with 55 percent of residents. Residents are also likely to choose less expensive sites with road access, while visitors look for beautiful areas. Neither residents nor visitors choose sites just because they have fishing derbies or because they are limited to fly fishing.

Economic Significance of Sport Fishing

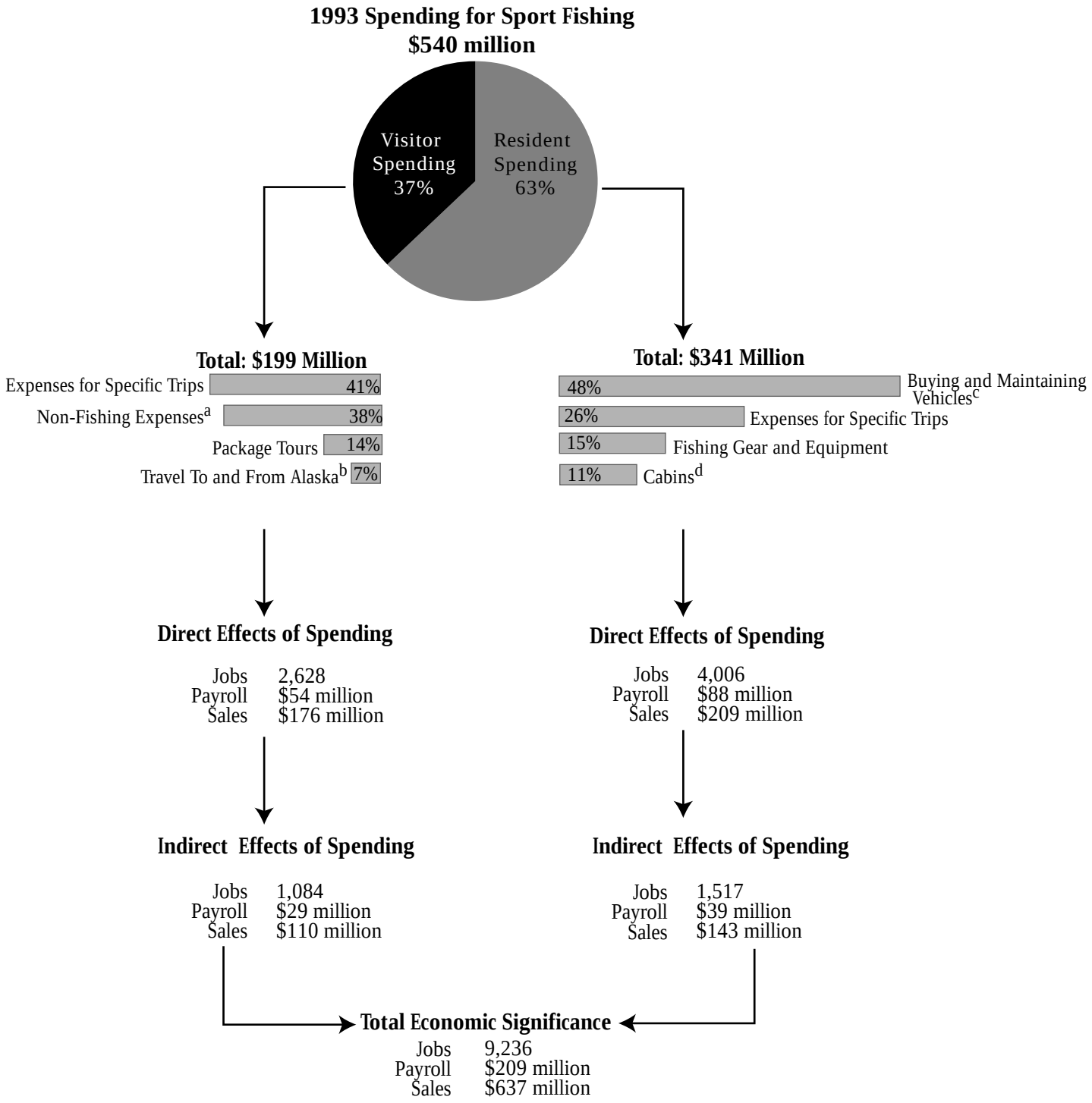
The economic effects of sport fishing start when anglers spend money. Sport anglers spent an estimated $540 million—residents $341 million and visitors $199 million—for sport fishing in 1993 (Figure 6).

For residents, the biggest expense (48 percent) was the share of vehicle costs that can be attributed to sport fishing trips, followed by expenses for specific trips (26 percent) and then fishing gear and equipment (15 percent).

The largest share of visitor expenses (41 percent) was for fishing trips, which include costs of guides and charters. (Visitors also undoubtedly spend a lot for equipment and vehicles they use to go fishing, but those expenses aren't included here, because they don't have an economic effect in Alaska.) The next biggest expense (38 percent) was money they spent during fishing trips but which was not specifically for fishing—for places to stay, for instance. Package tour costs—which typically include costs of fishing, lodging, transportation, and eating—made up about 14 percent of visitor spending.

That spending directly created jobs and payroll in Alaska: an estimated 6,635 jobs and $142 million in payroll in 1993. In turn, this spending created more jobs and payroll as it circulated through the economy: an additional 2,600 jobs and $67 million in payroll. So the total economic significance of sport fishing in 1993 was 9,236 jobs, $209 million in payroll, and $637 million in sales.

Figure 6. Economic Significance of Sport Fishing in Alaska, 1993



[a]This is money visiting anglers spent for items not directly related to fishing on days they fished; this spending is attributable to sport fishing because it occurred during fishing trips.

[b] Includes only the portion of travel expenses that have an instate economic effect.

[c] Includes only the estimated portion of such expenses attributable to sport fishing trips.

[d] Includes only the portion of purchase and maintenance costs attributable to sport fishing.

Figure 7 shows how spending by sport anglers in 1993 was divided among regions. Nearly two-thirds of all spending was in Southcentral Alaska, with resident spending in that region twice as large as visitor spending. Close to 20 percent of spending was in the Southeast, and there visitor spending was slightly higher than resident spending. Almost all the 10 percent of spending in the Northern region was by residents, and most of the 8 percent of spending in the Southwest was by visitors.

Figure 8 shows the differences in trip-related spending by residents and visitors. (That spending excludes equipment and vehicle purchases, which are not tied to specific fishing trips.) Guide and charter services made up the single biggest expense, accounting for a third of all trip spending. Visitors spent most of that. The next largest expense was personal transportation (19 percent of trip spending), with residents spending two-thirds of that. The next largest expenses were for bait and tackle (15 percent) and groceries (13 percent)—again, as you would expect, residents spent the most for those items.

Figure 7. Regional Spending By Sport Anglers, 1993
(Shares of Total Resident and Visitor Spending)

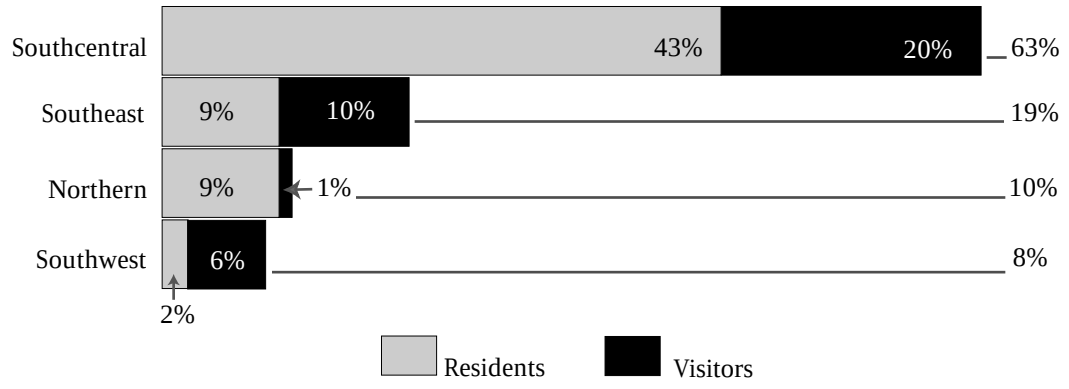
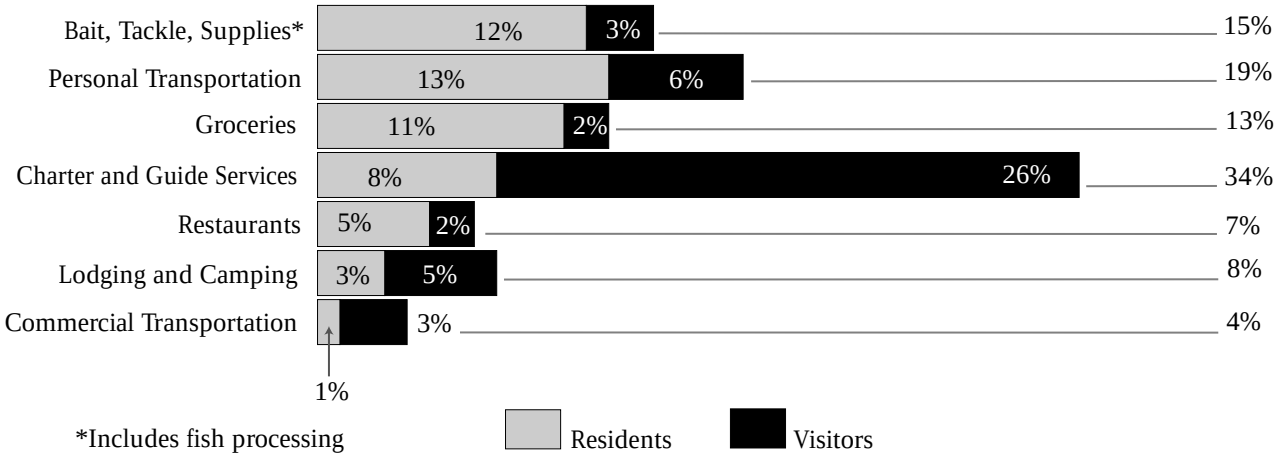


Figure 8. Resident and Visitor Trip Related Spending, By Category, 1993
(Shares of Total Resident and Visitor Spending)

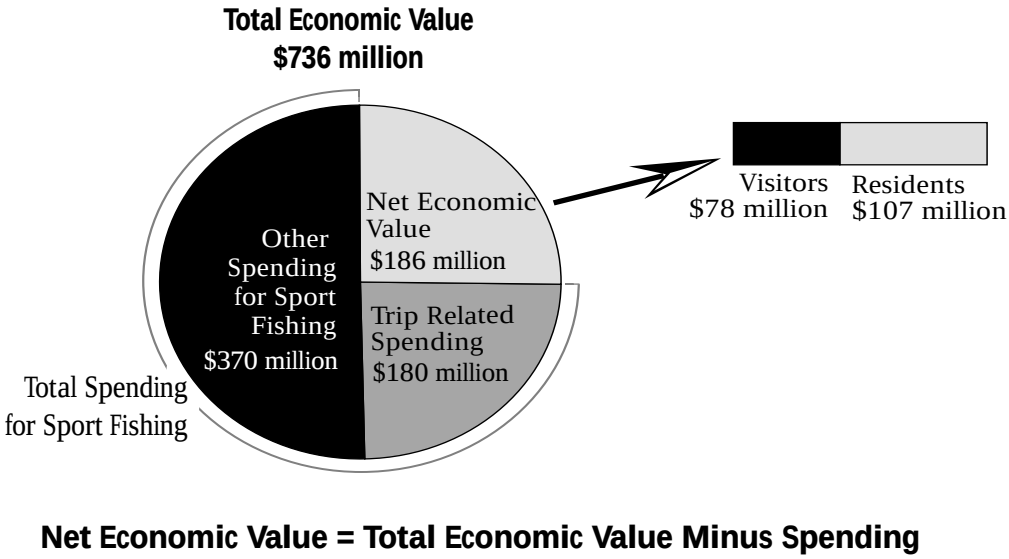


Net Economic Value

Alaskans and visitors valued sport fishing at about $736 million in 1993. That's the combination of what they actually spent for it (around $550 million) and how much more they would have been willing to spend ($186 million). We estimated that total value through travel cost models, which allow us—by analyzing anglers' behavior—to put monetary value on intangible benefits like the enjoyment of fishing.

The additional amount anglers would have been willing to pay—$186 million—is the net economic value: a measure of the additional benefits sport anglers got from fishing in 1993, besides the benefits they paid for. Economists also sometimes refer to net economic value as net willingness to pay—the additional amount anglers would have been willing to pay, besides what they actually did pay.

Figure 9. Total and Net Economic Value of Sport Fishing in Alaska, 1993



Net Economic Value = Total Economic Value Minus Spending

Data and Model Reliability

The surveys and models in this study provide new and valuable information never before collected or reported. Overall, the study provides the only comprehensive and detailed economic data that exist on recreational fishing in Alaska. Still, our results are subject to some error—as are the results of any complex analysis based on detailed information collected through surveys. That's because we can realistically collect data from only a small portion of the population (which can produce sampling error) and because the data collection methods may produce other kinds of error (non-sampling error). The quality of our data, and our modeling decisions, compare favorably with those used in other studies—as evidenced by (among other things) the peer-reviewed publications that have grown out of this study. Still, we emphasize that all our figures are estimates subject to some margin of error. Appendix G of the full report discusses in detail data and model reliability.

The margin of error for any variable that we estimate using a sample increases as sample size declines—for instance, when we look at a region rather than the entire state, or at a variable derived from a question not everyone answered. Also, the margin of error is greater for variables based on questions with a lot of variation in the responses (such as the number of trips households took in a year) and smaller for variables based on questions with less variation in the responses (for example, whether any household member had fished within the past three years). Our statewide estimates have the smallest margins of error. Estimates for the less populated regions, as well as estimates for specific fisheries or locations, have substantially larger margins of error, because they're based on much smaller samples. But the errors are not biased—that is, they do not systematically over- or under-estimate values.

In addition to sampling error, which is unavoidable, we also believe (based on other sources of data) that some respondents under-reported the number of fishing trips they took in 1993. We calculated weights to correct for that under-reporting—but under-reporting nevertheless adds to our uncertainty about how our estimate of fishing trips compares with the actual number of fishing trips in 1993. Another type of non-sampling error could result from reporting errors by respondents—that is, respondents might have made mistakes in reporting where they fished, what they caught, or other variables. Or errors might result if respondents interpreted questions differently—so, for example, their answers might be based on different definitions of what constitutes a fishing trip or of who qualifies as a participant.

We used sample data to generate estimates of the economic significance and of the economic value of the sport fisheries. These analyses required the use of assumptions and models. We are relatively confident in our estimates of economic significance, which are based on survey information about the pattern of sport fishing expenditures and on our knowledge about the structure of the Alaska economy. Our estimates of net economic value, by contrast, are based on our ability to predict anglers' behavior, using available information about angler characteristics, quality of fishing at various sites, and costs of going fishing. Our model calculations are affected by many factors, including variables that we weren't able to include because no data exists.

Chapter 1. Purpose and Scope of Study

Purpose

The Alaska Department of Fish and Game contracted with ISER to assess the economics of sport fishing in Alaska. This is an important consideration in the allocation of fish stocks among users, in the evaluation of fishery projects, and in land and water management and other planning decisions. In these and other instances resource managers need economic information to help them develop plans for the most beneficial and sustainable uses of Alaska's fish stocks.

Methods of Analysis

We estimated the economics of sport fishing in Alaska by looking at: (1) economic significance; and (2) net economic value. Economic significance measures sport fishing's contributions to economic activity—in jobs, income, and sales. Net value analysis looks at all the costs and benefits—both the market and the less tangible costs and benefits—of sport fishing and estimates its overall economic contribution. To do our analyses, we built economic models, using primarily information we collected in three surveys in 1993 and 1994: a telephone survey of resident sport anglers, a mail survey of non-resident sport anglers, and a mail survey (with follow up by telephone) of guide and charter businesses. (The survey questionnaires are in Appendix A.) We also used many secondary sources. Our methods of analysis are described more in Chapter 2.

Value and Limits of Analysis

This report provides the most comprehensive, detailed data available on sport fishing in Alaska. We used state-of-the-art survey designs and methods of analysis, providing rigorous, independent measures of the amount of effort devoted to sport fishing in Alaska and its economic importance.

But our estimates are based on data from 1993 and 1994, and it's not entirely clear how sport fishing has changed since then. The Department of Fish and Game reports that the number of resident licenses issued has stayed roughly the same, while the number issued to nonresidents grew about 25 percent. At the same time, the department also reports that measures of fishing pressure—angler-days fished and numbers of fishing trips—have not changed substantially since 1993. There is some evidence that the growing number of visiting anglers may be mostly casual anglers, who fish once or twice while they're in Alaska. Numbers of sport charters operating in Southcentral and Southeast Alaska have certainly increased in the 1990s, and many customers of those charters are tourists who buy single-day licenses.

So the overall economic contribution of sport fishing may not have changed substantially since our survey. In any case, patterns of sport fishing—what people buy for sport fishing

and how they travel to sport fishing locations, for instance—don't change quickly. We believe the broad picture of the economics of sport fishing in Alaska that we present here is valid. Also, the data provides a valuable benchmark for understanding fishery values and assessing future change. [1]

Report Organization

Chapter 2 provides more information about our surveys, methods of analysis, and the economic models we developed for this study.

Chapter 3 profiles recreational fishing in Alaska in 1993, based on our surveys. It discusses, among other things, characteristics of resident and nonresident households with anglers, as well as how many fishing trips anglers took that year, what they fished for, and how they got to the fishing sites.

Chapter 4 begins with estimates of anglers' spending for sport fishing in Alaska in 1993—spending that is the basis for our estimates of both economic significance and net economic value of sport fishing in Alaska. The chapter then presents our estimates of economic significance, as measured by jobs, payroll, and sales that sport fishing directly and indirectly generated in Alaska, and within regions of the state, in 1993. We estimated economic significance primarily with an input-output model of the Alaska economy—a model we developed specifically for this project from survey information.

Chapter 5 presents our net economic value analysis, done with a series of travel cost models we developed for this study. It includes estimates of statewide economic value and value by site, species, and selected fisheries.

A series of appendixes includes our survey questionnaires as well as descriptions of how we built our models, confidence intervals for our findings, detailed tables, and discussions of data reliability and model resolution.

[1] One of the intended uses of this work was to help ADF&G in evaluation of regulatory options and other management decisions. However, the value of the study for use in current fisheries management is limited—not only by the passage of time but because our data are better suited to analysis of fisheries in the aggregate rather than to decision-making about individual fisheries. See Chapter 2 and Appendix G for more discussion of these issues.

Chapter 2. Data Sources and Methods

This chapter describes information we collected and methods we used to assess the economics of sport fishing in Alaska. More details are included in a series of appendixes.

We assessed the economic importance of sport fishing in two ways: (1) *net economic value and* (2) *economic significance*. Our information came largely from surveys we conducted of resident and non-resident sport anglers and of guide and charter businesses. We also used many secondary sources.

Estimating the Economics of Sport Fishing

Net economic value measures how much an economic activity—like fishing—is worth to a particular group of residents (like Alaskans). It measures worth by subtracting costs from benefits; in this study, those are the benefits sport fishing provides, minus the costs of getting those benefits. It includes both market and non-market benefits and costs. To estimate net economic value, we used information from our surveys and other sources to construct travel cost models.

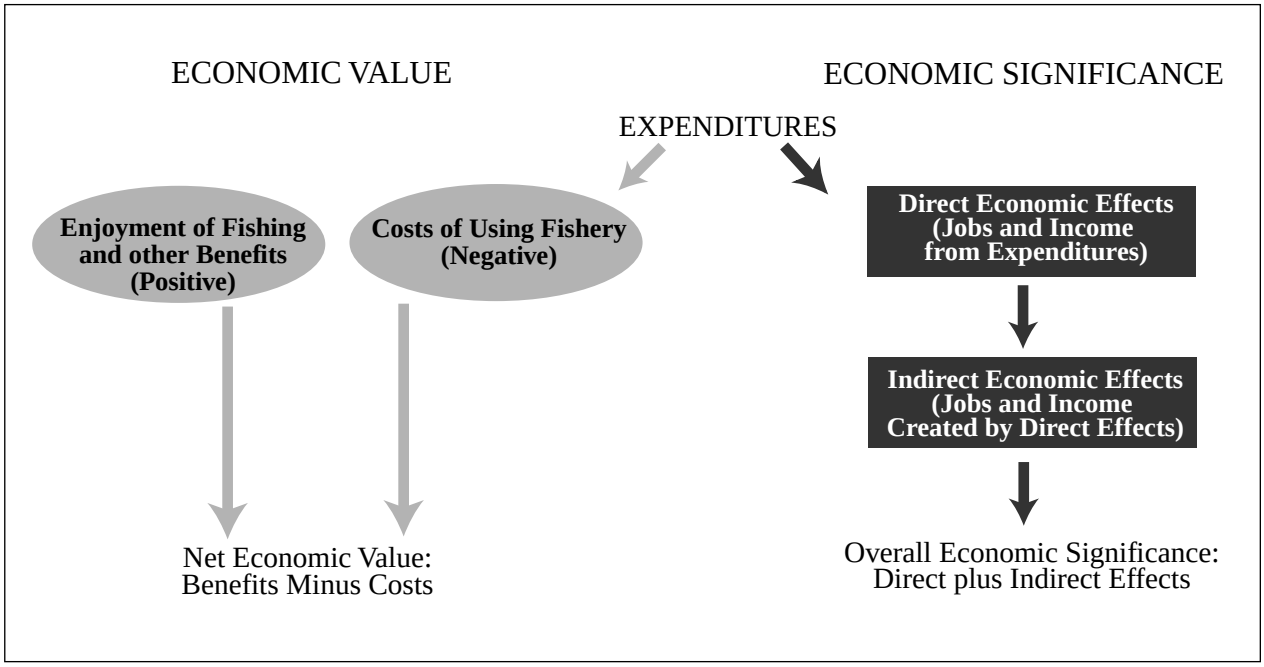
Economic significance includes the spending, jobs, income, or other measures associated with an economic activity (like fishing). Spending for sport fishing directly creates jobs and income (for sport fishing guides and others) and indirectly creates additional jobs and income (for store owners and others), as fishery income circulates through the economy. To estimate economic significance, we used information from our surveys and other sources in both an input-output model of the Alaska economy and in our travel cost models.

Both methods are useful ways of assessing economic importance of an activity, although they assess "economic importance" in different ways. *A critical difference between the two analytical methods is the way they deal with expenditures*. Economic value looks at spending for sport fishing as a cost, since it reduces the amount of money anglers have to spend for other things. Economic significance, by contrast, uses spending for sport fishing as the basis for estimating the jobs and income associated with for sport fishing. Expenditures include payments to sport fishing guides, owners of tackle shops, and others. Figure 2-1 shows how expenditures are used to determine economic significance and net economic value.

To calculate economic significance, we consider expenditures as a means of generating jobs and income both directly (for guides and others in the sport fishing industry) and indirectly (for people who benefit from expenditures of the sport fishing industry). If expenditures drop, then jobs, income, and economic activity drop; if expenditures increase, more jobs and income are created and economic activity increases.

To calculate net economic value, we consider expenditures as the costs of using the fishery. For instance, if a sport angler hires a fishing guide, that is a cost of using the fishery. People pay such costs in the hope of getting the benefits of the fishery. For sport anglers, the benefits are the pleasures of fishing—catching fish but also less tangible benefits like spending time on a scenic river. After estimating costs and benefits, we subtract costs from benefits. That difference between costs and benefits is the net value.

Figure 2-1. Measuring Significance and Value of Sport Fishing



Surveys of Anglers and Businesses

To estimate the economics of sport fishing, we first had to collect data. Our analysis is based primarily on 1993 and 1994 surveys of resident and non-resident sport anglers and of guide and charter businesses. We also used information from prior fisheries studies and a variety of other data sources, which we can group into three categories: (1) conversations with fisheries experts from ADF&G and other organizations; (2) reports and other fisheries-related material from ADF&G; (3) guide books, gazetteers, newspapers, maps, and other sources.

Table 2-1 shows who ISER surveyed, numbers of respondents, methods of survey, response rates, and margins of error.

Table 2-1. ISER Sport Angler and Guide Surveys, 1993-1994

Survey Respondents	When	Method	Number of Responses	Response Rate	Margin of Error[a]
Sport Anglers Alaska Statewide	June 1993	phone	1,355	83%	±4%
Sport Anglers Alaska Statewide Follow-up[b]	Fall 1993	phone/panel	918	68%	±5%
Non-resident sport anglers	Winter 1993/94	mail	4,278	61%	±2%
Guide and charter businesses	Winter 1993/94	mail/ phone follow-up	331	29%[c]	±11%

[a]This is a standard measure of sampling error representing the 95 percent confidence interval on the percentage answering a yes/no question, with 50 percent of respondents answering yes. Confidence intervals for our actual survey estimates are discussed in Appendix G. [b]ADF&G conducted follow-up interviews with the same respondents interviewed in June. [c]73 percent of the major firms and 27 percent of the smaller firms responded.

We also used extensive secondary data. For each fishing site we coded variables representing site facilities such as campgrounds, boat ramps, lodging, and cabins; fishing quality variables by species, including 1992 annual sport catch, weekly newspaper fishing reports, creel and sonar variables for some sites and species, and dummy variables indicating availability and peak availability by area and week; site use variables such as 1992 annual angler days and weekly indicators of crowding or a major fishing derby; fishing regulations by week and species including open or closed, size limits and bag limits; and weekly weather variables by area, including precipitation, wind, temperature, daylight, and tides.

Statewide Sport Angler Survey

In the summer of 1993 ISER surveyed 1,355 Alaska resident sport anglers by telephone, collecting information on sport fishing expenditures and trip characteristics. In the fall of 1993, ADF&G did follow-up interviews with 918 of the same respondents interviewed in June. Some of the respondents also completed and returned, by mail, monthly diaries of their summer fishing trips. Respondents were asked about past years' fishing, about winter fishing trips (November 1992-April 1993) and summer fishing trips (May-October 1993), about expenditures for a subset of trips, about the boats and other equipment used on fishing trips, and about the demographics of their households. Respondents were also asked why they fished, their sources of information about fishing locations, how various factors weighed in their decisions about where to fish, and about different policy options for certain fisheries. The finished sample included information on 6,700 trips, with detailed expense information for 2,191 trips.

ISER used the data from this survey to construct the resident travel cost model and measure sport anglers' willingness to pay for sport fishing opportunities (discussed later in this chapter). The data was also used to calculate the level of resident expenditures associated with sport fishing activity in the state.

SAMPLE DESIGN

For sampling, we stratified Alaska into 11 regions, based on ADF&G information about the distribution of fishing trips across the state. Using a computer program ISER designed to draw accurate samples from both more and less populated areas, we drew random samples from residential telephone numbers for each region.

The finished sample (after we eliminated households because they refused to participate, had no sport anglers, or for other reasons) contained 1,355 resident households with sport anglers—enough to follow the anglers throughout the season, given the inevitable attrition associated with a series of surveys. Appendix A provides details about our sampling procedures.

PRE-SEASON SURVEY

We conducted the initial interviews in April and May 1993. The 1,355 respondents were asked about the number of fishing trips their households had taken in 1992, about winter fishing trips (November 1992-April 1993), about household demographics, and about the equipment—including vehicles, boats, or planes—used on fishing trips. Respondents were also asked about the reasons why they fish, their sources of information about fishing locations, and the importance of various factors in their decisions about where to fish. Finally, they were asked if they would be willing to complete diaries of fishing trips in the coming season—the summer of 1993 (May through October). Respondents who agreed received four monthly mailing between June and September and were asked to record the date and location of each fishing trip, to provide detailed information logs about one specific trip to each site they had visited since the last mailing, and to return the diaries by mail. Respondents gave detailed information about target species and expenditures. Those respondents who didn't complete diaries were asked for this information when they were re-interviewed in the post-season survey.

POST-SEASON SURVEY

In October and November 1993, the Sport Fish Division of the Alaska Department of Fish and Game attempted to re-interview the respondents ISER had interviewed the previous June. The division was able to complete interviews with 918 of the previously interviewed 1,355 respondents. This post-season questionnaire asked household respondents whether they still owned the equipment described in the June interview and about any equipment purchased since June. Respondents were asked about different policy options for certain fisheries and if any one in the household had fished in those specific fisheries in the previous three years. Finally, those respondents who had not completed diaries about their summer fishing trips completed them over the phone. All respondents were also asked about their autumn fishing trips.

RESPONSE RATES

In April and May 1993, ISER attempted to call 2,301 Alaska households. We were able to reach 1,993 households, of which 1,416 had anglers who had fished within the previous 3 years. We completed interviews with 1,355 households, for a response rate of 83 percent. The estimated margin of error for this survey is +- 4 percent. (See definition of margin of error in footnote to Table 2-1.) About 600 households supplied at least some trip information in diaries

we mailed them throughout the summer. We didn't calculate a response rate for the mail-back component.

The response rate for the post-season survey—conducted by ADF&G—was 68 percent of the households ISER interviewed in the spring and about 56 percent of all the fishing households we initially tried to contact .The margin of error for the follow-up survey is +-5 percent.

We collected basic information on about 5,000 summer (May through October) trips in the mail-back and post-season surveys, and 1,700 winter (November through April) trips in the pre-season survey. Respondents provided detailed expense information through trip logs for about 1,700 summer and 491 winter trips. Appendix A provides more details about response rates.

WEIGHTING

In each region, we used screening information to estimate the proportion of households that had fished in the three previous years. We applied that proportion to the total number of resident households in the region, to estimate the total number of fishing households. The number of completed interviews is expressed as a proportion of the total number of fishing households in the region. The weight for each surveyed household is the inverse of that sampling fraction. Because the response rates differed across regions, we adjusted the weights for post-season questionnaires separately for each. We expressed the total number of completed post-season surveys as a fraction of the total fishing households in each region, and the post-season weight is the inverse of that new sampling fraction.

Table 2-2. Weights for Resident Angling Households

	Survey Screened HH	Non Fishing HH	Fishing HH	Percent of HH Who Fish	Est.* Total Households	Est. Angling Households	Completed Postseason Surveys	Household Weight
Region								
1. Anchorage Municipality	483	149	334	69.2%	90,725	62,738	211	297.33
2. Fairbanks Borough	312	105	207	66.3%	28,310	18,738	140	134.16
3. Kenai Pen. Borough	191	38	153	80.1%	15,510	12,425	105	118.33
4. Mat-Su Borough	198	41	157	79.3%	15,505	12,294	104	118.21
5. Kodiak	73	23	50	68.5%	4,605	3,154	35	90.13
6. Other Southcentral	60	10	50	83.3%	5,977	4,980	37	134.61
7. Juneau Borough	207	50	157	75.8%	10,669	8,092	107	75.62
8. Ketchikan Borough	158	50	108	68.4%	5,428	3,710	66	56.22
9. Sitka Borough	74	15	59	79.7%	3,098	2,470	31	79.67
10. Other Southcentral	78	25	53	67.9%	7,291	4,954	29	170.83
11. Rest of Alaska	159	71	88	55.3%	18,761	10,383	53	195.91
Total	1993**	577	1416	71.0%	205,878	143,983	918	

**Total households estimated by applying households sizes from the 1990 US Census to 1993 population estimates from the Alaska Department of Labor*

***Of the 1993 households we screened, 577 had not fished in the previous three years and were not interviewed; 61 of those who had fished did not complete a preseason interview; 1,355 completed pre-season interviews*

For several reasons, we believe that some households—particularly those that fish often—under-reported the number of fishing trips they took. Some households returned early- season mail surveys, but not a complete set, and were not contacted in the post-season survey. So we missed any trips they took after the mail survey they completed.

Also, respondents in the pre-season survey estimated they would take 2.4 million trips in the coming season, but in mail and post-season surveys they reported actually taking only 630,000 trips. By comparison, ADF&G's 1993 harvest survey reported 1.865 million sport angler trips, with an estimated 70 percent of those trips, or 1.3 million, taken by residents.

We addressed this problem by using a sub-sample of our Southcentral anglers. We interviewed them again in 1994 and developed a model that relates the number of non-reported trips per month to trips each household actually reported in 1992 and 1993 and to other household characteristics. We don't believe that underreporting of the number of trips produced a bias in the estimate of expenditures per trip, or in the distribution of expenditures across categories.

Table 2-3. Weights for Resident Angler Trips

Region	Sample Summer Trips	HH Weight	Trips with/HH and Trip Weight	Inferred Average Trip Weight
1. Anchorage Municipality	831	297.33	373,871	1.51
2. Fairbanks Borough	435	134.16	82,643	1.42
3. Kenai Peninsula Borough	798	118.33	151,039	1.60
4. Mat-Su Borough	556	118.21	104,262	1.59
5. Kodiak	243	90.13	29,797	1.36
6. Other Southcentral	232	134.61	50,300	1.61
7. Juneau Borough	646	75.62	68,313	1.40
8. Ketchikan Borough	1,060	56.22	80,242	1.35
9. Sitka	155	79.67	17,414	1.41
10. Other Southeast	131	170.83	34,924	1.56
11. Rest Of Alaska	243	195.91	78,704	1.65
Total	5,330		1,071,511	

Although the two-stage weighting procedure represents our best estimate of sport fishing households and fishing trips, there are several reasons why the weighted sample might not perfectly represent Alaska anglers:

Households that refused to participate were not a random group. The same is true of households that did not participate for other reasons. These include households we could not contact at all, households with no English-speaking adult, and households where no one was available during the survey period.

Households that move frequently were more likely to drop out between the pre- and post-season surveys. So, the post-season sample is a sample of households that move somewhat less frequently than the average across all households.

In bush areas, many households have unlisted telephone numbers. Our random-digit dialing method for contacting households normally would sample from unlisted as well as listed

numbers. However, in prefixes with only a few active residential lines (generally less than 2,000) random-digit dialing becomes too costly, and we sample from a file of listed telephone numbers. So we miss all rural households with unlisted telephone numbers.

We don't know how the fishing patterns of the households we didn't talk to might differ from those who did participate, but we assume that the sample is fairly representative and that the differences are probably not significant.

Non-Resident Angler Survey

In the spring of 1994 ISER mailed out a survey to 7,000 nonresidents who sport fish in Alaska and received 4,200 responses. We developed the sample from ADF&G's 1993 nonresident sport license file and designed it to be large enough to yield valid sub-samples for different categories of non-resident anglers, such as those visiting relatives and those on expensive fishing trips to remote places. Information we collected included total expenditures associated with visits to Alaska for fishing, as well as the composition of expenditures. We also asked for information on the number of specific fishing trips, species targeted, and harvests. Finally, we also collected attitudinal information, to measure the important factors influencing anglers' decisions about going fishing and fishing locations.

The survey was mailed in March 1994, with two rounds of follow-up mailings in April and May. We ultimately achieved a response rate of 61 percent (with a margin of error of +- 2 percent). Of the 4,278 households that responded, 4,123 actually fished in 1993.

ADF&G personnel did coding and data entry in the fall of 1994. Subsequent cleaning by ISER revealed a high rate of inconsistency among respondents as well as inconsistencies in coding and data entry. With the support of ADF&G, ISER re-coded and re-entered all the information on sites and trip origin.

WEIGHTING

Our weighted survey results project that nonresidents made about 200,000 fishing trips in Alaska in 1993. This is lower than expected, both in comparison with our estimate of resident trips in 1993 (about 1,000,000) and in comparison with ADF&G estimates. Our estimate of nonresident angler days fished (980,000), however, exceeds the ADF&G estimate (810,000) by 20 percent. This leads us to believe that the survey respondents used a different definition of "trip" when answering our mail survey.

Table 2-4. Weights for Nonresident Angling Households

Number of Households* (From ADF&G)	114,155
Number of Household Survey Responses	4,278
Household Weight	26.6842

* Households with at least one member purchasing a nonresident license for sport fishing.

Guide and Charter Survey

Also in the spring of 1994, ISER conducted a mail-out and telephone survey of Alaska guide and charter businesses. The survey collected information on business revenues, including the

proportion attributable to sport fishing and specific activities related to sport fishing, such as guiding, transportation, and lodging.

We started with a list ADF&G provided of 1,983 businesses offering guide and charter services in Alaska. Table 2-5. The list included businesses with employees who accompanied and directed anglers in sport fishing and businesses that provided transportation to fishing locations; its coverage was slightly broader than the definition of "guide" used in the ADF&G guide registration program. ADF&G mailed each business a postcard to verify that it was in operation and offering guide and charter services in 1993. Of the 1,867 postcards delivered (116 were undeliverable), 1,178 were returned; 834 indicated they were in the guide and charter business and 344 reported they were not.

In late December 1993, we mailed a detailed questionnaire (pre-tested by mail, with telephone follow-up) to all 1,523 businesses on the ADF&G list, excluding those who had reported they were not in the guide and charter business in 1993. The response rate was very low, even after a follow-up telephone contact by ADF&G.

Table 2-5. Estimating the Number of Businesses Providing Guide and Charter Services in Alaska in 1993

Initial List of Possible Businesses	1,983
Status Known:	
Undeliverable	116
Not in G&C Business	344
In G&C Business	834
Status Unknown	689
Full Survey Initial Mailing	1,523
Self-Representing Firms	46
New Firms added at this stage	13
Sampled Firms	1,490
Follow-up Sample Size	148
Status Known:	
In G&C Business	82
Not in G&C Business	28
Status Unknown	38
Percent of Status Known that are in G&C	74.5%
Implied Number of Firms in G&C business in Sampled Firm Group	1,111

We were worried that this low rate of return would cause response bias, so we drew a sample from the initial survey mailing list for a second mailing of the same questionnaire, to be followed by a telephone contact and interview by ISER personnel. The sample consisted of two strata: a) 46 firms[1] identified by regional biologists as the major guide or charter businesses in their regions and expected to be a self-representing stratum; and b) a random

[1]There were 46 in the original identification, but two were excluded before the mailing because they weren't guide/charter operations; two more were excluded later.

sample of 148 businesses chosen from the 1,523 original mailing[2] (with a few changes). Thirty-two of the businesses in this sample had already returned surveys from the initial mailing, so the follow-up mailing in February 1994 consisted of 162 surveys.

We completed interviews with 29 of the major guide and charter businesses and with 64 of the random sample of remaining businesses. Along with the 238 completed questionnaires returned by mail, the finished sample included 331 businesses.

A major portion of the survey was information on expenditures and employment, including the location of expenditures and the residence of employees. We also got general descriptions of the businesses and data on capital expenditures, equipment owned, and location of business. The finished sample of 331 businesses represented a 73 percent response rate for large firms and 27 percent for other firms, for an overall response rate of 29 percent. ADF&G entered the data and ISER cleaned it.

WEIGHTING

There were two strata:

1. The self-representing big firms: Of the 46 in the initial list, we completed 29 interviews, 6 reported they weren't in the guide and charter business, 9 didn't respond, and 1 one was unknown, for a response rate of 29/40=72.5 percent. The weight for these firms is the inverse of the response rate, 1.38. (Table 2-6).

2. Other firms: We compared the responses of the 238 from the initial survey mailing with the 64 from the intense follow-up group and found no significant differences in revenues or expenditures. Consequently, we combined these two groups into a single stratum of 302 businesses for weighing. We had to estimate how many businesses in Alaska are involved in guiding or chartering for sport anglers. We based this estimate on the results of the sample of 150 businesses. Of these, 64 provided interviews; 18 gave us enough information to believe they're in the guide and charter business; 4 gave last resort information; 12 refused, but did not say they weren't involved in guiding or chartering; 2 completed interviews that were lost; 28 were either not in business or not involved in guiding or chartering. Of the 110 businesses we know something about, 82—or 74.5 percent— are in our universe. Our initial listing was 1,523; we added 13 businesses, but pulled 46 into the "big firms" group; that left 1,490. Of these 1,490 businesses, we estimate that 1,111 firms provide guide and charter services to sport anglers. The weight for the surveys is 1111/302=3.63.

Table 2-6 Weights for the Guide and Charter Survey

Self Representing Firms	46
Not in G&C Business	6
In Business	40

[2]We excluded any firms for which the questionnaire was undeliverable and firms which we knew from the first mailing were not in the guide or charter businesses. We added a few firms missed on the very first list of 1,983.

Completed Interviews	29
Weight (40/29)	1.38
Sampled Firms	1,490
Estimated Number in G&C	1,111
Completed Interviews	302
Weight (1111/302)	3.68

Net Economic Value

Our approach to estimating the net economic value of sport fishing was using our survey data to construct travel cost models.

Constructing Travel Cost Models

The travel cost method *indirectly* estimates net value by analyzing anglers' behavior. It estimates value by comparing the likelihood that an angler will visit a fishing site with measures of fishing quality and the cost of getting to the site. We used statistical analysis of survey data and other information to try to identify a break-even point where an angler decides whether or not to take an additional sport fishing trip. This method is described in detail in Appendixes C and D.

We used the resident and nonresident trip data and secondary site data to estimate travel cost models of sport fishing. (Appendix B describes the estimation of the travel cost equations.) The resident travel cost model actually consists of four regional models, based on the residence of the angling household. The model regions were defined as Southeast (management areas A – H), Southcentral (management areas K- P), Interior (management areas U, I, and J), and Kodiak (area Q). The remaining management areas did not have enough survey observations to allow us to estimate travel cost equations. Model estimates therefore do not include the net economic value to rural residents in northern and western Alaska—6 percent of sport fishing households. Nor did we model winter trips by resident households. Winter fishing generates 15 percent of our resident survey trips and 6 percent of expenditures. The resident models were estimated from 5,087 summer (May–October 1993) fishing trips residents took.

We divided non-residents anglers into three categories and estimated a separate model for each category: one statewide model for destination anglers (those who came for no reason other than fishing) and two regional models—Southeast and the rest of Alaska—for incidental anglers (those who came for other reasons).[3] For nonresidents, the regions are defined by fishing destination. The nonresident models represent 87,151 of an estimated 114,155 nonresident households taking 132,567 recreational fishing trips in Alaska in 1993.

The resident models were based on richer survey data that could support a more sophisticated design than the nonresident models. The resident models used a two-stage, weekly angler

[3] In the nonresident travel cost models we exclude fishing trips made by 27,000 non-resident households who came to Alaska to visit friends or relatives. We assume that they took their fishing trips with those friends and relatives and that we've already captured their consumer surplus in the resident models of net value. However, we did include their expenditures in the estimate of the economic significance of nonresident sport anglers in the state.

decision tree: whether to fish in a given week and, if so, where to fish. The nonresident models were single stage: where to fish. The decision to fish in Alaska is exogenous to our nonresident model, as is the month the trip started. These modeling constraints on the anglers' choices cause the model to underestimate net economic value to some degree.

Both resident and nonresident models we constructed estimate travel costs based on air and surface miles between origin and destination. We used the resident survey data's rich and high-quality expenditure information to estimate separate equations to model food, lodging, guide and charter, and bait and miscellaneous costs per fishing trip. The resident models also include an estimate of angler time spent at the fishing site as a factor influencing the trip costs and benefits.

Lost wages are included as a cost of the trip for those anglers who said they could have worked instead of going fishing. In contrast, the nonresident model uses a simple linear regression to compute a summary value of average trip costs for each alternative.

Once we had estimated all component model equations we built spreadsheet versions of the travel cost models for general application. (See Appendix D.) The full micro data set is far too large for use in a desktop computing environment. The resident spreadsheet models use mean values for the model variables by demographic groups. The nonresident spreadsheet models use a sample of observations from the micro data set. The sampling strategy more accurately represents the nonlinearities in the micro model, but requires running the model a number of times to obtain the distribution of results. We used these spreadsheet models to generate the estimates of net economic value by site, region and species, and selected fisheries as reported in Chapter 5.

Estimating Net Economic Value

Our travel cost models allowed us to estimate the net economic value of sport fishing. But net economic value as defined by economists and as used in this study may not be familiar to many readers. So here we describe the broad concept of net economic value.

Earlier we defined net economic value as benefits minus costs. What is the definition of cost? Economists define the cost of a good, service, or experience by what we give up or forego to obtain it. What we give up includes the costs of anything we have to buy—such as the gasoline a sport angler buys for his camper. Cost also includes the value of sport anglers' time. If a sport angler gives up a day of work to go fishing, from an economic perspective that is as much a cost of fishing as the cost of the gas used to get to the fishing site. Economists refer to these kinds of costs as "opportunity costs."

What is the definition of value or benefit? Economists usually define the value of a good, service, or experience in terms of "willingness to pay" or "willingness to accept." In this study we use willingness to pay. *Willingness to pay is* the largest amount a person would pay to obtain an item or undertake an activity. That willingness to pay includes not only what he actually pays, but any additional amount he would be willing to pay, if he had to.

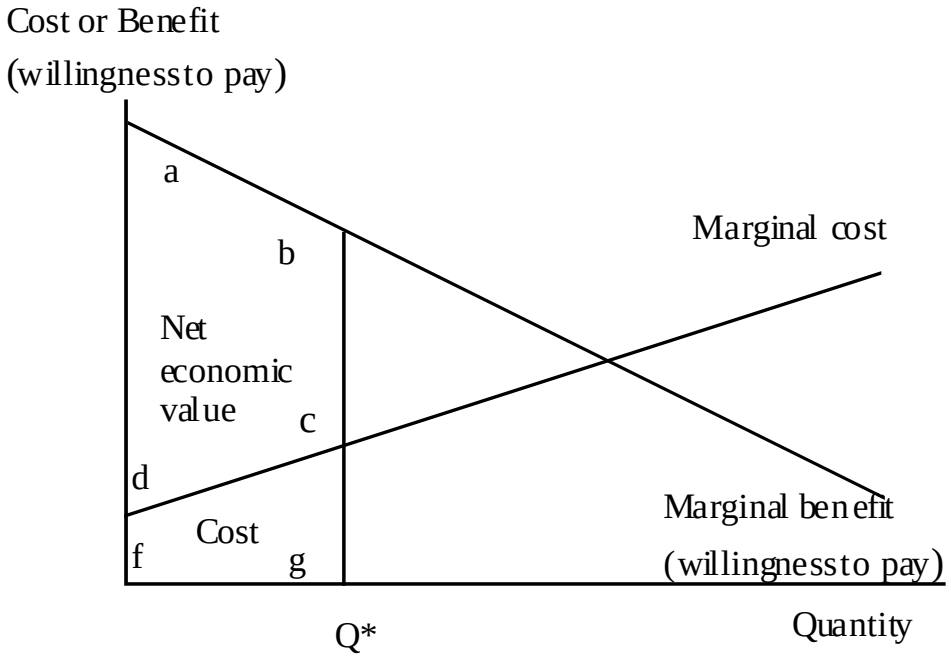
Willingness to pay can measure the value of goods or activities that don't have a market price. For instance, if someone gives you a freshly caught sockeye salmon, the fact that you got it for free does not mean it has no value. Its value to you is whatever you would have been willing to

pay for it. Thus, a good, service, or experience can have a value in dollars, even if no one actually pays.

Our the travel cost analysis—described earlier—relies on observed changes in behavior that indicate willingness to pay.

Figure 2-2 illustrates the concept of net economic value. For any given quantity of some hypothetical good, there is an additional cost or benefit—known to economists as marginal cost or marginal benefit—from producing or consuming one more unit of the good. The marginal or additional cost is the cost of producing one more unit of the good. It is shown as an upward sloping line, because as quantity increases marginal cost usually rises. In other words, the more we have of a good, the higher the additional cost of adding one more unit. The marginal or additional benefit from consuming one more unit of the good is shown as a downward sloping line, because as quantity increases marginal benefits usually decline. In other words, the more we have of a good, the lower the additional benefit from having one more unit. (If this good is traded in markets, then the marginal benefit curve equals the market demand curve and the marginal cost curve equals the market supply curve.)

Figure 2-2. Marginal Benefit, Marginal Cost, and Net Economic Value



For any given quantity of a good, service, or experience, the net economic value is the benefits minus the costs: the difference between the total benefit (the area under the marginal benefit curve in Figure 2-2) and the total cost (the area under the marginal cost curve). For quantity Q* net economic value is shown by the trapezoid a-b-c-d (total benefits are shown by the trapezoid a-b-f-g, while total costs are shown by the trapezoid d-c-f-g).

In measuring net economic value it's crucial to define for whom we are measuring benefits and costs. In this study, we estimate the net economic value of sport fishing for Alaskan and nonresident anglers.

Economic Significance

We developed an Alaska input-output model specifically for this project, so we could estimate the overall economic significance of sport fishing in Alaska, the significance by region, and the significance of individual sites. We also used that model, in conjunction with the travel cost models described above, to estimate the economic significance of specific fisheries and species.

Alaska Input-Output Model

Appendix B provides a detailed technical description of the input-output model. The model relates changes in spending in a particular industry to impacts on the Alaska economy. It is custom designed to take account of unique characteristics of the state's economy.

Our economic significance estimate includes jobs, payroll, and sales resulting from sport angler spending in 1993—calculated from projections of spending for sport fishing, based on our surveys of resident and nonresident anglers. The input-output model calculates direct, indirect and induced effects on total payroll, employment, and sales by industry. Economic significance statewide and by region, site, species, and selected fisheries is reported in Chapter 4.

Chapter 3. Survey Findings

Here we report the findings of ISER's 1993 and 1994 surveys of Alaska's resident and nonresident sport anglers and of guide and charter businesses. (Appendix A includes survey descriptions and questionnaires; Appendix G discusses survey confidence intervals.) Not all respondents answered every question, so "Total" numbers cited in tables vary.

Alaska Resident Anglers

Household Profile

Nearly half of the 206,000 households in Alaska in 1993 had sport anglers who had fished that year, and 70 percent had anglers who had fished sometime in the previous three years (Table 3-1). Households with anglers tend to be larger—61 percent had three or more persons (Table 3-2); to have higher incomes—78 percent earned more than $25,000 in 1992 (Table 3-4); and to have lived in Alaska longer--80 percent had been here more than five years (Table 3-5) than households without anglers. Fishing is a family activity: 54 percent of the fishing households included children. Twenty-six percent of the households included persons over the age of 60 (Table 3-3). Most households have at least one skilled angler: 53 percent have anglers self-described as advanced or expert (Table 3-7), and 79 percent say they know the best places to fish (Table 3-8).

Table 3-1. Number of Alaska Households with Anglers, by Survey Region

Region	Total Households*	Non-Fishing Households	Households fished Last 3 years	Percent HH fished Last 3 years	Households fished 1993	Percent HH fished 1993
Anchorage	90,725	27,988	62,738	69%	43,410	48%
Fairbanks	28,310	9,527	18,783	66%	12,209	43%
Kenai	15,510	3,086	12,425	80%	9,111	59%
Mat-Su	15,505	3,211	12,294	79%	8,156	53%
Kodiak	4,605	1,451	3,154	68%	1,532	33%
Remote SC	5,977	996	4,980	83%	3,096	52%
Juneau	10,669	2,577	8,092	76%	4,991	47%
Ketchikan	5,428	1,718	3,710	68%	2,474	46%
Sitka	3,098	628	2,470	80%	1,673	54%
Remote SE	7,291	2,337	4,954	68%	2,904	40%
Remote SW&AYK	18,761	8,377	10,383	55%	5,290	28%
Total	205,878	61,895	143,983	70%	94,846	46%

* Based on 1990 U.S. census household size and 1993 Alaska Department of Labor estimates.

Sport hunting and fishing are important to fishing households. Of household respondents, 68 percent said that hunting and fishing were a very or somewhat important reason for living in

their present communities (Table 3-9); 44 percent (excluding those who had lived there all their lives) said hunting and fishing were very or somewhat important in their decision to move there (Table 3-10).

Table 3-2. Alaska Households with Anglers, by Size

Household Size	Number of Households	Percent of Households
1	14,698	10%
2	41,227	29%
3	28,055	20%
4	28,436	20%
5	17,360	12%
6	8,424	6%
7	3,273	2%
8	1,986	1%
Total	143,459	100%

Table 3-3. Composition of Alaska Households with Anglers

Number of fishing households with:				
		Under 18		Total
Age 60+	Age 18-59	None	One or More	Number
None	One	9,768	5,759	
	Two or more	26,654	63,841	
One or more	none	16,524	1,326	
	One	7,695	2,913	
	Two or more	4,888	4,413	143,781
Percent of fishing households with:				
		Under 18		Total
Age 60+	Age 18-59	None	One or More	Percent
None	One	7%	4%	
	Two or more	19%	44%	
One or more	none	11%	1%	
	One	5%	2%	
	Two or more	3%	3%	100%

Table 3-4. 1993 Income of Alaska Households with Anglers

Annual Income	Number of Households	Percent of Households
$0 to $10,000	6,783	5%
$10-25,000	20,627	16%
$25-$50,000	49,802	38%
$50-$75,000	27,516	21%
$75-100,000	25,235	19%
Total who Answered	129,963	100%

Table 3-5. Years Households with Anglers Have Lived in Alaska

Years in AK	Number of Households	Percent of Households
One year or Less	6,501	5%
1-5 years	20,970	15%
5-10 years	20,593	14%
10-15 years	20,591	14%
15-20 years	19,030	13%
20-25 years	16,967	12%
25-30 years	11,188	8%
30-35 years	10,057	7%
35-50 years	13,696	10%
over 50 years	4,066	3%
	143,659	

Table 3-6. Years in Current Community of Alaska Households with Anglers

Number of Years in Community	Number of Households	Percent of Households
One year or Less	10,651	7%
1-5 years	29,722	21%
5-10 years	27,642	19%
10-15 years	23,465	16%
15-20 years	15,122	11%
20-25 years	13,158	9%
25-30 years	8,996	6%
30-35 years	5,617	4%
35-50 years	7,771	5%
Over 50 years	1,393	1%
Total	143,535	100%

Table 3-7. Skill of the Most Experienced Angler in Resident Households

Skill of Most Experienced Angler	Number of Households	Percent of Households
1 BEGINNER	14,472	10%
2 INTERMEDIATE	52,459	37%
3 ADVANCED	51,471	36%
4 EXPERT	24,035	17%
Total	142,437	100%

Table 3-8. Resident Anglers' Knowledge about Where to Fish

Do you know the best places to fish?	Number of Households	Percent of Households
1 YES	112,949	79%
3 SOMETIMES/SOMEWHAT	1,980	1%
2 NO	28,089	20%
Total	143,018	100%

Table 3-9. Importance of Hunting and Fishing in Why Alaskan Anglers Live in Communities

Importance of Hunting/Fishing Opportunities	Number of Households	Percent of Households
1 VERY IMPORTANT	51,750	36%
2 SOMEWHAT IMPORTANT	45,284	32%
3 NOT VERY IMPORTANT	45,920	32%
Total	142,954	

Table 3-10. Importance of Hunting and Fishing in Alaskan Anglers' Decisions About Moving to Current Communities

Importance of Hunting/Fishing Opportunities	Number of Households	Percent of Households
1 VERY IMPORTANT	26,179	20%
2 SOMEWHAT IMPORTANT	31,370	24%
3 NOT VERY IMPORTANT	71,281	55%
Total	128,830	100%

Summer Fishing Trips

From May through October 1993, Alaskan households took more than one million fishing trips; 61 percent of these trips were in June and July (Table 3-11). Households with anglers took an average of more than 4.5 trips each over the summer (Table 3-12).

While Anchorage households make up 44 percent of fishing households statewide, they took only 35 percent of the summer 1993 trips. The average number of trips per Anchorage fishing household in 1993 was 3.6. The 13 percent of fishing households that live in Fairbanks averaged the fewest trips—3.0. Ketchikan residents took the most trips per household—11.4—but with only 3 percent of Alaska's fishing households, they accounted for only 7 percent of the trips. Kenai had the highest participation rate: 80 percent of all households fished in the early 1990s. Kenai also had the second highest number of trips per fishing household—7.0—and accounted for 14 percent of summer trips statewide. Mat-Su anglers took 10 percent of summer trips (Tables 3-1, 3-11, and 3-12).

Thirty percent of the trips with an identified target species targeted king salmon, with peak participation in June. Sixteen percent targeted silver salmon, with peak participation in August. Another 16 percent targeted red salmon, with peak participation in July. Ten percent targeted trout, with peak participation in June. And 9 percent targeted halibut, with peak participation in July. (Table 3-13) By a wide margin, the most popular area for fishing was the Kenai Peninsula. Thirty four percent of all resident summer trips were to sites on the Kenai. The Knik Arm drainage (Mat-Su), Tanana River area (Fairbanks), and Ketchikan areas followed, with nine, seven and seven percent of trips respectively. (Table 3-14) The most popular site was the lower Kenai River. Including the trips that did not specify which part of the river was fished, the lower Kenai River accounted for roughly 100,000 trips. If we include the upper river and its major tributary, the Russian River, Kenai River resident fishing trips top 155,000—about 14 percent of all summer trips. (Table 2-17)

Also popular in Southcentral are Resurrection Bay and Katchemak Bay. The most popular sites in Southeast are the Juneau "breadline," Doty Cove to Berners Bay, and Clarence Strait near Ketchikan. The Delta Clearwater River tops the list in the Interior. (Table 2-17)

Table 3-11. Summer 1993 Resident Fishing Trips, by Survey Region and Month

Region	May	June	July	August	Sept.	October	Total
Anchorage	36,340	127,209	109,724	76,782	17,561	2,137	369,754
Fairbanks	10,503	30,406	27,772	10,040	3,796	966	83,483
Kenai	14,583	50,296	57,472	23,338	7,298	730	153,717
Mat-Su	10,701	28,797	31,216	29,711	3,355	366	104,146
Kodiak	1,626	5,478	4,027	11,387	7,522	185	30,226
Remainder SC	2,061	17,714	16,987	8,977	5,358	276	51,373
Juneau	11,204	17,008	18,327	10,695	10,424	467	68,127
Ketchikan	13,758	19,195	16,684	15,219	11,766	289	76,911
Sitka	4,025	5,742	4,310	2,639	921	164	17,800
Remainder SE	10,546	14,485	4,111	3,813	2,204	0	35,160
Remainder Ak	12,758	17,387	32,294	15,711	2,264	402	80,816
Total	128,105	333,718	322,925	208,312	72,469	5,982	1,071,511

Table 3-12. Mean Number of Summer Fishing Trips, per Resident Angling Household, by Region

Region	Mean Trips
Anchorage	3.56
Fairbanks	2.96
Kenai	6.99
Mat-Su	4.66
Kodiak	6.05
Remainder Southcentral	6.76
Juneau	4.87
Ketchikan	11.39
Sitka	3.83
Remainder Southeast	5.57
Remainder Alaska	5.74
State	4.56

Table 3-13. Number and Percentage of Resident Summer Trips Identifying a Target Species, by Species and Month

	Number of Trips							
	May	June	July	August	Sept.	October	Unkn.	Total
Number with at least one target	90,833	220,626	235,738	162,801	66,995	15,849	5,434	798,276
King Salmon	38,655	110,429	60,634	14,443	9,226	5,438	1,895	240,721
Silver Salmon	1,246	4,583	24,370	76,326	33,075	2,338	1,120	143,059
Red Salmon	3,868	25,858	74,751	30,614	639	892	252	136,874
Other Salmon	10,663	12,538	24,583	8,948	5,577	497	473	63,279
Trout	12,733	22,153	21,411	15,585	9,146	2,946	489	84,464
Dolly Varden	3,068	6,799	10,010	6,468	3,193	297	537	30,371
Steelhead	3,777	2,692	0	0	148	668	0	7,285
Grayling	2,732	19,094	15,281	13,303	3,666	1,907	252	56,236
Whitefish	5,141	4,362	4,002	1,553	3,205	566	537	19,365
Halibut	13,831	22,783	23,214	14,075	2,994	188	648	77,733
Groundfish	590	791	3,170	4,950	466	237	0	10,203
Clams & Mussels	1,198	643	1,007	0	0	0	0	2,848
Crab & Shrimp	204	91	682	1,661	818	382	171	4,009
Herring	-	474	-	-	95	-	-	568
No target Specified	35,341	105,259	82,722	44,242	5,237	118	236	273,235
Total Trips	126,174	325,885	318,460	207,043	72,232	15,967	5,670	1,071,511
	Percent of Trips							
	May	June	July	August	Sept.	October	Unkn.	Total
Percent with least one target	72%	68%	74%	79%	93%	99%	96%	75%
King Salmon	31%	34%	19%	7%	13%	34%	33%	22%
Silver Salmon	1%	1%	8%	37%	46%	15%	20%	13%
Red Salmon	3%	8%	23%	15%	1%	6%	4%	13%
Other Salmon	8%	4%	8%	4%	8%	3%	8%	6%
Trout	10%	7%	7%	8%	13%	18%	9%	8%
Dolly Varden	2%	2%	3%	3%	4%	2%	9%	3%
Steelhead	3%	1%	0%	0%	0%	4%	0%	1%
Grayling	2%	6%	5%	6%	5%	12%	4%	5%
Whitefish	4%	1%	1%	1%	4%	4%	9%	2%
Halibut	11%	7%	7%	7%	4%	1%	11%	7%
Groundfish	0%	0%	1%	2%	1%	1%	0%	1%
Clams & Mussels	1%	0%	0%	0%	0%	0%	0%	0%
Crab & Shrimp	0%	0%	0%	1%	1%	2%	3%	0%
Herring	0%	0%	0%	0%	0%	0%	0%	0%
No target specified	28%	32%	26%	21%	7%	1%	4%	25%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Table 3-14. Locations of Resident Angler Summer Trips, by ADF&G Area and by Site

Area	Number of Trips	Percent of Trips
1 Ketchikan Area (A)	78,074	7.3%
2 Prince of Wales Area (B)	3,888	0.4%
3 Kake, Petersburg, Wrangell, Stikine Area (C)	29,428	2.7%
4 Sitka Area (D)	20,227	1.9%
5 Juneau Area (E)	66,324	6.2%
6 Haines-Skagway Area(F)	961	0.1%
7 Glacier Bay Area (G)	1,218	0.1%
8 Yakutat Area (H)	624	0.1%
9 Glennallen Area (I)	40,179	3.7%
10 Prince William Sound Area (J)	21,854	2.0%
11 Knik Arm Drainage Area (K)	97,478	9.1%
12 Anchorage Area (L)	51,510	4.8%
13 East Side Susitna Drainage Area (M)	50,300	4.7%
14 West Side Cook Inlet (N)	46,085	4.3%
15 Kenai Peninsula Area (P)	365,265	34.1%
16 Kodiak Area (Q)	42,533	4.0%
17 Naknek Drainages (R)	26,655	2.5%
18 Kvichak River Drainage Area (S)	1,162	0.1%
19 Nushagak Area (T)	275	0.0%
20 Tanana River Area (U)	79,036	7.4%
21 Kuskokwim River Area (V)	22,170	2.1%
22 Seward Peninsula/Norton Sound(W)	19,728	1.8%
23 Northwest Alaska Area (X)	4,967	0.5%
24 Yukon River Area (Y)	922	0.1%
25 North Slope Brooks Range Area (Z)	646	0.1%
Total	1,071,511	100.0%

Table 3-15. Most Popular Sites for Resident Summer Sport Fishing, 1993

(Sites with More than 5,000 Resident Trips)

Southcentral	Trips		Southeast	Trips
1509 A. KENAI R. - COOK INLET TO SOLDOTNA BR. FW	79,071		501 DOTY COVE- BERNERS BAY W TO PT RETREAT SW	36,528
1542 KENAI R. UNSPECIFIED	23,922		102 CLARENCE STRAIT SW	34,041
1506 RESURRECTION BAY SW	50,311		101 EAST, WEST, BEHM CANALS SW	20,208
1505 OTHER KACHEMAK BAY SW	30,514		505 OTHER SW	19,737
1524 RUSSIAN R. FW	29,948		109 OTHER SW	16,288
1104 LITTLE SUSITNA R. FW	25,449		307 OTHER SW	14,150
1302 WILLOW CREEK FW	24,150		404 OTHER SITKA SOUND, VITSKARI I. SW	11,514
1707 NAKNEK R. AND TRIBUTARIES FW	20,305		405 OTHER SW	7,434
1501 ANCHOR R., WHISKEY GULCH, DEEP CREEK SW	19,136		305 FREDERICK SOUND SW	6,601
1606 OTHER SW	17,539			
1219 SHIP CREEK FW	16,610			
1121 OTHER LAKES FW	15,540		**Arctic-Yukon-Kuskokwim**	**Trips**
1530 OTHER LAKES FW	15,151		2007 DELTA CLEARWATER R. FW	28,234
1122 FISH CREEK (DIPNET)	14,589		2106 OTHER STREAMS FW	20,059
1513 KASILOF R. FW	13,940		2215 OTHER STREAMS FW	11,107
1404 LAKE CREEK FW	13,749		2017 QUARTZ LAKE FW	8,122
1504 HOMER SPIT SW	12,753		2033 OTHER LAKES FW	8,032
917 COPPER R. DIPNET (NEAR CHITINA)	12,369		2032 OTHER STREAMS FW	6,919
1512 D. KENAI R. - SKILAK INLET TO KENAI LAKE FW	12,345			
1403 DESHKA R. (KROTO CREEK) FW	12,167			
1110 KEPLER LAKE COMPLEX FW	11,264			
1529 OTHER STREAMS FW	11,262			
1001 VALDEZ ARM/BAY) SW	10,406			
1601 CHINIAK BAY AREA SW	10,215			
1511 C. KENAI R. - MOOSE R. TO SKILAK FW	9,186			
1226 OTHER LAKES FW	8,904			
1508 OTHER SW	8,613			
1517 NINILCHIK R. FW	8,455			
1201 SW SITES	8,398			
1304 MONTANA CREEK FW	8,394			
1007 OTHER SW	8,238			
1613 OTHER STREAMS FW	7,447			
1416 OTHER STREAMS FW	7,320			
915 OTHER STREAMS FW	6,530			
1114 BIG LAKE FW	6,522			
1105 KNIK R. AND TRIBS, JIM CREEK FW	5,965			
1607 BUSKIN R. FW	5,404			
1207 DELONG LAKE FW	5,158			
1406 ALEXANDER CREEK FW	5,053			

Most anglers fish locally and for less than one day. More than a quarter traveled less than fifteen minutes to their fishing sites, and over half traveled less than one hour. (Table 3-16) About two-thirds of resident anglers considered travel time to fishing sites as a benefit rather than a cost of fishing (Table 3-17). Three quarters of anglers used vehicles to reach their destinations, and more than half used boats. About two percent used airplanes. Nearly five percent reported using no vehicle, boat, or plane. (Table 3-18). Seventy percent of residents' fishing trips last a day or less (Table 3-19). Residents used charter services for only about 6 percent of their fishing trips (Table 3-20).

Table 3-16. Resident Travel Time to Fishing Sites

Travel Time	Percent of Trips	Cumulative Percent
15 minutes or less	27%	27%
15 - 30 minutes	11%	37%
30 minutes - 1 hour	17%	55%
1 - 1.5 hour	6%	61%
1.5 - 2 hour	10%	71%
2-3 hour	11%	82%
3-4 hour	7%	89%
4-5 hour	5%	94%
5-6 hour	3%	97%
6-12 hour	3%	99%
Over 12 hour	1%	100%

Table 3-17. Is Travel Time a Benefit or Cost?

	Percent
1 Benefit	65%
2 Cost	29%
3 Both	5%
4 Neither	1%
Total	100%

Table 3-18. Residents' Mode of Travel to Fishing Site

Mode of Travel	**Percent of trips**
No Vehicle, Boat, Plane reported	4.6%
Vehicle Only	37.2%
Boat Only	18.5%
Air Only	0.8%
Vehicle & Boat	37.8%
Vehicle & Air	0.3%
Boat & Air	0.6%
Vehicle, Boat & Air	0.2%
All Trips Using:	
Vehicle	75.5%
Boat	57.1%
Airplane	1.9%

Table 3-19. Length of Resident Fishing Trips

Trip Duration	Number	Percent
1 day	702,401	69.3%
2 days	141,778	14.0%
3 days	90,537	8.9%
4 days	31,831	3.1%
5-7 days	37,209	3.7%
8-14 days	6,918	0.7%
More than 14 days	2,433	0.2%
Total trips	1,013,107	100.0%

Table 3-20. Residents' Use of Charter Services

On this fishing trip, did your household use a charter?		
	Percent	Number
Yes	6%	63,867
No	94%	1,007,644
Of those who used a charter, how many trips and people used services?		
	# of Trips	# of People
	63,867	126,084
What Services did the charter include?		
	% of Trips	# of People using service
Air	14%	17,380
Boat	79%	100,608
Guide	18%	26,853
Other	7%	12,353
Food	11%	13,348
Lodging	7%	8,043
Equip.	51%	68,268

Preferences of Resident Anglers

In the pre-season survey, we asked all the respondents about why they fished and what things were important in their decisions about where to fish. For 90 percent of fishing households, having fun is always an important reason why they go fishing; the percentage rises to 98 if we consider households where having fun fishing is sometimes important as well. Over 90 percent of households also count doing something with friends or with family as always or sometimes important. For about 80 percent of anglers, doing something challenging is always or sometimes important. For nearly three-quarters of resident households that fish, getting food is always or sometimes important (Table 3-21).

Alaskan anglers said their most important source of information about fishing was friends and relatives, followed by the Alaska Department of Fish and Game (Table 3-22). Over 80 percent of resident fishing households cited six factors as always or sometimes important in choosing where to fish: abundant fish, a beautiful area, few other anglers, inexpensive and quick to get to, with road access (Table 3-23). Half to two-thirds of angler households never found seven other characteristics important: mining near the fishing site, likelihood of catching a trophy-sized fish, a site with a marine anchorage, a site with fly-in access, or the opportunities to participate in derbies, fly fishing, or catch and release fishing.

Table 3-21. Why Resident Anglers Fish

	Always	Sometimes	Never
To have fun	90%	8%	1%
To do something with friends	53%	43%	4%
To do something with family	63%	31%	6%
To do something challenging	34%	46%	19%
To get food	34%	39%	27%

Table 3-22. Sources of Resident Fishing Information

Importance of source	Number of Households			Total HH	Percent of Households		
	VERY	SOMEWHAT	NOT		VERY	SOMEWHAT	NOT
Friends/Relatives	61,869	57,638	20,895	140,402	44%	41%	15%
Dept. of Fish and Game	42,434	59,966	37,670	140,070	30%	43%	27%
TV or Radio	15,884	57,576	66,771	140,231	11%	41%	48%
Newspapers	15,005	58,087	67,357	140,449	11%	41%	48%
Books/Magazines	12,706	54,979	72,672	140,357	9%	39%	52%

Table 3-23. Why Alaskan Anglers Choose Fishing Locations

Is this a reason why you fish at a site?	Always	Sometimes	Never
Having a good chance to catch a lot of fish?	55%	38%	6%
Not having to spend a lot of money to get there?	48%	41%	11%
An area with few other anglers?	45%	42%	13%
Being in an area of exceptional beauty?	39%	47%	14%
An area with road access?	46%	39%	16%
Not having to travel a long time?	29%	50%	21%
An area with a good boat launching place?	23%	40%	37%
Not seeing commercial development?	31%	34%	35%
Not having to walk very far?	17%	45%	38%
Not seeing evidence of human settlement?	16%	45%	38%
Not seeing clearcuts?	28%	27%	45%
Low chance of bear encounters?	27%	30%	44%
Not seeing mining operations?	27%	23%	50%
Having a good chance to catch a trophy-sized fish?	13%	35%	52%
An area with a marine anchorage?	10%	32%	58%
A site limited to catch & release fishing?	6%	38%	56%
Opportunity to participate in a fishing derby?	5%	29%	66%
An area with fly-in access?	5%	29%	65%
A site limited to fly fishing?	5%	27%	68%

Nonresident Anglers

Angler Profile

Since the mid-1980s the number of nonresident fishing licenses issued has grown about 6.7 percent per year. This growth is directly correlated with the growth in the number of visitors to the state. About 20 percent of visitors obtain licenses. Since 1990, more nonresident than resident licenses have been issued.

In the spring of 1994, ISER conducted a mail-out survey of 7,000 nonresident households with members who purchased fishing licenses in Alaska. Of those, 4,278 households responded, and 4,123 had actually fished in Alaska in 1993. About 4 percent of nonresidents who purchased Alaska fishing licenses in 1993 did not actually fish. Respondents from foreign countries as well as those from the U.S. returned our survey, as Table 3-24 shows. Whether we estimate the number of nonresident households visiting from each location based on the surveys mailed out or on those returned makes little difference in the geographic distribution of visitors.

Anglers from about 114,000 nonresident households fished recreationally in Alaska in 1993. Ninety four percent of them were from other states, predominantly the Pacific states. Of the six percent who were foreign visitors, about half were Canadian. One third of the visiting anglers came to Alaska in July; only two percent came during the winter (November through April), as Table 3-25 shows. The average trip lasted two weeks (Table 3-26). A quarter of the households extended their trip by one or more days for fishing (Table 3-27). Generally they were just one or two persons traveling; only 15 percent of households had three or more persons on the trip (Table 3-28).

With a 1993 median household income of over $50,000 (Table 3-29), nonresident anglers have higher incomes on average than either their Alaskan or their Lower 48 counterparts. More than half considered themselves to be advanced or expert fishermen (Table 3-30).

Table 3-24. Residence of Visiting Anglers

Region of Residence	**Nonresident Households***	
U.S. Total	**107,452**	**94%**
Pacific States	44,325	39%
Mountain States	16,764	15%
Midwest	18,265	16%
South Central	9,605	8%
South Atlantic	10,470	9%
Northeast	7,991	7%
Canada	**3,310**	**3%**
Yukon	1,402	1%
B.C. and Alberta	1,158	1%
Saskatchewan, Manitoba	114	0%
Ontario and East	375	0%
Other Countries	**3,392**	**3%**
Europe	2,038	2%
Other Foreign	1,370	1%
Total	114,155	100%

Source: Alaska Department of Fish and Game

Table 3-25. When Do Anglers Visit Alaska?

Month Visit Started	Households	Percent
January	219	0%
February	137	0%
March	274	0%
April	602	1%
May	5,913	5%
June	21,927	20%
July	35,368	32%
August	29,866	27%
September	13,085	12%
October	1,560	1%
November	493	0%
December	575	1%
Total	110,019	100%

Table 3-26. How Long Do Visiting Anglers Stay in Alaska and How Many Days Do They Add for Fishing?

Trip Length	Percent of Households	Mean Days Added to Trip for Fishing
Less than 5 days	9%	0.54
5 to 7 days	29%	0.72
8 to 14 days	37%	1.17
15 to 30 days	15%	1.56
over 30 days	10%	2.51
	100%	1.18

Table 3-27. Percentage of Visiting Households That Extend Their Trips for Fishing

Extra days added to fish	Percent of Households
No days added	75%
One or two	10%
Three to five	9%
Six to 10	4%
Over 10	2%
	100%

Table 3-28. Number of Household Members Visiting Alaska

Number of HH Members on Trip	Percent of Households
1	43%
2	42%
3	7%
4	5%
5 or more	3%
Total	100%

Table 3-29. 1993 Household Income of Visiting Anglers

Annual Income in Thousands	Percent of Households
10 and under	2%
11 to 25	7%
26 to 50	35%
51 to 75	20%
76 to 125	24%
Over 125	12%

Table 3-30. Fishing Skill of Visiting Anglers

Skills of Best Angler in Household	Percent of Households
Beginner	11%
Intermediate	36%
Advanced	39%
Expert	14%
	100%

Fishing Trips by Visiting Anglers

Nearly half the fishing trips visiting anglers took in Alaska in 1993 were to the Kenai Peninsula (Table 3-31). The most popular sites were the Kenai River, with 32,000 trips and Kachemak Bay, with 14,000 trips (Table 3-32). Among those who reported targeting a particular species, one third of the trips targeted silver salmon, one quarter targeted halibut, and one fifth targeted king salmon (Table 3-33). Another 14 percent were fishing for salmon, but didn't know which type. 1n 1993 nonresident anglers caught 242,000 silvers, 102,000 reds, and 59,000 king salmon (Table 3-34).

Table 3-31. Where Do Visiting Anglers Fish?

Management Area	All Household Trips	
	Number	Percent
1 Ketchikan Area (A)	10,140	6%
2 Prince of Wales Area (B)	3,549	2%
3 Kake, Petersburg, Wrangell, Stikine Area (C)	2,668	1%
4 Sitka Area (D)	6,431	4%
5 Juneau Area (E)	8,085	5%
6 Haines/Skagway Area(F)	3,175	2%
7 Glacier Bay Area (G)	1,388	1%
8 Yakutat Area (H)	2,935	2%
9 Glennallen Area (I)	3,682	2%
10 Prince William Sound Area (J)	6,511	4%
11 Knik Arm Drainage Area (K)	3,629	2%
12 Anchorage Area (L)	2,668	1%
13 East Side Susitna Drainage Area (M)	5,337	3%
14 West Side Cook Inlet (N)	5,550	3%
15 Kenai Peninsula Area (P)	81,227	46%
16 Kodiak Area (Q)	4,189	2%
17 Naknek Drainages (R)	2,909	2%
18 Kvichak River Drainage Area (S)	4,029	2%
19 Nushagak Area (T)	2,081	1%
20 Tanana River Area(U)	4,750	3%
21 Kuskokwim River Area (V)	907	1%
22 Seward Penin./Norton Sound(W)	614	<1%
23 Northwest Alaska Area (X)	213	<1%
24 Yukon River Area (Y)	560	<1%
25 North Slope/Brooks Range Area (Z)	374	<1%
Unknown	10,540	6%
Total	178,144	

Table 3-32. Most Popular Fishing Sites for Visiting Anglers

Sites with over 1,000 Trips	Trips		Sites with over 1,000 Trips	Trips
Southcentral Region			**Southeast Region**	
1542 Kenai Unspecified	31,754		109 Other Salt	7,738
1505 Other Kachemak Bay Salt	14,089		505 Other Area 5 Salt	5,417
1506 Resurrection Bay Salt	9,286		405 Other Area 4 Salt	3,282
1507 Lower Cook Inlet, Outer Gulf Coast Salt	4,776		404 Other Sitka Sound	2,829
1524 Russian River Fresh	4,723		203 Other Prince of Wales Salt	2,402
1007 Other Area 10 Salt	4,109		307 Other Wrangell/Petersburg Area Salt	1,841
1501 Anchor River, Deep Creek Area Salt	3,389		501 Doty Cover, Berners Bay, Pt. Retreat	1,628
1529 Other Area 15 Str. Fresh	2,428		602 Haines Sub-area Salt	1,174
1513 Kasilof River Fresh	2,402			
1606 Other Salt	1,815			
1504 Homer Spit Salt	1,734			
1416 Other Area 14 Str. Fresh	1,654		**Arctic-Yukon-Kuskokwim Region**	
1508 Other Area 15 Salt	1,628		2033 Other Area 20 Lakes Fresh	1,574
1104 Little Su River Fresh	1,574		2032 Other Area 20 Str. Fresh	1,067
1302 Willow Creek Fresh	1,468			
1807 Alagnak (Branch) River Fresh	1,227			
1312 Other Area 13 Str. Fresh	1,201			
915 Other Area 9 Str. Fresh	1,174			
1714 Other Area 17 Str. Fresh	1,094			
1810 Other Area 18 Str. Fresh	1,094			
1120 Other Area 11 Str. Fresh	1,067			
1530 Other Lakes Area 15 Fresh	1,067			
1307 Talkeetna River and Tributaries	1,041			
1005 Valdez Road System Salt	1,014			

Table 3-33. Target Species for Visiting Anglers

Silver Salmon	32%
Halibut	25%
King Salmon	20%
Salmon (type not specified)	13%
Red Salmon	11%
Trout (type not specified)	5%
Pink Salmon	5%
Rainbow Trout	4%
Arctic Grayling	3%
Dolly Varden	3%
Northern Pike	1%
Chum Salmon	1%
Arctic Char	1%
Other Fish: Salt water	1%
Other Fish: Fresh water	1%
Invertebrates	1%
Target unknown or no target	2%

Table 3-34. 1993 Catch of Visiting Anglers

	King Salmon	Red Salmon	Silver Salmon	Grayling	Steelhead
Southeast	19,933	4,003	92,487	320	0
Southcentral	37,465	98,305	143,214	4,056	213
A-Y-K	1,628	0	6,724	2,268	0
Total	59,025	102,307	242,426	6,644	213

Preferences of Visiting Anglers

Most nonresident anglers fish for fun rather than for food. Ninety percent say having fun is a very important reason for going fishing, while only nine percent say getting food is a very important reason (Table 3-35). More nonresidents fish as something to do with friends or family (56 percent cite this as very important) than for the challenge (42 percent say this is very important). The main criteria visitors use in deciding where to fish is the chance to catch a lot of fish (Table 3-36). Not having to spend a lot of money to get there, not having to travel a long time, and being in beautiful areas with few other anglers are also important. For visitors, friends and relatives are the most important source of information about where to fish (Table 3-37).

Table 3-35. Why Visiting Anglers Fish

How important are these reasons for fishing?	Total HH	Percent of Households Citing Reason		
		Very	Somewhat	Not
Have fun	104,042	90%	9%	1%
Do something with friends	99,292	57%	25%	18%
Do something with family	97,291	56%	20%	24%
Do something challenging	99,959	42%	40%	19%
Get food	99,189	9%	28%	63%

Table 3-36. How Visiting Anglers Choose Fishing Locations

	Number of HH	Percent of Households Citing Reason		
Importance of reasons for choosing location		Very	Somewhat	Not
Having a good chance to catch a lot of fish	101,773	67%	26%	7%
Not having to spend a lot of money to get there	98,011	29%	50%	21%
An area with few other anglers	97,771	32%	45%	24%
Being in an area of exceptional beauty	101,000	49%	40%	11%
An area with road access	97,585	25%	32%	43%
Not having to travel a long time	97,718	20%	46%	34%
Not having to walk very far	97,824	12%	33%	55%
Not seeing evidence of human settlement	96,544	14%	35%	51%
Having a good chance to catch a trophy-sized fish	99,558	29%	33%	38%
A site limited to catch and release fishing	95,663	6%	17%	77%
Opportunity to participate in a fishing derby	96,176	2%	5%	94%
A site limited to fly fishing	96,117	6%	12%	83%

Table 3-37. How Visitors Learn About Fishing Locations

Sources	Total HH	Percent of Households Citing Source		
		Very	Somewhat	Not
Friends and Relatives	101,186	67%	18%	15%
Dept. Of Fish and Game	95,556	22%	34%	44%
TV or Radio	93,714	5%	24%	72%
Newspapers	94,462	8%	27%	66%
Books/Magazines	95,503	16%	40%	44%
Tourist Brochures	96,944	18%	34%	48%

Winter Fishing by Alaskans

Of the 1,355 Alaskan households ISER surveyed in 1993, 314 reported taking winter fishing trips. If we extrapolate our survey sample to fishing households statewide, we can estimate that about 33,960 Alaskan households took winter fishing trips (November through April) in 1993. Those households took an average of 5.4 trips per household, for an estimated total of 183,722 winter fishing trips.

Only one member of the household went on most winter fishing trips (Table 3-38). Thirty percent of the trips had purposes other than fishing (Table 3-39). Only a very small share of respondents (5 percent) reported that they could have been working for pay instead of going fishing (Table 3-40). Half the winter trips required less than a half hour of travel time (Table 3-41) and a third involved travel distances of less than 5 miles (Table 3-42). For half the trips, respondents described travel time as a benefit rather than a cost (Table 3-43). The median time winter anglers spent fishing was about three hours (Table 3-44); only eight percent of the trips lasted longer than a day (Table 3-45).

Table 3-38. How Many Household Members Went on Winter Trips?

Number of HH Members on Trip	Number of Trips	Percent of trips
1	95,897	53%
2	52,123	29%
3	22,663	12%
4	7,044	4%
5	3,125	2%
6	1,382	1%
Total with responses	182,234	

Table 3-39. Was the Reason for the Winter Trip Just Fishing?

Fishing as Reason for the Trip:	Number of Trips	Percent of Trips
All, 100%	125,667	69%
Not all, but Half or More	44,300	24%
Less than Half	11,029	6%
Total with responses	180,996	

Table 3-40. Share of Winter Anglers Who Could Have Worked for Pay

	Number	Percent
Yes	9,015	5%
No	172,632	95%
Total with responses	181,647	

Table 3-41. Travel Time to Winter Fishing Site

Travel Time:	Number of Trips	Percent of Trips
15 minutes or less	50,435	28%
15 to 30 minutes	40,347	22%
30 minutes -1 hour	39,122	21%
1-2 hours	34,020	19%
More than 2 hours	18,075	10%
Total with responses	181,999	

Table 3-42 Driving Distance to Winter Fishing Site

Driving Distance:	Number of Trips	Percent of Trips
Did not Use Vehicle	11,925	7%
1 mile or less	26,623	15%
1-5 miles	35,697	20%
6-10 miles	17,178	10%
10-15 miles	11,970	7%
15-20 miles	12,749	7%
20-30 miles	12,951	7%
30-50 miles	19,776	11%
50-70 miles	16,073	9%
Over 70 miles	15,396	9%
Total with responses	180,338	

Table 3-43. Was Travel Time a Benefit or a Cost of Winter Fishing?

	Number of Trips	Percent of trips
Benefit	84,982	50%
Cost	64,706	38%
Both	1,475	1%
Neither	2,011	1%
Don't Know	18,418	11%
Total with responses	171,592	

Table 3-44. Time Spent Fishing on Winter Trips

Fishing Time	Trips	Percent
1 hour or less	22,283	13%
1-2 hours	40,351	23%
2-4 hours	63,925	36%
4-8 hours	34,090	19%
Over 8 hours	17,270	10%
Total with responses	177,920	

Table 3-45. Length of Winter Fishing Trips

Length of Trip	Number of Trips	Percent
One Day	167,060	92%
Two Days	7,701	4%
Three Days	3,611	2%
Four Days	3,862	2%
Total with responses	182,234	

About half the winter fishing trips statewide in 1993 were in the Mat-Su, Anchorage and Kenai areas (Table 3-46). The remote areas in the Southwest (excepting Kodiak) and the Arctic-Yukon-Kuskokwim region (excepting Tanana) are much more strongly represented in winter fishing (about 16 percent of winter trips) than in summer fishing (7 percent of trips). The most popular sites for winter fishing in Southcentral are Big Lake and other unidentified lakes in the Mat-Su and Kenai areas (Table 3-47). In Southeast the most popular sites are the saltwater around Juneau and Fredrick Sound north of Petersburg. Ice fishing in the saltwater is popular on the Seward Peninsula, while Quartz Lake is the most popular winter fishing site in the Tanana area. Trout is the most targeted species in winter fishing statewide, followed by Dolly Varden (Table 3-48).

Table 3-46. Alaskans Winter Fishing Trips by Area

Area	Trips	Percent
1 Ketchikan Area	3,420	2%
2 Prince Of Wales Area	2,069	1%
3 Kake/Petersburg/Wrangell	7,337	4%
4 Sitka Area	3,432	2%
5 Juneau Area	12,653	7%
6 Haines/Skagway Area	2,048	1%
7 Glacier Bay Area	587	0%
8 Yakutat Area	95	0%
9 Glennallen Area	7,932	4%
10 Prince William Sound	2,670	1%
11 Knik Arm Drainage	36,319	20%
12 Anchorage Area	27,600	15%
13 East Side Susitna Drainage	1,986	1%
14 Westside Cook Inlet	238	0%
15 Kenai Peninsula Area	26,198	14%
16 Kodiak Area	4,178	2%
17 Naknek Drainages	6,323	3%
19 Nushagak Area	3,333	2%
20 Tanana River Area	13,321	7%
21 Kuskokwim River Area	5,575	3%
22 Seward Peninsula/NOR	7,071	4%
23 Northwest Alaska Area	3,978	2%
24 Yukon River Area	3,251	2%
Total with Responses	181,616	

Table 3-47. Number of Winter Fishing Trips by Site and Region

Southeast			Arctic-Yukon-Kuskokwim	
Site	**Trips**		**Site**	**Trips**
505 SLT/OTHER SALTWATER	5,736		2201 SLT/SALTWATER SITES	6,761
501 SLT/DOTY COVE,BERNER	5,481		2017 FRSH/QUARTZ LAKE	5,300
305 SLT/FREDERICK SOUND	4,500		2406 FRSH/OTHER YUKON R D	2,498
203 SLT/OTHER SALTWATER	2,032		2033 FRSH/OTHER LAKES	2,221
404 SLT/OTHER SITKA SOUN	1,927		2016 FRSH/BIRCH LAKE	1,992
302 SLT/REMAINDER WRANGE	1,272		2108 KUSKOKWIM RIVER	1,935
602 SLT/HAINES SUBAREA	1,174		2303 FRSH/KOBUK RIVER	1,935
102 SLT/CLARENCE STRAIT	1,022		2301 SLT/SALTWATER SITES	1,613
402 SLT/STARRIGAVAN BAY	893		2101 SLT/SALTWATER SITES	1,075
504 SLT/JUNEAU ROAD SYST	692		2104 FRSH/KANEKTOK RIVER	1,075
304 SLT/GRAYS PASS	685		2002 FRSH/LOWER CHENA RIV	759
702 SLT/GLACIER BAY	587		2102 FRSH/ANIAK RIVER	753
603 FRSH/SKAGWAY SUBAREA	581		2405 FRSH/NULATO RIVER	753
502 SLT/SHEEP CREEK AREA	479		2014 FRSH/MIDDLE TANANA R	569
101 SLT/EAST,WEST,BEHM C	450		2107 FRSH/OTHER LAKES	521
109 SLT/OTHER SALTWATER	375		2024 FRSH/CHENA HOT SPGS	474
116 FRSH/OTHER STREAMS	337		2314 FRSH/OTHER LAKES	430
117 FRSH/OTHER LAKES	300		2003 FRSH/PILEDRIVER SLOU	380
610 FRSH/OTHER LAKES	293		2029 FRSH/HARDING LAKE	380
108 SLT/CARROL INLET	262		2030 FRSH/MEADOW ROAD LAK	288
104 SLT/TONGASS NARROWS	225		2020 FRSH/VOLKMAR LAKE	285
107 SLT/MOUNTAIN POINT	225		2106 FRSH/OTHER STREAMS	215
303 SLT/DUNCAN SALTCHUCK	196		2004 FRSH/NENANA RIVER DR	199
310 FRSH/PETERSBURG CREE	196		2005 FRSH/CHATANIKA RIVER	190
314 FRSH/OTHER STREAMS	196		2022 FRSH/STEESE PONDS	190
315 FRSH/OTHER LAKES	196		2212 FRSH/SHAKTOOLIK RIVE	108
512 FRSH/TWIN LAKES	160		2216 FRSH/OTHER LAKES	108
114 FRSH/WARD LAKE	150		2026 FRSH/TANGLE LAKES &	95
403 SLT/SILVER BAY	141		2215 FRSH/OTHER STREAMS	95
405 SLT/OTHER SALTWATER	141		Total A-Y-K	33,197
412 FRSH/OTHER LAKES	141			
313 FRSH/THOMS CREEK & L	98			
803 FRSH/SITUK RIVER	95			
103 SLT/REVILLAGIGEDO CH	75			
506 FRSH/JUNEAU ROAD SYS	53			
209 FRSH/KARTA RIVER	37			
Total Southeast	31,400			

Table 3-47 (cont'd). Number of Winter Fishing Trips by Site and Region

Southcentral			**Southcentral** (cont'd)	
Site	**Trips**		**Site**	**Trips**
1114 FRSH/BIG LAKE	14,659		913 FRSH/SUMMIT LAKE	664
1121 FRSH/OTHER LAKES	12,650		1218 FRSH/BEACH LAKE	597
1530 FRSH/OTHER LAKES	11,152		1113 FRSH/LUCILLE LAKE	544
1707 FRSH/NAKNEK RIVER &	6,021		1510 FRSH/B-KENAI RIVER	480
1213 FRSH/FT RICH-OTTER L	4,772		1537 SSF/KACHEMAK BAY	446
1205 FRSH/C STREET	4,176		1540 SLT CLAMS/CLAM GULCH	446
1519 FRSH/SWANSON RIVER	3,878		1209 FRSH/EAF-SIXMILE LAK	398
916 FRSH/OTHER LAKES	3,757		1216 FRSH/LOWER FIRE LAKE	398
1902 FRSH/NUSHAGAK RIVER	3,226		1302 FRSH/WILLOW CREEK	397
1202 FRSH/JEWEL LAKE	3,182		907 FRSH/TOLSONA LAKE	387
1214 FRSH/FT RICH-CLUNIE	2,983		1506 SLT/RESURRECTION BAY	330
1206 FRSH/CHENEY LAKE	2,784		1516 FRSH/DEEP CREEK	330
1110 FRSH/KEPLER LAKE COM	2,581		1713 FRSH/BECHAROF SYSTEM	302
1204 FRSH/SAND LAKE	2,187		1015 FRSH/OTHER LAKES	291
1601 SLT/CHINIAK BAY	2,153		1417 FRSH/OTHER LAKES	238
1606 SLT/OTHER SALTWATER	1,974		1210 FRSH/EAF-GREEN LAKE	199
1112 FRSH/FINGER LAKE	1,894		1215 FRSH/FT RICH-GWEN LA	199
1512 FRSH/D-KENAI RIVER	1,801		1307 FRSH/TALKEETNA RIVER	199
1207 FRSH/DELONG LAKE	1,790		1521 FRSH/SWAN LAKE CANOE	199
1226 FRSH/OTHER LAKES	1,790		1514 FRSH/ANCHOR RIVER	165
1505 SLT/OTHER KATCHEMAK	1,767		1903 FRSH/WOOD RIVER LAKE	108
1119 FRSH/OTHER NANCY L S	1,709		1501 SLT/ANCHOR R,WHISKEY	83
1522 FRSH/SKILAK LAKE	1,553		1504 SLT/HOMER SPIT	83
1115 FRSH/NANCY LAKE	1,526		1508 SLT/OTHER SALTWATER	83
1007 SLT/OTHER SALTWATER	1,407		1520 FRSH/SWANSON R CANOE	83
1511 FRSH/C-KENAI RIVER	1,403		1526 FRSH/CRESCENT LAKE	83
1313 FRSH/OTHER LAKES	1,312		1538 SLT CLAMS/DEEP CREEK	83
1211 FRSH/EAF-HILLBERG LA	1,193		1304 FRSH/MONTANA CREEK	79
911 FRSH/VAN(SILVER)LAKE	1,161		1614 FRSH/ROADSIDE LAKES	52
908 FRSH/LAKE LOUISE	994		Total Southcentral	116,778
1003 SLT/ORCA INLET	972			
914 FRSH/CROSSWIND LAKE	968			
1217 FRSH/MIRROR LAKE	954			
1513 FRSH/KASILOF RIVER	893			
1523 FRSH/HIDDEN LAKE	859			
1111 FRSH/WASILLA LAKE	755			

Table 3-48. Species Targeted on Winter Fishing Trips

Target Species	Trips	Percent
King Salmon	17,530	10%
Silver Salmon	11,381	7%
Red Salmon	2,582	1%
Other Salmon	380	0%
Trout	93,841	54%
Dolly Varden	38,251	22%
Steelhead	3,799	2%
Grayling	4,529	3%
Whitefish	19,556	11%
Herring	1,852	1%
Halibut	9,366	5%
Groundfish	5,295	3%
Clams	14,806	8%
Crabs and Shrimp	11,566	7%
Some Target listed	174,570	
No Target Listed	9,151	
Total Trips with Responses	183,721	

Guide and Charter Operators

In the winter of 1993-94, ISER also surveyed businesses offering sport angler guide and charter services. These respondents represent an estimated 1,151 firms in the state. They range in scale from an individual fishing guide to a full-service lodge operator. Almost two thirds use power boats to provide fishing guide services, as Table 3-49 shows. Many businesses provide more than one service.

Table 3-49. Guide and Charter Services Provided in Alaska, 1993

Types of services	Number providing service	Percent providing service
Power-Boat Charter	726	63%
Fishing Guide	324	28%
Other Guide	240	21%
Float Charter	49	4%
Air Charter	27	2%
Transportation	51	4%
Lodging	185	16%
Total businesses providing services	1,151	

Looking at the revenues guide and charter businesses earned from sport fishing in 1993, 56 percent came from guiding activities, 20 percent from transportation services, and 14 percent from lodging (Table 3-50).

Table 3-50. 1993 Guide and Charter Revenues, by Service

Total revenues of guide and charter businesses	$109,922,209	
Share of revenues attributable to sport fishing	$66,250,055	Percent of Sport fishing revenues
Sport fishing revenues from:		
Guiding	37,038,678	56%
Transportation services	13,505,245	20%
Lodging	9,506,229	14%
Rental of equipment, tackle, or gear	786,721	1%
Food sales	3,115,679	5%
Other activities	1,608,909	2%

Nearly half the guide and charter businesses in Alaska operate in Southcentral and more than a third operate in Southeast (Table 3-51). The payroll distribution is parallel: 50 percent in Southcentral, 34 percent in Southeast, and 11 percent in Southwest (Table 3-52). The distribution of employees by home residence is somewhat different, since 20 percent of the full- and part-time employees reside outside Alaska (Table 3-53).

Table 3-51. Where Charter Businesses Operate in Alaska

	Number of Firms	Percent of Firms
Arctic-Yukon-Kuskokwim only	47	4%
Southwest only	101	9%
Southcentral only	530	47%
Southeast only	412	37%
Southwest and Southcentral	19	2%
Southwest and AYK	6	1%
Southwest and Southeast	4	0%
AYK, Southcentral and Southwest	1	0%
Total, Known locations	1,120	
Unknown locations	31	
All Businesses	1,151	

Table 3-52. 1993 Guide and Charter Payroll by Region of Payment

Payroll by region:		
Southcentral	$ 15,519,998	50%
Southeast	10,580,086	34%
Southwest	3,260,892	11%
Arctic-Yukon-Kuskokwim	521,982	2%
Outside Alaska	1,030,711	3%
Total Payroll	$ 28,065,895	100%

Table 3-53. Employees of Guide and Charter Businesses, by Region of Residence

Full Time Employees (by Usual Home)	2,877	100%
Southcentral	1,311	46%
Southeast	736	26%
Southwest	173	6%
Arctic-Yukon-Kuskokwim	73	3%
Outside Alaska	552	19%
Part-Time Employees (by Usual Home)	1,390	100%
Southcentral	441	34%
Southeast	436	33%
Southwest	69	5%
Arctic-Yukon-Kuskokwim	97	7%
Outside Alaska	260	20%

Chapter 4. Economic Significance of Sport Fishing in Alaska

Here we estimate the economic significance of sport fishing—for the state, for regions, and for selected fishing sites, fisheries, and species. "Significance" measures all the jobs, payroll, and sales associated with sport fishing, based on an estimate of what anglers spend for fishing and the additional economic activity generated by that initial spending. Remember (as discussed on page 4-30) that this is not a measure of how much economic activity would disappear, if there were no sport fishing. Without fishing, anglers would still spend (in other ways) at least some of what they previously spent for sport fishing, continuing to generate jobs and income.

Spending for sport fishing has direct, indirect, and induced effects on jobs and payroll. The *direct* effect is the jobs created and payroll paid in businesses selling directly to the anglers, such as food stores and guide services. The *indirect* effect is the jobs created and payroll paid in those businesses that sell to businesses providing goods and services directly to anglers; these include, for example, truck drivers delivering stock to the food stores and advertising agents providing services to the guides. The *induced* effect is the jobs created and payroll paid in businesses that provide goods and services to the employees holding the direct and indirect jobs—such as the food store worker and the guide.

Summary of Statewide Economic Significance

In 1993, residents and nonresidents spent $540 million in Alaska on goods and services attributable to sport fishing. Of this total, residents spent $341 million, or 63 percent, and nonresidents spent $199 million. That spending directly accounted for 6,635 jobs (annual average equivalent basis), with a payroll of $142 million. The indirect and induced effects of this activity accounted for an additional 2,601 jobs and $67 million in payroll which, when added to the direct jobs and payroll, resulted in total economic activity represented by 9,236 jobs (annual average equivalent) and $209 million in payroll. Total sales attributable to sport fishing, including indirect and induced effects, were $637 million.

Methodology

We began the analysis with data from ISER surveys of what resident and nonresident angler households spent for sport fishing in Alaska in 1993. We also used information from the 1993-94 ISER survey of guide and charter businesses. The infinite variety of possible types of human behavior makes it impossible to capture and summarize all possible trip varieties and combinations in the survey questions and analysis; rather we attempted to characterize the most common and important types of behavior.

We identified several types of spending related to sport fishing and allocated either all or a portion of spending in each category to sport fishing. For residents we used three categories of expenditure: (1) trip-specific expenditures, which can be identified as related to a single fishing trip—for instance, bait or fuel to get to the fishing site—including guide

expenditures; (2) capital expenditures for equipment—both for equipment exclusively for fishing, such as rods and reels, and for equipment only partially used for fishing, such as camping equipment used not only for fishing but also for hunting or general recreation; (3) capital expenditures and general maintenance expenditures for cars, other motor vehicles, boats, and planes, as well as for cabins. Capital expenditures include any purchases not consumed during single trips.

For nonresidents, we used four types of expenditures: (1) trip-specific expenditures; (2) package tour expenditures —that is, costs of tours visitors purchase before arriving in the state and usually including transportation to and from Alaska and a variety of other tourist-related services such as food, lodging, and transportation within the state; (3) other spending (mainly for food and lodging) by nonresidents on days they were fishing, but which was not specifically related to fishing trips; (4) travel expenses to and from Alaska.

We allocated a portion of capital expenses, spending not tied to specific fishing trips, package tour costs, and costs of travel to and from Alaska to sport fishing. The portion attributed to sport fishing depended on, among other things, how much of vehicle and other equipment use was for sport fishing; whether certain trips had purposes other than fishing; and whether visiting anglers would have come to Alaska anyway, even if they couldn't fish. Our allocation procedures are discussed more in relevant sections of this chapter and in Appendix B.

We then constructed *expenditure profiles* for resident and nonresident anglers. We ran each *expenditure profile* through a *commodity by industry matrix*, to produce a *final demand vector* which, in conjunction with the Alaska input-output model developed for this study, generated estimates of economic significance. Details about this process are in Appendix B.

Total and Regional Expenditures and Economic Significance

Map 4-1 shows the regions used in this analysis. Table 4-1 shows total expenditures related to sport fishing in Alaska in 1993 and regional expenditure figures. The total amount spent on goods and services used (either partly or exclusively) in sport fishing in Alaska was actually $1,334 million. From that total we netted out $766 million in spending that was associated with other activities. For residents we included only a portion of spending on vehicles (cars, boats, planes, campers); on other general outdoor equipment; and on cabins used for sport fishing, since those things are often used for other activities as well. We also netted out a portion of expenditures anglers actually made during fishing trips since, in many cases, fishing is only one of the reasons for the trip. For nonresidents we included only the portion of their expenditures to and from Alaska that was for transportation services provided within the state. Also, we included only a portion of nonresident expenditures that were not specifically for fishing trips, based on whether the households would have come to Alaska anyway, if they had been unable to fish. With these adjustments, we estimated $568 million of spending was attributable to sport fishing in Alaska in 1993. Finally, we subtracted another $29 million, to account for what residents spent outside the state on supplies and equipment used in Alaska.

Table 4-1 also shows the relative importance of the various categories of angler spending attributable to sport fishing. For residents, spending associated with the purchase and maintenance of vehicles accounted for 51 percent of the total. Next, in order of importance, were expenditures attributable to specific fishing trips, which accounted for 22 percent of the total. This was followed in importance by fishing-related capital expenditures—like fishing gear—but excluding vehicles and spending on cabins. Nonresidents spent the largest amount on trip-specific expenditures, but almost as much on other expenditures while in the state during the days they were fishing. Nonresident anglers spent a large amount on package tours, but only a portion of that is attributable to sport fishing. Their instate expenditures on transportation services associated with travel to and from the state were also relatively small.

Table 4-1 also summarizes the regional distribution of instate spending attributable to sport fishing, by showing the location where the spending actually took place. Sixty-three percent of statewide spending, $338 million, occurred in Southcentral Alaska, followed by Southeast with 19 percent, or $105 million. The Northern region accounted for $56 million; the Southwest had the smallest share with $41 million. The regions differ in the share of expenditures accounted for by residents and nonresidents. In the Southwest, almost 80 percent of the expenditures were made by nonresidents. In the Southeast nonresidents accounted for only a little more than half of the total. In the Southcentral region, resident expenditures dominated, but because the total angler spending in Southcentral was so large, more than half of all nonresident spending occurred there. In the Northern region most of the spending was by residents. (Confidence intervals for the estimates in Table 4-1 are discussed in Appendix G.)

Table 4-2 summarizes several measures of the economic significance of sport fishing by region. Of the 9,236 annual average equivalent jobs associated with sport fishing activity in Alaska, 6,100 were located in Southcentral Alaska, 1,751 in Southeast, 910 in the Northern region, and 475 in the Southwest. Payrolls and sales followed a similar pattern. The largest portion of the total jobs, payroll, and sales came directly from the businesses that sold goods and services to the sport fishermen. This appears in the table as the direct effect. The indirect/induced effect is the result of spending by these businesses serving the sport fishermen. The direct effect economic multipliers show the ratio of the total to the direct effect for sales, payroll, and employment. For example, on average, 1.39 total jobs were created for every job in a business providing goods and services related to sport fishing. The final demand multipliers reflect the same information but show the total sales, payroll, and employment associated with $1 million in spending related to sport fishing within the state. For example, $1 million of additional spending related to sport fishing will support 24 full-time equivalent jobs in the economy. More detailed tables showing economic significance are contained in Appendix F.

Resident Sport Fishing Expenditures

Residents spent $891 million on goods and services that were used at least partly in the pursuit of sport fishing in 1993 (Table 4-3). The portion we attributed to sport fishing was $370 million, and the amount actually spent within Alaska was $341 million. The largest share was spent in Southcentral Alaska, followed by Southeast and then the Northern region; the least was spent in the Southwest. We included in our estimate all anglers, including those not required to obtain fishing licenses.

Including food, lodging, supplies, guiding services, commercial transport, and personal transport, residents spent $101 million on trip-specific expenditures in 1993. As one might expect, gas, groceries, and supplies were the most important items, and 95 percent of these expenditures occurred during the summer months, with only 5 percent occurring in the winter season (November through April). Of this $101 million, we attributed $88.7 million to fishing, since people often have multiple purposes when they take trips that involve fishing. All these trip-specific expenditures occurred within the state, and almost all occurred within the anglers' region of residence, since only a few resident trips took anglers outside their home regions.

In 1993 Alaskans spent a total of $69 million on fishing-related capital expenditures, consisting of both fishing gear and miscellaneous equipment, such as camping gear, that is used both for fishing and other activities such as hunting. Of the $54 million that is attributable just to sport fishing, about 93 percent was spent within Alaska, with the remainder spent outside the state, either through catalogues or when Alaskans took trips out of the state. In estimating these expenditures, we recognized that not all anglers fish every year. For determining fishing-related expenditures on equipment, vehicles, and cabins, we consider any household that fished in any of the three preceding years to be an angler household.

Alaskans also spent $646 million in 1993 to buy, maintain, and insure vehicles used for sport fishing. Most of this was for cars (including trucks and motor homes), but it also included $151 million for boats and $39 million for planes. Boats were most often used for fishing, followed by planes and then cars. We attributed a portion of this spending to sport fishing, based on the percentage of total running time that was for sport fishing. After netting out purchases made outside Alaska, we estimated residents spent $163 million in Alaska on transportation-related expenditures for sport fishing in general, but not connected to specific trips. Half of this was expenditures for boats, with spending for cars almost as large, followed by spending for planes.

Alaskans also spent $75 million buying and maintaining cabins and land used in connection with sport fishing. About half of this, $39 million, was attributable just to sport fishing.

The importance of vehicles in total expenditures for sport fishing is underscored by the large number of Alaska's angler households that own transportation equipment used in sport fishing. Table 4-4 shows that 39 percent of resident angler households own boats used for sport fishing; 8 percent own cabins; 5 percent own motor homes; 4 percent own planes; and 4 percent own land. Some households own more than one of these items. The total market value of these items attributable to sport fishing is estimated to be $1,381 million.

Our regional distribution of sport fishing expenditures is based on anglers' responses on the ISER survey of resident anglers. Although most anglers fish—and report spending money for sport fishing—in the regions where they live, there are some exceptions. Anglers who live in one region and fish in another probably report some expenditures in both regions. In addition, expenditures associated with some sites typically occur or are reported outside the region where those sites are located. This is most likely the case for guiding expenditures in Southwest Alaska, which are sometimes reported in the Southcentral region, since that region is often the home base for either travel agents or guiding operations. Finally, since the expenditures reported in Table 4-4 are based on a survey of a sample of anglers, there may in fact have been regional expenditures within a category in a region, even if none of our surveyed anglers reported expenditures in that category.

Resident sport fishing expenditures do not generally represent "new" purchasing power coming into the economy and, consequently, we cannot treat these purchases as an increase in final demand. For example, the money residents spent on food while on fishing trips is offset by a reduction in the amount they spent on food at home. If an angler foregoes the purchase of a new rod and reel, it will probably be because another expenditure is more important. Because of the fact that resident anglers would be spending their income on something else if they were fishing less means that resident sport fishing expenditures cannot be said to generate an increase in employment, payrolls, and sales within the economy. If residents spent $341 million more on other activities besides fishing, the number of jobs and sales in the economy would be approximately the same because total purchasing power would be unchanged.

The direct effect of resident sport fishing expenditures on sales by industry and region is shown in Table 4-5. The total of $209 million in direct effect is considerably less than the amount expended instate by resident anglers because of “leakages.” These leakages are due to the absence of any significant instate manufacturing and the fact that some expenditures do not generate economic activity. Because so little is manufactured in Alaska, dollars associated with the purchase of new equipment and vehicles flow directly outside the state after passing through the hands of the retailer and have no further effect on the Alaska economy. In addition, the purchase of used vehicles, previously owned cabins, and land represents a transfer of an asset, but only the transaction costs, typically about 10 percent of the purchase price, generate instate economic activity.

Sport fishing expenditures directly influence the majority of industries in the economy, with the largest concentrations in the retail trade and business services sectors. Other sectors with significant final demand attributable to resident sport fishing are insurance, other manufacturing, eating and drinking, transit, health services, wholesale trade, and chemicals and petroleum processing. In Table 4-5 we do not explicitly identify the guide and charter industry, since its activities span many of the traditional business sector categories.

The total economic significance of the resident sport fishery—employment, payroll, and sales— is shown by industry in Table 4-6. This table includes the direct, indirect, and induced effects of resident sport fish expenditures. We can see that once the multiplier effect of resident sport fish spending is taken into account, the flow of that money through the economy influences all sectors. As with the direct effect, the sectors most influenced by sport fish spending are retail trade and personal services. In 1993, a total of 5,524 annual average equivalent jobs with a payroll of $127 million were attributable to resident sport fish spending. Sales, net of leaks of the cost of manufactured goods and the value of transfers of assets, totaled $351 million.

Table 4-7 summarizes several measures of the economic significance of resident sport fishing by region. Of the 5,524 annual average equivalent jobs associated with sport fishing activity in Alaska, 3,832 were in Southcentral Alaska, 794 in Southeast, 774 in the Northern region, and 123 in the Southwest. Payrolls and sales followed a similar pattern. The largest portion of the total jobs, payroll, and sales came directly from the businesses that sell goods and services to the sport fishermen. This is shown in the table as the direct effect. The indirect/induced effect is the result of spending by the businesses serving the sport fishermen. The direct effect economic multipliers, as well as the final demand multipliers, are approximately the same as those for the entire sport fishery, shown in Table 4-2. More detailed tables showing economic significance of the resident sport fishery are contained in Appendix F.

The resident economic significance can be broken out between expenditures that are related specifically to sport fishing trips and those that are not related to trips. Summer trip-related expenditures resulted in total employment of 1,234, payroll of $27 million, and sales of $92 million. Winter trip-related expenditures resulted in total employment of 68, payroll of $1 million, and sales of $5 million. Expenditures not related to trips cannot be divided between summer and winter fishing; total employment resulting from those expenditures was 4,222, with a payroll of $98 million and sales of $243 million. These calculations are shown in detail in Appendix F.

Nonresident Sport Fishing Expenditures

Visiting anglers spent $442 million on goods and services used at least partly in the pursuit of sport fishing in Alaska in 1993 (Table 4-8). There are several ways to allocate the expenditures of nonresidents between sport fishing and other activities, since most visitors come to Alaska for more reasons than just fishing. Our solution to the allocation problem was to divide the visiting anglers into two groups—those who would not have come to Alaska if they had not been able to fish, and those who would have come anyway. For the first group—avid anglers—we attributed all their expenditures to sport fishing, even if they did other things as well. For the second group—casual anglers—we assigned all their spending for fishing trips, but only 31 percent of their other spending, to sport fishing. The percentage we assigned to sport fishing was based on the proportion of days during their visits that they actually spent sport fishing.

Using this allocation method, we estimated that nonresident sport fishing activity drew $199 million of spending into Alaska in 1993 —spending that would have gone elsewhere except for sport fishing. The largest share was spent in the Southcentral region, followed by the Southeast, the Southwest, and the Northern region, where nonresidents spent the least. We included in our estimate all anglers, including those not required to obtain fishing licenses.

Visiting anglers spent $80 million on trip-specific expenditures, including food, lodging, supplies, guiding services, commercial transport, and personal transport. For nonresidents, guiding services made up the largest component of trip-specific expenditures, accounting for $44 million, or 55 percent. We attributed all trip-specific expenditures for nonresidents to fishing, although in some instances a trip might have had more than one purpose. All these trip-specific expenditures occurred within the state.

Nonresidents who fished spent $98 million on package tours in 1993. These packages generally included the cost of travel to and from the state. Netting out this travel left $62 million for package tour expenditures not related to travel for visiting anglers. Of that $62 million, $28 million was attributable to sport fishing, based on whether the visiting households would have come to Alaska anyway, if they had not been able to fish. For the 40 percent of nonresident households that would not have come to Alaska if they had not been able to fish, we attributed all of their instate package tour expenditures to sport fishing. For the 60 percent who would have come to Alaska anyway, even if they had not been able to fish, we attributed none of their instate package tour expenditures to sport fishing.

Although nonresident sport fishermen spend large amounts on fishing-related capital expenditures, these expenditures are not generally made within Alaska so this category was zero for the nonresidents.

Nonresident fishermen spent $166 million on goods and services (primarily food and lodging) not directly related to fishing while they were in Alaska. We attributed 45 percent of this, $75 million, to fishing, based on anglers' reasons for visiting the state and their length of stay. We attributed all instate spending to sport fishing for those anglers who would not have come if they had not been able to fish. For those anglers who would have come in any

event, we assigned a portion of their non-fishing expenditures to sport fishing, based on the ratio of their sport fishing days to total days in Alaska.

Nonresidents spent $134 million on travel to and from Alaska in 1993. They spent most of this money before coming to Alaska, since air travel was the most common means nonresident anglers used to get to Alaska. However, we recognize that a portion of the nonresident budget for transportation to and from the state has an instate economic effect, since some of the transportation services are provided in Alaska. For example, visitors arriving by air require ticket agents, baggage handlers, airplane maintenance staff, and other support personnel to service the aircraft and passengers. Some of the pilots live in the state. These considerations resulted in an instate allocation of a portion of the budget for nonresident travel to and from Alaska by plane, cruise ship, and ferry. We assumed that all expenditures up to the Alaska border by visiting anglers arriving by car occurred outside the state.

In determining what share of travel expenses to and from Alaska to allocate instate, we distinguished between those visiting households that said they would not have come to Alaska if they had not been able to fish and those who said they would have come anyway. For the 41 percent of nonresident households that said they would not have come if they hadn't been able to fish, we attributed all their travel expenses to and from Alaska to sport fishing. For those households that said they would have come anyway, we didn't attribute any of their travel costs to and from Alaska to sport fishing.

To allocate expenditures for instate transportation services, we again divided nonresident anglers into two categories. For those who said they would not have come if they couldn't fish, we assigned all spending for instate travel services to sport fishing. For those who said they would have come anyway, even if they couldn't fish, we assigned 31 percent of their instate travel expenses to sport fishing, using the ratio of the days they spent sport fishing to their total days in Alaska. This procedure resulted in a total of $15 million attributable to sport fishing from nonresident spending for instate transportation, mostly air transportation.

The composition and regional distribution of nonresident sport fishing expenditures is different from that of residents. Although residents and nonresidents reported spending about the same amount for trip-specific expenditures, the nonresidents spent a much larger portion of their trip-specific expenditures on guide services. Also, nonresident spending was more concentrated in Southeast and Southwest Alaska than was resident angler spending.

In contrast to resident sport fishing expenditures, which reflect the purchasing power of resident Alaskans who would spend their money on other things if they could not fish, nonresident sport fishing expenditures are an addition to the aggregate purchasing power in the economy. This will be the case as long as these nonresidents would have spent their money outside Alaska if they could not fish. If this is the case, we can treat nonresident sport fishing expenditures as an increase in final demand, which does not draw purchasing power away from other sectors of the economy. [1]

[1] The nonresident sport fishing analysis could be characterized as an `economic impact analysis.` Sales to nonresident sport fishermen have the same qualitative effect on the economy as the sales of the commercial fishery, the mineral industry, or the timber industry. In all these instances, increases in sales result in the creation of new jobs and income for Alaskans. Like these other sectors, the nonresident sport fishery is a `basic industry`. See page 4-30 for a discussion of "significance" and "impact" analysis.

The direct effect on sales by industry and region of nonresident sport fishing expenditures is shown in Table 4-9. The total of $177 million in direct effect is slightly less than the amount expended instate by nonresident anglers, due to the lack of any significant instate manufacturing and the outside purchases of some guiding firms. Because of the absence of manufacturing, dollars associated with the purchase of most goods flow directly outside the state after passing through the hands of the retailer and have no further effect on the Alaska economy. The purchase of services from some Alaska guiding firms actually represents purchases made outside Alaska. For example, if groceries at a lodge are purchased directly from Seattle, those dollars effectively bypass the Alaska economy even if they appear to be spent in the state.

Like the spending of resident anglers, spending by nonresident anglers directly influences the majority of industries in the economy. However, in contrast to resident expenditures, a larger concentration of nonresident spending is in the lodging and eating and drinking business sectors. Other sectors with significant final demand attributable to nonresident sport fishing are air transportation, other transportation services, retail trade, and business services. Guiding services are not separately identified here as an industry.

Table 4-10 shows the total economic significance of the nonresident sport fishery by industry for employment, payroll, and sales. This table includes the direct, indirect, and induced effects of nonresident sport fish expenditures. We can see that once the multiplier effect of nonresident sport fish spending is taken into account, all sectors of the economy are influenced by the flow of sport fishing expenditures. As with the direct effect, the sectors most influenced by nonresident sport fish spending are lodging and eating and drinking. A total of 3,712 annual average equivalent jobs were attributable to nonresident sport fish spending in 1993, with a payroll of $84 million. Sales, net of what leaked out of the Alaska economy because of the lack of instate manufacturing and because of some direct outside purchases, were $286 million.

Table 4-11 summarizes several measures of the economic significance of nonresident sport fishing by region. Of the 3,712 annual average equivalent jobs associated with nonresident sport fishing activity in Alaska, 2,268 were located in Southcentral Alaska; 957 were in the Southeast; 352 were in the Southwest region; and 135 were in the Northern region. Payrolls and sales followed a similar pattern.

Comparison of the nonresident economic significance with that of the resident anglers shown in Table 4-7 shows that more economic activity in Southeast and Southwest Alaska was attributable to nonresident angler spending than resident spending. In the Southeast, 957 jobs were attributable to nonresidents compared to 794 for residents. In Southwest Alaska, 352 jobs were attributable to nonresidents compared to 123 for residents. In contrast, in Southcentral Alaska, 3,832 jobs were attributable to residents and 2,268 to nonresidents, while in the Northern region 774 jobs were attributable to residents and 135 to nonresidents.

The largest portion of the total jobs, payroll, and sales came directly from the businesses that sell goods and services to the sport anglers. This is shown in Table 4-11 as the direct effect. The indirect/induced effect is the result of spending by the businesses serving the sport

anglers. The direct effect economic multipliers, as well as the final demand multipliers, are about the same as those calculated in Table 4-2 for the entire sport fishery. More detailed tables showing economic significance of the nonresident sport fishery are contained in Appendix F.

Guide and Charter Expenditures

The most readily identifiable sector of the economy influenced by sport fish spending is the industry loosely defined as guides and charters, which includes businesses that provide guiding services, transportation services (primarily boats and planes), food, lodging, and miscellaneous other goods and services in conjunction with those primary activities. We estimated total sales of this industry to be $110 million, with total full-time equivalent employment of 1,250 distributed by region, as shown in Table 4-12. This table also shows that 73 percent—$80 million— of the sales of guide and charter businesses were for sport fishing activities. This is greater than the expenditures of $56 million reported by sport fishermen themselves for guide and charter services. This is because a portion of expenditures on package tours was attributable to guide and charter businesses.

The total economic significance of guide and charter spending associated with the sport fishery is shown in Table 4-13 by industry for employment, payroll, and sales. This table includes the direct, indirect, and induced effects of guide and charter spending by both residents and nonresidents. We see that once the multiplier effect is taken into account, all sectors are influenced by this flow of sport fishing expenditures through the economy. In 1993, a total of 1,396 annual average equivalent jobs with a payroll of $34 million were attributable to nonresident sport fishing spending. Sales, net of leaks of the cost of manufactured goods, were $118 million.

Table 4-14 summarizes several measures of the economic significance of guide and charter spending by region. Of the 1,396 annual average equivalent jobs associated with the purchase of guide and charter services, 781 were located in Southcentral Alaska, 427 were in the Southeast, 147 were in the Southwest region, and 41 were in the Northern region. These regional totals are net of a portion of guide and charter jobs created in the Southwest and the Northern regions, which went to nonresidents. As shown in Table 4-12, the percentage of nonresident employment in guide and charter firms in these regions was high. Since nonresident employees spend most of their income outside the state, their earning and, consequently, the jobs associated with their earnings, do not appear in these estimates.

Average Expenditures

Average instate expenditures per household, angler, and trip are presented in Table 4-15. We derived these average expenditures figures by dividing the total estimated number of fishing trips (for residents and for nonresidents) by the estimated number of angling households (again, resident and nonresident). (Confidence intervals for these estimates are discussed in Appendix G.) These average expenditure figures help fill out the broad picture of what anglers spend in Alaska.

These estimates separately identify trip-specific expenditures and other expenditures related to sport fishing but not tied to specific trips. For residents, those other expenditures include spending on capital equipment and for nonresidents include living expenses while they're in Alaska as well as some of the expenditures associated with travel to and from the state. For residents, these figures show the economic significance of sport fishing and for nonresidents they are an estimate of the spending that generates economic impact in Alaska.

The expenditures that are not trip-specific are allocated equally across all trips. This assumption works in the aggregate, but not when we are calculating the economic impact or significance of specific types of sport fishing trips or of fishing trips that target more than one species. For those more narrow analyses, we can easily identify only expenditures specific to those trips.

Economic Significance of Sport Fishing Sites, Species, and Fisheries

It's important to emphasize here that an economic significance analysis is not the same as an economic impact analysis—which is the term most people are familiar with. Before presenting our estimates of the economic significance of fishing sites and species, below we first discuss the difference between "significance" and "impact," to help readers understand what we are in fact measuring.

Distinguishing Significance Analysis from Impact Analysis

An economy grows when more money comes into it—or shrinks when there is less money circulating. Within an economy—which could be anything from the national economy to a local economy in a village— people choose how they will spend their incomes. If they spend more on one thing, they will spend less on another—so the total amount of purchasing power in the economy doesn't change, although the composition of that spending may change. But if, for instance, a new mine opens in Alaska and begins exporting zinc, those exports bring new money into Alaska's economy—so purchasing power in the state does grow.

Economic significance analysis measures and describes the amount of economic activity attributable to spending for some particular thing—in our analysis, economic activity attributable to sport fishing. It measures how changes in spending for sport fishing affect the economic activity associated with sport fishing. It does not, however, attempt to measure how aggregate spending in the economy changes because of changes in spending for sport fishing.

Economic impact analysis, by contrast, does take into account the change in aggregate purchasing power in an economy when spending for some specific activity changes. If sport anglers spend more for sport fishing, they spend less for other things. Impact analysis measures that substitution effect, to produce an estimate of how aggregate purchasing power in an economy changes when spending for some activity changes. The types of changes we could assess using economic impact analysis include things like an increase in the number of non-local sport anglers fishing in a specific region; an increase in the number of tourists traveling to Alaska to fish; or a restriction on access to some fishery that had the effect of reducing the number of tourists who come to Alaska to fish.

Depending on the boundaries of the economic region under analysis, sport fishing expenditures in Alaska may or may not represent new purchasing power coming into the economy. In general, the smaller the definition of the region of analysis—an individual fishing community, for example— the more likely it is that a change in sport fishing expenditures represents a change in aggregate purchasing power in the region. That's because the smaller the region, the more likely it is that whatever substitutions in spending anglers make will be outside the region.

Let's consider sport fishing on the Kenai Peninsula, for instance. If fishing on the Kenai Peninsula were closed, that area would suffer a significant economic loss. That's because most anglers who fish for salmon on the Kenai Peninsula do not live on the peninsula—they are either from other areas of Alaska or from outside the state. So whatever they spend locally for sport fishing is an infusion of money into the peninsula's economy. The loss to the

statewide economy would be smaller, because Alaskan anglers would likely substitute other kinds of spending in Alaska, if they could no longer fish on the Kenai. But visiting anglers who wanted to fish on the Kenai would be less likely to spend that money in other ways in Alaska—so the statewide economy would suffer some loss.

Our travel cost model is, however, unable to predict how anglers would substitute spending for other kinds of activities besides sport fishing, if they lost the opportunity to fish at a site or for a species. In general, resident anglers might be expected to spend the same amount in the economy, whether they could fish for a particular species or not. We can assume that whatever they didn't spend to fish for a particular species they would spend on other fishing or on other activities such as hunting. Since we do not have information on the characteristics of potential spending on other activities, we can not do an economic impact analysis. As a first approximation, however, the statewide economic impact for resident anglers of losing a species or a fishery, as compared to the economic significance, would be zero—since the loss of expenditures from the closure would be offset by an equivalent increase in expenditures on other activities within the state.

Tourism (including visits by nonresident anglers) is a basic industry for Alaska, since it brings money into the economy and stimulates job and income creation in Alaska. The closure of a sport fishery could cause nonresident anglers to shift some of their spending to other fisheries or to other activities in Alaska— but it could also cause them to spend more outside Alaska. For example, they might sport fish at sites outside Alaska; they might spend less in Alaska, even while visiting for the same length of time; or they might shorten or cancel trips to Alaska. Any reduced tourist spending in Alaska would cost the state jobs and income.

We were not able to estimate economic impact for nonresident fishing, since our nonresident travel cost model does not allow for a reduction in the total number of trips taken when a fishery is eliminated. Also, our model captures very little of the variation in nonresident expenditures by site, so a simple reallocation of expenditures across sites would have little effect. Below we discuss how we did allocate and measure sport fishing expenditures to estimate economic significance of sites and species.

Allocating and Measuring Expenditures

To analyze the economic importance of particular species or sites, we have to first estimate how much spending is associated with them. As we noted earlier, there are two categories of spending to consider. Some expenses are trip-specific, which means the expenditures would not have occurred if the particular fishing trip had not taken place. The other is more general spending that is for sport fishing but that can't be identified with a particular trip. Below we describe three possible ways to measure the expenditures associated with a site or a species. Each succeeding method results in a smaller estimate of expenditures.

One method is to look at the total spending associated with sport fishing, and from that to calculate the *average* spending per angler or per trip, including expenditures not specific to trips. This would be the appropriate measure for estimating the economic contribution of adding a new angler, resident or nonresident, to those already fishing.

A second method is to look only at the trip-specific expenditures. For existing fishermen the expenditures associated with a change in the number of trips to a site or trips which target a particular species would be measured by the average trip-specific expenditures associated with that site or species. This measure of spending is the *marginal* spending per angler or per trip. This is the method we used for estimating the economic significance of sites, presented beginning on page 4-32.

A third method is to look at the actual change in fishing expenditures associated with a change in fishing conditions for existing fishermen. For example, if a regulatory change restricts fishing at some sites or for some species, fishing activity and expenditures will decline at some sites or for some species and expand at other sites or for other species. Because of this shift, the net change in expenditures will be less than the *marginal* change associated with any particular site or species. We used this method to estimate the *incremental* change in aggregate sport fishing expenditures for species and selected fisheries, using the travel cost model developed for the economic value analysis of sport fishing. Those estimates are presented beginning on page 4-39.

Estimates of Economic Significance by Site

The economic significance of sport angling at a particular site is a measure of the effects of the expenditures associated *specifically* with that site. It excludes expenditures that are related to sport fishing but that are not site specific. Most important expenditures excluded are for vehicle purchases, maintenance, and insurance, as well as general travel expenditures for visiting anglers. Expenditures made outside Alaska are also excluded.

Estimating the economic significance of a particular site in this way is a marginal analysis, as defined in the preceding section, and involves no assumptions about how anglers would shift their expenditures, if that site were closed. This should not be confused with an incremental analysis, which measures how jobs and payroll would change if site characteristics changed.

Table 4-16 shows trip-specific expenditures of resident anglers during summer 1993, by fishing zones and largest sites. (The fishing zones are ADF&G's sport fishing management areas, as shown on Map 5-1 in Chapter 5.) Table 4-17 shows the economic significance of those trip-specific expenditures. Residents spent nearly $95 million on trip-related expenditures. After adjusting this total downward for multipurpose trips, for which only a share of expenditures could be attributable to sport fishing, we estimated that 1,222 annual average jobs and $27.381 million in payroll were associated with sport fishing sites across the state. (An annual average job is a person working year-round and is a smaller number than the number of seasonal jobs that might be created during the peak of the sport fishing season.)

About three quarters of the jobs and payroll were attributable to sites in Southcentral Alaska, which produced 924 annual average jobs and nearly $21 million of payroll. The top five sites for resident fishing were all in Southcentral Alaska, with Resurrection Bay at Seward and Kachemak Bay at Homer leading the list.

These figures represent the effects throughout Alaska of expenditures associated with Southcentral sites. The overwhelming majority of those economic effects occurred within the Southcentral region itself. The expenditure information is the trip-specific expenditure data taken directly from the survey responses of resident sport angler households. As with any survey-based calculation, the quality of the information is better for the sites with larger expenditures. A few sites show no expenditures; this is most likely because the data is from a sample, rather than because there really weren't any expenditures at that site. The composition of expenditures varies by site. Because different categories of expenditures have different economic multipliers, the total economic significance may differ between sites that have identical levels of expenditures.

Table 4-18 shows the 1993 site-specific spending of visiting anglers, by fishing zone and largest sites. Table 4-19 shows the economic impact of that spending—again, by fishing zone and largest sites. Visiting anglers spent nearly $79 million on trip- related expenditures. We assumed for nonresidents that their trips were entirely for sport fishing and estimated that trip-related spending by visiting anglers generated 1,265 annual average jobs and $29.425 million in payroll at sites throughout Alaska.

Even though residents spent more for fishing trips than nonresidents, our estimates of economic effect are similar. That's because we assumed some of the resident trips were multipurpose, while all the nonresident trips were strictly for fishing. If we had assumed that some nonresident trips were also multipurpose, then the nonresident economic impact would have been somewhat less than the resident economic significance. But we have no data to support an allocation of some nonresident trips to purposes other than fishing.

About half the economic impact from nonresident fishing trips was in Southcentral Alaska, 25 percent in Southeast, and the remainder in the Southwest and Northern parts of the state. The four of the five sites with the largest economic significance were in Southcentral and one in Southeast.

Table 4-20 summarizes the regional economic effects and compares the resident and nonresident location of expenditures for fishing trips. Nonresidents are clearly more important in Southeast and Southwest Alaska, while residents dominate in Southcentral. In the Interior resident spending was somewhat more important than nonresident.

Estimates of Economic Significance of Species and Selected Fisheries for Resident Sport Fishing

A fishery is defined as a species at particular sites over a particular period of time—say, for example, Kenai River late-run red salmon. The economic significance of a fishery is defined as the *incremental change* in jobs and payroll from the loss of that fishery. It is based on the reduction in expenditures associated with the lost species, partially offset by increased expenditures at other sites and for other species. In calculating economicsignificance by species, we included only trip-related expenditures and excluded other expenses that are related to sport fishing but are not tied to particular trips. That's because any way we allocated those general sport fishing expenditures among individual species would be arbitrary.

We estimate the economic significance using the travel cost model, since it is designed to predict how sport anglers will change their behavior (number of trips, destinations, and species fished) if fishing opportunities or fishing conditions change. The model assumes that if one fishery were no longer available, some anglers would continue to fish for other species at the same sites, some anglers would substitute other sites, and some anglers would not fish. [2]

The economic significance results by fishery and species cannot be aggregated because of the assumptions used to produce the estimates. The significance for each fishery is a measure of the incremental effect of eliminating that fishery or species from the set of alternatives available to sport anglers. Since this effect is net of the increase in expenditures on other fisheries and species, summing the individual results would underestimate the significance of closing all the fisheries simultaneously, just as summing the results for any two fisheries would underestimate the significance of simultaneous closure of both fisheries.

Since anglers' decisions about where to fish are based on their net willingness to pay—the value they place on the site, minus their costs of fishing at the site— it is possible for net fishing expenditures to increase when a site is excluded. Were this to happen, it would be because anglers were switching to a site where the gross benefits were somewhat smaller but the cost associated with the site was slightly higher.

The definition of "trip-related expenditures" in the model and in this economic significance analysis by fishery is more inclusive than in the economic significance analysis by site, which we described in the previous section. In the model, all vehicle-related costs are included and allocated to trips. The specific expenditures included in the model (and the analysis by fishery) but excluded from the analysis by site are the purchase of new and used vehicles (boats, cars, trucks, campers, and planes), insurance, storage, and general maintenance not specifically identified with a trip. These expenditures are allocated to trips on the basis of total miles traveled or hours of travel time (for boats and planes). Thus the cost of these vehicles is allocated to trips on the basis of the share of total use associated with those trips. (This definitional difference precludes a direct comparison of trip related

[2] The model structure does not allow for substitutions to other parts of the season. All substitutions take place within the same week.

expenditures from the economic significance analysis by site with trip- related expenditures from the economic impact analysis by fishery. In addition the economic significance analysis by site is based on expenditures reported in the survey while the expenditure information for the analysis by fishery comes from the model.)

Table 4-21 shows the incremental change in resident angler expenditures on sport fishing from eliminating individual species or selected fisheries as projected by the travel cost model, and the net economic significance of eliminating those fisheries, derived by using the input-output model.

The largest losses in expenditures are for large fisheries for which there are no close substitutes—for instance, halibut in Southcentral Alaska. The loss of economic activity at the site of the closed fishery would in fact be larger than reported in Table 4-21, because the net economic significance reflects increased sport fish expenditures at other sites. The results for individual species or fisheries reported in this table are not additive. In other words, the net economic significance of eliminating all king salmon fisheries would be larger than the sum of the king salmon fisheries presented here.

We cannot estimate economic significance for nonresident fishing by species for two reasons. While the travel cost model produces acceptable predictions of sport fishing trip for nonresidents, model estimates of nonresident expenditures by site are not acceptable. The root of the problem is poor expenditure data from the survey. Without good predictions of expenditures by site, we cannot estimate economic significance for the change in the distribution of trips. And without a participation equation, we cannot project changes in total expenditures by nonresidents.

Table 4-21. Incremental Significance of Resident Sport Fishing, By Species and Selected Fisheries

	Net Change in Expenditures		Net Economic Impact		
			Jobs		Payroll
Mgmt. Areas A—H					
Species					
Marine King	$8,700,772		107.4		$2,356,315
Halibut	$2,975,116		42.5		$1,037,630
Marine Coho	$330,574		4.6		$112,121
Dolly	$221,350		1.8		$30,518
Freshwater Coho	$24,202		0.3		$9,098
Mgmt. Areas I—T					
Species					
Halibut	$12,142,226		124.0		$2,888,109
Coho	$7,629,065		86.4		$2,019,662
Red	$7,767,724		79.0		$1,684,690
King	$5,524,565		56.3		$1,315,628
Trout	$4,523,586		42.6		$933,727
Dolly	$1,193,253		11.1		$241,546
Fishery					
Kenai P Halibut	$8,896,324		82.4		$1,785,752
W. Susitna King	$1,046,164		17.1		$467,346
CI Marine Late Run King	$1,515,002		12.6		$276,931
Gulkana R King	$1,364,431		8.1		$180,443
Kenai R Late Run Red	$878,656		8.5		$178,856
Kenai R Early Run Coho	$614,231		6.3		$127,683
CI Marine Early Run King	$477,337		3.9		$86,977
Kenai R Rainbow Trout	$362,965		4.0		$79,621
Kenai R Late Run King	$338,786		3.5		$72,092
Russian R Early Run Red	$305,706		2.7		$52,444
Kenai R Early Run King	$245,897		2.4		$49,142
E. Susitna King	$43,819		0.9		$17,553
Ship Creek King	$29,986		0.0		$751
Mgmt. Areas U-Z					
King	$4,456,419		28.7		$694,675

Note: Map 5-1 in Chapter 5 shows boundaries of management areas.

Comparison With Earlier Studies

1991 U.S. Fish and Wildlife Service Survey

In 1991 the U.S. Fish and Wildlife Service conducted a national survey of fishing, hunting, and wildlife-associated recreation. The survey found that Alaska residents spent $239 million on sport fishing (not all of which occurred in Alaska). This included $75 million for trip-related expenditures (of which $6 million was for guides); $24 million for fishing equipment; $10 million for auxiliary equipment (for example, camping gear, clothing, and binoculars); $65 million for special equipment (boats, canoes, trailers, and pickups, for instance); and $64 million for other fishing costs (magazine subscriptions, membership dues and contributions, and land leasing and ownership). Nonresidents spent $167 million on trip-related expenditures while in Alaska. This consisted of $46 million for food and lodging, $78 million for transportation, $39 million for privilege and other fees (primarily guiding services), and $4 million for other expenses. Total days fished were 1.8 million by residents and 982,000 by non-residents.

Because of the different categories used in this national study, it is difficult to compare its results to ours. For example, it is difficult to identify the $64 million of other fishing costs of residents. One would expect this national study to produce somewhat lower estimates of expenditures than the present study, since the national study includes only specialized transportation equipment and makes no allocation of the costs of automobiles to sport fishing.

As with many national surveys of this type, part of its value lies in its state-by-state comparative information. This study shows that, compared to the national average, a relatively small share of sport fish expenditures in Alaska are trip related. The proportion for the United States as a whole is 49 percent, while for Alaska residents it is only 31 percent. Alaska was one of only six states (the others being Montana, Delaware, Maine, New Hampshire, and Vermont) where nonresident trip-related expenditures exceeded those of residents. Alaska had the highest percentage of residents who fish but do not hunt (26 percent) and ranked fifth among the states for residents who both fish and hunt (12 percent). It had the smallest percentage of anglers who fished in other states (5 percent).

1988 Jones and Stokes Study of Sport Fishing in Southeast Alaska

A study of Southeast Alaska sport fishing done for 1988 by Jones and Stokes found that residents and nonresidents together spent $65 million in Alaska for sport fishing in the Southeast region. Residents from all regions of the state spent $40 million, and nonresidents spent $25 million, excluding the cost of travel to and from the state. This was equivalent to $2,148 per resident angler household and $798 per nonresident household. It was equivalent to $211 per household trip for residents and $279 per household fishing day for nonresidents. The total economic effect of this spending was 1,113 full-time equivalent jobs, $29 million of earnings (payroll), and $78 million in output (sales).

By contrast, we estimate total sport- fishing-related expenditures in Southeast in 1993 of $105 million, with $53 million provided by nonresidents and $52 million by residents. This is a reversal of the relative importance of the two groups since the earlier study. The total economic effect of this spending in 1993 was 1,751 annual average jobs, $39 million in payroll, and $118 million of sales.

Even if we were to net out from the present study nonresident expenditures associated with travel to Alaska (about $4 million) and the food expenditures of residents while on fishing trips (about $3 million), as the 1988 Southeast study did, we can conclude that the growth in expenditures since 1988 has been significant. In 1993 dollars, the 1988 expenditures were $79 million. This suggests a 24 percent increase in real spending over the time interval between the 1988 study and ours. (The Jones and Stokes study also included the economic effect of public management of sport fishing resources while the present study does not.)

1986 Jones and Stokes Study of Sport Fishing in Southcentral Alaska

A study of Southcentral Alaska sport fishing done for 1986 by Jones and Stokes found that $93 million was spent in Alaska related to sport fishing in the Southcentral region. Residents from all regions of the state spent $72 million and nonresidents spent $21 million, excluding the cost of travel to and from the state. This was equivalent to $677 per resident angler household and $753 per nonresident household. The economic effect of this spending was 2,840 jobs (on a full- time equivalent basis), $65 million of earnings (payroll), and $206 million in output (sales).

Although the present study is generally more inclusive of expenditures, it finds a significant increase in the economic significance of the sport fishing in Southcentral Alaska since the time of this earlier study. We estimated total sport fishing-related expenditures in Southcentral Alaska of $338 million, with $233 million provided by residents and $105 million by nonresidents. The total economic effect of this spending in 1993 was 6,100 annual average jobs, $139 million in payroll, and $433 million of sales.

Even if we were to net out from the present study the expenditures associated with travel to Alaska and vehicle purchase costs, as the 1986 Southcentral study apparently did, we can conclude that the growth in expenditures since 1986 has been significant. Furthermore, the 1988 study appears to have overestimated the economic multipliers associated with sport fishing expenditures and, consequently, overestimated their total importance for the economy.

Chapter 5. The Net Economic Value of Sport Fishing in Alaska

In this chapter we report the net economic value of sport fishing in Alaska, as estimated by our travel cost models. Net value attempts to measure the overall value of sport fishing, by adding all the benefits (including both market and less tangible benefits) and subtracting all the costs (again, including the out-of-pocket and less tangible costs). For the net value analysis, we used the Department of Fish and Game's sport fishing management areas, shown in Map 5-1. This chapter also includes estimates of economic impact by species and fishery, developed with both the travel cost models and the Alaska input-output model described in Chapter 4. We discussed our methods of analysis in Chapter 2; the appendixes provide details on the methods and on estimation and construction of the models.

Interpreting Travel Cost Model Estimates

The travel cost method is a standard technique frequently used to estimate the value of a wide variety of "recreational" visits. In particular, we used a discrete choice model, in which the model estimates the likelihood that an angler will choose one particular site from a set of alternatives, based on expected cost, fishing quality, and other relevant variables. Using discrete choice models to estimate value is discussed byA. Myrick Freedman III in "Recreational Uses of Natural Resource Systems," in *The Measurement of Environmental and Resource Values*, published by Resources for the Future in 1993. We use a logit functional form to estimate :

(1) the probability that an angler chooses to fish (participation equation)

(2) for each of a discrete set of available fishing sites, the probability that an angler who chooses to fish will choose a particular site (site choice equation)

Although we can't fully observe anglers' utilities, we can observe that portion of utility reflected in their choices. Specifically, the probability that an angler chooses a site is equal to the probability that the angler's utility is greater fishing at that site than at any of the available alternative sites. So the equation (discussed in Appendix C) for calculating the probability of choosing a given site is also a way to estimate the observable component of utility:

$$P_{it} = \frac{e^{x_{it}b}}{\sum_{i=1}^{N} e^{x_{it}b}}$$

where Pi|t is the probability that the angler chooses site i in week t, X_{it} is the vector of variables for site i in week t, and b is the vector of estimated parameters.

There are several theoretical approaches to deriving a welfare measure from this equation. In our study the value of the site is equal to a price that, if added to the costs of visiting the site, would make anglers indifferent to the availability of the site. Thus we estimate the willingness to pay per angler household as:

$$WTP=\frac{LN(\exp(\beta_n) + 1) - LN(\exp(\beta_0) + 1)}{Coeff_{iv} * Coeff_{tc}}$$

Where:

β_0 = the linear combination of the variables in the participation equation and the coefficients of that equation, when all sites are included in the site choice equation

β_n = the linear combination of the variables in the participation equation and the coefficients of that equation, when site n is excluded from the site choice equation (which reduces the inclusive value variable in the participation equation)

$Coeff_{iv}$=the coefficient on inclusive value (see Appendix C) in the participation equation

$Coeff_{tc}$=the coefficient on travel cost in the site choice equation

Appendix C discusses previous major studies that have applied this technique to assessing the value of Alaska resources.

Readers should keep in mind some cautions when comparing or aggregating estimates of net economic value for resident and nonresident anglers. The precise meaning of these estimates depends on the choice structure imposed on the model in the process of estimation, as well as on the method used for calculating net economic value and the definitions used for costs and fishing amenities. The resident and nonresident models differ considerably in their choice structure (the total number of nonresident trips is fixed, since we did not have the data to develop a participation equation for nonresidents); site aggregation; time dimension (weekly versus monthly); and definition of costs (time and capital depreciation are included for residents but not for nonresidents).[1] Specifically, the resident model allows onsite time as well as the total number of trips to change, reflecting substitution between fishing and non-fishing activities. For nonresidents, however, the total number of trips and days is fixed, constraining total demand to be inelastic.

Because the nonresident model considers only one margin of choice, it is inelastic in its projections, and systematically underestimates changes in trips and overestimates net economic value.[2] We believe, however, that this bias is not large, because nonresidents are less flexible in their fishing choices anyway. Trips to Alaska are usually planned months or even years in advance and with far less information about alternatives than is available to residents.

[1] There is also the question of whether a dollar of travel cost has the same value for residents and nonresidents.

[2] It may under or over estimate the change in expenditures, depending on the relative costs of the site.

Model estimates do not reflect the growth in nonresident sport fishing since 1993. Also, our nonresident estimates do not include nonresidents visiting friends or relatives. We assume those nonresidents are included in the resident model estimates. However, nonresidents visiting friends and relatives but fishing on their own may not have been counted.

Our models compute value using regionwide coefficients for a limited number of site variables—those variables that were statistically significant predictors of site choice across all households regionwide.[3] These estimated coefficients and the resulting value estimates are a kind of an average. As with all averages, they predict more precisely for large groups than for small. Thus the model is more accurate for aggregations of sites or species representing a large number of trips, and much less accurate for particular fisheries. The model is most useful for analyzing management alternatives that affect a number of sites or species. It is not likely to be better than professional judgment, however, for analyzing management alternatives for individual fisheries that represent a small proportion of the total trips regionwide.

The model is based on the pattern of fishing trips that existed in 1993. While we can fairly assume that angler choice behavior is reasonably consistent over a number of years, we cannot assume that site conditions remain the same. Not only do biological stocks vary from year to year, but so do site amenities, accessibility, and available information. There may also be usage trends that our cross-section data do not capture. Certainly we know that nonresident fishing has increased and that the effects of these new anglers are not evenly distributed. This means that while the model continues to be useful for understanding how angler behavior and economic effects might change under different policy scenarios, the estimates of value for particular sites will, over time, be outdated.

While we can not analytically estimate formal confidence intervals for these models, the sensitivity of model results to individual coefficients and other sources of uncertainty suggest that small differences in estimated values are not significant and are not a reliable foundation for distinctions in policy. (See Appendix G for further discussion of model resolution.)

[3] If the survey sample had been substantially larger, we would have estimated all coefficients more precisely and found a greater number of significant variables. On the other hand, a larger data set and model with more variables would soon exceed our computational capacity.

Total Estimated Value of Sport Fishing

The overall economic value of sport fishing is the sum of what anglers actually spend to fish and how much more they would be willing to pay for the opportunity to fish. This additional willingness to pay, beyond actual expenditures, is the net economic value. Figure 5-1 summarizes our estimates of the overall value of sport fishing in Alaska—including both expenditures and net economic value— for resident and nonresident anglers.

As of 1993, we estimated the overall value of sport fishing in Alaska at about $738 million. That included about $180 million resident and visiting anglers spent for specific fishing trips and another $370 million they spent for expenses related to sport fishing but not tied to specific trips. The remaining $186 million is the net economic value: the additional amount they would have been willing to pay for sport fishing. Close to $108 million is the resident share of that net value and $78 million the nonresident share.

We arrived at these totals by adding our model estimates for individual sites or groups of sites (as presented in Tables 5-1 and 5-2). Readers should keep in mind that the totals in Figure 5-1 are lower-bound estimates. Adding up the estimates for individual sites (or groups of sites) produces a lower bound estimate of the total net economic value, because we estimate the net value of each site by estimating the loss that would result from eliminating the site. If fishing sites that were close substitutes were still available, the loss would be less than if no such similar sites were available. So if all the sites were eliminated, the actual loss would be greater than our model projects, because there would be no possibility of substituting other

Figure 5-1. Economic Value of Sport Fishing

Estimates of Net Value by Site

In Tables 5-1 and 5-2 we present our model estimates of numbers of trips and net economic value for residents and nonresidents by site (or groups of sites) statewide. Because our model is based on averages, we know that the model tends to underestimate trips and net economic value for the most popular sites and tends to overestimate trips and net economic value for the least popular sites.

These estimates represent the net economic benefit to angling households of having a given site or group of sites available for fishing. Remember that net value by site is calculated as the loss in total net benefit, if that one site were eliminated from the set of available choices. If one site were closed, anglers would shift some of their fishing activity to other sites. If the other sites were close substitutes, there would be little loss in benefit to anglers. Loss of unique sites, however, would represent a larger net loss.

For resident anglers, the estimated net value of all fishing sites in 1993 was about $108 million, with about two thirds of that value in sites in the Southcentral region (Table 5-1).

The estimated net value for visiting anglers in 1993 was about $78 million. We divided visiting anglers into two large categories—those who came to Alaska specifically to fish, and those who came for other purposes as well as fishing. In Table 5-2 we refer to those two classes of anglers as “serious” and “incidental” anglers. It was the incidental anglers who contributed the most to net value—about two thirds of the total—partly because there are many more incidental than serious anglers.

Tables 5-3 and 5-4 show the top 20 sites for residents and nonresidents, ranked by estimated net economic value. The most popular sites—the ones with the largest number of trips—have the highest value. It is mainly the total number of trips to a site that makes it more or less valuable; the differences in net value per trip across sites are relatively small, compared with the differences in the number of trips to different sites. The net value per trip is higher in the Interior model, because anglers in the Interior would have fewer substitute fishing choices if a site were eliminated. Anglers in the Interior also pay more per trip than anglers elsewhere—more than twice as much as anglers in Southcentral, the next highest group.

Table 5-1.Trips and Net Economic Value, by Region and Site, Summer 1993 Resident Trips

Southeast Region Anglers

Area	Sites	Trips	NEV
A	East, West, Behm Canal	20,208	$189,982
A	Clarence Strait Salt	34,041	$267,476
A	Revillagigedo Channel	4,611	$225,397
A	Tongass Narrows Salt	222	$200,368
A	Yes Bay		$152,999
A	Mountain Point Salt	399	$125,426
A	Carrol Inlet Salt	590	$107,748
A	Ketchikan Area Road	112	$30,652
A	Other Ketchikan Area Salt	16,288	$224,361
A	Other Ketchikan Area Fresh	1,602	$37,546
B	Prince Of Wales Area Salt	3,368	$545,904
B	Prince Of Wales Area Fresh	280	$21,651
C	Blind Slough Salt	1,610	$101,724
C	Remaining Wrangell Narrow	1,677	$69,522
C	Duncan Saltchuck, Ca	641	$105,206
C	Frederick Sound Salt	6,601	$127,356
C	Zimovia Strait		$67,253
C	Petersburg Creek Frsh	1,572	$51,868
C	Other Wrangell-Petersburg Area Salt	14,150	$76,675
C	Other Wrangell-Petersburg Area Fresh	2,671	$68,470
D	Starrigavan Bay Salt	412	$226,449
D	Other Sitka Sound	11,625	$493,237
D	Other Area 4 Salt	7,434	$523,663
D	Other Sitka Area Fresh	836	$24,735
E	Doty Cove, Berners Bay	36,528	$479,312
E	Mitchell Bay Salt Lagoon		$369,464
E	Juneau Road System Salt	4,764	$265,472
E	Other Juneau Area Salt	19,276	$367,088
E	Juneau Road System Fresh	2,579	$46,499
E	Lake Florence Fresh	86	$161
E	Other Juneau Area Fresh	1,999	$48,185
F	Skagway Sun-Area Salt		$110,074
F	Haines Sub-Area Salt	479	$102,578
F	Area F Fresh		$26,343
G	Icy Straits Salt	507	$334,886
G	Excursion Inlet Salt	364	$155,161
G	Other Salt Area G	229	$256,508
G	Fresh Area G		$33,914
H	Area H	306	$156,845
	Other Alaska	2,250	$21,402
	Total, Southeast Region	200,317	6,839,559

Kodiak Region Anglers

Area	Sites	Trips	NEV
Q	Chiniak	10,215	$534,986
Q	Buskin	5,404	$123,902
Q	Other Salt	5,046	$154,615
Q	Other Fresh	8,919	$448,294
	Other Alaska	981	$3,759
	Total, Kodiak Region	30,565	$1,265,556

Southcentral Region Anglers

Area	Sites	Trips	NEV
M	Willow Creek	23,669	2,185,397
M	Other Willow-Cantwell L&S	24,072	2,188,104
K	Little Su River	24,970	2,111,097
K	Wasilla Creek	3,161	341,568
K	Kepler & Wasilla Area Lakes	15,468	1,983,386
K	Fish Creek	14,589	747,026
K	Big Lake & Tribs	9,458	1,672,374
K	Other Mat-Su Lakes & Streams	27,932	2,299,016
L	Ship Creek	16,429	609,147
L	Other Anchorage Lakes & Streams	26,147	6,162,971
N	Deshka R	12,167	520,883
N	Other West Side Lakes & Streams	33,714	3,756,294
K-N	Saltwater Areas K-N	9,454	508,187
P	Anchor River, Whiskey Gulch	18,246	2,368,080
P	Resurrection Bay	48,163	6,302,292
P	Kachemak Bay	27,156	3,091,778
P	Homer Spit Shore	12,617	706,945
P	Other Kenai Salt	10,746	7,688,895
P	Personal Use Dipnet	7,422	696,278
P	Upper Kenai River	12,345	1,199,695
P	Lower Kenai River	114,291	3,555,119
P	Russian River	29,799	3,601,118
P	Kasilof R	13,552	1,812,717
P	Ninilchik To Anchor River	15,909	1,015,427
P	Swanson River & Swan Lakes	9,504	1,328,929
P	N Kenai`	6,026	1,564,401
P	Kenai Other Lakes & Streams	26,183	7,775,853
I	Glenallen Area Lakes & Streams	17,700	3,063,101
J	Prince William Sound Salt	3,317	413,384
	Other Alaska	11,690	501,599
	Total, Southcentral Region	625,896	$71,771,061

Interior Region Anglers

Area	Sites	Trips	NEV
I	Copper River Dipnet	7,649	$2,928,890
I	Gulkana River	6,195	$1,097,206
I	Other Fresh Area I	9,673	$2,109,740
J	Valdez Arm	9,186	$2,748,234
J	Other PWS Salt	6,861	$1,903,569
J	Area J Fresh	954	$144,854
	Areas K-N (Fresh)	3,596	$596,504
P	Kenai Peninsula Area	8,892	$1,752,837
U	Piledriver Slough, M	1,883	$197,854
U	Chatanika River Up F	3,010	$726,710
U	Salcha River Frsh	2,885	$610,595
U	Delta Clearwater	28,234	$710,066
U	Tangle Lakes, River	1,503	$506,927
U	Chena Lake Frsh	3,740	$608,649
U	Chena River	3,638	$799,055
U	Birch, Quartz Lakes	8,041	$2,116,953
U	Other Area U Fresh	19,167	$3,656,809
	Other Alaska	15,022	$4,521,774
	Total, Interior Region	140,129	$27,737,228

Note: Trips are as reported by survey respondents; NEV is projected with our travel cost model. Therefore, it is incorrect to use these figures to calculate a per-trip NEV.

Table 5-2. Trips and Net Economic Value, by Angler Group and Site, 1993 Nonresident Trips

Serious Anglers, All Regions

Area	Site Name	Trips	NEV
A	Area A salt	3,336	$603,343
B	Area B fresh	400	$596,010
B	Area B salt	1,948	$48,349
D	Sitka Sound	1,067	$71,047
C-D	Area C and Other Area D Salt	2,535	$1,117,419
A,B-F	Areas A,B-F fresh	1,734	$238,687
E	Area E Salt	2,055	$2,032,561
F-G	Areas F-G Salt	1,121	$33,855
H	Area H fresh	1,414	$640,148
H	Area H salt	1,014	$1,177,331
I-J	Area I-J fresh	1,494	$370,177
J	Area J salt	1,308	$171,125
K-L	Area K-L fresh	1,067	$760,439
M	Area M fresh	1,574	$967,356
N	Area N	3,149	$835,834
P	Anchor River, Deep Creek salt	1,334	$1,054,197
P	Kachemak Bay	4,563	$408,021
P	Resurrection Bay	2,188	$155,327
P	Lower Cook Inlet / outer coast	2,268	$1,308,331
P	Kasilof River	1,147	$440,485
P	Russian River	1,841	$646,593
P	Kenai River	11,928	$3,987,664
P	Other Kenai fresh	2,295	$694,736
P	Other Kenai Salt	1,494	$1,088,166
Q	Area Q fresh	881	$804,409
Q	Area Q salt	1,201	$52,839
R	Area R	1,414	$86,758
S	Area S	2,935	$1,807,318
T	Area T Fresh	1,388	$1,685,419
T-Z	Area T salt, Areas U-Z	1,308	$170,350
	Total, Serious Anglers	63,402	$24,054,291

Southeast Region Incidental Anglers

Area	Site Name	TRIPS	NEV
A	Tongass Narrows	267	$123,759
A	Ketchikan Area Frsh	107	$192,816
A	Other Ketchikan Area Salt	4,696	$1,067,258
B	Prince of Wales Area	534	$96,981
C	Wrangell-Petersburg Area	827	$164,353
D	Sitka Sound	1,201	$257,942
D	Sitka Area Fresh	133	$66,462
D	Other Sitka Salt	1,201	$234,058
E	Juneau Area Fresh	454	$100,360
E	Juneau Area Salt	3,549	$731,477
F	Skagway Salt	160	$67,111
F	Haines Salt	480	$44,847
F	Chilkoot Lake	187	$22,546
F	Chilkoot River	267	$77,999
F	Other Area F Fresh	80	$31,776
G	Icy Straits	187	$206,312
G	Glacier Bay	240	$8,951
H	Yakutat Area Fresh	160	$63,183
H	Yakutat Area Salt	133	$9,297
	Other Alaska	160	$34,279
	Total, SE Incidental Anglers	15,023	$3,601,766

Remainder Alaska Incidental Anglers

Area	Site Name	**TRIPS**	**NEV**
A-H	Southeast	267	$ 983,739
I	Glennallen Streams	294	$1,006,305
I	Glennallen Area Lakes	1,227	$ 557,355
J	Prince William Sound	2,375	$1,645,641
K	Mat-Su Area	1,067	$1,553,541
L	Bird Creek	160	$1,732,131
L	Other Anchorage	667	$1,109,451
M	Talkeetna River	267	$ 112,331
M	Sheep Creek	187	$ 820,794
M	Other Area M	1,201	$1,624,559
N	Area N	1,067	$ 260,266
P	Anchor R. area Salt	1,014	$2,875,670
P	Kachemak Bay	4,937	$5,620,178
P	Resurrection Bay	3,602	$2,024,814
P	Lower CI/Outer Gulf	1,441	$1,428,150
P	Kasilof River	747	$ 781,248
P	Anchor River	374	$1,301,461
P	Russian River	1,281	$1,519,332
P	Resurrection Creek	80	$ 524,944
P	Kenai River	10,860	$11,056,697
P	Other Kenai P. Fresh	2,241	$1,882,127
P	Other Kenai Salt	1,147	$1,985,469
Q	Kodiak Fresh	507	$2,778,610
Q	Kodiak Salt	480	$ 303,645
R	Naknek River	347	$ 517,722
R	Brooks River	80	$ 90,295
R	Other Area R	454	$ 124,005
S	Area S	720	$ 700,637
T	Area T	534	$ 560,360
U	Tanana Area	2,375	$2,394,715
V-Z	Areas V-Z	1,147	$ 223,585
	Total, Other Incidental Anglers	43,148	$50,099,776

Note: Trips are as reported by survey respondents; NEV is projected with our travel cost model. Therefore, it is incorrect to use these figures to calculate a per-trip NEV.

Table 5-3. Top 20 Resident Sites by Net Economic Value

Area	Site Name	Water type	Base Trips	Net Value
P	Other Kenai Peninsula lakes and streams	F	66,108	$7,855,485
P	Resurrection Bay (Seward)	S	51,629	$6,473,629
L	Anchorage lakes and streams	F	40,864	$5,470,011
P	Other Kenai Peninsula saltwater	S	32,679	$3,940,416
P	Kenai River below the Soldotna bridge	F	32,071	$3,900,227
N	Other West Cook Inlet / Susitna River area lakes and streams	F	28,966	$3,850,400
P	Russian River	F	32,436	$3,723,515
P	Kachemak Bay (Tutka Bay, Halibut Cove, Other)	S	27,256	$3,189,724
I	Copper River dipnet	D	12,043	$2,928,957
J	Valdez Arm and Bay	S	12,258	$2,850,809
P	Lower Cook Inlet / Outer Gulf Coast	S	22,279	$2,696,712
P	Anchor River, Whiskey Gulch	S	21,302	$2,509,300
K	South Mat-Su Streams (Knik River and tributaries, Cottonwood Creek, and Eklutna Power Plant Raceway)	F	17,889	$2,356,158
M	Willow Creek	F	16,564	$2,239,570
I	Other Area I lakes	F	12,897	$2,198,125
K	Little Susitna River	F	16,378	$2,165,824
Q	Chiniak Bay Area	S	16,316	$2,150,258
U	Quartz Lake	F	8,586	$2,137,001
Q	Other Kodiak area	S	13,485	$2,132,198
J	Other Prince William Sound area	S	9,709	$2,066,588

Table 5-4. Top 20 Nonresident Sites by Net Economic Value

Area	Site Name	Water type	Base Trips	Net Value
P	Kenai River below the Soldotna bridge	F	9,527	$8,536,504
P	Kenai River above the Soldotna bridge	F	7,269	$6,513,430
P	Anchor River, Whiskey Gulch	S	5,004	$3,931,160
P	Kachemak Bay (Tutka Bay, Halibut Cove, Other)	S	4,349	$3,785,614
P	Lower Cook Inlet / Outer Gulf Coast	S	3,660	$2,737,106
S	Area S lakes, streams, and saltwater	S	3,477	$2,508,454
Q	Other Kodiak lakes and streams	F	2,895	$2,398,080
P	Homer Spit	S	2,578	$2,244,014
P	Resurrection Bay (Seward)	S	2,717	$2,181,711
P	Russian River	F	2,860	$2,167,046
T	Nushagak River System	F	3,005	$2,133,342
E	Doty Cove to Berners Bay	S	3,923	$1,795,587
L	Bird Creek	F	2,152	$1,762,033
P	Other Kenai Peninsula saltwater	S	2,119	$1,619,676
P	Kenai Peninsula clams and shellfish	C	1,900	$1,454,592
P	Anchor River	F	1,792	$1,421,928
M	Willow Creek	F	1,777	$1,378,239
J	Other Prince William Sound	S	1,295	$1,276,276
P	Kasilof River	F	1,645	$1,222,553
H	Yakutat area	S	1,733	$1,195,296

Estimates of Net Value by Species

In Table 5-5 we present our model estimates of the net value of major species for residents and nonresidents, by management region and selected fisheries. These represent the net economic benefit to angling households —the benefit exceeding their fishing costs—of having that species available for fishing. We calculated net value by species as the loss in total net benefit, if the variables for that species are zeroed out for every site in the management region. The model found that the most valuable species for residents is trout—but this category is an aggregation of rainbow, lake, brook, and cutthroat trout. For individual species, king salmon and halibut are nearly tied for top net value statewide for residents and nonresidents both.

Table 5-5. Net Economic Value, by Species and Selected Fisheries

Fishery		Resident	Nonresident
		(thousands of dollars)	
Mngmt. Areas A—H			
Marine King Salmon		$8,594	$4,212
Halibut		1,222	2,657
Dolly Varden		384	1,666
Marine Coho Salmon		349	1,444
Freshwater Coho Salmon		19	383
Mngmt. Areas I—T			
Trout (rainbow, lake, brook, cutthroat)		$25,512	$1,613
Halibut		18,831	8,440
Coho		13,462	8,097
King		12,407	7,021
Red		9,747	6,556
Dolly		4,009	6,617
Kenai Pen. Halibut		14,866	8,064
Cook Inlet Marine Late-Run King Salmon		2,992	308
Gulkana River King Salmon		1,755	87
W.Susitna King Salmon		1,688	337
Kenai River Late-Run Red Salmon		1,528	1,944
Kenai River Early-Run Coho Salmon		1,359	1,794
Russian River Early-Run Red Salmon		1,175	350
Cook Inlet Marine Early-Run King		1,111	404
Kenai River Rainbow Trout		921	780
E. Susitna King Salmon		754	526
Kenai River Late-Run King		752	1,157
Kenai River Early-Run King		724	1,423
Ship Creek King Salmon		165	175
Kenai River Late-Run Coho		11	130
Mngmt. Areas U-Z			
Whitefish		$1,856	$41
King Salmon		817	35

Appendix A: Survey Descriptions And Questionnaires

Description of Surveys

ISER conducted three surveys in 1993 and 1994 for this study of sport fishing in Alaska: a telephone survey of resident sport anglers, a mail survey of non-resident sport anglers, and a mail-out telephone survey of guide and charter businesses.

Residents

ISER conducted a statewide telephone survey of Alaska resident sport fishermen collecting information on sport fishing expenditures and trip characteristics. ISER used the data from this survey to construct the resident travel cost model and measure sport anglers' willingness to pay for sport fishing opportunities. The data was also used to calculate the level of resident expenditures associated with sport fishing activity in the state.

SAMPLE DESIGN

For sampling, the state was stratified into 11 regions based on ADF&G information about the distribution of fishing trips across the state. Target sample size for each stratum ranged from 50 to 300. For each strata, a sample of telephone numbers was selected using a procedure known as random digit dial. In this procedure, the sample frame contains all residential telephone prefixes in the state, including residential prefixes on military bases. ISER designed a computer program that selects a sample of phone numbers using two methods. In more populated areas, ones with more than 2,500 residential tie lines (i.e., assigned telephone numbers), random four-digit numbers within each prefix were generated. In areas where the prefix had fewer than 2,500 residential ties, the residential numbers contained in the most current telephone directories were entered directly into the computer. The samples were drawn in proportion to the number of residential ties in the prefix. Thus, within each stratum, a prefix with 5,000 residential ties had a sample size twice that of a prefix with 2,500 residential ties.

A selected telephone number could not be discarded and replaced unless: (1) it was a non-working number; (2) it was a business number; (3) an adult in the household declined to participate in the survey on two separate phone calls; (4) repeated attempts over at least a four-day period, including both daytime and evening hours, failed to reach anyone at the dialed number; (5) it was not an eligible household (e.g. a hospital room); or (6) no one in the household had sport fished within the past three years and did not anticipate fishing in the next year.

Once the interviewer determined that the number reached was a residence, the respondent was asked if a member of the household had sport fished in Alaska within the past three years or anticipated fishing in the next year. If a member of the household had fished or anticipated fishing, the interviewer asked to speak with the person who knew the most about

the household's fishing activities. If no one had fished and didn't anticipate fishing, no more questions were asked. To ensure that each household heard the same definition of sport fishing, all interviewers read the same description verbatim.

The finished sample contained 1,355 resident angling households—a large enough sample to follow the anglers through the entire season, given the inevitable attrition associated with a series of surveys.

PRE-SEASON SURVEY

The initial interviews were conducted in April and May of 1993. The 1,355 respondents were asked about the number of fishing trips the household took in 1992, about winter fishing trips (November 1992-April 1993), about the demographics of the household, and questions about the equipment—including cars, trucks, campers, boats, or planes—used on fishing trips. For each piece of equipment, the questions went into detail about the age, purchase price, current value, fuel consumption, fixed and variable costs, and amount of use on fishing trips in the previous year. We used all that information in developing the travel cost model. In addition, respondents were asked about the reasons why they fish, their sources of information for fishing locations, and the importance of different reasons in their decisions about where to fish.

These respondents were also asked if they would be willing to complete a diary of their fishing trips taken in the summer of 1993 (May through October). Those respondents who said they would complete the diary were asked for their mailing addresses. There were four monthly mailings between June and September. Respondents were asked to note the date and location of each fishing trip they took and to provide detailed information logs about one specific trip to each site they had visited since the last mailing. They returned the diaries through the mail. Respondents gave detailed information about the target species and expenditures while on fishing trips. Those respondents who didn't complete diaries were asked these questions when they were re-interviewed in the post-season survey.

POST-SEASON SURVEY

In October and November of 1993, the Sport Fish Division of the Alaska Department of Fish and Game attempted to re-interview the respondents ISER had interviewed the previous June. They were able to complete interviews with 918 of the previously interviewed 1,355 respondents. This post-season questionnaire asked if the household still owned the equipment described in the June interview and about any equipment purchased since June. Respondents were asked about various policy options for certain fisheries and whether anyone in the household had fished in one of these fisheries in the past three years. Finally, those respondents who had not completed diaries on their summer fishing trips were asked for the information over the phone. All respondents were asked about their autumn fishing trips. ISER used this detailed information about fishing trips in developing the travel cost model.

RESPONSE RATES

We called 2,301 households across Alaska in April and May 1993. Of these, 577 had not sport fished in the previous three years; we were unable to reach 287, and 82 declined to participate. Among households we couldn't reach, or who refused to talk to us, we don't

know whether any members of the household fish. We assumed that these households fish in the same proportion as those households we were able to contact. About 71 percent of households we contacted had sport fished within the last three years. We interviewed 1,355 households, representing about 83 percent of the fishing households we tried to interview. The estimated margin of error is +- 4 percent.

We mailed four sets of trip diaries and logs to 1,135 households (some households did not want to complete the mail portion of the survey and did not provide addresses), and 596 households provided at least some of their trip information in the mail survey. We didn't calculate a response rate for the mail back component. Each mailing followed up on previous mailings, as well as asking for information about new trips. The mailings were followed up by the post-season survey, which filled in data that was incomplete or missing in the mail back returns. So a non-response for any one mailing did not necessarily reflect any loss of data. Of the autumn calls to the 1,355 households from the spring survey, 126 declined to complete the follow-up survey, we could not contact 311 households, and 918 completed post-season interviews. The response rate for the post-season sample was 68 percent of the households we had interviewed in the spring. The post-season interviews represent about 56 percent of the total fishing households we initially tried to contact (68 percent of the 83 percent we contacted for pre-season information). The margin of error is +- 5%.

We collected basic information on about 5,000 summer (defined as May through October) trips in the mail-back and post-season surveys, and 1,700 winter (November through April) trips in the pre-season survey. Respondents provided detailed expense information through trip logs for about 1,700 summer and 491 winter trips.

WEIGHTING

In each stratum, we used screening information to estimate the proportion of households that had fished in the three previous years. We applied that proportion to the total number of resident households in the stratum, to estimate the total number of fishing households. The number of completed interviews is expressed as a proportion of the total number of fishing households in the region. The weight for each surveyed household is the inverse of that sampling fraction. Because the response rates differed across strata, we adjusted the weights for post-season questionnaires separately for each stratum. We expressed the total number of completed post-season surveys as a fraction of the total fishing households in each stratum, and the post-season weight is the inverse of that new sampling fraction.

Table A-1. Weights of Resident Angling Households

	Survey Screened HH	Non Fishing HH	Fishing HH	Percent of HH Who Fish	Est.* Total Households	Est. Angling Households	Completed Postseason Surveys	Household Weight
Strata								
1. Anchorage Municipality	483	149	334	69.2%	90,725	62,738	211	297.33
2. Fairbanks Borough	312	105	207	66.3%	28,310	18,738	140	134.16
3. Kenai Pen. Borough	191	38	153	80.1%	15,510	12,425	105	118.33
4. Mat-Su Borough	198	41	157	79.3%	15,505	12,294	104	118.21
5. Kodiak	73	23	50	68.5%	4,605	3,154	35	90.13
6. Other Southcentral	60	10	50	83.3%	5,977	4,980	37	134.61
7. Juneau Borough	207	50	157	75.8%	10,669	8,092	107	75.62
8. Ketchikan Borough	158	50	108	68.4%	5,428	3,710	66	56.22
9. Sitka Borough	74	15	59	79.7%	3,098	2,470	31	79.67
10. Other Southcentral	78	25	53	67.9%	7,291	4,954	29	170.83
11. Rest of Alaska	159	71	88	55.3%	18,761	10,383	53	195.91
Total	1993**	577	1416	71.0%	205,878	143,983	918	

**Total households estimated by applying households sizes from the 1990 US Census to 1993 population estimates from the Alaska Department of Labor*

***Of the 1993 households we screened, 577 had not fished in the previous three years and were not interviewed; 61 of those who had fished did not complete a preseason interview; 1,355 completed pre-season interviews*

For several reasons, we believe that some households—particularly those that fish often—under-reported the number of fishing trips they took. Some households returned early- season mail surveys, but not a complete set, and were not contacted in the post-season survey. So we missed any trips they took after the mail survey they completed.

Also, respondents in the pre-season survey estimated they would take 2.4 million trips in the coming season, but in mail and post-season surveys they reported actually taking only 630,000 trips. By comparison, ADF&G's 1992 harvest survey reported 1.865 million sport angler trips, with an estimated 70 percent of those trips, or 1.3 million, taken by residents.

We addressed this problem by using a sub-sample of our Southcentral anglers. We interviewed them again in 1994 and developed a model that relates the number of non-reported trips per month to trips each household actually reported in 1992 and 1993 and to other household characteristics. We don't believe that underreporting of the number of trips produced a bias in the estimate of expenditures per trip, or in the distribution of expenditures across categories.

Table A-2. Weights for Resident Angler Trips

Strata	Sample Summer Trips	HH Weight	Trips with/HH and Trip Weight	Inferred Average Trip Weight
1. Anchorage Municipality	831	297.33	373,871	1.51
2. Fairbanks Borough	435	134.16	82,643	1.42
3. Kenai Peninsula Borough	798	118.33	151,039	1.60
4. Mat-Su Borough	556	118.21	104,262	1.59
5. Kodiak	243	90.13	29,797	1.36
6. Other Southcentral	232	134.61	50,300	1.61
7. Juneau Borough	646	75.62	68,313	1.40
8. Ketchikan Borough	1,060	56.22	80,242	1.35
9. Sitka	155	79.67	17,414	1.41
10. Other Southeast	131	170.83	34,924	1.56
11. Rest Of Alaska	243	195.91	78,704	1.65
Total	5,330		1,071,511	

Although the two-stage weighting procedure represents our best estimate of sport fishing households and fishing trips, there are several reasons why the weighted sample might not perfectly represent Alaska anglers:

Households that refused to participate were not a random group. The same is true of households that did not participate for other reasons. These include households we could not contact at all, households with no English-speaking adult, and households where no one was available during the survey period.

Households that move frequently were more likely to drop out between the pre- and post-season surveys. So, the post-season sample is a sample of households that move somewhat less frequently than the average across all households.

In bush areas, many households have unlisted telephone numbers. Our random-digit dialing method for contacting households normally would sample from unlisted as well as listed numbers. However, in prefixes with only a few active residential lines (generally less than 2,000) random-digit dialing becomes too costly, and we sample from a file of listed telephone numbers. So we miss all rural households with unlisted telephone numbers.

We don't know how the fishing patterns of the households we didn't talk to might differ from those who did participate, but we assume that the sample is fairly representative and that the differences are probably not significant.

Nonresident Survey

In the spring of 1994 ISER conducted a mailout-mailback survey of sport anglers who had fished in Alaska but live outside the state. Information collected in the survey included total expenditures of nonresident sport anglers visiting Alaska, as well as the composition of those expenditures. We also collected information on the number of specific fishing trips, species targeted, and harvests, as well as attitudinal information to measure the important factors influencing anglers' decisions about fishing and preferred fishing locations.

We developed the sample of 7,000 from ADF&G's 1993 nonresident sport license file and designed it to be large enough to get valid sub-samples for different categories of nonresident anglers—for example, those visiting relatives and those on expensive trips to remote fishing spots. We pre-tested the questionnaire on a sample of 50. Of these, 47 reached households (3 were returned as undeliverable) and 13 were completed and returned through the mail. We then telephoned the pre-test sample to discuss the questionnaire. As a result, we simplified the survey, hoping to increase the response rate.

The survey was mailed in March 1994, with two rounds of follow-up mailings to non-respondents in April and May. We ultimately achieved a response rate of 61 percent (with a margin of error of +- 2%). Of the 4,278 responses, 4,123 actually fished in 1993.

ADF&G personnel did coding and data entry in the fall of 1994. Subsequent cleaning by ISER revealed a high rate of inconsistency in responses as well as in coding and data entry. With the support of ADF&G, ISER re-coded and re-entered all the site and trip origin information.

WEIGHTING

Our weighted survey results project about 200,000 trips. This is lower than expected, both in comparison with resident trips (about 1,000,000) and in comparison with ADF&G estimates. Our estimate of non-resident angler days fished (980,000), however, exceeds the ADF&G estimate (810,000) by 20 percent. This leads us to believe that the survey respondents used a different definition of "trip" when answering our mail survey.

Table A-3. Weights for Nonresident Angling Households

Number of Households (From ADF&G)	114,155
Number of Household Survey Responses	4,278
Household Weight	26.6842

Guide and Charter Survey

The universe for the sample was based on a list ADF&G provided of 1,983 businesses offering guiding and charter services in Alaska. The list included businesses that employed persons to accompany and direct anglers in sport fishing as well as businesses that provided transportation services to fishing locations; its coverage was slightly broader than the definition of "guide" used in the ADF&G guide registration program. ADF&G mailed each business a postcard to verify that was operating in 1993 and offering guide and charter services. Of the 1,867 delivered (116 were undeliverable), 1,178 postcards were returned; 834 indicated they were in the guide and charter business and 344 said they were not.

In late December, 1993, we mailed a detailed questionnaire (pre-tested by mail with a telephone follow-up) to all 1,523 businesses on the ADF&G list, except those who had said they were not in the guide and charter business in 1993. The response rate was very low, even after a follow-up telephone contact by ADF&G.

Because of our concern over response bias, we drew a sample from the initial survey mailing list for a second mailing of the same instrument, to be followed by a telephone contact and interview by ISER personnel. The sample consisted of two strata: a) 46[1] firms identified by regional biologists as the "major" guide/charter businesses in their regions and expected to be a self-representing stratum; and b) a random sample of 148 businesses chosen from the 1,523 original mailing(with a few changes).[2] Thirty-two of the businesses in this sample had already returned surveys from the initial mailing so the follow-up mailing in early February 1994 consisted of 162 surveys.

We completed interviews with 29 of the "major" guide and charter businesses and 64 of the random sample of remaining businesses. Along with the 238 completed questionnaires returned by mail, the finished sample included 331 businesses.

ADF&G entered data and ISER cleaned it.

WEIGHTING

There were two strata:

1. The self-representing big firms: Of the 46 in the initial list, we completed 29 interviews, 6 reported they weren't in the guide and charter business, 9 didn't respond, and 1 one was unknown, for a response rate of 29/40=72.5 percent. The weight for these firms is the inverse of the response rate, 1.38. (Table A-4).

[1]There were 46 originally identified, but two were excluded before the mailing because they weren't guide/charter operations; two more were excluded later.

[2]We excluded any firms for which the questionnaire was undeliverable and firms which we knew were not guide/charter businesses, based on the first mailing. We added a few firms that were missed on the very first list of 1,983.

2. Other firms: We compared the responses of the 238 from the initial survey mailing with the 64 from the intense follow-up group and found no significant differences in revenues or expenditures. Consequently, we combined these two groups into a single stratum of 302 businesses for weighing. We had to estimate how many businesses in Alaska are involved in guiding or chartering for sport anglers. We based this estimate on the results of the sample of 150 businesses. Of these, 64 provided interviews; 18 gave us enough information to believe they're in the guide and charter business; 4 gave last resort information; 12 refused, but did not say they weren't involved in guiding or chartering; 2 completed interviews that were lost; 28 were either not in business or not involved in guiding or chartering. Of the 110 businesses we know something about, 82—or 74.5 percent— are in our universe. Our initial listing was 1,523; we added 13 businesses, but pulled 46 into the "big firms" group; that left 1,490. Of these 1,490 businesses, we estimate that 1,111 firms provide guide and charter services to sport anglers. The weight for the surveys is 1111/302=3.63.

Table A-4. Weights for Guide and Charter Survey

Self Representing Firms	46
Not in G&C Business	6
In Business	40
Completed Interviews	29
Weight (40/29)	1.38
Sampled Firms	1,490
Estimated Number in G&C	1,111
Completed Interviews	302
Weight (1111/302)	3.68

Survey Questionnaires

See attached questionnaires for the pre- and post-season surveys of resident anglers and the surveys of nonresident anglers and guide and charter businesses.

Appendix B:
Modeling Economic Significance and Economic Impact

Appendix B. Modeling Economic Significance and Economic Impact

Calculating the economic effects of sport fish expenditures involves three components. The first is the determination of the expenditures associated with sport angler trips. This results in a vector of expenditures, categorized by a common set of goods and services including food, lodging, gasoline, guiding services, and other expenses. The vector of expenditures is then converted into a "final demand vector," so it can serve as input for an input-output model. This is accomplished by running the vector of expenditures through a commodity by industry matrix, which converts expenditures by commodity to expenditures by the industries represented in the input-output model. The final step is running the input-output model, using the final demand vector as input. The input-output model produces estimates of the total effect (direct, indirect, and induced) of sport anglers' expenditures in the form of jobs, payroll, and sales.

This appendix describes each of these elements of the analysis. The commodity-industry matrix and the input-output model were constructed on spreadsheets, making them easy to use and self-documented.

B.1 SPORT FISHING EXPENDITURES

Data on sport fishing expenditures comes from the resident and nonresident surveys conducted by ISER for the fishing year 1993. Surveys covered both the summer and winter seasons. A nonresident household survey covered the summer season. A survey of guide and charter operations provided some additional information on angler expenditures for these services, as well as information on the characteristics of these businesses. Limitations on the length of the surveys dictated the level of expenditure detail we could collect. Thus, in some instances where data was not available from the surveys to estimate a particular type of expenditure, we also used other sources as noted.

The sport fishing expenditure data from the surveys can be aggregated and displayed in a large number of ways, only a few of which are reported in this study. We calculated a number of aggregate expenditure measures for resident and nonresident sport fishing in Alaska. These include total expenditures on goods and services used for sport fishing (including capital goods); total expenditures on goods and services attributable to sport fishing (site specific and total); and instate spending attributable to sport fishing (site specific and total). We further allocated expenditures to the region within the state where they occurred. We also present information on particular types of expenditures by site.

Since the expenditure information is for the angler household it is possible to construct many other aggregations of expenditures related to sport fishing. Some obvious examples would be expenditures associated with marine versus fresh water sites, expenditures associated with shore versus boat fishing, or expenditures for guided versus unguided trips. Expenditures associated with different types of angling households could also be generated. Those could include households resident in Southcentral Alaska, households with retirees, households

with planes, households with incomes above a certain level, households with avid anglers, and many others. Variations in characteristics of nonresident households also allow the calculation of expenditures for particular types of visitors.

For some aggregations, arbitrary allocations would be required. For example, some fishing trips target more than one species. Any method that divides the trip-specific costs among the different species targeted during a single trip would be arbitrary. Whenever it is necessary to make such an arbitrary allocation, the assumption used must be explicitly stated. The same holds true for capital expenditures that can only arbitrarily be allocated among various sites visited by a given angler household.

B.1.a. Resident Summer Sport Fishing Expenditures

We divided resident summer sport fishing expenditures into 4 major categories.

1. Trip-Specific Expenditures. This category includes expenditures that can be specifically identified with an individual sport fishing trip—our basic unit of analysis. A trip consists of one or more members of a household traveling to and from at least one fishing site and fishing for at least one target species. The data on these expenditures in any particular analysis could come either directly from the surveys—pre-season, trip logs, and post-season—or from estimates made with the travel cost model.

The general expenditure categories are food, lodging, guide and charter services, transportation costs specifically related to getting to and from the fishing site from the anglers' place of residence, and all other expenses. They are divided into more detailed categories for use in the economic model.

Trip-specific expenditures generally occur in the same region of the state as the fishing site and the angler's region of residence. Some anglers do travel outside their home regions for fishing trips—for example, anglers from Fairbanks traveling to Valdez—and some purchases occur outside the region of the site—for example, aviation fuel purchased in Southcentral Alaska for a flight to a fishing site in Southwest Alaska. These expenditures outside the region of the fishing site for food, lodging, supplies, guiding services, and transportation account for a relatively small portion of total expenditures related to sport fishing.

Some trips are multipurpose. For example, a sport fishing trip could include shopping, visiting friends, or camping. We assume in this analysis that sport fishing is the primary purpose of the trips reported by sport fishermen, but attribute a portion of expenditures to non-fishing activities based on responses to questions about the purpose of each trip.

The category of guiding services actually consists of a number of different types of expenditures. We identify four major categories as follows: guiding, air tax services, food and lodging, and boat charter services.

Anglers reported guiding service expenditures by the location of the guide and charter service—which does not always correspond with the region where the guiding services were actually performed. We adjusted the location of guide and charter service expenditures from the region where the service was purchased to the region where the service was provided,

using information from the guide and charter survey. This adjustment better reflects where the economic effects of charter activity associated with any site will actually be felt.

2. Fishing-Related Capital Expenditures. This category includes expenditures on sport fishing equipment and supplies—such as rods and reels or tackle—used over the course of several trips or seasons. Also included as "sport fishing supplies" are less obvious items such as magazines (although licenses are excluded). It includes expenditures associated with winter as well as summer trips. There are several ways to get this information from surveys. Household survey questions asked about total expenditures on various types of equipment during the year. We assumed that the survey year was typical for estimating such purchases, and this method also took into account the fact that some anglers might have bought equipment and yet not fished in 1993. This is because we defined an "angler household" as any household that had fished within the last 3 years. An alternative method of estimating average annual expenditures would have been to ascertain the total stock of fishing-related equipment owned by angler households and estimate an annual equipment replacement rate. But we felt this approach potentially introduced an unjustified degree of error, since it would have required survey respondents to supply a detailed inventory of equipment and us to make an independent estimate of the replacement rate. A third method would have been to survey retail suppliers of equipment; however, this method would not have allowed us to match expenditures with angler households.

Within fishing-related capital expenditures we also include equipment that can be used for other activities. Examples include expenditures for general camping gear or other equipment that can be used for sport fishing as well as for other activities such as hunting or working. We estimated the total annual expenditures on these items from the household survey in the same manner we used to estimate expenditures on equipment solely for sport fishing. We then calculated the portion attributable to sport fishing based on survey responses to a question about the portion of time this equipment was used for sport fishing.

Unlike trip-specific expenditures, which are made entirely within Alaska, some fishing-related capital expenditures are made outside the Alaska economy—either when anglers take trips outside or order items from catalogues. We estimated the portion of fishing-related capital expenditures made outside Alaska from survey responses to questions about where purchases were made.

3. Transportation-Related Capital Expenditures. This category consists of the expenditures associated with the purchase and maintenance of cars, trucks, boats, planes, and other vehicles used entirely or partially for sport fishing. Expenditures covering both the summer and winter fishing seasons are included here. We obtained information on each vehicle owned by each household, including age, years owned, estimated value, expenditures on repairs, maintenance, insurance, and storage, and total annual use (miles or hours) as well as use for sport fishing. We estimated annual purchases based on the average of the most recent three-year period. We adjusted vehicle purchase prices from 1991 and 1992 upward to 1993 values, based on the depreciation rate in the average value of vehicles taken from vehicle survey data. Boat and plane purchase prices from early years were not adjusted, because we assume they depreciate very little within three years.

Expenditures for repairs, maintenance, insurance, and storage were taken from the survey profiles. We included boat and plane storage costs, but not the cost of garages for automobiles and trucks. We calculated the portion of expenditures attributable to sport fishing based on the portion of miles or hours respondents estimated they used their vehicles for sport fishing. We estimated the portion of purchases of vehicles made in Alaska from survey responses.

4. Cabins. Based on the household survey, we calculated the number of cabins resident sport anglers owned or to which they had access. We also estimated the percentage of use that was related to sport fishing, based on survey information. Cabins used in both the summer and winter seasons are included here. Respondents also estimated the value of their property. Additions to the stock during the year 1993-1994 were estimated based on the U.S. census of housing data for the 10-year period from 1980 to 1990. Independent of the survey, we estimated that 75 percent of the value of property was in structures (and 25 percent in land) and that 75 percent of structures were commercially constructed (and 25 percent do-it-yourself). This provided an estimate of gross expenditures and revenues to the construction industry associated with additions to the stock of cabins related to sport fishing in a year.

The turnover of the existing stock through real estate transactions was estimated at 5 percent annually. Further assuming a 10 percent real estate commission on such sales, we were able to estimate the gross revenues of the real estate sector from the annual sale of cabins and second homes of resident sport fishermen.

Annual maintenance expenditures associated with the stock of cabins were estimated at 4 percent, net of the 25 percent of “do it yourself" owners. This was consistent with the level of maintenance expenditures reported by households in the survey. Annual expenditures on appliances were estimated at 5 percent of the stock.

These methods produce estimates of the annual flow of expenditures associated with cabins and real property used by residents for sport fishing in Alaska. It is distinct from the total value of real property used by residents for sport fishing in Alaska, which is a much larger amount. This total value represents the present value of the future stream of benefits (willingness to pay) of residents from the use of this real estate for all activities, including sport fishing. Since the real property does not—in the absence of a transaction or the construction of a structure—represent any current economic activity, it does not directly enter into the calculation of the economic significance or impact of sport fishing.

B.1.b. Winter Resident Sport Fishing Expenditures

We estimated winter resident sport fishing expenditures separately only for trip-specific expenditures. We used the same categories for summer and winter trip-specific expenditures. The estimates of fishing-related capital expenditures, transportation-related capital expenditure,s and cabins represent annual amounts which are associated with both summer and winter fishing.

B.1.c. Nonresident Summer Sport Fishing Expenditures

We got our data on nonresident sport fishing expenditures from ISER's survey of those who purchased nonresident fishing licenses in 1993. Anglers were asked to report expenditure information for their 1993 trips to the state, if they sport fished during those visits. They were also asked to provide detail on the specific sites they visited. From this information, we grouped nonresident expenditures into five categories.

1. Trip-Specific Expenditures. Nonresident trip-related expenditures were reported in the same general categories as the resident trip-related expenditures. Further allocations into more detailed categories were based on assumptions that involved allocating food expenses between groceries and restaurants, lodging expenses between hotels and camping, boat expenses among fuel, repairs, and parts, and vehicle expenses among fuel, repairs, and parts. Expenses for guiding and charter services were allocated among the categories of guide service, air taxi services, food and lodging, and boat charter services, based on regression analysis using survey responses about the types of guide services used.

We attributed all trip-specific expenditures to sport fishing for nonresident visitors.

Because some nonresident visitors had trip-specific expenditures that were included in the price of their package tours, this category does not, in the aggregate, include all nonresident expenditures specifically for sport fishing trips. It was not possible for us to determine the extent of trip-specific expenditures included in package tours and not reported elsewhere for the 23 percent of nonresident visitors who reported purchasing package tours as part of their visits to Alaska.

2. Package Tours. A large share of nonresident visitors (23 percent of survey respondents) come to Alaska through package tours, although the definition of "package tour" is not precise. Most but not all visitors traveling by cruise ship reported expenditures on package tours. Furthermore, different types of packages include different items. For example, they may differ in the travel expenditures included. A package may include all expenditures from a gateway city, which could be Seattle, Anchorage, or Kodiak.

A visitor purchasing a package tour will not normally be able to identify what shares of the total package costs are for travel to and from Alaska, food, lodging, and other expenses while they're in the state. To deal with this, we attributed shares of package tour expenditures to the different categories of expenditures used elsewhere in the study. We allocated package tour expenditures first into two categories: (1) costs of travel to and from Alaska, and (2) all other costs.

We added travel expenditures to and from Alaska paid for through package tours to travel expenditures to and from Alaska reported by independent travelers to estimate total travel expenditures to and from Alaska.

All other package tour travel expenditures attributable to sport fishing include both non-trip-specific as well as some trip-specific expenditures of visitors who indicated that sport fishing was the purpose of their visit to the state. We assumed that package tour visitors who did not come to Alaska specifically to sport fish did so just incidentally, when they had an

opportunity. Thus we did not include their non-trip-specific expenditures as sport fishing related. But for anglers who would not have come to Alaska if they couldn't fish, we included all non-trip-specific expenditures. Some trip-specific expenditures that were not separately reported by package tour anglers—because they were included in the price of the package—are also included in this category.

We divided all other package tour expenditures (including both non-trip-specific expenditures as well as some trip-specific expenditures) equally among five more detailed categories of expenditures: food, lodging, personal service, transportation, and durable goods.

3. Fishing-Related Capital Expenditures. We assumed that all fishing-related capital expenditures made by nonresidents occur outside the state. This assumption helped to keep the length of the nonresident survey manageable and undoubtedly improved the response rate. We recognize that while they're in Alaska, nonresidents do buy some equipment used in sport fishing. However, the total economic impact of these expenditures is small, because almost all of this equipment is manufactured outside Alaska.

4. Non-Fishing Instate Expenditures. We divided all nonresident anglers into two categories, based on the intensity of their fishing interest—which we determined based on responses to a question about whether they would have visited the state if they had been unable to sport fish. For nonresident households that would not have visited Alaska if they had been unable to fish (41 percent), we attributed all instate expenditures to sport fishing. For households that reported they would have visited even if they had been unable to fish (59 percent), we attributed a portion of non-fishing instate expenditures to sport fishing, based on the expenditures during the days when household members fished. (For nonresident anglers visiting Alaska for reasons besides fishing, we attributed $22.7 million of $84.2 million in food and lodging expenditures to non-trip-specific sport fishing expenditures.) We divided total non-trip-specific expenditures into two categories: (1) food and lodging, and (2) all other.

Some anglers reported lodging expenditures during fishing trips as "trip specific," while others did not. By combining trip-specific and non-trip-specific food and lodging expenditures, we can estimate the total food and lodging expenditures of nonresident angler households that were attributable to sport fishing in Alaska.

Non-trip-specific expenditures do not include expenditures made as part of package tours.

5. Travel Expenditures To and From Alaska. Nonresidents spend a large portion of their travel budgets on transportation to and from Alaska by air, cruise ship, ferry, and automobile (including campers). A portion of these expenditures occurs within Alaska, depending on how they travel. Total travel expenditures to and from Alaska include both the reported expenditures of independent visitors and the portion of package tour expenditures allocated to travel to and from Alaska. We estimated this to be $134.2 million.

For the 12 percent of nonresident households that travel by automobile, we assumed all travel expenditures en route to Alaska occurred outside the state. When these visitors crossed the

border they begin to make expenditures that fell into category 4—non-fishing instate expenditures.

Spending on air transport services was the largest reported travel expenses for nonresidents, but most of that spending does not effect the Alaska economy. For each round-trip interstate air traveler, we estimated $150 of expenditures was for Alaska-based, transportation-related services. (See Table B-1.) This estimate is based on data from ISER's 1995 study of Anchorage International Airport, which reports the ratio of passengers to air carrier jobs. Also, from the input-output model we derived information on the ratio of sales to employment in the air carrier industry and used that ratio to calculate the $150 figure for each round-trip flight.

For the 3 percent of nonresident anglers traveling by state ferry, we estimated the per capita instate expenditure for transport services as $299. This estimate was based on an analysis of data from the 1992 *Alaska Marine Highway System Economic Benefits Study* by McDowell and Associates. From that study we were able to calculate the per-passenger instate expenditures for resident worker wages, benefits, and vendor purchases.

For cruises ship passengers, data does not exist on the average instate expenditures directly related to travel to and from Alaska. We assume that all employees are nonresidents and that no procurement of goods or services for the cruise ships occurs within the state. The transportation services are then limited to the docking of the cruise ships in port. We assume this is $10 per round trip for the 5 percent of nonresident anglers who traveled by cruise ship. (The total share of angler visitors who traveled on cruise ships for at least part of their trips is 10 percent, since most passengers cruise in one direction and fly in the other.)

Some travel expenditures of nonresidents are not attributable to sport fishing. For those visitors who would not have come if they could not have sport fished, we attributed all Alaska transport services to sport fishing. For the remaining visitors who said they would have come even if they could not have sport fished, we attributed a share of Alaska transport services to sport fishing based on the portion of days they spent fishing while visiting Alaska. This varied from 32 percent of days for visitors who arrived by air to 17 percent for travelers who came on cruise ships or in land vehicles.

The regional allocation of these travel service expenditures varied by mode of travel. Land vehicle visitors incurred no expenditures instate on travel to Alaska. Cruise and ferry visitor travel service expenditures in the state occurred exclusively in the Southeast. Air travel service expenditures were allocated among Southeast, Southcentral, and Northern regions, based on the initial point of entry of the visiting household.

B.2 COMMODITY-INDUSTRY MATRIX

The commodity-industry matrix is a large spreadsheet that converts **angler expenditures by commodity** (both goods and service purchases), as they are reported by anglers and compiled into vectors of expenditures, into vectors of expenditures by industry (**final demand vectors**). This conversion is necessary, since the input-output model, which is our tool for calculating the economic significance and economic effects of sport fishing, describes the economy in terms of 40 different industries. The commodity-industry matrix is also the location of a number of additional adjustments that are necessary to prepare the sport fish expenditure vectors for conversion into vectors of final demand by industry.

For example, when an angler buys a lure in a local sporting goods shop, that is a typical expenditure that influences the local economy. Using the commodity-industry matrix we can identify the industries directly effected by this purchase—manufacturing, transportation, and trade. The commodity-industry matrix allocates each dollar spent on lures into the portions that are ultimately paid to the firm manufacturing the lure, to the transportation companies that bring the lure to the sport shop, and to the sport shop itself (the gross margin) from the sale after the payment for the goods and the transportation.

Using the commodity-industry matrix, we convert each of the categories of expenditures described in section B.1. into a vector of expenditures by industry. We then add these vectors together to get a vector of final demand that includes all categories of expenditures. Various subsets of categories—such as guide and charter expenditures, or winter trip specific expenditures—can also be combined.

Before converting expenditures by commodity to expenditures by industry, we must break down three categories of expenditures reported by anglers into more detailed expenditure categories. These special categories are guide and charter expenditures, auto insurance expenditures, and nonresident package tour expenditures in Alaska.

Based on regression analysis, we allocated the guide and charter expenditures reported by anglers among four major categories: guiding services; air taxi; food and lodging; and boat charter. We further disaggregated guiding services based on the distribution of operating and capital expenditures reported in our survey of guide and charter businesses. We allocated these survey expenditure categories among the National Income and Product Account (NIPA) personal consumption expenditure categories (see below) using a simple set of assumptions. For example, we allocated the expenditure category of utilities used in the survey into the NIPA personal consumption expenditure categories of electric (37) and water and sewer (39).

We further adjusted the regional distribution of guide and charter expenditures to take into account the fact that the region of service provision does not in all cases correspond to the region of the fishing site. For example, guide businesses that provide services in Southwest Alaska purchase some of their inputs—such as groceries and air transport services—in Southcentral Alaska or outside the state. These out-of-region purchases are not captured in the average interregional purchases by industry, which are part of the structure of the

regional input-output model. Consequently, they must be separately identified and incorporated into the allocations of guide and charter expenditures by region.

We adjusted guide and charter expenditures in the Southwest and Interior regions to account for spending that occurs in Southcentral Alaska and outside the state. We assume all Southcentral and Southeast guide and charter expenditures occur within those respective regions. These adjustments are based on responses from the guide and charter survey about the location of expenditures by firms located in various regions of the state. For example, firms located in Southwest Alaska reported that only 11 percent of their service-related vendor purchases occurred in that region, while 34 percent occurred in Southcentral and 54 percent occurred outside Alaska. The percentages varied with the type of vendor purchase, but the general pattern of large leakages out of region in Southwest, with smaller leakages from the Interior, was consistent across purchase categories.

Auto insurance premiums pay for three main activities—automobile repairs, medical services, and insurance broker expenses. Based on information from the Alaska Division of Insurance's *Annual Report on Automobile Insurance*, we divided insurance premium expenditures into the following personal consumption expenditure categories: auto repair (74), drugs (45), physicians (47), and motor insurance (77), which includes the cost of administering insurance policies.

We initially divided nonresident package tour expenditures into (1) travel expenditures to and from the state and (2) all other expenditures. We added together, and treated similarly, travel expenditures to and from the state reported by visitors who had package tour expenditures and by visitors who traveled on their own.

"All other" expenditures consisted mostly of non-trip specific expenditures. We divided these equally among five more detailed sport fish categories of expenditures: food, lodging, personal services, transportation, and durable goods purchases.

After we categorized sport fish related expenditures in sufficient detail, we converted them into the NIPA personal consumption expenditure categories. This then allowed us to link the personal consumption expenditure categories to industries in the national input-output table.

For some sport fish expenditure categories—such as groceries—there is a comparable NIPA personal consumption expenditure category. Grocery purchases as reported by anglers can be directly linked to "Food Purchased For Off-Premise Consumption," in the NIPA personal consumption expenditure accounts. Table B.2 further shows the industries (national I-O definitions) where sales are generated by the purchase of food for off-premise consumption (Source: *Survey of Current Business*, April 1994). The table shows that in 1987 consumers purchased $330.8 billion worth of groceries.

Although most of the food produced came from the Food and Kindred Products Industry, there were nine different industries that provided portions of the items sold as groceries. We calculated the share produced by each industry based on purchasers' prices—the prices that consumers pay. For each type of commodity, the purchase price is further divided among three major categories of businesses. Overall food producers received $211 billion, transportation providers were paid $7.8 billion, and wholesale/retail trade businesses received

$112 billion from the sale of groceries. We calculated the distribution of purchase price for each type of commodity between producer price, transport margin, and trade margin. This allowed us to distribute $100 of grocery purchases by anglers among all the relevant industrial sectors (defined by the NIPA input-output tables). The margins estimated in this manner are equal to those of the national economy and do not vary by region of the state.

Some sport fish expenditure categories are not directly comparable to those in the NIPA personal consumption expenditure list. We assigned those expenditures the NIPA industry categories that most closely corresponded. For example, we assigned sport angler expenditures on air charters to the NIPA industry category of Air Transport (65D). We divided other sport fish expenditure categories—such as guide and charter transportation—among four personal consumption expenditure categories: New Autos (70), Other Motor Vehicles (72), Tires, Tubes, Accessories and Other Parts (73), and Gasoline and Oil (75). These in turn were allocated among NIPA industries, using the procedure described in the previous paragraphs.

Regional input-output models in general do not contain as much industry detail as the NIPA input-output model. Whereas the version of the NIPA model used to assign personal consumption expenditures to industries has 85 industrial sectors, the Alaska input-output model divides all regional economic activity into 40 industries. So we had to assign each of the NIPA industry categories to an appropriate Alaska input-output model category. For example, Air Transport was assigned to Air Transport, but New Cars had to be assigned to Other Manufacturing, since there is no category in the Alaska input-output model for new automobile manufacturing.

For expenditures on services, the correspondence between the expenditure and an industry is complete at this point. However, each category of expenditures on goods at this point still consists of the manufacturing cost, the transportation margin, and the trade margins. For example, the spending on sporting equipment is the total amount that sport anglers paid for the equipment, which includes the cost of manufacturing the goods, the cost of transporting them to Alaskan stores, and the costs associated with wholesaling and retailing the equipment. The costs associated with the purchase of sporting goods must be allocated across industries before being put into the vector of final demand.

For each manufactured good, the share of expenditures which is manufacturing cost (goods at producer prices) is split out and allocated to the appropriate manufacturing industry in the Alaska input-output model. This amount is then adjusted downward by an estimate of the share of manufacturing which occurs within the state. Since very little manufacture of consumer goods does take place within Alaska, we assume between 0 and 50 percent to be local manufacture, depending on the item. For example, automobile manufacturing is assigned 0 share, while oil and gas manufacturing is assigned 50 percent share. These shares are based on general knowledge of the manufacturing sector of the Alaska economy. The shares by industry are shown in the table on the following page.

Alaska I-O Industry		Local manufacturing share
1	agriculture	.05
3	fishing	.2
5	other mining	.05
8	food and kindred products	.05
10	chemicals and petroleum	.05
11	lumber and wood	.2
12	other manufacturing	varies

The transportation margin is allocated among the seven transportation sectors of the Alaska input-output model, based on our judgement of the structure of the economy. These sectors are: Railroads, Local and Inter Urban Transit, Motor Freight and Warehousing, Water Transportation, Air Transportation, Pipelines, and Transportation Services.

For simplicity we assume the entire transportation margin is spent within Alaska and influences the Alaska economy. Since the transport margins are a small share of the purchasers' price, this simplification does not significantly bias the results of the analysis.

The share of expenditures on manufactured goods which is the trade margin (wholesale and retail markup) is allocated between wholesale and retail trade activities, based on the 1987 NIPA personal consumption expenditure category transport and trade margins. We assume 50 percent of the wholesale activity and 100 percent of the retail activity occur in Alaska

The result of these adjustments for expenditures on goods is twofold. First, a portion of the dollars spent on goods flows directly out of the state and has no indirect or induced economic effects. Secondly, the typical expenditure on a good generates economic activity in the trade and transport sectors, and if the good is manufactured locally, within one of the manufacturing industry sectors. An example of the treatment of sport fishing expenditures on goods is shown in Table B-3.

Using these conversions, all sport fish expenditures could be allocated to an industry represented in the Alaska input-output model. These expenditures attributable to sport fishing could then be allocated among the four regions represented in the input-output model. Most but not all expenditures occur within the region where the fishing site is located. In addition, some capital expenditures take place outside the state and do not influence the Alaska economy. These non-Alaska expenditures are removed from the vector of final demands at this point. The result is a 160-element vector of final demands for 40 industries for each of four regions of the state.

B.3 INPUT OUTPUT MODEL

The primary purposes of the ISER Alaska input-output model are to measure the economic impact and economic importance of selected activities on the Alaska economy and to measure the economic impact of changes in the level of these activities. A related purpose is to study the structure of the Alaska economy.

B.3.1 Output

The output measures that the model can produce include output (sales), employment, payroll, employee compensation, and value added for 40 industries in four regions of the state. As currently configured, the model generates output, employment, and payroll by industry and geographic region as well as aggregates across industries and regions. Additional measures, such as tax revenues generated by industry, may be added as data becomes available.

Output represents all the sales revenues of firms except for the trade sector, where output is a measure of the trade margin (the difference between revenues and the cost of goods sold). For this reason, employment and payroll are generally more useful indicators of economic activity than output or sales. **Employment** is annual average employment based on the average annual wage of workers in each industry. **Payroll** is the total wages received by workers. **Employee Compensation** is all payments to workers including payments in kind and payments made on behalf of the worker, such as for health insurance. **Value Added** includes not only employee compensation, but also indirect business taxes and profits. It is the best measure of the income earned within the region and is comparable to Gross Product.

Each output measure is presented in total and also allocated among the Direct, Indirect, and Induced effects. The **Direct Effect** measures the direct effects produced in Alaska industries by the changes in **Final Demand** contained in the **Final Demand Vector.** For example, an increase in export sales of Alaskan coal (measured at the mine mouth, net of transportation costs) would generate an increase in output, employment, and payroll in the coal mining industry to satisfy the higher level of industry demand. This is the direct effect of the change in final demand for export coal sales.

The **Indirect Effect** measures the changes in output, employment, and payroll for Alaska businesses that result from local businesses supplying goods and services to the coal mining industry. For example, an increase in coal production would require more fuel, and Alaska fuel producers and distributors would increase their production to meet the increased demand indirectly created for them by the increase in coal exports. Furthermore, firms selling to the fuel suppliers would experience increases in their businesses and this would be included in the indirect effect. The indirect effect is a measure of the interdependency of industrial sectors within the economy.

The **Induced Effect** further measures the changes in output, employment, and payroll for all Alaska businesses resulting from consumer purchases by households with workers whose incomes increase due to the rise in economic activity in the region. For example, new workers in the fuel distribution business will make personal consumption expenditures they

would not otherwise have made. These purchases increase demands in trade, services, and other sectors of the economy. Businesses in these sectors in turn hire additional workers who spend their new wages in the economy, further stimulating economic activity across a broad spectrum of industries. This process continues until spending within the economy stops. **Leakages** that stop this process of re-spending within the region consist primarily of the purchase of goods and services outside the region and savings.

The example of the economic effect of an increase in coal exports of $1 million is shown in Table B-4, which is a sample of the output of the model. The first page contains the final demand vector showing an increase in output of $1 million for the Other Mining industry. The direct and total effects are summarized on the second page of the output. The direct effect, all of which occurs in Other Mining, consists of an increase of output by $1 million, payroll by $326.9 thousand, and annual average employment by 5.5 workers. The total effect on the economy of this increase in export sales is an increase of output by $1.682 million, payroll by $486.3 thousand, and employment by 11.3 (annual average workers). The sum of the indirect and induced effects, which represent the effects which occur almost entirely outside the mining industry, are an output increase of $.682 million, payroll increase of $159.4 thousand, and employment increase of 5.7. The distribution of total payroll across industries demonstrates that the effect of this increase in export sales influences economic activity throughout the economy. This is shown in page 3 of the output. The trade and service industries share most of the indirect and induced sales generated by this change in final demand. The final 3 pages of output provide more detail by industry and type of effect.

B.3.2. Multipliers

The process by which purchases by businesses and households further stimulate purchases by other businesses and households is known as the **Multiplier Effect**. Several types of **Economic Multipliers** can be derived from the input-output model, summarizing the amount of total economic activity stimulated by a change in final demand.

The U.S. Department of Commerce uses two different categories of economic multipliers: **Direct Effect Multipliers** and **Final Demand Multipliers**. A direct effect multiplier is defined as the ratio of the total to the direct change in a measure of economic activity, such as sales, employment, or payroll. A final demand multiplier is defined as the ratio of the total economic effect to the change in final demand measured in dollars, and can be interpreted as a “bang per buck” measure. An additional measure known as a **Response Coefficient** is also occasionally used. This is a measure of the change in some economic variable in response to a one-unit change in the physical output of some good or service.

The direct effect multipliers for coal export sales are shown on the second page of the sample output in Table B-4. The output multiplier of 1.68 means that total output of $1.68 million is generated by an increase of $1 million in direct output. The payroll multiplier of 1.49 means that total payroll increases by $1.49 million from an increase of $1 million in direct payroll. The employment multiplier of 2.03 means that 2.03 total jobs are generated for each direct job generated.

Final demand multipliers for coal exports are also shown on the second page of the sample output. The final demand output multiplier is $1.68 indicating $1.68 million in total output

for a $1 million change in final demand. The final demand payroll multiplier of $.49 indicates that $.49 million in total payroll is produced by a $1 million change in final demand. The final demand employment multiplier of 11.28 indicates that 11.28 total jobs are created by an increase in final demand of $1 million.

Direct effect multipliers are also defined as Type I, Type II, Type III, and so on, based on the categories of spending that are included in the calculation. The Type I multiplier includes direct plus indirect effects; the Type II multiplier includes direct, indirect, and induced effects. The multipliers generated as output of the Alaska I-O model are Type II multipliers because the model is **closed to households**, meaning that the change in household purchases in response to a change in final demand is included in the calculation. A Type III multiplier is sometimes defined as differing from a Type II multiplier in the treatment of household expenditures. In the Forest Service IMPLAN model, the Type III multiplier includes a household expenditure response based on spending by new households that move into the region rather than additional spending by existing households in the region. Type II multipliers will be larger than Type I multipliers, because they include the household spending response.

Generally regional models are not closed to investment or government spending. The response of new capital investment spending and government spending tend to occur with a time lag and the link between changes in current output levels and changes in investment spending and government spending tends to be less direct than changes in current business activity and household spending. Because these responses are not included in the Alaska input-output model, it is characterized as an impact model and its multipliers as **Impact Multipliers**. Some input-output models, however, are closed to state and local government spending. These may also be called Type III models. A model that is also closed to investment is sometimes called a Type IV model.

Since it is an impact model, the Alaska Input-Output model has multipliers that are generally smaller than those of a dynamic simulation model such as ISER's MAP econometric model for Alaska. The MAP model incorporates an investment spending response as well as a government spending response to changes in current economic activity. In a simulation model, the size of the multiplier will generally vary over time as the effects of these responses work through the economy. In addition, a simulation model can reflect the process of structural change over time, which is not captured in a static input-output model. Import substitution is one form of structural change that could reduce leakage over time for a given level of final demand. In particular, the introduction of a new industry selling to final demand in a region can alter the pattern of trade coefficients in many industries, if new types of firms move into the region to supply inputs to the new industry.

The size of the multiplier depends not only on the variable being measured and whether the model is closed to the household sector. For a given change in final demand the multiplier varies by industry as well as by location. This is shown in Table B-5, where final demand multipliers for employment and payroll as well as total output multipliers are presented for each industry in the model for each region. Industries that have relatively large purchases of supplies produced by Alaska businesses (most services and supplies like fuels); industries that are labor intensive; and industries with a large ratio of value added to sales will tend to

have larger multipliers. This is because the local purchase of supplies leads to a larger indirect effect, a large share of expenses devoted to payroll leads to a large induced effect, and a large share of sales consisting of value added potentially results in large increases in public and private income within the region. (The economic effect of $1 of payroll is the same for all industries, but the multiplier will be larger if there are more payroll dollars.)

The role of payroll in determining the size of the multiplier is particularly important in Alaska since inter-industry purchases (backward links) are less important here than in more mature economies. The absence of a developed manufacturing sector means that most goods must be purchased outside the state, resulting in large leaks of spending and small indirect multiplier effects. Most of the backward links occur as the result of the purchase of services and the purchase of raw materials by natural resource processors (which may be constrained by supply).

Smaller regions tend to have a narrower range of businesses represented in the local economy and consequently the leaks out (purchases from other regions) will tend to be higher and the multipliers lower.

The size of the multiplier depends on the structure of the economy at the time of the change in final demand. For example, the availability of supplies and labor is important. If resident workers are available, the induced effects will be larger than if nonresident and transient workers fill the jobs created by the change in final demand. In this case, much of the household income will leak out of the region and generate economic activity where these temporary workers permanently reside. In addition, the size of the economy will influence its structure and consequently the share of supplies that a business or household is likely to purchase locally.

The size of the multiplier also depends on the size of the area within which the effects are being measured. Generally the larger the area, the smaller the leakage of transactions and the larger the multipliers. In the Alaska Input-Output model, the multipliers for each industry in each region can be calculated based on the effects occurring either within the region of direct effect or throughout the state. The second page of Table B-5 shows that the total output multipliers are generally larger for the state than for the region. Changes in final demand in the Southeast, Southwest, and North regions have effects not only within region but also in the Southcentral region. The same is true for payroll and employment multipliers.

Finally, the size of the multiplier depends on the characterization of the change in final demand. An increase of coal exports of $1 million measured at the mine mouth will have effects on the economy over and above the direct, indirect, and induced effects we have discussed. The most obvious additional effect will be to increase the output of the Alaska businesses transporting the coal to tidewater. This is a **forward link** that should be included as an additional component of the change in final demand when conducting the economic impact or significance analysis. Often, however, it is incorrectly included with the indirect and induced effects in the numerator of the multiplier formula. The result is an inappropriate multiplier value.

B.3.3. Regional Divisions

The model produces both statewide and region output for up to four regions. The model is designed with a procedure allowing the user to customize the analysis to the census division level or to another regional disaggregation defined by aggregations of census divisions. This procedure involves the creation of regional input-output tables using the state table and region-specific information on location quotients, value added components, and worker residence. The current version of the model consists of four regions: Southeast, Southcentral, Southwest, and Northern, shown in Map 4-1 in Chapter 4. The regional version of the model includes an inter-regional linkage module to account for out-of-region purchases by businesses and households, which occur in all regions except Southcentral.

B.3.4. Types of Analysis

The input-output model can be used to conduct both **economic impact analysis** and **economic significance analysis**. These are different methods of assessing the economic importance of an activity within a region.

Economic impact is the traditional analysis done using input-output. A final demand vector, representing a change in export sales, or income flowing into a region, is used to calculate the resulting total change in economic activity. The assumption of this type of analysis is that all the economic activity thus measured is attributable to the change in final demand, and would not occur without that change in final demand.

An economic significance analysis is a description of the level of activity associated with an industry or sector, but it does not presume the activity would not occur if the industry or sector were absent. In this case, the vector used to generate the result is not really a final demand vector. Rather, it represents the activity whose importance is being measured.

For example, the model could be used to estimate the economic importance of a new ski resort in Southcentral Alaska. The change in final demand represented by the new resort would determine its economic impact on the region. The change in final demand would come primarily from nonresident visitors who would be attracted to Alaska to use the new resort. The components of the change in final demand would be not only spending at the resort, but also travel and spending on other activities by visitors while they're in Alaska. In contrast, the economic significance of the resort would be based on its total sales to both residents and nonresidents. The economic significance would include but be greater than the impact, because resident spending at the resort would be largely offset by reduced spending elsewhere in the region. The net economic effect of the shift in the pattern of resident expenditures would be small, even though it might be difficult to determine what spending was eliminated by the presence of the resort.

B.3.5 Implementation

The model resides in a Lotus V file (OUTPUTn) which consists of several sheets for formulating the Final Demand Vector, storing the Total Requirements Table and other data vectors necessary to run the model, and displaying the model output (n designates the version of the file). A separate set of files contains the data necessary for the creation of the Total

Requirements Table. These files are arranged sequentially so that the model can be easily updated and revised as conditions warrant. A summary of the Lotus file structure is attached as Figure B.1.

Use of the model requires the creation of a final demand vector describing the change in final demand resulting from the activity under study, broken down by the 40 industries and four regions represented in the model. Examples of final demand vectors include the expenditures associated with an increase in the number of tourists visiting the state or the opening of a new mine which exports its output to other states or countries.

Correctly structuring the final demand vector is the most important and often the most difficult task involved in using the model. There are three different forms of final demand vector that the model can accept. Each is constructed and interpreted differently. The types of vector are as follows:

1. **Sales to final demand of one or more firms represented among the columns of the Direct Requirements Table**. **[FINAL DEMAND CHANGE]** An example of this would be an increase of $1 million in export sales of the mining industry. In this case the final demand vector would have a single entry of $1 million in the Other Mining Industry row in the appropriate region. (Depending on the analysis, it might also have an entry in the Railroad Transportation row representing the cost of transportation from the mine mouth to tidewater.)

This is the easiest type of final demand vector to create and use and the type most commonly presented as an example in descriptions of the input-output model methodology—but it is rarely used with the Alaska input-output model. That's because most analysis involves activities that are not well represented by the 40 industries included in the model. For example, we might want to calculate the impact of an increase in sales by bush air carriers to tourist visitors. Although the model has an Air Transport Industry, it includes large domestic and international passenger and freight carriers as well as bush carriers. Bush carriers are only a small part of the industry, and they may well have structural characteristics very different from the larger carriers. Estimation of the impact of bush carrier expansion based on industry averages would be possible, but a better estimate could be made using more specific information about the bush carriers. This can be done using the second method of constructing a final demand vector. Table B-7 shows the form of the final demand vector, the summary of the economic effect, and the summary of total employment, payroll, and sales by industry statewide for an increase of output in Other Mining of $1 million.

2. **Total local purchases by a firm, including payroll. [PROCUREMENT]** This alternative allows us to "fine tune" the final demand vector using locally available information to better represent the activity under analysis rather than relying on the aggregate industry average structural information embedded in the direct requirements table. For example, the bush air carrier sector of the Air Transport industry in Alaska may be more labor intensive than the industry average, pay a lower average wage, and have a higher percentage of resident employees than the industry average. This information is important for determining the total economic effect of a change in final demand for bush carrier services—but this information is not imbedded in the input-output model, where Air Transport represents the average structure for the industry.

There are two ways to incorporate this firm-specific information into the analysis. The first would be to add a new row and column to the direct requirements table for the activity under consideration—in this case the bush carrier industry. This would require a revision of the existing Air Transportation row and column of the direct requirements table in order to divide it into two new industries representing a new Bush Carrier industry and the redefined Air Transportation Industry, Net of Bush Carriers. An alternative, and simpler, procedure is to treat the final demand vector as if it were the direct requirements vector for the bush carrier industry. This avoids the necessity of splitting out bush carriers from other air carriers but retains the bush carrier specific information in the analysis. This procedure yields virtually identical results to adding rows and columns when the inter-industry purchases are limited. (Presentation of the results requires adding the direct impacts back into the output from the model to get the total impact. This procedure occurs automatically when this alternative is specified in OUTPUTn.) Table B-8 shows the form of the final demand vector, the summary of the economic effects, and the summary by industry for an analysis of an increase in output of Other Mining by $1 million, using specific information about firm procurement and payroll. In this case, we derived the distribution of firm purchases from the Other Mining column of the direct requirements table. The resulting total economic effects are identical to those which are shown in Table B.7 and which we calculated simply by using a final demand vector with $1 million in output for the Other Mining industry.

Because information on industry purchases may not be available for the categories into which the input-output model divides economic activity, it may be necessary to use a matrix that converts firm purchases by commodity into purchases by industry prior to creation of the final demand vector.

3. Personal Consumption Expenditures [HOUSEHOLD EXPENDITURES] This alternative allows us to estimate the economic effects of a change in personal income or personal consumption expenditures. Examples of activities subject to this type of analysis would be the Permanent Fund Dividend or an increase in nonresident visitor expenditures. A change in personal income would be easily represented in the model by a change in the Household row of the final demand vector. For example, in Table B.9 we show this method for analyzing a $50 million increase in personal income. If this income comes in the form of a transfer payment, there will be no direct output, payroll, or employment associated with it, so there are no multipliers in the usual sense.

If it is possible to specify the personal consumption expenditures households would make in response to a change in income, or if a change in personal consumption expenditures itself is the activity of interest, then the final demand vector would represent those specific expenditures. Since the personal consumption expenditures are generally reported by commodity, whereas the input-output model is designed around industries, it is necessary to convert expenditures by commodity into expenditures by industry in order to create the final demand vector for household expenditures. Conversion tables for personal consumption expenditures are available from the National Income and Product Accounts to accomplish this. For example, a tourist purchase of a souvenir cannot be directly represented in a final demand vector because there is no industry classification entitled “Souvenirs.” The commodity-industry matrix would allocate this tourist purchase among the appropriate

manufacturing industry and the transportation and trade margins represented by the purchase price.

Table B.10 demonstrates the use of the model to calculate the economic effects of an increase in personal consumption expenditures associated with an increase of resident personal income of $50 million. Here we assume that the composition of new personal consumption expenditures is the same as the average represented in the model by the Household column. (We use the coefficients of the household column of the direct requirements table to allocate shares of the $50 million in personal income to the industries where it is spent.) The result is that about half of the $50 million, $25.8 million, is spent within the region on personal consumption expenditures. The total effect of these personal consumption expenditures, specifically identified by industry, is the same as the effect shown in Table B.9. In that table, household income was increased by $50 million and the model allocated that additional income among the various industries based on the pattern of personal consumption expenditures in the model.

B.3.6. Model Construction

The starting point for the creation of the Alaska input-output model is the RIMSII model for Alaska, published by the U.S. Department of Commerce, Bureau of Economic Analysis. This is a 39-industry input-output model constructed from the national input-output model. (See *Regional Input-Output Modeling System (RIMS II): Estimation, Evaluation, and Application of a Disaggregated Regional Impact Model* and *Regional Multipliers: A User Handbook for the Regional Input-Output Modeling System (RIMS II)*, both from the Bureau of Economic Analysis. The current version of the model uses the tables published in 1993.)

The regionalization of the RIMSII model uses a disaggregated "mixed location quotient" technique to generate regional trade coefficients directly from the national technical coefficients without the necessity of creating a regional transactions table. Earnings-based location quotients are used for industries that sell predominately to intermediate demand, while personal-income-based location quotients are used for industries that sell predominately to final demand. The use of personal-income-based location quotients in service industries is intended to account for all sources of output demand in these industries. Furthermore, RIMSII estimates regional Household row and column coefficients based on national I-O household payment and expenditures coefficients. The resulting coefficients are then aggregated from the 496-industry level into a more manageable table of technical coefficients.

Although the RIMSII model is not based on a survey, it has been shown to closely approximate the results of very expensive survey-based models for some states. However, a number of further adjustments have been done to the RIMSII model so that it more closely represents the structure of the Alaska economy and the regions within Alaska.

1. Disaggregate Important Alaska Industries. We disaggregated three RIMSII industries—Forestry and Fishing, Transportation, and Miscellaneous Services—using data from the detailed national input-output tables of the U.S. Department of Commerce, Bureau of Economic Analysis. For each of these three RIMSII industries, the appropriate set of industries from the national table was substituted into the RIMSII direct requirements table.

For example, seven separate industries—Railroads, Local Transportation, Motor Transportation, Water Transportation, Air Transportation, Pipelines, and Transportation Services—were inserted into the direct requirements table in place of the single Transportation industry. The national coefficients were adjusted to reflect Alaska conditions, using location quotients constructed from Alaska and U.S. earnings data. The result of this procedure was a hybrid direct requirements table containing 48 industries.

2. Combine Small Alaska Industries. To form a smaller and more manageable table of industries, we combined several small industries (industries that have little presence in Alaska) from this hybrid direct requirements table. For example, we combined a number of manufacturing industries that have very little Alaska presence—apparel, printing and publishing, rubber and leather products—into a single category of "Other Manufacturing." This aggregation was done using employment and wage shares for each of the combined industries in calculating each aggregated industry trade coefficients.

Table B-11 shows the relationship between the 39 RIMSII industries and the 35 industries in the Alaska I-O model after the disaggregation and aggregation procedures. (The computer program is capable of accommodating 40 industries. This allows for further disaggregation of industries or for closing the model to other sectors, such as local government.)

3. Regionalize the Model. We next used earnings-based location quotients to regionalize the Alaska I-O model into four regions which are aggregates of Alaska census areas. (Users can redefine these regions, but four is the maximum number into which the state can be divided.) The four-region direct requirements table includes inter-regional purchases to reflect the fact that economic activity in the regional centers such as Anchorage is influenced by changes in final demand in outlying regions such as the Southwest. The inter-regional purchase coefficients were calculated so that the statewide total economic effect of a change in final demand occurring in any region would be the same. The location by region of the economic effects differs depending on the region of final demand change. The current version of the model assumes that purchases flow from outlying regions to Southcentral Alaska but that no purchases flow out from Southcentral to the other regions.

4. Localize Alaska Wage Rates and Value Added. After regionalization, the direct requirements table—a 160 by 160 matrix—was inverted to create a total requirements table. Pre-multiplication of this total requirements table by a 160-by-1 final demand vector generates a vector of total change in output for 40 industries in four regions of the state. From this output vector employment, payroll, value added, and other variables by industry and region can be generated using output ratios. The ratio of payroll to output by industry is used to calculate the total payroll effect of a change in final demand. At this point, the residence adjustment for nonresident payroll paid by industry is adjusted, based on judgement by the authors. The average annual wage by industry by region is used to calculate the total employment effect of a change in final demand (currently based on 1994 wage rates). The ratio of value added to output is used to calculate the total value added effect of a change in final demand.

5. Commodity by Industry Matrix. Since many applications of the input-output model are based on changes in final demand described by commodity rather than industry, a commodity

by industry matrix is required to convert expenditures by commodity into expenditures by industry. The commodity by industry matrix not only allocates manufactured good expenditures to the appropriate manufacturing industry, it also splits out the transportation and trade margins.

B.3.7. Model Accuracy

The model is constructed using both national and Alaska sources. The national data include the National Income and Product Accounts, the National Input-Output Model (including supplementary tables), and the RIMSII models for Alaska. The data from these sources are in the form of coefficients and ratios describing the structure of the economy and particular industries. This structure tends to be relatively stable over time. The technical coefficients reflect the average production process for each industry and relative input prices. These coefficients will change over time if the average technology in the industry changes, the mix of firms in the industry changes, or if relative prices change. In using national data from former years we assume that these changes, to the extent they do occur, happen gradually and have little effect on the results generated by the model.

The process of converting the national input-output direct requirements table into a set of regional trade coefficients introduces some potential errors. These include aggregation bias, bias due to the existence of cross-hauling, and differences in production functions between Alaska and the U.S. average. Aggregation bias occurs when firms with different production functions are assigned to the same industry. The result is an industry that does not exactly reflect the characteristics of either firm. This problem is minimized in RIMSII by conducting the regionalization procedure on the most disaggregated level the data will allow. The disaggregation process assumes that intermediate output in the region is sold within the region to meet local firm demands before any is exported to other regions. In reality, sometimes inputs are imported even when local industry output is sufficient to meet local demand. Because the regionalization procedure cannot estimate the extent of this cross-hauling, the regional trade coefficients may have some upward bias. The amount of cross-hauling between the Alaska economy and the rest of the world has not been documented, but it is probably relatively small—so we disregard this as a factor influencing the quality of the regional model. Differences in the industry production functions between Alaska and the rest of the U.S. are potentially more significant, and it is here that adjustments to the Alaska I-O model are made based on our judgement and knowledge of the local economy. These differences are likely to be in industries like Petroleum and Construction, where the production function is influenced by local geography and climate.

In addition, the RIMSII trade coefficients will change if there are changes in the locally supplied shares of industry inputs. Again, in using RIMSII we assume that changes in the locally provided shares of inputs to Alaskan industries occur very slowly and that these changes do not have an appreciable effect on the results of the model. Of course, change can be rapid for individual industries due to the small size of the economy. The introduction of a new firm or the loss of an existing firm within an industry, or a change in the source of supply for an important input to an industry, can change the trade coefficients for that industry in the direct requirements table. Because of this, the model results for individual

industries are less robust than the aggregate results across all industries or broad categories of industries.

In general, a change in the trade coefficients for one industry will have a very small effect on the aggregate results of any analysis using the input-output model. More important than the size of any particular trade coefficient is their sum, which represents the share of industry inputs that is supplied from within the economy. As long as the leakage out of the economy does not change appreciably due to a change in one trade coefficient, the aggregate economic impact will not vary much with variation in the individual trade coefficients.

In Alaska, the sum of the trade coefficients for most industries is relatively small since many industrial inputs, particularly intermediate manufactured goods, are not produced locally. The indirect economic effect of any change in final demand will be relatively small. The induced economic effect due to household spending of income may be larger because household purchases tend to have a higher local component. As a result, the most important variables for determining the total economic effect of a change in final demand within Alaska are generally the proportions of the direct effect that are paid to Alaskan suppliers and Alaskan households. (It is also important to properly identify what share of any change in final demand should be allocated to Alaska. For example, a wilderness resort serving nonresidents may buy groceries in Seattle. So although the visitors pay for groceries they eat at the resort, that particular visitor purchase does not have an indirect or induced effect on the Alaska economy.)

The Alaska data include payroll and employment information from the Alaska Department of Labor, earnings and income data from the U.S. Department of Commerce, value added developed by ISER, and incidental data from a variety of Alaska sources, used to adjust model coefficients to better reflect current Alaska conditions. Furthermore, it is necessary that the wage rate data consistently use the same base year as the data in the final demand vector that is used to drive the model.

The accuracy of estimates of economic effects also depends on proper model application. This in turn requires knowledge of the structure of the economy and judgement about how it is likely to change in response to a change in final demand. Two important considerations are whether supply constraints will influence the response and whether the change should be treated as an average or a marginal change.

The output of most industries can increase in response to an increase in demand, although sometimes only with a lag. The natural resource industries are generally constrained by supply, so that an increase in final demand for the output of the seafood, wood products, mining, petroleum, and perhaps the tourism industries might be unsatisfied from local sources of supply. In those instances, an increase in final demand could only be satisfied through an increase in imports of the commodity that is constrained by supply. The locally supplied commodity for which a potential supply constraint is most important is petroleum, since fuel is used as an important input in a broad range of industries. The supply of labor might be another instance where a short-term shortage results in the importation of workers. The potential for supply constraints is handled on a case by case basis in the application of the model.

An important assumption of the input-output model is that in response to a change in final demand, the composition of purchases by each industry in the economy will be similar to the average for the industry. There are two reasons why this assumption might not be valid. First, the firms within the industry affected by the change in final demand might not be representative of the average for the industry. For example, the Air Transportation industry aggregates together national and international passenger and freight carriers with bush airlines. Although both are engaged in Air Transportation, the structure of purchases for a typical international freight carrier could be quite different from that of the typical Alaska bush carrier. A change in final demand that specifically affects Alaska bush air carriers may then not be properly modeled by the Air Transportation industry, which includes the international freight carriers. Second, a change in final demand could stimulate the establishment of new businesses rather than expansion of existing businesses in the region. If the structure of the new businesses were significantly different from that of existing businesses, the average coefficients in the direct requirements table for that industry might not be appropriate. For example, the Food Manufacturing industry consists primarily of shore-based fish processing. It would be inappropriate to use this industry to estimate the effect of a new large-scale meat processing plant on the economy. In both these instances, it would be preferable to construct a direct requirements vector that specifically described the structure of the business activity under analysis.

B.3.8. ISER Studies Employing the Alaska Input-Output model

Alaska Employment With and Without MarkAir: Range of Potential Effects, for MarkAir, January 1995.

Alaska Small Scheduled Air Carriers: Economic Significance, for PennAir, February 1995.

Marginal Oil Field Development—The Economic Impact, for Alaska Oil and Gas Policy Council, June 1995.

The Economic Contribution of the Anchorage International Airport, for Anchorage International Airport, October 1995.

The Petroleum Industry and the Fairbanks Economy, for BP Alaska, November 1995.

Heavy Oil Development: The Economic Impact, for BP Alaska, December 1995.

Economic Effects of Management Changes for Kenai River Late-Run Sockeye, for Alaska Department of Fish and Game, January 1996.

The North Star Project: Economic Impact, for BP Alaska, April 1996.

Economic Impacts of the 1996 Arctic Winter Games, for Arctic Winter Games International Committee, June 1996.

Sport Fishing in Alaska: Economic Importance (Review Draft), for Alaska Department of Fish and Game, October 1996.

Economic Impact of the 1995 Carr's Great Alaska Shootout, for University of Alaska, November 1996.

Management Alternatives for the Guided Sport Fishery for Halibut Off Alaska, for North Pacific Fisheries Management Council, April 1997.

Appendix C: Estimating the Travel Cost Equations

The travel cost method is a standard technique frequently used in net economic value analysis; it is used to estimate anglers' future fishing decisions and their willingness to pay for fishing.[1] It involves a detailed analysis of where anglers go fishing and how much it costs them to get there. Our application of the travel cost method makes use of observations on anglers' actual choices among the available fishing opportunities to estimate the value of sites, species, or characteristics of the fishery. Variables that explain anglers' choices about how often and where to go fishing include site and angler characteristics and the travel cost to the site. Since travel cost is expressed in dollars, it is part of the price anglers pay for fishing trips and is a key variable for determining value.

Three main steps were involved in estimating the travel cost models. First, we collected data on fishing behavior over the course of the 1993 season, from representative samples of resident angler households. Then, using statistical methods to analyze the data, we estimated a set of equations predicting anglers' choices about when and where to go fishing, based on travel costs to alternative sites, attributes of the site, information about conditions each week, and household characteristics. Finally, we derived an estimate of net economic benefits from the estimated equations. This appendix details how we built the data set and estimated the travel cost equations for our analysis.

Overview of this Application

We estimated and built seven separate models: four for resident summer anglers, by region of origin and three for nonresident anglers, by type. These are shown in Table C-1.

Table C-1. The Seven Travel Cost Models

Angler Group Modeled	Origin Area
Resident Anglers–Southeast	Southeast Alaska Residents
Resident Anglers–Southcentral	Anchorage, Matanuska-Susitna, and Kenai Borough residents
Resident Anglers–Southcentral and Interior	Other Alaska residents on the road system*
Resident Anglers–Kodiak	Kodiak Island Borough residents
Nonresident Destination Anglers	Visitors who came to Alaska primarily to fish
Nonresident Incidental Anglers–Southeast	Visitors to Southeast who decided to fish while here
Nonresident Incidental Anglers–Southcentral and Interior	Visitors to Southcentral and Interior who decided to fish while here

* "Interior" for this model means the Fairbanks North Start Borough, Southeast Fairbanks census area, Denali Borough, City of Nenana, and the Valdez-Cordova-Whittier census area.

[1] See A. Myrick Freeman III, "Recreational Uses of Natural Resource Systems," Ch. 13 in *The Measurement of Environmental and Resource Values: Theory and Methods*, Resources for the Future, Washington D.C., 1993.

For the resident models (except Kodiak), we approached the decision to go fishing as a two-stage problem: first, anglers decide whether to go fishing; then they decide where to fish. Figure C-1 shows this decision structure. We used a weekly or monthly decision horizon, or in the case of Southcentral Alaska residents, a combination of the two: a weekly model for frequent anglers and monthly model for infrequent anglers.

The steps involved in estimating the resident models are illustrated in Figure C-2. The first step was estimating the cost of each fishing alternative. Our cost equations include transportation, food, lodging, guide services, and other items. The second step was building a data set describing expected costs and fishing quality for each fishing alternative, every time an angler took a trip. We used this data set to estimate the probability of an angler's choosing a site, given the decision to take a trip (step three). The fourth step was building a data set describing the weekly or monthly choice about whether to go fishing, including an index of overall fishing quality, constructed from the site choice equation. We then used this data set to estimate the participation equation. The final step was combining the three estimated equations and data in a model to estimate net benefits associated with specified changes in model variables. This last step is documented in Appendix D.

We were not able to develop a participation equation for the nonresident models, so therefore construction of those models did not involve steps four and five.

Contrast with Other Studies

Our study methodology was based on Jones and Stokes' studies of sport fishing in Southeast and Southcentral Alaska (1991, 1987). While our model has similar capabilities as the Southeast Alaska Sport Fishing Model, the differences are worth noting. The models differ in the structure each imposes on the anglers' fishing choices. Jones and Stokes analyzed whether an angler took one or several fishing trips each week. For Southcentral anglers, we distinguished between frequent and infrequent anglers, modeling the former on a weekly basis and the latter on a monthly basis. Given a decision to go fishing at least once a week, anglers in the Jones and Stokes' studies chose a site and a target species combination; fishing for king salmon in Lynn Canal is a distinct and exclusive alternative from fishing for silver salmon in Lynn Canal. In our study, anglers chose a site, but did not specify the target; all the species available at that site are considered in their decision. Neither approach is "right" or superior; either way of allocating willingness to pay (WTP) across species and sites is arbitrary—yet they yield different estimates. Our model structure allows anglers more substitution; with available substitutes, the estimated value of any one species is necessarily lower.

In their equations, Jones and Stokes used many site-specific dummy variables to represent unspecified attractions for particular site/species combinations. This weakens the explanatory value of the model: with much of the site value accounted for by site-specific constants, relatively little of it can be attributed to generic and variable site characteristics. Our equations ascribe all the variance in angler choices to identified site characteristics. Also, though Jones and Stokes had more observations (in the region) to work from, their 15 percent survey response rate provides less confidence in the data. While the Jones and Stokes model purports to estimate WTP for more species than appear in our model, we believe that our results are more meaningful for policy analysis.

Jones and Stokes and other previously published site-choice equations treat on-site fishing time as exogenous: they assume on-site fishing time is implicitly fixed before the trip begins. Furthermore, they don't include travel and on-site time as costs of the trip. We believe that if an angler could otherwise have worked during that time, then travel and on-site fishing time should be considered as costs. In previous studies, anglers' reported on-site time is one of the variables used to predict expenditures such as food, bait, lodging, and guide costs. But if fishing hours on-site is in fact endogenous, treating it as an independent variable in the expenditure equations will provide inefficient and biased regression results. In addition, leaving out the cost of travel and on-site time substantially underestimates the costs of a recreational visit, leading to a significant downward bias in estimates of willingness to pay. In our study, on-site fishing time is estimated endogenously and travel time cost is included as a portion of total trip cost for those who could have worked.

Our trip cost estimates also included lodging, guide and charter costs, vehicle maintenance costs, and capital costs. Jones and Stokes included only fuel, tackle, food, and beverage costs. Finally, their analysis is based on 1987 dollar values while ours is based on 1993 dollar values.

Model Assumptions and Limits

Travel cost models rely on a variety of standard theoretical assumptions. These include: that all anglers have well-defined, stable preferences; that these preferences are similar enough in their domain so they can be meaningfully aggregated to infer consumer surplus or "willingness to pay (WTP);" that interpersonal comparisons of WTP are valid and meaningful; that WTP is a meaningful metric of welfare; and that the mean marginal utility of money is an unbiased estimator for calculating WTP— the distribution of marginal utilities of money is not skewed, and the variance is small so that with the nonlinearities in the model the bias is inconsequential.

The predictive power of a model is limited by the available explanatory variables. In this model, some key dimensions—such as the time dimension of fishing quality, measures of crowding, site aesthetics, availability of guide services, and salience of site information such as advertising—were measured poorly or not at all. In using the model as estimated, we assume that the errors in the estimated fishing choice from omitted or poorly measured independent variable variables are randomly distributed; and that a policy change modeled as a change in the included variables yields an unbiased estimate of changes in angler behavior. Predictive power of the model is also limited by variation between sites. The travel cost model can estimate values associated with specific site characteristics as long as the data contain sufficient variation between sites. Where the number of observations reflecting variation is very small, however, the model cannot estimate value.

Data Collection and Construction of Variables

In 1993 we conducted telephone interviews with more than 1,000 resident fishing households throughout Alaska, asking about their demographics and 1993 fishing activities and expenditures. We collected similar information from about 4,500 nonresidents with a mail survey. The surveys are described in detail in Appendix A.

In addition to angler data from the surveys, we needed information on fishing opportunities available to anglers. For each site, we collected information on facilities, species availability, 1992 catch and angler effort, weather, fishing regulations, and reported fishing quality. For characteristics that vary over the summer—that is, catch and availability data and weather—we tried to identify values for each site each week. We constructed catch rate variables using 1992 rather than 1993 data for two reasons. First, anglers wouldn't know the 1993 catches for any given week until that week was over; they would have to rely on information from previous years. Second, we needed an independent variable to explain the dependent variable of days fished. So we used 1992 data to ensure exogenous catch and participation variables.

Finally, angler characteristics may interact with site characteristics. For example, anglers who dislike crowded fishing are less likely to choose crowded sites; anglers who own cabins are more likely to fish at sites near their cabins.

Below is a complete list of information we collected.

Site Facility Variables

These variables did not vary by week. Sources*: Alaska Atlas and Gazetteer, U.S. Forest Service, and local information sources.*

Fuel available at site
Potable water available at site
Boat ramp at site
Nearby food
Nearby commercial lodging
Nearby campground
Nearby public cabin

Other Site Variables

Days Fished: Total angler-days in 1992, as reported by ADF&G in 1992 *Sport Fish Survey.*

Crowding: ADF&G area biologists identified site-week combinations they considered crowded enough to discourage more anglers from fishing—known as "combat fishing," coded as 1 for crowded, coded 0 otherwise.

Species Variables

For each of the species listed below, we developed a number of variables.

King Salmon (includes jack kings)
Red Salmon
Silver Salmon
Pink & Chum Salmon
Trout (includes cutthroat, brook, rainbow, and lake trout, and landlocked king, silver, and kokanee salmon)
Dolly Varden/Char
Steelhead
Grayling
Whitefish (includes sheefish, northern pike, burbot, and other whitefish)
Herring
Halibut
Ground and Other Finfish (includes rockfish, cod, ling cod, pollock, sole, monkfish, and flatfish)
Clams, Crab, and Other Shellfish (includes razor and hardshell clams; shrimp; king, Dungeness, and tanner crab; and other shellfish)

Availability: 0 (not available) through 2 (peak fishing time), reported by ADF&G by area A through Z and for salt or fresh water; from ADF&G published information.

Catch: Total catch of species by site, as reported by ADF&G in 1992 *Sport Fish Survey.*

Catch per Unit Effort: Catch / Days Fished. Although this value is a constant across the summer, it was usually interacted with Availability so it was 0 when species was not available.

Report: Weekly reports by species and site as reported by `Anchorage Daily News, Fairbanks Daily News-Miner,` and `Juneau Empire`. Reports were coded 1 (worst) through 5 (best).

Creel Surveys: ADF&G surveys available for some sites and species; produce estimates of catch per angler day by site and week. We used 1992 data for this variable.

Bag Limits: For each site/species by week, from ADF&G 1993 regulations.

Open: For each site/species by week, from ADF&G 1993 regulations.

Sonar Count: For Kenai River sites and red salmon only, provided by ADF&G.

Weather Variables

`Data from the Alaska State Climate Center`

Precipitation: Number of days in each week with precipitation greater than 0.1 and 0.5 inches, for Anchorage, Homer, Juneau, Valdez and Ketchikan.

Wind: Number of days in each week that wind speed exceeded 10 knots and 20 knots for Juneau, Ketchikan, and Homer.

Temperature: TG40, the number of days in each week that the mid-range temperature exceeded 40, for Anchorage, Homer, Juneau, Valdez and Ketchikan; and AncTemp, the average mid-range Anchorage temperature for the week.

Daylight: The median estimated hours of daylight during the week, for Anchorage. We used this variable in areas other than Anchorage as well, as a proxy for their daylight hours

Tides: At various locations, from published tide tables.

Angler Household Characteristics

`Data from the 1993 ISER survey`

Boat ownership: 1 if the angler reported owning a boat (other than a canoe or small rubber raft), otherwise 0.

Cabin ownership: This variable is specific to both angler and site. It is 1 if the angler owns a cabin near the site, 0 otherwise.

Skill: The most skilled angler in each household was rated as beginner, intermediate, advanced, or expert.

Income: The 1992 household income.

Family composition: The number of retired persons in each household, the number self-employed, and the number of household members under 18, 18 to 49, and 50 and over.

Angler preferences: What factors are important in choosing a fishing site, what sources of information the angler relies on, why the angler goes fishing.

Resident Models

Cost Equations

A key variable in the travel cost model is the trip cost, which is modeled as the sum of fuel cost, vehicle depreciation cost, lost income for those who could have worked during their travel and on-site fishing time, and other trip expenditures such as food, lodging, bait, and guide services. An angler is more likely to go to a fishing site that costs less for the same quality of fishing. All resident summer fishing models (four of the seven models) use the same time and cost equations, which are described in this section. Estimating nonresident costs posed special challenges, as described in the nonresident section of this appendix.

TRAVEL COST

For each trip they took, anglers told us where they started the trip and which of their vehicles they used to travel to the site; they also supplied information on vehicle costs. For each of our seven groups of anglers (Table C-1), we developed a matrix of vehicle, boat, and air distances from the relevant trip origins to the available sites and a list of fuel costs at both trip origins and sites. Combined with the survey information, this matrix allowed us to estimate travel costs to the sites not chosen.

THE VALUE OF TIME

Previously published studies have treated on-site fishing time as exogenous and implicitly fixed before the trip begins. Furthermore, earlier studies have not included travel and on-site time as costs of the trip. We believe that if an angler could otherwise have earned money during that time, then travel and on-site fishing time should be considered as costs. In previous studies, anglers' reported on-site time is one of the variables used to predict expenditures such as food, bait, lodging, and guide costs. But if fishing hours on-site is in fact a dependent variable, treating it as an independent variable in the expenditure equations will provide inefficient and biased regression results. In addition, leaving out the cost of travel and on-site time substantially underestimates the costs of a recreational visit, leading to a significant downward bias in estimates of willingness to pay.

A simple test of whether on-site time is endogenous or exogenous is regressing the variable on all other exogenous variables in the same equation. If a statistically significant relationship can be found, then fishing hours on-site is determined within the equation and thus is endogenous. If there is no statistically significant relationship, fishing hours on-site is just another exogenous variable. Table C-2 below shows the results of this regression. We found that travel time, boat ownership, fishing for halibut, king peak fishing times, and bag limits—and the amount of money an angler could otherwise have earned— are all highly significant. Based on theory as well as the results of our test, we believe that on-site fishing

time is endogenous. It is one explanatory variable in our food, lodging, guide and miscellaneous cost equations. We estimate different on-site time regressions for Southcentral residents and for other Alaska residents, which are described in the appropriate region sections of this appendix.

Table C-2. Regression Testing For On-Site Time Independence

Variable	Definition	Coefficient	Standard Error	t-ratio
lfhours	DEPENDENT: Estimated total person hours on-site			
Constant		5.0760	1.858	2.732
Hrs_trip	hours reported traveling to a site	0.33357	0.06444	5.176
Npeople	number of household members on a trip	-1.7678	0.1705	-10.369
Fuelwat	1 if fuel and water are available at the site, otherwise 0	5.2706	3.511	1.501
Boatramp	1 if boat launching ramp is available at the site, otherwise 0	-1.5064	0.8796	-1.713
Derby	1 for any derby at the site in a given week, otherwise 0	0.54448	0.7320	0.744
Pcabin	1 if public cabin is available near the site, otherwise 0	0.70694	1.140	0.620
Campgr	1 if camp ground is available near the site, otherwise 0	1.2615	1.377	0.916
Commerc	1 if commercial lodging is available near the site, otherwise 0	-4.3074	3.570	-1.206
Trout	1 if angler reported trout as a target species, otherwise 0	-0.33488	0.8133	-0.412
Salt	1 if water type is salt, otherwise 0	-0.52177	0.6456	-0.808
Boat	1 if angler owns a boat, otherwise 0	1.7261	0.4621	3.735
Income	Angler's household income in $1000	-0.016475	0.0057	-2.889
Skill	0 if most skilled angler in household is a beginner, otherwise 1	0.27369	0.2695	1.016
Nretire	Number of retired person in angler's household	-0.22585	0.3628	-0.622
Ksalmon	1 if angler reported king salmon as a target species is, otherwise 0	-0.52032	0.5680	-0.916
Halibut	1 if angler reported halibut as a target species is, otherwise 0	-1.8748	0.7517	-2.494
Cabin	1 if an angler owns a cabin near the site, otherwise 0	-0.22358	1.262	-0.177
Camper	1 if angler's household owns a camper, otherwise 0	0.70352	0.6949	-1.012
Cpueking	Annual king salmon catch divided by total days fished at site	-0.64228	2.221	-0.289
Cpuemax1	Annual catch for the species (excluding king salmon) that was caught most at a site divided by total days fished at site	-0.043629	0.3499	-0.125
Cpuemax2	Annual catch for the species (excluding king salmon) that was caught second most at a site divided by total days fished at site	2.5404	2.011	1.263
*Peakking	1 during weeks rated as peak for king salmon at site, otherwise 0	1.3823	0.5532	2.499
*Peakmax1	1 during weeks rated as peak for species caught most (excluding king salmon) at site, otherwise 0	1.0929	0.5867	1.863
Peakmax2	1 during weeks rated as peak for species caught second most (excluding king salmon) at site, otherwise 0	-0.34934	0.5712	-0.612
*Kingbag	Bag limit for king salmon	1.6203	0.5982	2.709
Max1bag	Bag limit for the species caught most (excluding king salmon)	-0.010567	0.1254	-0.084
Max2bag	Bag limit for the species caught second most(excluding king salmon)	-0.36131	0.1041	-3.472
Crowding	1 if a site rated by ADF&G biologist as crowded that week, otherwise 0	-0.40573	0.7791	-0.521
Tg40_1	Number of days during the study week that the mid-range temperature was above 40 Fahrenheit	0.044381	0.08714	0.509
Pg10_1	Number of days during the study week that precipitation exceeded 0.10 inches	0.20788	0.2279	0.912
Othearn	1 if angler could have earned money elsewhere instead of taking the fishing trip, otherwise 0	-0.015879	0.5692	-0.028
Othearnd	Dollar amount that angler could have earned elsewhere instead of taking the fishing trip	0.0032519	0.0006931	4.692
Sigma		6.4069	0.1439	44.556

* Used in on-site time estimation for Interior, Southeast, and Kodiak.

ESTIMATING TRAVEL TIME

Travel time is one explanatory variable for site choice. Even if the dollar cost of travel and the fishing quality are the same, people will choose to fish more often at nearby sites than at distant ones. In addition, people who could have earned money instead of fishing lose wages while traveling as well as while fishing. So, we need to estimate travel time as well as travel cost to all possible sites.

Using data on trips taken, we estimated a linear regression that expresses total travel time as a function of road miles, air hours, and boat hours (from the travel cost matrices described above). Using the same data, we estimated marginal lost wages as a function of estimated (rather than reported) one-way travel time and on-site fishing time. Table C-3 shows the regression results.

Table C-3. Travel Time Regression

Multiple R	.46217
R Squared	.21360
Adjusted R Square	.21218
Standard Error	3.31365

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	3	4977.64011	1659.21337
Residual	1669	18326.07739	10.98027

F = 151.10856 Signif F = .0000

Variable	B	SE B	Beta	T	Sig T
VEHMI2	.013558	.000064586	.455853	20.992	.0000
BTVLHRS2	.091755	.027334	.072868	3.357	.0008
PTRAVHRS	.110507	.342047	.007015	.323	.7467
(Constant)	1.248547	.098274		12.705	.0000

ESTIMATING LOST WAGES

We estimated marginal and average lost wages. Average lost wages can be calculated for each angler who reported lost wages: it is the total an angler could have earned, divided by the total time (travel and on-site) spent on the fishing trip. We estimated only one marginal lost wage for all anglers who could have worked, by regressing the reported lost earnings against reported travel and on-site time. Table C-4 shows the regression results.

Table C-4. Marginal Wage Regression

Multiple R	.191
R Squared	.036
Adjusted R Square	.034
Standard Error	11877.06

Coefficients

Variable	B	Std. Error	Beta	T	Sig T
(Constant)	271.122	39.306		6.898	.000
TVL_EQ	13.806	3.635	.146	3.798	.000

HRS_FISH	6.765	3.118	.084	2.170	.030

FOOD, LODGING, GUIDING, AND MISCELLANEOUS TRIP COSTS

We estimated equations for food, guiding, lodging, and miscellaneous costs using the instrumental variable for on-site time, as described above, along with site and angler variables, trip information on the angler's target species, and information on actual angler expenditures. We used a censored regression (tobit) model for the estimation, since there are no negative expenditures. The expenditure equations are detailed below.

Table C-5. Censored Regression Results for the Food Cost Equation
(On-site time treated as endogenous)

Variable		Coefficient	Standard Error	t-ratio
Constant		-56.352	10.62	-5.305
Ifhours	Estimated on-site hours	4.2195	0.7327	5.759
Hrs_trip	One way travel time	5.3857	1.406	3.830
Trout	1 it trout is a target species, otherwise 0	-34.362	14.02	-2.450
Income	Angler's 1992 household income, in thousands	0.41344	0.1015	4.075
Nretire	Number of retired persons in angler's household	-25.312	6.842	-3.700
Camper	1 in angler's household owns a camper, otherwise 0	-42.145	11.61	-3.629
Sigma		95.891	2.877	33.326

N=876
Log-likelihood= -3748.8
Restricted (Slopes=0) Log-L= -5058.65
Chi-Squared(9)= 216
Significance Level= 0

Table C-6. Censored Regression Results for the Miscellaneous, Including Bait Cost Equation
(On-site time treated as endogenous)

Variable		Coefficient	Standard Error	t-ratio
Constant		-23.782	6.248	-3.806
Ifhours	Estimated on-site hours	3.0309	0.4012	7.555
Nretire	Number of retired persons in angler's household	-15.573	3.898	-3.996
Sigma		60.715	1.655	36.684

Miscellaneous cost = f(One, Ifhours, Income, Nretire)
N=876
Log-likelihood= -4019.5
Restricted (Slopes=0) Log-L= -4752.32
Chi-Squared(5)= 132
Significance Level = 0

Table C-7. Censored Regression Results for the Lodging Cost Equation
(On-site time treated as endogenous)

Variable		Coefficient	Stan. Error.	t-ratio
Constant		-204.96	20.60	-9.951
Ifhours	Estimated on-site hours	6.1979	1.359	4.562
Hrs_trip	One way travel time	6.9357	2.400	2.890
Boat	1 in angler's household owns a boat, otherwise 0	-41.803	14.30	-2.922
Nretire	Number of retired persons in angler's household	-47.690	15.78	-3.022
Halibut	1 it halibut is a target species, otherwise 0	64.562	18.63	3.466
Sigma		137.03	7.953	17.231

Lodging cost = f(One, Ifhours, Hrs_trip, Boat, Nretire, Halibut)
N=876
Log-likelihood= -1300.5
Restricted (Slopes=0) Log-L= -4726.1

Chi-Squared(4)= 1982
Significance Level= 0

Table C-8. Censored Regression Results for the Guide Cost Equation
(On-site time treated as endogenous)

Guide Cost = f(One, Ifhours, Hrs_trip, Boat, Ksalmon, Halibut, Cpuemax2, Pg10_1)

Variable		Coefficient	Standard Error	t-ratio
Constant		-1227.8	151.9	-8.084
Ifhours	Estimated on-site hours	17.100	5.371	3.184
Hrs_trip	One way travel Estimated on-site hours time	18.941	8.433	2.246
Boat	1 in angler's household owns a boat, otherwise 0	-463.25	80.89	-5.727
Ksalmon	1 it king salmon is a target species, otherwise 0	320.16	77.53	4.130
Halibut	1 it halibut is a target species, otherwise 0	751.34	96.27	7.804
Cpuemax2	Catch rate for 2nd most caught species (excl Kings)	598.13	201.3	2.971
Pg10_1	Number of days in week mid-range temperature exceeded 40	85.697	26.89	3.187
Sigma		401.85	39.41	10.198

N=1496
Log-likelihood= -633.61
Restricted (Slopes=0) Log-L= -1624.9
Chi-Squared(4)= 2964
Significance Level= 0

ALTERNATIVE TOTAL TRIP COST SPECIFICATIONS

We tested several ways of including time and lost wages as part of trip costs. All methods included lost wages, applied only to anglers who said they could have earned money if they had chosen not to fish. In the ***structural*** form, we used all the costs we could identify; we estimated food, lodging, guiding, and miscellaneous cost equations as described above. But on-site time is a benefit as well as a cost: people enjoy fishing. So we also calculated trip costs excluding the portion associated with on-site time. This is the ***reduced*** form cost. To calculate it, we used our estimated cost equations, but eliminated the on-site time term. Finally, we considered on-site time as potentially ***exogenous,*** determined by the choice of site rather than by angler characteristics. To calculate exogenous trip costs, we used the full cost equations, but instead of our calculated instrumental variable for on-site time, we used the average reported site time at each site. Including two specifications of lost wages and three of trip costs produced six total trip cost variables that we tested in the site choice equation.

Site Choice Equation

We used the expenditure estimates to construct, for each trip taken, a set of trips the angler could have taken (to the other available sites), complete with site characteristics and estimated expenditures. The data set used to estimate site choice is described in Table C-9.

Table C-9. Data Structure for Site Choice Estimation

Trip Number	HH	Origin	Site	Was This the Site Chosen?	Total Trip Cost	HH Variables	Site Variables
1	as reported	as reported	1	no	Estimated by equations	as reported	matched in for site
1	as reported	as reported	2	no	Estimated by equations	as reported	matched in for site
1	as reported	as reported	3	no	Estimated by equations	as reported	matched in for site
1	as reported	as reported	4	no	Estimated by equations	as reported	matched in for site
1	as reported	as reported	5	Yes	Estimated by equations	as reported	matched in for site
1	as reported	as reported	6	no	Estimated by equations	as reported	matched in for site
1	as reported	as reported	7	no	Estimated by equations	as reported	matched in for site
1	as reported	as reported	8	no	Estimated by equations	as reported	matched in for site
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
1	as reported	as reported	n	no	Estimated by equations	as reported	matched in for site
2	as reported	as reported	1	Yes	Estimated by equations	as reported	matched in for site
2	as reported	as reported	2	no	Estimated by equations	as reported	matched in for site
2	as reported	as reported	3	no	Estimated by equations	as reported	matched in for site
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
2	as reported	as reported	n	no	Estimated by equations	as reported	matched in for site

… . and so on, for all reported trips

We wanted to model the conditional probability (given that the angler does choose to make one or more fishing trips in week t) that the angler chooses site i in week t (Pi|t):

$$P_{it} = \frac{e^{x_{it}b}}{\sum_{i=1}^{N} e^{x_{it}b}}$$

The term $X_{it}b$ is a linear combination of the independent variables x_1 through x_n[2]—including trip cost, household, and site variables— and their coefficients b_1 through b_n. We applied multinomial logit estimation to this data set to derive coefficients providing the maximum likelihood that the site with the highest calculated probability is the site the angler actually chose.

Trip cost is a key variable in the site choice equation; we test several specifications of trip cost for each site choice equation. The ***structural*** trip cost specification includes all costs of the trip—including those associated with travel and on site time—as endogenous variables. The ***exogenous*** specification includes time costs as an exogenous part of total cost. The ***reduced*** specification excludes the on-site time portion of costs (because it considers on-site time as a benefit rather than a cost) but includes the travel time costs for those who could have worked.

[2] N here is the number of different explanatory variables.

Participation Equation

We stated above that when deciding whether or not to fish, anglers have expectations about the costs they are likely to incur and the fishing quality at all their possible site choices. In our model, this information about fishing opportunities and costs is expressed by

$$I = \ln\left[\sum e^{x_{it} b}\right].$$

This term, known as the ***inclusive value,*** is the log of the denominator of the conditional probability expression. It is an index of fishing quality across all sites in week t. The inclusive value is one of the independent variables in explaining participation decisions. We also used household variables (such as boat ownership, income, and skill) and weather variables to explain participation. Site-specific variables are not independent variables for explaining participation, since the angler can consider all sites when deciding whether or not to fish, and because the effect of site variables is already expressed in the inclusive value.

We tested several different specification of the inclusive value to identify the best fit for each participation equation: structural, reduced and exogenous—corresponding to whether the total cost variable in the site choice equation was specified as structural, reduced, or exogenous.

We calculated the inclusive value for each angler household each week they could have taken trips (i.e., every week). The data set for estimating the participation equation is described in Table C-10.

Table C-10. Data Structure for Participation Estimation

Household Number	Week	Did HH Fish this week?	Inclusive Value (I_t)	HH Variables	Weather Variables
1	1	No	estimated by equations	as reported	matched in for site
1	2	Yes	estimated by equations	as reported	matched in for site
1	3	Yes	estimated by equations	as reported	matched in for site
1	4	no	estimated by equations	as reported	matched in for site
1	5	Yes	estimated by equations	as reported	matched in for site
1	6	no	estimated by equations	as reported	matched in for site
1	7	no	estimated by equations	as reported	matched in for site
1	8	Yes	estimated by equations	as reported	matched in for site
.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.	.	.
1	27	no	estimated by equations	as reported	matched in for site
2	1	Yes	estimated by equations	as reported	matched in for site
2	2	Yes	estimated by equations	as reported	matched in for site
2	3	Yes	estimated by equations	as reported	matched in for site
.	.	.	.	.	.
.	.	.	.	.	.
2	27	no	estimated by equations	as reported	matched in for site

...and so on for all angling households

We estimated the probability that an angler makes at least one fishing trip in week t (P_t) as:

$$P_t = \frac{e^{I_t \lambda + W_t b}}{\sum_{t=1}^{T} e^{I_t \lambda + W_t b}}$$

The term I_t is the ***inclusive value*** from the site choice equation evaluated in week t, and λ is its coefficient. The term $W_t b$ is a linear combination of the independent variables—household and weather characteristics in week t—and their coefficients. Again, we used a logit estimation to model the coefficient values.

The probability that an angler makes a trip to a given site in a given week is the product of the two probabilities:

$P_{it}=P_{i|t} * P_t$

Extrapolating to the total angler population, the number of trips to site i in week t is calculated by multiplying this joint probability by the number of resident anglers in the region represented.

Southcentral Angler Model

The Southcentral travel cost model represents summer season fishing activities by angler households resident in the Anchorage, MatSu or Kenai Borough areas. We analyzed the demand for sport fishing by Southcentral residents using weekly data of 1298 sport fishing trips reported by 251 anglers over 27 weeks, from April 29 to November 3. Weeks were defined from Thursday to Wednesday to include a weekend. Table C-11 shows the distribution of sample Southcentral resident summer trips by week. Table C-12 shows the distribution by origin.

Table C-11. Distribution of Sport Fishing Trips

Week	Date	Number of Trips
1	April 29 - May 5	10
2	May 6 - May 12	27
3	May 13 - May 19	37
4	May 20 - May 26	40
5	May 27 - June 2	84
6	June 3 - June 9	82
7	June 10 - June 16	95
8	June 17 - June 23	99
9	June 24 - June 30	92
10	July 1 - July 7	71
11	July 8 - July 14	82
12	July 15 - July 21	101
13	July 22 - July 28	92
14	July 29 - August 4	73
15	August 5 - August 11	77
16	August 12 - August 18	65
17	August 19 - August 25	57
18	August 26 - September 1	44
19	September 2 - September 8	26
20	September 9 - September 15	15
21	September 16 - September 22	8
22	September 23 - September 29	4
23	September 30 - October 6	4
24	October 7 - October 13	3
25	October 14 - October 20	6
26	October 21 - October 27	3
27	October 28 - November 3	1/total=1298

Table C-12. Origins of Sport Fishing Trips

Origin	Number of Respondents	Number of Trips
Anchorage	115	537
Anchor Point	3	10
Big Lake	4	23
Chugiak	3	21
Eagle River	13	70
Homer	12	43
Hope	1	2
Houston	1	5
Kenai	14	132
Nikiski	1	2
Nikolaevsk	1	4
Ninilchik	1	2
Palmer	19	120
Seward	3	9
Soldotna	20	151
Sterling	4	15
Tyonek	3	7
Wasilla	30	143
Willow	1/total = 251	2/total = 1298

SITES MODELED

To feasibly estimate the site choice equation, we had to consolidate the hundreds of sport fisheries in the region into a small number of exhaustive and mutually exclusive alternatives. The guidelines we used were: to keep the most popular sites in each management area narrowly defined, so that site characteristics could be meaningfully identified; to cluster sites geographically and by primary means of access (plane, boat, or car) so that travel costs could be meaningfully assigned to the group; and to group sites by type of fishing. We aggregated all the fishing sites into 30 sites, listed in Table C-13. The set of sites available to anglers each week varies somewhat, since some weeks some sites are closed.

Table C-13. Sport Fishing Sites Available to Southcentral Anglers

Aggregated Sites	Type of Fishery	Primary Access Mode
1. Willow Creek	fresh	vehicle
2. Other Area M (Willow to Cantwell) lakes and streams	fresh	vehicle
3. Little Susitna River	fresh	vehicle
4. Wasilla Creek (Rabbit Slough)	fresh	vehicle
5. Kepler Lake complex and Wasilla area lakes	fresh	vehicle
6. Fish Creek	personal use dipnet	vehicle
7. Big lake and tributaries	fresh	vehicle
8. Other Mat Su (Area K) lakes & streams	fresh	vehicle
9. Ship Creek	fresh	vehicle
10. Other Anchorage (Area L) lakes and streams	fresh	vehicle
11. Deshka River (Kroto Creek)	fresh	boat
12. Other Area N (W. Susitna and W. Cook Inlet) lakes and streams	fresh	boat, plane
13. Saltwater of Areas K - N.	salt	vehicle
14. Anchor River and Whiskey Gulch	salt	vehicle, boat
15. Resurrection Bay	salt	vehicle, boat
16. Kachemak Bay	salt	vehicle
17. Homer Spit (shoreline)	salt	vehicle
18. Kenai Peninsula other saltwater	salt	vehicle, boat
19. Personal use dipnet	personal use dipnet	vehicle, boat
20. Upper Kenai River	fresh	vehicle
21. Lower Kenai River	fresh	vehicle
22. Russian River	fresh	vehicle
23. Kasilof River	fresh	vehicle
24. Nichick to Anchor Rivers	fresh	vehicle
25. Swanson River and Canoe Route and Swan Lakes Canoe Route	fresh	vehicle
26. North Kenai lakes and streams	fresh	vehicle
27. Kenai Peninsula other lakes and streams	fresh	vehicle, boat
28. Management Areas I and J (Glennallen), fresh water	fresh	vehicle
29. Management Areas I and J (PWS), salt water	fresh	vehicle
30. Other Alaska	fresh or salt	vehicle

On-Site Fishing Time

For Southcentral anglers' on-site time, we estimated the regression equation reported in C-14, using Southcentral resident trip data only.

Table C-14. Regression Results for On-Site Fishing Time

Variable	Definition	Coefficient	Standard Error	t-ratio	Prob
lfhours	DEPENDENT: Estimated total person hours on-site				
Constant		-2.1985	2.558	-0.86	0.39
ItitcstR	Cost of trip to site excluding on-site time effects; calculated using cost equations omitting on-site time term	-0.030224	0.01127	-2.682	0.0073
Hrs_trip	hours reported traveling to a site	0.4296	0.2008	2.14	0.03234
Othearn	1 if angler could have earned money elsewhere instead of taking the fishing trip, otherwise 0	-1.5076	0.7182	-2.099	0.0358
Npeople	number of household members on a trip	0.038748	0.1596	0.243	0.8082
Trout	1 if angler reported trout as a target species, otherwise 0	-0.00005399	0.00002112	-2.557	0.0106
SP6	Annual Dolly Varden catch at site	-0.00001599	0.00001682	-0.951	0.3417
Kingdf	Annual king salmon catch divided by total days fished at site; 0 during weeks kings not available	-1.107	2.672	-0.414	0.6786
Sockdf	Annual red salmon catch divided by total days fished at site; 0 during weeks reds not available	0.014745	0.9087	0.016	0.9871
SP1Rept	Weekly report of King fishing quality in local newspapers	0.055677	0.2082	0.267	0.7891
Silver	Annual silver salmon catch at site; 0 in weeks silver salmon not available	0.000028823	0.00003359	0.858	0.3909
SP3	Annual red salmon catch	0.000001508	0.00001206	0.125	0.9005
KSonar	Lower Kenai Sonar count fore red salmon in July & August; applied only to Kenai & Russian R sites	0.0013324	0.006357	0.210	0.834
PinkChum	Sum of annual pink and chum salmon catch at site; 0 in weeks these salmon not available	-0.00001707	0.0001456	-0.117	0.9066
Halipeak	1 for Kenai Peninsula marine sites, all weeks; otherwise 0	1.5126	1.678	0.902	0.3673
RedBag	Bag limit for red salmon, by site and week	0.81069	0.3838	2.112	0.0347
Troutbag	Bag limit for trout, by site and week	0.47331	0.2812	1.683	0.0923
Campgr	1 if camp ground is available near the site, otherwise 0	0.15548	1.239	0.126	0.9001
Derby	1 if there is a fishing derby at site that week, otherwise 0	8.3681	2.137	3.915	0.0001
FuelWat	1 if fuel or potable water available at site, otherwise 0	6.2161	1.584	3.924	0.0001
Pcabin	1 if public cabin is available near the site, otherwise 0	-3.9117	1.533	-2.551	0.0107
Crowding	1 if a site rated by ADF&G biologist as crowded that week, otherwise 0	0.70211	1.122	0.626	0.5316
SewDby	1 Resurrection Bay during Seward Silver Salmon Derby, otherwise 0	9.6564	2.539	3.804	0.0001
Sigma		10.888	0.2444	44.545	0.0000

N=994
Log-likelihood= -3254.3
Restricted (Slopes=0) Log-L= -3365.9
Significance Level= 0

Site Choice Equation

After estimating on-site fishing time and trip expenditures, we were able to develop the site choice equation. The site-choice equation estimates the probability that an angler selects the ith site in week t; for i=1 to 30 and t=1 to 27. To estimate this equation we tried many variables, including weekly fishing quality, annual fishing quality, annual catch, peak fishing times, and bag limits for most of the species listed earlier, as well as household-site interactions and site characteristics. We report below only the variables that appear in our final equation.

We used a discrete choice model:

$$P_{it} = \frac{e^{x_{it}b}}{\sum_{i=1}^{30} e^{x_{it}b}}$$

where, $X_{it}b$— a linear combination of variables (X_{it}) and coefficients (b)—explain the probability (P_{it}) that an angler selects the site i in week t ; i=1 to 30 and t=1 to 27.

We estimated this equation using maximum likelihood techniques, testing a large number of variables. We tested weekly and annual fishing quality, annual catch, peak fishing times, household-site interactions, site characteristics, and bag limits. We report below only the variables that appear in our final equation. The linear combination of the selected explanatory variables is :

$$\begin{aligned} Xb_{it} = {} & b_1 Tripcost_i + b_2 Nhtravl_i + b_3 Nifhours_i + b_4 Yifhours_i + b_5 Trout_i + b_6 Dolly_i \\ & + b_7 Kingdf_i + b_8 Sockdf_i + b_9 Kingrept_{it} + b_{10} Silver_i \\ & + b_{11} Sockeye_i + b_{12} Ksonar_{it} + b_{13} Pinkchum_i + b_{14} Halipeak_{it} + b_{15} Troutbag_{it} \\ & + b_{16} Campgr_i + b_{17} Crowding_i + b_{18} Sewdby_i \end{aligned}$$

The estimation results reported in Table C-15 are generally plausible. A positive sign on the coefficient for an explanatory variable means that the higher the value of the variable, the more likely it is that an angler will select site i over the alternative sites. One the other hand, a negative sign means the higher the value of the variable, the less likely an angler will choose site i.

Table C-15. Coefficient Estimates for the Site Choice Equation

Variable	Coefficient	Stan. Error.	t-ratio
Tripcost	-0.0035016	0.0004773	-7.206
Travtime	-0.092842	0.01196	-7.761
Nifhours	-0.16922	0.04320	-3.917
Yifhours	-0.010504	0.05283	-0.199
Trout	0.0000050369	0.000001895	2.658
Dolly	0.0000078114	0.000001549	5.043
Kingdf	1.5537	0.2200	7.063
Sockdf	0.50876	0.07105	7.160
Kingrept	0.10003	0.01793	5.578
Silver	0.000018265	0.000002842	6.427
Sockeye	0.0000047022	0.000001064	4.421
Ksonar	0.0020336	0.0006783	2.998
Pinkchum	0.000030181	0.00001386	2.177
Halipeak	1.3449	0.1322	10.171
Troutbag	0.15562	0.01854	8.392
Campgr	1.7246	0.9522	1.811
Crowding	-1.7190	1.020	-1.685
Sewdby	1.1473	0.3114	3.684

N = 38730
Log-likelihood = -3806.3
Restricted (Slopes=0) = -4390.9
Chi-Squared (15) = 1169.2
Significance Level = 0.32173E-13

Definition of Variables for Table C-15

$Tripcost_i$ (for those who could have worked): trip cost to get to site `i`: fuel cost + food cost + bait cost + lodging cost + guide cost + vehicle depreciation cost + lost wage for travel and on-site time.

$Tripcost_i$ (for those who could not have worked): trip cost to get to site `i`: fuel cost + other trip expenditures + vehicle depreciation cost

$Travtime_{i:}$ travel time to get to site `i` for those who could have worked

$Nifhours_i$: on-site fishing hours by anglers who could not have worked.

$Yifhours_i$: on-site fishing hours by anglers who could have worked.

$Trout_i$: annual total catch for trout at site `i` from the ADF&G statewide harvest survey.

$Dolly_i$: annual total catch for Dolly Varden at site `i` from the ADF&G statewide sport harvest survey.

$Kingdf_{i:}$ annual fishing quality for king salmon at site `i`, which is total annual catch for king salmon divided by days of fishing by anglers at the `i`th site.

$Sockdf_i$: annual fishing quality for sockeye salmon at the `i`th site, which is total annual catch for sockeye salmon divided by days of fishing by anglers at the `i`th site.

$Kingrept_{it}$: fishing quality for king salmon at the `i`th site per week published in the `Anchorage Daily News.` The data was coded 0 to 6. Zero indicates closed or no report; six indicates best fishing quality.

$Silver_i$: annual total catch for silver salmon at the `i`th site from the ADF&G statewide sport harvest survey.

$Sockeye_i$: annual total catch for sockeye salmon at the `i`th site from the ADF&G statewide sport harvest survey.

$Ksonar_{it}$: The sonar count in the Kenai River, measured near the Soldotna Bridge.

$PinkChum_i$: annual total catch for pink or chum salmon at the `i`th site from the ADF&G statewide sport harvest survey.

$Halipeak_{it}$: Halipeak=1 if Halibut is peak available at the `i`th site in week `t`, otherwise Halipeak=0. This data was developed from the ADF&G brochures.

$Troutbag_{it:}$ Bag limit for trout at the `i`th site in week `t`.

$Campgr_i$: Campgr=1 if a campground is available, otherwise campgr=0.

Crowding $_{it}$: Crowding=1 if the `i`th site is crowded in week `t`, otherwise Crowding=0.

Sewdbyit: Sewdby=1 if Seward Silver Salmon Derby is held in week t, otherwise Sewdby=0.

Fishing quality of course influences anglers' decisions about where to fish. Anglers are more likely to go to sites with high catch rates, and more likely to go fishing in weeks when catch rates are high. Fishing quality at each site can be indicated by several variables. For instance, the total annual catch for each major species at each site is one measure of fishing quality—but it doesn't show weekly variation in fishing quality at the same site over the season. Another indicator of fishing quality is the total catch per day at each site—which is the total annual catch divided by days fished. This indicator can give anglers more information about their individual chances of catching fish. A better sign of fishing quality—that shows weekly variation across sites—is the weekly information published in the `Anchorage Daily News` and weekly peak fishing time data from ADF&G brochures.

In our estimation results, all the coefficients of fishing quality variables have positive signs. The annual total catches for trout `(Trout),` Dolly Varden `(Dolly),` silver salmon `(Silver),` sockeye salmon `(Sockeye),` and pink or chum salmon `(Pinkchum)` at each site are factors that Southcentral anglers consider when deciding where to fish. The estimation results show that anglers prefer to fish at sites with high annual catches for major species.

The factors most affecting anglers' choices about where to fish for king salmon are catch per angler day `(Kingdf)` and published weekly fishing quality information `(Kingrept).`

Many Southcentral anglers like to fish for sockeye in the Kenai and Russian Rivers. The model shows that anglers consider the annual total catch `(Sockeye),` the catch per angler day `(Sockdf),` and the sonar count `(Ksonar)` when they're deciding where to fish.

Anglers are more likely to go sockeye fishing at sites with high catch rates and to go fishing in weeks when the catch rate is high.

Anglers are particularly interested in fishing for halibut when halibut fishing is reported to be at its peak (Halipeak). The model indicates that total annual catch of halibut and catch per angler day are less important considerations.

Some regulations and site characteristics also affect anglers' decisions about where to go fishing. A higher bag limit for trout (Troutbag) and availability of a campground (Campgr) attract more anglers to a site. The Seward Silver Salmon Derby (Sewdby) in late August draws many anglers. The model shows that anglers are less likely to go to a fishing site if it is crowded (Crowded).

Many regulations and site characteristics we tested did not seem to be relevant to anglers' decisions about where to fish. In general, fishing quality seems to be the biggest consideration.

When anglers choose fishing sites, costs as well as benefits affect their decisions. Anglers won't travel to a site if it is more expensive than other sites with the same fishing quality. Travel costs include much more than just fuel costs. Anglers may need to pay for food, bait, lodging, or guide costs. In addition, capital depreciation and maintenance costs of vehicles anglers use to get to fishing sites should be included as part of travel costs. Finally, for those anglers who could have worked during their travel and on-site fishing time, we have to consider lost earnings. Therefore, the total travel cost is the sum of fuel costs, other trip expenditures, vehicle depreciation and maintenance costs, and lost earnings for those who could have worked. For those who didn't have the option of working instead of fishing, the total travel cost is the sum of fuel costs, other trip expenditures, and vehicle depreciation and maintenance costs only. The model results show that travel costs (Tripcost), travel time (Travtime), and on-site time (Nifhours and Yifhours) are important in explaining anglers' decisions about where to fish. The signs of all these variables are negative—which means anglers are willing to reduce their travel costs and shorten their travel and on-site time.

We tested many more variables than those included in the site-choice equation. In particular, we tested variables for household-site interactions— such as ownership of a cabin near a site—and variables such as wind, temperature, and tide. None showed a significant relationship to angler's site-choice decisions.

Overall, our site-choice equation for Southcentral anglers indicates that among all the factors they consider when deciding where to go fishing, they are most influenced by fishing quality, availability of facilities, and travel costs.

Table C-16: Regression Results for the Southcentral Site Choice Equation

Variable	Definition	Coefficient	Stan. Error.	t-ratio
Tripcost	trip cost for a trip to the site, including lost wage for those who could have worked	-0.0035016	0.0004773	-7.206
Travtime	travel time to get to the site for those who could have worked	-0.092842	0.01196	-7.761
Nifhours	travel time to get to the site for those who could have worked	-0.16922	0.04320	-3.917
Yifhours	on-site fishing hours by anglers who could have worked	-0.010504	0.05283	-0.199
Trout	annual total catch for trout at the site	0.000005037	0.000001895	2.658
Dolly	annual total catch for dolly at the site	0.000007811	0.000001549	5.043
Kingdf	Annual king salmon catch divided by total days fished at site; 0 in weeks kings are not available	1.5537	0.2200	7.063
Sockdf	Annual red salmon catch divided by total days fished at site; 0 in weeks reds are not available	0.50876	0.07105	7.160
Kingrept	Weekly king fishing quality at site, as reported by newspapers	0.10003	0.01793	5.578
Silver	annual total catch for silver salmon at the site	0.000018265	0.000002842	6.427
Sockeye	annual total catch for red salmon at the site	0.000004702	0.000001064	4.421
Ksonar	Weekly sonar count on lower Kenai River, for weeks of late run reds only	0.0020336	0.0006783	2.998
Pinkchum	Sum of annual total catch for pinks and chum salmon at the site	0.000030181	0.00001386	2.177
Halipeak	1 during weeks rated as peak for halibut fishing at site, 0 otherwise	1.3449	0.1322	10.171
Troutbag	Bag limit for trout at site during week I	0.15562	0.01854	8.392
Campgr	1 if campground available near site, otherwise 0	1.7246	0.9522	1.811
Crowding	1 at site-week combinations considered crowded, otherwise 0	-1.7190	1.020	-1.685
Sewdby	1 for Resurrection Bay during Seward salmon and halibut derbies, otherwise 0	1.1473	0.3114	3.684

N = 38730 (1291 trips x 30 sites)
Log-likelihood = -3806.3
Restricted (Slopes=0) = -4390.9
Chi-Squared (15) = 1169.2
Significance Level = 0.32173E-13

Participation Equation

To improve the participation model fit, we divided our sample of Southcentral anglers into two groups—frequent anglers and infrequent anglers. We classified as frequent anglers those households that in pre-season (April) interviews said they expected to take six or more fishing trips during the summer of 1993. Infrequent anglers were those who said they expected to take fewer than six fishing trips. We believe that (1) these two groups respond differently to our explanatory variables, and (2) anglers who fish less than once per month are unlikely to fish in any given week; it's more appropriate to model monthly participation for this group. We used a multinomial logit model to estimate the frequent anglers' participation decisions per week and a binomial logit model to estimate the infrequent angers' participation decisions per month.

FREQUENT ANGLERS

We modeled the participation decisions of frequent anglers each week. The frequent anglers' weekly participation equation estimates the probabilities that a frequent angler will make zero, one, or two or more trips in week t. The equation was estimated on 212 household for 27 weeks, or 5,716 household-weeks. The functional form of the weekly participation equation is as follows:

$$\pi_{tn} = \frac{e^{W_{tn}}}{e^{W_{t0}} + e^{W_{t1}} + e^{W_{r2}}}, \text{ for n= 0, 1, } 2^{+}$$

where,
π_{tn} = the probability that an angler makes n trips or trips in week t, where n=0, 1, or 2^+ trips

W_{tn} = the linear combination of coefficients and explanatory variables, where n indicates that we model different sets of coefficients for each of the alternatives. The coefficients for making 0 trips are 0. Therefore,

$W_{t0} = 0$, and $e^{W_{t0}} = 1$.

And the equation above becomes:

$$\pi_{t1} = \frac{e^{W_{t1}}}{1 + e^{W_{t1}} + e^{W_{r2}}} \quad \text{and} \quad \pi_{t2} = \frac{e^{W_{t2}}}{1 + e^{W_{t1}} + e^{W_{r2}}}$$

The expected number of trips by frequent angler households in a given week is the sum of:

π_1 (probability of a household taking one trip) *
43,892 (the number of frequent angler households) plus
π_2 (the probability of a household taking two or more trips) *
43,892 (the number of frequent angler households) *
3.28 (the mean number of trips / week by households taking two or more trips in a week

The probability of a household deciding not to fish in any given week is the residual: $1-\pi_1-\pi_2$.

Table C-17. Participation Equation for Southcentral Anglers

Variable	Infrequent Anglers	Frequent Anglers	
	For taking one or more trips in week t	For taking one trip in week t	For taking two or more trips in week t
Constant	-10.221	-9.6242	-15.762
	(-13.476)	(-13.431)	(-10.588)
Incl	0.53587	0.14882	0.51043
	(4.188)	(1.418)	(2.892)
Boat	0.55459	-0.044883	0.42022
	(4.934)	(-0.537)	(3.143)
Skill	0.20774	0.50472	0.60425
	(1.842)	(5.281)	(3.779)
Many	0.27975	0.32269	0.48774
	(2.280)	(3.802)	(3.651)
Anctemp	0.055006	0.074563	0.097428
	(5.260)	(8.922)	(6.759)
Camper	0.41598		
	(2.200)		
Daylight	0.18585		
	(7.449)		
Avgearn		-0.00011643	-0.0015336
		(-0.943)	(-3.700)
Avgreasn		0.010937	0.022620
		(5.266)	(5.634)
Tg40_1		0.27477	0.34551
		(3.849)	(2.022)
Wind20		-0.19915	-0.30144
		(-2.882)	(-2.806)
Pg10_1		-0.16099	-0.12509
		(-4.731)	(-2.363)
Winter		0.54778	0.35736
		(6.408)	(2.595)
Trips92		0.0011726	0.0076190
		(1.017)	(6.122)
Observations	1,504		
Log-likelihood	-1044.7	-:	
Initial (Slopes=0)	-1248.3	-:	
Chi-Squared	407.3		

Definition of Variables in Table C-17

Incl: Inclusive value that represents overall fishing quality index in week t.

Boat: Boat=1 if an angler owns a boat, otherwise Boat=0.

Skill: Skill=1 if an angler is experienced, otherwise Skill=0.

Many: Many=1 if the number of anglers in a household exceeds 2, otherwise Many=0.

$Anctemp_t$: the average temperature in Anchorage in week t.

Camper: camper ownership

Daylight:	number of daylight hours in Anchorage
Avgearn:	the amount of money an angler could have earned if he hadn't taken the fishing trip.
Avgreasn:	the percentage of a given trip attributable to fishing activities.
$Tg40\_1_t$:	the number of days in week t when the temperature exceeds 40 degrees
$Wind20_t$:	the number of days in week t with wind speeds exceeding 20.
Pg10_1:	number of days in the week with precipitation less than .10 inches
Winter:	Winter=1 if an angler took at least one fishing trip in week t, otherwise Winter=0.
Trips92:	the number of fishing trips reported by an angler in 1992.

Table C-17 shows the results of participation equation estimations. The most important variables in predicting participation for frequent anglers are the temperature variables (Tg40_1t and Anctemp). The model shows—as we would expect—that frequent anglers are more likely to go fishing in warmer weather. Precipitation (Pg10_1) and high winds (Wind20) discourage fishing. Overall fishing quality in week t is also important. An angler is more likely to make a fishing trip or several trips when the quality index (Incst) is high. On average, anglers for whom fishing is the primary purpose of their trips (Avgreasn) are more likely to participate in any given week than anglers who made the trip mainly for some other reason but who also went fishing. And on average, anglers who could have worked instead of fishing (Avgearn) are less likely to make one or more trips than anglers who didn't have the option of working.

Other variables that affect the decision to go fishing in any given week include personal characteristics and past fishing activity. Not surprisingly, anglers who own boats (Boat=1) make more trips than ones without boats. Anglers with more fishing skill (Skill=1) make more trips than unskilled anglers. The more anglers in a household, the more fishing trips the household makes (Many). The model shows that an angler is more likely to go fishing in week t if he took one or more trips in the winter (Winter=1). And the more fishing trips an angler made in 1992 (Trips92), then the more trips likely the angler is to make one or more trips in week t in 1993.

Our chosen independent variables are better at explaining the probability of more than one trip than the probability of exactly one trip. Only the precipitation coefficient has a larger value in the one-trip equation, and fishing quality (the inclusive value), boat ownership, the potential for earning money instead of fishing and the number of trips taken in 1992 all have a several times greater effect on the probability of multiple trips than of one trip. Three of the variables that are significant predictors for taking more than one trip in a week are insignificant for taking exactly one trip. Boat ownership (Boat) makes an angler more likely to fish more than once a week, but makes no difference on the decision to participate just once. Anglers with paid work (Avgearn) are neither discouraged nor encouraged from fishing once, but are significantly less likely to fish two or more times in a week. The number of fishing trips taken in 1992 (Trips92) helps predict the probability of taking multiple trips in week t in 1993, but has no apparent impact on the decision to take one trip in week t. The

inclusive value is a significant predictor for multiple trips during the week, but for just one trip per week it is not as strong a predictor.

INFREQUENT ANGLERS

For infrequent angler households, we model the probability that a household will make zero or one or more trips in month k. The data set is still weekly; in a month where the household makes at least one trip, every week in that month will indicate that the household fished that month. The equation was estimated on 80 households for 27 weeks, or 2,078 household weeks. The functional form of this participation equation is:

$$\pi_{kn} = \frac{e^{W_{kn}}}{e^{W_{k0}} + e^{W_{k1}}}, \text{ n= 0, } 1^{+}$$

where,

π_{kn} = the probability that an angler makes one or more trips in month k, n=0, 1^{+}
W_{kn} = the linear combination of coefficients and variables.
As above, the coefficients for the probability of zero trips are zero, so this equation reduces to:

$$\pi_{k1} = \frac{e^{W_{k1}}}{1 + e^{W_{k1}}}$$, the probability of fishing at least one trip in the month;

and $1-\pi_{k1}$, the probability of not fishing that month.

And the **expected number of trips in week t** =
$-\pi_{k1}$ (the probability of taking at least one trip) *
16,785 (the number of Southcentral Casual Households) *
2.08 (the mean reported trips per month for those who took trips)
4 or 5 (the number of weeks in the month).

The variables that predict how often an infrequent angler will go fishing differ from those that predict how often a frequent angler will go fishing. The fishing quality index (Incs), boat ownership (Boat), fishing skill (Skill), and the average temperature (Anctemp) are still important predictors, but the other weather and fishing history variables, angler earnings, and reasons for the trip do not seem to predict fishing trips for households that make only a few trips all season. Two new variables are significant: camper ownership (Camper) and the number of daylight hours (Daylight).

Like frequent anglers, infrequent anglers are influenced by weather. The average temperature (Anctemp) and the average length of a day (Daylight) are quite important in explaining the infrequent angler's decision to go fishing. The model shows that infrequent anglers fish more often when the temperature is high and the daylight is long. An infrequent angler is more likely to make a fishing trip when the overall fishing quality is good. The regression results indicate that anglers who own boats (Boat) or campers (Camper) make more trips than

anglers without boats or campers. Anglers with higher levels of fishing skills (Skill) make more trips than anglers with lower levels of fishing skills. The more anglers in a household (Many), the more fishing trips the household makes.

Interior Angler Model

The Interior travel cost model represents summer season fishing among angler households in the Fairbanks North Star and Denali boroughs, the Valdez /Cordova/Whittier and Southeast Fairbanks census areas, and the City of Nenana. We analyzed the demand for sport fishing among Interior residents using weekly data from 395 sport fishing trips reported by 121 angler households over 27 weeks, from April 29 to November 3.

ON-SITE TIME

We used the same equation to model on-site time for resident anglers in Interior Alaska and in Southeast and Kodiak, discussed in later sections. This equation is simpler than the one for resident anglers in Southcentral. From the regression reported in Table C-2 (page C-9) we chose variables that met three criteria: they were highly significant, they varied from site to site, and they were likely to have policy implications. We used only those variables, reported below, which are sufficient to model the change in on-site time. To ensure we didn't bias our expenditure calculations, we applied a constant term for each site. The constant was calculated so that the mean on-site time calculated by the equation was equal to the mean reported on-site time for each site.

Table C-18. On Site Time Equation for Interior, Southeast, And Kodiak Anglers

Abbreviated On-Site Time Equation for Interior Alaska Resident Anglers				
Variable	Definition	Coefficient	Std Error	T-Statistic
Peakking	1 during peak weeks for king salmon at site, otherwise 0	1.3823	0.5532	2.499
Peakmax1	1 during weeks rated as peak for species caught most (excluding king salmon) at site, otherwise 0	1.0929	0.5867	1.863
Kingbag	Bag limit for king salmon	1.6203	0.5982	2.709
Constant	Calculated for each site to calibrate to mean site time			

Interior Fishing Sites

We defined 19 fishing sites for Interior Alaska .

Table C-19. Interior Fishing Sites

Code	Site	Type of Fishery	Primary Access Mode
917	Copper River Dipnet	Fresh (Dipnet)	Car
951	Gulkana River	Fresh	Car
956	Other Fresh Zone 9	Fresh	Car
1001	Valdez Arm	Salt	Car
1055	Other PWS Salt	Salt	Boat
1056	Zone 10 Fresh	Fresh	Car
1459	Zones 11-14 (fresh)	Fresh	Car
1559	Zone 15	Fresh or Salt	Car
1656	Kodiak Salt	Salt	Plane, Boat
2003	Piledriver Slough	Fresh	Car
2005	Chatanika River	Fresh	Car
2006	Salcha River Frsh	Fresh	Car
2007	Delta Clearwater Riv	Fresh	Car
2026	Tangle Lakes, River	Fresh	Car
2027	Chena Lake Frsh	Fresh	Car
2051	Chena River	Fresh	Car
2052	Birch, Quartz Lakes	Fresh	Car
2055	Other Z 20 Fresh	Fresh	Car
5059	Other Alaska	Fresh or Salt	Plane, Boat

INTERIOR SITE CHOICE EQUATION

We chose the reduced form of trip cost, using the marginal wage estimate for lost wages.

Table C-20. Interior Site Choice Equation

Variable	Definition	Coefficient	Std Err	t-Statistic	Prob
RTOTCST1	Trip Cost excluding costs related to on-site time	-0.00128772	0.0003940	-3.268	0.0011
NHTRAVL	Travel time for anglers who could not have earned money	-0.063215	0.008630	-7.325	0.0000
KINGQUAL	King catch rate * availability (0,1,2) * bag limit	1.2742	0.3763	3.386	0.0007
AHALDF	Halibut catch rate * availability (0,1,2)	1.0161	0.3499	2.904	0.0037
REDRPT	Red fishing quality as reported by newspaper	0.13619	0.03022	4.507	0.0000
SILVERDF	Silver catch rate when open and available, otherwise 0	1.8866	0.4973	3.793	0.0001
BOATRAMP	1 if boat ramp at site, otherwise 0	1.3136	0.1560	8.418	0.0000
CMPGRND	1 if camp ground at site, otherwise 0	1.1734	0.1683	6.972	0.0000
WHFSHDF	Whitefish catch rate if open and available; otherwise 0.	0.58841	0.2013	2.923	0.0035

INTERIOR PARTICIPATION EQUATION

We had fewer reporting households in Interior than in Southcentral Alaska—121 as compared with almost 300. There weren't enough Interior households to allow us to estimate frequent and infrequent anglers separately. Although we tested weekly participation equations, the monthly equation provided a better fit.

Table C-21. Interior Participation Equation

Variable	Definition*	Coefficient	Std Err	t-Statistic
Constant		-9.8884	1.762	-5.61
Inclusive Value		0.90471	0.392	2.308
Daylight		0.29799	0.03346	8.906
Skill		0.28328	0.1758	1.612
Avgearn		0.000303	0.000137	2.208

*Definitions the same as listed for Table C-17.

Southeast Angler Model

SOUTHEAST FISHING SITES

In Southeast, fishing is usually more local than in Southcentral or Interior. Traveling any distance requires a boat (which is time-consuming and expensive) or a plane (which is fast but even more expensive). Because most Southeast anglers fish locally, and there are many fishing sites, we structured the site choice equation with two sets of site choices. Northern Southeast anglers (those living in the Juneau, Sitka, Haines, and Skagway areas) had a choice of 20 sites, while Southern Southeast anglers (Petersburg, Wrangell, Ketchikan and Prince of Wales Island areas) had a choice of 21 sites.

Table C-22. Southeast Sites

Code	Name	Code	Name
21	Southern Southeast Sites	20	Northern Southeast Sites
101	East, West, Behm Can	402	Starrigavan Bay Salt
102	Clarence Strait Salt	404	Other Sitka Sound
103	Revillagigedo Channe	405	Other Area 4 Salt
104	Tongass Narrows Salt	456	'Other Fresh Area 4'
105	Yes Bay	501	Doty Cove, Berners ayB
107	Mountain Point Salt	503	Mitchell Bay Salt Lagoon
108	Carrol Inlet Salt	504	Juneau Road System S
151	Ketchikan Area Road	505	Other Area 5 Salt
155	'Other Salt Area 1'	506	Juneau Road System F
156	'Other Fresh Area 1'	509	Lake Florence Frsh
255	'Area 2 Salt'	556	'Other Fresh Area 5'
256	'Area 2 Fresh'	601	Skagway Sun-Area Salt
301	Blind Slough Salt	602	Haines Sub-Area Salt
302	Rema Wrangell Narrow	656	Area 6 Fresh
303	Duncan Saltchuck, Ca	701	Icy Straits Salt
305	Frederick Sound Salt	703	Excursion Inlet Salt
306	Zimovia Strait	755	Other Salt Area 7
310	Petersburg Creek Frs	756	Fresh Rea 7
355	'Other Salt Area 3'	859	'Other Sites Area 8'
356	'Other Fresh Area 3'		
5059	All Other Alaska	5059	All Other Alaska

SOUTHEAST SITE CHOICE EQUATION

We estimate a single site choice equation for all Southeast anglers. The equation is based on 884 sport fishing trips reported by 148 angler households. As with the Interior equation, we used reduced form total cost, with lost wages estimated at the marginal (rather than average) rate. We estimated on-site time with the same three-term equation as for the Interior region (discussed earlier), with constant terms for each Southeast site.

Table C-23. Southeast Site Choice Equation

Variable	Definition	Coefficient	Std Error	T-Stat
RTOTCST1	Trip Cost excluding costs related to on-site time	-0.006262	0.0006037	-10.373
NHTRAVL	Travel time for anglers who could not have earned money	-0.10884	0.01043	-10.434
KINGdf	King catch rate	2.1677	0.3447	6.288
HALDF	Halibut catch rate	0.68777	0.2316	2.970
Sp1B	King Bag Limit	0.85827	0.1392	6.168
SP6Rate	Dolly Varden Creel Survey catch rate	1.1652	0.4598	2.534
BOATsite	1 if angler hh owns boat and site is saltwater, otherwise 0	1.0103	0.3059	3.302
Wind20S	If salt site, days in week winds exceeded 20 kn , otherwise 0	-0.85511	0.5869	-1.457
Salt	1 if salt water site, 0 if fresh	-0.90834	0.3493	-2.6
Sp2	Annual silver catch at site	0.0000072167	0.00000208	3.47

SOUTHEAST PARTICIPATION EQUATION

We were able to model Southeast anglers' participation on a weekly basis. The equation is based on 148 angler households fishing over 27 weeks. Hours of daylight was the strongest predictor of changes in fishing participation across time, followed by the inclusive value; both skill and the number of anglers in the household were important for predicting different participation rates across households.

Table C-24. Southeast Participation Equation

Variable	Definition	Coefficient	Std Error	T-Stat
Constant		-7.9632	0.5536	-13.12
INCR	Inclusive Value	0.39743	0.08668	4.585
Skill	0 if most experienced angler in HH is beginner, otherwise 1	0.52645	0.1115	4.720
Cabin	1 if hh owns a cabin near site; otherwise 0	1.5633	0.954	1.639
PG50_1	Number of days in week precipitation exceeds 0.5 inch	-0.18746	0.09309	-2.014
Daylight	Mean hours of daylight in Anchorage during week	0.17216	0.02011	8.559
Anglers	Number of anglers in HH	0.1432	0.02974	4.815
Avgearn	Dollars angler could have earned if working instead of fishing; Average across all summer trips for HH	0.000285	0.00028506	1.844

Kodiak Island Angler Model

To model Kodiak resident fishing, we had 247 trips reported by 18 angler households. The sample was too small to allow us to estimate a participation equation, so our model holds the number of fishing trips for Kodiak residents constant, allocating them across sites according to the probabilities estimated in the site choice equation.

We used only five sites in the site choice equation: the Buskin River (the closest and most popular freshwater site), Chiniak Bay (the closest and most popular saltwater site), other freshwater Kodiak sites, other saltwater Kodiak sites, and other Alaska fishing. Fishing is good everywhere on Kodiak Island; cost is a major factor in site choice. Its coefficient is about –0.007—slightly higher than Southeast's -0.006 and far higher than Interior's –0.001 or Southcentral's –0.003.

Table C-25. Kodiak Site Choice

Variable	Definition	Coefficient	Std Error	T-Stat
ITOTCSTR	Reduced form total cost	-0.00717	0.001011	-7.087
Grndfish	Groundfish catch	5.58E-05	.000001563	3.572
TROUTDF	Trout catch rate	4.2586	1.159	3.675

Other Southwest Alaska and AYK

Our survey contained few trips to the Southwest and Arctic/Yukon/Kuskokwim (AYK) and not enough variance in fishing destinations by origin to estimate site choice equations for the remainder of the state. The loss in economic value or net benefits represented by this omission is very small compared with the imprecision in estimates for the rest of the state.

Nonresident Models

The nonresident travel cost model represents year-round fishing in Alaska by angler households from outside Alaska. About 4,300 angler households—61 percent—responded to a mail survey we sent to 7,000 households in which at least one person had purchased a 1993 Alaska nonresident sport fishing license. Anglers provided information on 6,676 fishing trips. Unlike the resident survey, where we attempted to identify the week of the trip, for nonresidents we know only the month their trip to Alaska began. We assigned all their reported trips to that month, and constructed monthly (rather than weekly) site, species, and weather variables.

The majority of these anglers were visiting friends and relatives in Alaska. We believe that in most cases these nonresidents fished with their friends or relatives, and we have therefore already modeled their expenditures and economic benefits in our resident equations. We estimated nonresident site choice for the remaining 972 households that made 1,678 fishing trips with an average of 1.71 anglers and 2.60 days per trip.

We divided the anglers into three types and estimated separate models for each. ***Destination anglers*** we defined as those who:

- said the main purpose of their trip was fishing
- did not come on business or to visit friends
- would not have come if they couldn't have fished
- didn't use a private vehicle

The remaining nonresident anglers we classified as ***incidental*** and divided them by the reported origin of their trips:

Southeast Incidental: visitors to the Southeast panhandle

Southcentral-Interior Incidental: the remainder of the state, including Southcentral, Interior, and remote regions of Alaska.

Destination anglers were in the state an average of 9.8 days, of which they fished 7. Incidental anglers in Southeast were in the state an average of 15.2 days, of which they fished 2.3. Incidental anglers in the rest of the state fished about 6.4 days out of an average 28 days in the state. Southcentral incidental anglers were more likely to use a private vehicle (57 percent). Destination anglers reported higher levels of fishing skills. Destination anglers and Southeast incidental anglers were more likely to be on package tours, more likely to be on guided trips, and to have higher annual incomes on average than Southcentral and other anglers ($119,800 for destination anglers and $111,100 for Southeast incidental anglers, compared with $72,394 for Southcentral and other anglers).

Nonresident Cost Data

Determining the cost variable associated with each alternative fishing trip for nonresidents was problematic. Our mail survey, conducted months after the trips had taken place, did not elicit a consistent definition of a trip, consistent accounting of trip costs, or even accurate recall of place names. For the subtle and complex information we wanted, the surveys should

ideally have been conducted by telephone. Our efforts to estimate tobit equations (similar to those estimated for residents) explaining either components of cost or total costs failed—because zero reported costs did not mean zero costs; it meant that our survey questions did not elicit the information we wanted. In the end, to estimate trip costs for all anglers and all alternatives, we used a linear regression estimated from anglers who reported nonzero expenses. Even with this restricted domain, our regression explained less than a third of the variation in reported costs. The dependent variable was total trip-related costs per angler day. These included guide and charter expenses, lodging, bait, tackle, vehicle, and fish processing expenses. The independent variables included both site and angler characteristics. The equation and variable definitions are shown in Table C-26.

Table C-26. Nonresident Cost Equation

Variable	Definition	Coefficient
TRIPPAD	Guide and charter expenses, any included food and lodging, and bait, tackle and fish processing expenses, divided by angler days.	(Dependent Variable)
DESTANG	Coded 1 for destination anglers, 0 otherwise.	73.60
LINCOM	Log of income (in thousands).	48.95
LNANGL	Log of the number of anglers on the fishing trip.	-35.31
LNDAYS	Log of the number of days the fishing trip lasted.	-35.83
SITE258	Coded 1 for Prince of Wales Island salt water-- site of the Waterfall Bay Resort.	117.5
SITE1710	Coded 1 for the Brooks River-- site of the Brooks Camp Lodge in Katmai.	905.0
SITE1755	Coded 1 for other Area R fresh water-- several lodges are in the area.	162.1
KINGDF	Total 1992 king catch for the site divided by total angler days, set to 0 for weeks that king are not available or the fishery is closed.	97.93
HALDF	Total 1992 halibut catch for the site divided by total angler days, set to 0 for weeks that halibut are not available or the fishery is closed.	35.39
BTROUT	Bag limit for trout.	-4.9914
BHALIBUT	Bag limit for halibut.	-27.773

Using the previously developed matrix of road miles and air and boat hours, we estimated travel costs from the angler's origin within Alaska to the fishing site. We used Alaska residents' average vehicle miles per gallon or gallons per hour, plus gas prices at the trip origin. For destination anglers, we added commercial air fares from Seattle to their point of entry to Alaska to the travel costs for the first reported trip. We tested travel and other trip costs as two separate variables, and together as a single total cost variable. When entered separately, the travel costs had larger (negative) coefficients and were more significant than the other trip costs. For estimating the final equation, however, we used the combined total cost variable to produce one estimate of the marginal utility of income (b_1), to estimate net economic benefits.

Nonresident Site Data

We used the same site, species, and fishing quality data described earlier under Data Collection and Construction of Variables, but aggregated the variables by month to match the survey data.

Destination Anglers

There were 275 destination angler households reporting about 425 trips. We aggregated these trips into the 30 sites listed in Table C-27.

Table C-27. Fishing Sites and Trips for Destination Anglers

Site	Site Name	Trips
158	Ketchikan Area	20
255	Prince of Wales Area Fresh	4
258	Prince of Wales Area Salt	14
404	Sitka Sound	8
458	Other Sitka Area	16
555	Juneau Area Fresh	5
558	Juneau Area Salt	20
758	Glacier Bay	3
855	Yakutat Area Fresh	8
858	Yakutat Area Salt	4
955	Glennallen Area Fresh	6
1058	Prince William Sound	7
1255	Anchorage and Mat-Su Area Fresh	3
1355	E. Susitna Area Fresh	3
1459	W. Susitna Area	33
1501	Anchor River, Deep Ck. & Whiskey Gulch	7
1505	Kachemak Bay	29
1506	Resurrection Bay	9
1507	Lower Cook Inlet & Outer Gulf	22
1513	Kasilof River	9
1524	Russian River	12
1542	Kenai River	67
1555	Other Kenai Fresh	8
1558	Other Kenai Salt	15
1655	Kodiak Fresh	6
1658	Kodiak Salt	14
1755	Area R (AK. Penn)	11
1855	Area S	38
1955	Area T	18
5059	North, west and interior Alaska	6
Total		425

The site choice equation for destination anglers is shown in the table below. The variables explain about 28 percent of the variance in site choice by destination anglers. Total cost and travel time explain much more about the probability of choosing a site than any of the species variables; crowding explains the least.

Table C-28. Destination Angler Site Choice Equation

Variable	Definition	Coefficient	Std. Error	t-ratio
TOTCST	Total cost: estimated costs of charter, guide, bait and tackle, fish processing, and food and lodging reported as fishing expenses, plus estimated travel costs from the reported origin to the site.	-0.0015	0.0003	-5.9260
TRAVTIME	Estimated travel time from the reported origin to the site.	-0.5044	0.0335	-15.0530
KING	Total 1992 king salmon catch for the site	0.0001	0.0000	10.8060
KINGDF	Total 1992 king salmon catch for the site divided by total angler days, set to 0 for weeks that kings are not available or the fishery is closed.	1.6768	0.3693	4.5400
SILVERDF	Total 1992 catch for silver salmon, divided by total angler days, set to for 0 weeks that silvers are not available or the fishery is closed.	2.1234	0.3576	5.9370
REDDF	Total 1992 catch for sockeye salmon, divided by total angler days, set to for 0 weeks that sockeye are not available or the fishery is closed.	1.7725	0.1764	10.0490
PPKCHM	Peak season for pink or chum salmon, coded 1 for peak weeks and 0 otherwise.	0.9908	0.2774	3.5720
TROUTDF	Total 1992 catch for trout, all species combined, divided by total angler days, set to for 0 weeks that silvers are not available or the fishery is closed.	0.5378	0.1321	4.0710
HALIBRPT	Halibut fishing report, coded from 0 for closed or no information to 6 for really hot!	0.5175	0.0496	10.4340
HALDF	Total 1992 halibut catch for the site divided by total angler days, set to 0 for weeks that halibut are not available or the fishery is closed.	1.5854	0.1685	9.4070
PGROUND	Peak season for ground fish, coded 1 for peak weeks and 0 otherwise.	0.8804	0.2246	3.9200
WHITE	Total 1992 white fish catch, all species combined, for the site.	0.0003	0.0001	4.1420
CROWD1	Crowding: coded 1 for combat fishing, 0 otherwise.	-1.0615	0.2979	-3.5630

Discrete Choice Model
Maximum Likelihood Estimates

Log-Likelihood	-1042.4
Restricted (Slopes=0) Log-L.	-1445.5
Chi-Squared (13)	806.14
Significance Level	0.32173E-13

N(0,1) used for significance levels.
Cases=12,750

Southeast Incidental Anglers

There were 269 households in the Southeast incidental angler group, reporting 312 trips. We aggregated their possible site choices into 20 choices.

Table C-29. Sites for Southeast Incidental Anglers

Site	Site Name	Trips
104	Tongass Narrows	3
155	Ketchikan Area Fresh	4
158	Other Ketchikan Area Salt	102
259	Prince of Wales Area	5
359	Wrangell and Petersburg Area	2
404	Sitka Sound	32
455	Sitka Area Fresh	3
458	Other Sitka Area Salt	24
555	Juneau Area Fresh	5
558	Juneau Area Salt	72
601	Skagway Area Salt	5
602	Haines Area Salt	12
605	Chilkoot Lake	6
606	Chilkoot River	12
655	Other Haines & Skagway Area Fresh	3
701	Icy Straits	4
702	Glacier Bay	4
855	Yakutat Area Fresh	6
858	Yakutat Area Salt	4
5059	Other Alaska	4
Total		312

The equation for Southeast incidental anglers explains about 47 percent of the variance in site choice. For these anglers, total cost was the most powerful explanatory variable, and travel time was less important than either trout harvest or king catch per unit effort. Cost was even more powerful for those Southeast anglers who said not having to spend a lot of money to get to the fishing site was important.

Table C-30. Southeast Site Choice Equation

Variable	Definition	Coefficient	Std.Error	t-ratio	Prob
TOTCST	Total cost: estimated costs of charter, guide, bait and tackle, fish processing, and food and lodging reported as fishing expenses, plus estimated travel costs from the reported origin to the site.	-0.0067	0.0006	-10.6970	0.0000
TRAVTIME	Estimated travel time from the reported origin to the site.	-0.4320	0.0571	-7.5650	0.0000
KINGDF	Total 1992 king salmon catch for the site divided by total angler days, set to 0 for weeks that kings are not available or the fishery is closed.	13.5200	0.9806	13.7880	0.0000
SILVERDF	Total 1992 catch for silver salmon, divided by total angler days, set to for 0 weeks that silvers are not available or the fishery is closed.	2.3261	0.4867	4.7800	0.0000
PRED	Peak season for sockeye salmon, coded 1 for peak weeks and 0 otherwise.	2.1939	0.4575	4.7950	0.0000
PKCHMDF	Total 1992 catch for pink and chum salmon combined, divided by total angler days, set to for 0 weeks that pinks and chums are not available or the fishery is closed.	1.7652	0.4871	3.6240	0.0003
BDOLLY	Bag limit for dolly varden or arctic char.	0.1705	0.0303	5.6300	0.0000
TROUT	Total 1992 trout catch, all species combined, for the site.	0.0000	0.0000	7.9280	0.0000
HALIBRPT	Halibut fishing report, coded from 0 for closed or no information to 6 for really hot!	0.3222	0.0454	7.1010	0.0000
BGROUND	Bag limit for ground fish	0.6722	0.1050	6.4040	0.0000
ASTEEL	Steelhead availability: coded 1 if available, 0 otherwise.	1.9241	0.4780	4.0260	0.0001
MONEY1	Total cost for those who said not having to spend a lot of money to get to the site was an important factor in deciding where to fish.	-0.0096	0.0024	-3.9330	0.0001

Discrete Choice Model
Maximum Likelihood Estimates
Log-Likelihood -497.86
Restricted (Slopes=0) Log-L -934.67
Chi-Squared (12) 873.61
Significance Level 0.32173E-13
N(0,1) used for significance levels.
Cases=6240

Southcentral-Interior Incidental

There were 553 households in the Southcentral-Interior incidental angler group, which reported 941 trips. Their site choices were grouped into 31 sites.

Table C-31. Sites for Southcentral Incidental Anglers

Code	Site Label	Trips
559	Southeast Alaska	13
956	Glennallen Rivers and Streams	9
957	Glennallen Lakes	22
1058	Prince William Sound	45
1155	Mat-Su Area	28
1220	Bird Creek	5
1255	Other Anchorage Area Lakes and Streams	15
1307	Talkeetna River and Tributaries	8
1308	Sheep Creek	3
1355	Other E. Susitna Area Lakes and Streams	21
1459	W. Sustina and W. Cook Inlet	12
1501	Anchor River, Deep Ck. & Whiskey Gulch	29
1505	Kachemak Bay	118
1506	Resurrection Bay	76
1507	Lower Cook Inlet and Outer Gulf	36
1513	Kasilof River	17
1514	Anchor River	10
1524	Russian River	33
1527	Resurrection Creek	5
1542	Kenai River	240
1555	Other Kenai Fresh	54
1558	Other Kenai Salt	25
1655	Kodiak Fresh	5
1658	Kodiak Salt	9
1707	Naknek River and Tributaries	6
1710	Brooks River	5
1755	Other Area R	9
1855	Area S	7
1955	Area T	7
2055	Area U (Fairbanks)	50
5059	Other Northern and Western Alaska	19
Total		941

The site choice equation explains about 24 percent of the variance, with travel time the most important explanatory variable and total cost and species variables less powerful.

Table C-32. Southcentral Interior Incidental Angler Site Choice Equation

Variable		Coeffi.	Std.Error	t-ratio	Prob.
TOTCST	Total cost: estimated costs of charter, guide, bait and tackle, fish processing, and food and lodging reported as fishing expenses, plus estimated travel costs from the reported origin to the site.	-0.0013	0.0002	-5.2730	0.00
TRAVTIME	Estimated travel time from the reported origin to the site.	-0.4480	0.0195	-22.9930	0.00
KING	Total 1992 king salmon catch for the site	0.0000	0.0000	8.3560	0.00
SILVERDF	Total 1992 catch for silver salmon, divided by total angler days, set to for 0 weeks that silvers are not available or the fishery is closed.	3.4529	0.3538	9.7590	0.00
REDDF	Total 1992 catch for sockeye salmon, divided by total angler days, set to for 0 weeks that sockeye are not available or the fishery is closed.	1.2397	0.1108	11.1850	0.00
PKCHM RPT	Pink or chum salmon fishing report, coded from 0 for closed or no information to 6 for really hot.	0.1283	0.0280	4.5810	0.00
HALDF	Total 1992 halibut catch for the site divided by total angler days, set to 0 for weeks that halibut are not available or the fishery is closed.	1.0499	0.0952	11.0260	0.00
HALIBRPT	Halibut fishing report, coded from 0 for closed or no information to 6 for really hot!	0.7647	0.0348	21.9800	0.00
RBWRPT	Peak season for rainbow trout, coded 1 for peak weeks and 0 otherwise.	0.5699	0.0484	11.7720	0.00
DOLLYRP T		0.3346	0.0229	14.5980	0.00

APPENDIX D. BUILDING THE TRAVEL COST MODEL

APPENDIX D. BUILDING THE TRAVEL COST MODEL

As discussed in Appendix C, we estimated cost, site choice, and participation equations from the survey data. We used those equations to construct seven travel cost models in Excel spreadsheets:

- Southcentral Resident Anglers
- Interior Resident Angler s
- Southeast Resident Anglers
- Kodiak Resident Anglers
- Nonresident Destination Anglers
- Nonresident Incidental Anglers-Southeast
- Nonresident Incidental Anglers-Southcentral

As our methodology for building these models developed, and microcomputer technology progressed, we improved the model structure. There are three model structures in the seven model types. We start this appendix with a general discussion of the three model types. Next we discuss the general organization of the model variables. Finally, we present a brief description of the specifics of each of the seven models.

MODEL TYPES

The seven models fall into three structural types. The Kodiak model, with only five sites, six time periods, and no participation equation, is completely contained in one spreadsheet. There are no macros to run the model; rather, all times and sites are calculated and displayed in the spreadsheet.

The remaining three models for Alaska resident anglers do include participation equations. They also have more sites (19 to 30) and 27 week-long time periods. The main model spreadsheet calculates fishing behavior for one week. Macros change the references to time-variant site data variables to cycle the model through the full 27-week summer season. Other spreadsheets calculate anglers' willingness to pay for sites and the change in willingness to pay under different scenarios. Full use of these models requires opening the main model workbook, the workbook with site data, and the workbooks for calculating willingness to pay.

When we estimated the model equations, we modeled the behavior of each individual angler. This approach was not feasible for the resident spreadsheet models, because the files would have been too large for the desktop computers to handle smoothly. All the resident models represent anglers with the average characteristics of a group of anglers.

By contrast, the three nonresident models work with individual angler data. Each of the three models consists of two workbooks. This first workbook contains the individual trip data we used to estimate the site choice equation. We include only variables that appear in the model. For each trip, there are as many lines of data as potential sites. The household data are the same across all rows, and the relevant site and site-origin data are included in each row. A macro selects the rows for a random sample of 200 trips, and copies the data on just the selected trips to another workbook page. The model workbook contains the site data model equations, and refers to the selected trip page of the trip data workbook. Because we didn't interview nonresidents who did not fish in Alaska, we couldn't estimate a participation equation. Our nonresident model predicts the distribution of trips across sites and how that distribution might change with changing conditions.

DATA SOURCES

To build the spreadsheets, we used the same data we used when estimating the equations. These data sets are described more fully in other appendices.

ANGLER DATA

We grouped resident anglers by their home locations. For angler characteristics (such as income and boat ownership) we used the mean for anglers residing in each area. Average angler characteristics for each group are summarized on the "Households Data" page of the model workbooks. For nonresidents, we were able to use the individual household data collected for the selected trips.

SITE DATA

"Site data" refers broadly to any characteristic that varies across sites. Many of these variables change across the fishing season as well. Site data includes fishing quality variables such as species availability and catch; facility variables such as the availability of boat ramps and campgrounds; and weather data such as temperature and precipitation. Three of the seven models (Southeast Resident, Southcentral Resident, and Interior Resident) contain site data by week, for 27 weeks. The other four (Kodiak Resident and all three nonresident models) aggregate site data to the month level, for the six months of May through October. In addition, for a few site variables that don't vary over time, there is a Site Data page in the main model workbook.

SITE-ORIGIN DATA

This category refers to data specific to a given trip-origin/fishing-site pair. It is primarily travel cost data—estimates of the time and the cost of travelling to each of the alternative sites. As with the household data, we have grouped anglers into origins and used the average time cost for all anglers in each origin area to each site.

KODIAK RESIDENT ANGLERS

The Kodiak model (KMODEL1.xls) is the simplest. We had insufficient data to estimate a participation equation, so fishing participation is fixed at the levels we found in our survey for 1993. Fishing varies little from week to week, so we looked at monthly, rather than weekly time periods. The entire model is contained in a single workbook, with no need for links to other workbooks or macros to calculate successive time periods. The Kodiak model has two origins (Kodiak and Old Harbor) and five sites (Chiniak Bay, Other Kodiak Area Salt, Buskin River, Other Kodiak Area Fresh, Other Alaska Sites)

RELEVANT FILES: KMODEL.XLS

VARIABLES

Household Variables: variables pertaining to households (e.g., income and boat ownership) are entered in the model as the average value for households at a given origin. For dichotomous variables, such as boat ownership, this average is also the fraction of households in an origin that answered "yes."

Site-Origin Variables: (primarily the cost of travel to a site) were estimated from survey data and other data we collected.

Site Data Variables: The only site data variables in the Kodiak model were annual groundfish harvest and trout catch rate. These two variables didn't change across the May through October time frame of our summer model; values are listed in cells A27:D32 of the Site Choice sheet of KMODEL1.xls.

EQUATIONS

Expenditures: The expenditure equations calculate the cost of a trip from a given origin to a given site, using only exogenous variables.

Site Choice: The site choice equation uses the estimated cost from the expenditure equations, along with exogenous site variables, to estimate the distribution of trips across sites.

Participation: Participation is exogenous in this model. It is estimated from the number of trips recorded in the survey from each origin to each site each month. Because our sample (especially from Old Harbor) was small, we applied the distribution of trips across months for all Kodiak origins to the total number of trips from each origin. For the Kodiak origin, this made little difference; in Old Harbor, it let us avoid modeling the time distribution of all Old Harbor trips on the one angler household we interviewed there.

SOUTHCENTRAL MODEL

RELEVANT WORKBOOK FILES

Main Model: MDSFRSC2.xls
Site Data: Scen_A.xls
Willingness to Pay:
WTPSITES.xls to calculate the net value of each site;
WTPSCEN.xls to calculate the change in willingness to pay from a scenario change, such as closing a fishery or increasing bag limits

VARIABLES

Household Variables: Variables pertaining to households (e.g., income and boat ownership) are entered in the model (on the HHData page). In general, we took the mean value for households in a given origin group. For dichotomous variables, such as boat ownership, this average is also the fraction of households at an origin that answered "yes." In the Southcentral model, the six origins were grouped into Anchorage, Mat-Su Valley, and Kenai.

Site-Origin Variables: (primarily the cost of travel to a site) were estimated from survey data and other data we collected (such as Cooperative Extension Service information on gasoline prices).

Site Data Variables: For each of these models, there is a workbook with all the site characteristic variables (fishing quality, facilities, and others) and weather conditions. There is one sheet per week (27 sheets). A few site variables are defined as not varying over the season, and these are in the main model workbook on the Site Data sheet.

EQUATIONS

The expenditure equations calculate the cost of a trip from a given origin to a given site, using only exogenous variables. In the Southcentral model, we calculate on-site time as well as trip expenditures.

The site choice equation uses the estimated trip cost and on-site time from the expenditure equations, along with exogenous site variables, to estimate the distribution of trips across sites. For each origin, a number called the "inclusive value" is calculated to represent the total fishing quality available from all sites to anglers from that origin.

The participation equation includes the inclusive value from the site choice equation, along with exogenous household characteristics and weather conditions.

Because of the non-linear characteristics of the participation equation, using a simple arithmetic mean for household variables produced too few trips. Households that took many trips were lost in the average. To address this, for household variables in the participation equation, we took the square root of the mean of the squared variables. This approach, while not perfect, gave such households a greater influence in the calculated trips.

Also, Southcentral households have two separate participation equations, one for frequent anglers (households that made more than six trip per year) and another for infrequent anglers (households that made five or fewer trips per year).

SOUTHCENTRAL RESIDENT ANGLER ORIGINS & DESTINATIONS

Southcentral Origins
Anchorage
Palmer, Wasilla, Sutton
Big Lake, Houston Willow
Talkeetna area
Homer to Ninilchik
Kenai to Sterling
E. Kenai (Seward, Moose Pass, Cooper Landing)

Southcentral Destinations
Willow Creek
Other Willow-Cantwell Lakes & Streams
Little Su
Wasilla Creek
Kepler & Wasilla Area Lakes
Fish Creek
Big Lake & Tribs
Other Mat-Su L & S
Ship Creek
Other Anchorage L & S
Deshka R
Other West Side Lakes & Streams
Saltwater Area K-N
Anchor R Whiskey Gulch
Resurrection Bay
Kachemak Bay
Homer Spit Shore
Other Kenai Salt
PU Dipnet
Upper Kenai
Lower Kenai
Russian R
Kasilof R
Ninilchik to Anchor R
Swanson R, Swan Ls
N Kenai L & S
Kenai Other L & S
Glenallen Area L & S
PWS Salt
Other Alaska

INTERIOR MODEL

RELEVANT WORKBOOK FILES

Main Model: MODLINT6.xls
Site Data:LIMDAT5.xls
Willingness to Pay:
WTPINT6.xls to calculate the net value of each site;
WTPSCEN6.xls to calculate the change in willingness to pay from a scenario change, such as closing a fishery or increasing bag limits

VARIABLES

Household Variables: Variables that pertain to households (e.g., income and boat ownership) are entered in the model (on the HHData page). In general, we took the mean value for households in a given origin group. For dichotomous variables, such as boat ownership, this average is also the fraction of households at an origin that answered "yes." For the participation equation in the Interior model, we grouped the five origins into Fairbanks and Other.

Site-Origin Variables (primarily the cost of travel to a site) were estimated from survey data and other data we collected (such as Cooperative Extension Service information on gasoline prices).

Site Data Variables: LIMDAT5.xls is the workbook with all the site characteristic variables (fishing quality, facilities, and others) and weather conditions. There is one sheet per week (27 sheets). A few site variables are defined as not varying over the season, and these are in the main model workbook on the Site Data sheet.

EQUATIONS

The expenditure equations calculate the cost of a trip from a given origin to a given site, using only exogenous variables. Rather than using all the variables in the estimated on-site time equation, we approximated on-site time with the most important variables from the estimated instrument, adjusted so the average calculated on-site time equals the average reported on-site time.

The site choice equation uses the estimated trip cost and on-site time from the expenditure equations, along with exogenous site variables, to estimate the distribution of trips across sites. For each origin, we calculated a number called the "inclusive value" to represent the total fishing quality available from all sites to anglers from that origin.

The participation equation includes the inclusive value from the site choice equation, along with exogenous household characteristics and weather conditions.

INTERIOR RESIDENT ANGLER ORIGINS & DESTINATIONS

Interior Origins
Fairbanks North Star Borough
Cantwell to Nenana
Delta Jct. to Paxson
Copper River Basin
Valdez
Cordova
Tok

Interior Destinations
Copper River Dipnet
Gulkana River
Other Fresh Zone 9
Valdez Arm
Other PWS Salt
Zone 10 Fresh
Zones 11-14 (fresh)
Zone 15
Kodiak Salt
Piledriver Slough
Chatanika River Up F
Salcha River Fresh
Delta Clearwater River
Tangle Lakes, River
Chena Lake Fresh
Chena River
Birch, Quartz Lakes
Other Z 20 Fresh
Other Alaska

SOUTHEAST MODEL

RELEVANT WORKBOOK FILES

Main Model: MODLSE1.xls
Site Data: SEDATALL.xlw
Willingness to Pay: WTPSE.xls to calculate the net value of each site;
WTPSCNSE.xls to calculate the change in willingness to pay from a scenario change, such as closing a fishery or increasing bag limits

VARIABLES

Household Variables: Variables that pertain to households (e.g. income, boat ownership) are entered in the model (on the HHData page). In general, we took the mean value for households in a given origin group. For dichotomous variables, such as boat ownership, this average is also the fraction of households in an origin that answer 'yes'. In the Southeast model, the six origins were grouped into Northern Southeast and Southern Southeast for the Participation equation.

Site-Origin Variables (primarily the cost of travel to a site) were estimated from survey data and other data we collected (such as Cooperative Extension Service information on gasoline prices).

Site Data Variables: LIMDAT5.xls is the workbook with all the site characteristic variables (fishing quality, facilities, and others) and weather conditions. There is one sheet per week (27 sheets). A few site variables are defined as not varying over the season, and these are in the main model workbook on the Site Data sheet.

EQUATIONS

The expenditure equations calculate the cost of a trip from a given origin to a given site, using only exogenous variables. Rather than using all the variables in the estimated on-site time equation, we approximated on-site time with the most important variables from the estimated instrument, adjusted so the average calculated on-site time equals the average reported on-site time.

The site choice equation uses the estimated trip cost and on-site time from the expenditure equations, along with exogenous site variables, to estimate the distribution of trips across sites. For each origin, a number called the inclusive value is calculated to represent the total fishing quality available from all sites to anglers from that origin.

The participation equation includes the inclusive value from the site choice equation, along with exogenous household characteristics and weather conditions.

SOUTHEAST RESIDENT ANGLER ORIGINS & DESTINATIONS

Origins Southern SE	**Origins Northern SE**
Ketchikan	Sitka
Prince of Wales	Juneau
Wrangell Petersburg	Haines Skagway

Destinations Southern SE	**Destinations Northern SE**
East, West, Behm Canal	Starrigavan Bay Salt
Clarence Strait Salt	Other Sitka Sound
Revillagigedo Channel	Other Area 4 Salt
Tongass Narrows Salt	'Other Fresh Area 4'
Yes Bay	Doty Cove, Berners Bay
Mountain Point Salt	Mitchell Bay Salt Lagoon
Carrol Inlet Salt	Juneau Road System S
Ketchikan Area Road	OTHER Area 5 Salt
'Other Salt Area 1'	Juneau Road System F
'Other Fresh Area 1'	Lake Florence Fresh
'Area 2 Salt'	'Other Fresh Area 5'
'Area 2 Fresh'	Skagway Sun-Area Salt
Blind Slough Salt	Haines Sub-Area Salt
Remainder Wrangell Narrow	Area 6 Fresh
Duncan Saltchuck, Canal	Icy Straits Salt
Frederick Sound Salt	Excursion Inlet Salt
Zimovia Strait	Other Salt Area 7
Petersburg Creek Fresh	Fresh Area 7
'Other Salt Area 3'	'Other Sites Area 8'
'Other Fresh Area 3'	All Other Alaska
All Other Alaska	

NONRESIDENT DESTINATION ANGLERS

We identified nonresident "destination anglers" as those nonresident anglers who said they would not have made trips to Alaska if they could not have fished. While some of these anglers visited the state as independent travelers, many of them bought all-inclusive fishing lodge packages. The majority of nonresident anglers visiting remote locations were destination anglers.

As discussed above, the nonresident models don't simulate all anglers though each week of the season. Each model selects a random sample of trips we actually observed. For each trip, we have the household data for the anglers taking the trip and site data for all available sites. The model predicts the destination for the trip. The better the model fit, the more often the predicted site will be the site actually chosen.

RELEVANT WORKBOOK FILES

Main Model: MICROMODL.xls
Trip Data: EQN1TRIPS.xls

VARIABLES

Household Variables: Variables pertaining to households (e.g., income and boat ownership) are included as part of the individual data of the selected trips.

Site-Origin Variables trip cost, travel cost, and travel time were estimated from survey data and other data we collected (such as Cooperative Extension Service information on gasoline prices). As part of the estimation process for the site choice equation, we estimated a cost equation (Appendix C) to calculate the trip costs to sites not visited as well as the visited sites. These costs are included in the individual trip data and copied into the model along with other trip data.

Site Data Variables: Site data variables that don't change over time are included in the selected trip data. Fishing quality variables, which change over time and which must be changed for various policy models, are included on several pages in the model workbook. Each variable is assigned a rectangular array, with 30 rows for possible sites and 6 columns for months. The site choice equation cell refers to the proper cell of each array with an "=INDEX" function.

EQUATIONS

The expenditure equations are not present in these models. We include the result of the expenditure equation for each possible site for each trip exogenously to this model.

The site choice equation uses the estimated trip cost from the expenditure equations, along with exogenous site variables, to estimate the distribution of trips across sites.

The participation equation: We did not have information from nonresidents who did not fish in Alaska and therefore we couldn't estimate a participation equation.

NON-RESIDENT DESTINATION ANGLER SITES

Site #	Site Name
158	Ketchikan Area
255	Prince of Wales Area Fresh
258	Prince of Wales Area Salt
404	Sitka Sound
458	Other Sitka Area
555	Juneau Area Fresh
558	Juneau Area Salt
758	Glacier Bay
855	Yakutat Area Fresh
858	Yakutat Area Salt
955	Glennallen Area Fresh
1058	Prince William Sound
1255	Anchorage and Mat-Su Area Fresh
1355	E. Susitna Area Fresh
1459	W. Susitna Area
1501	Anchor River, Deep Creek. & Whiskey Gulch
1505	Kachemak Bay
1506	Resurrection Bay
1507	Lower Cook Inlet & Outer Gulf
1513	Kasilof River
1524	Russian River
1542	Kenai River
1555	Other Kenai Fresh
1558	Other Kenai Salt
1655	Kodiak Fresh
1658	Kodiak Salt
1755	Area R (AK. Penn)
1855	Area S
1955	Area T
5059	North, west and interior Alaska

SOUTHEAST INCIDENTAL ANGLERS

Southeast Incidental Anglers are those nonresident anglers who did not visit friends or relatives in Alaska, who would have come even if they hadn't been able to fish, and who fished in Southeast Alaska.

As discussed above, the nonresident models don't simulate all anglers though each week of the season. Each model selects a random sample of trips we actually observed. For each trip, we have the household data for the anglers taking the trip and site data for all available sites. The model predicts the destination for the trip. The better the model fit, the more often the predicted site will be the site actually chosen.

RELEVANT WORKBOOK FILES

Main Model: MICROMDL2.xls
Trip Data: EQN2TRIPS.xls

VARIABLES

Household Variables: Variables pertaining to households (e.g., income and boat ownership) are included as part of the individual data of the selected trips.

Site-Origin Variables trip cost, travel cost, and travel time were estimated from survey data and other data we collected (such as Cooperative Extension Service information on gasoline prices). As part of the estimation process for the site choice equation, we estimated a cost equation (Appendix C) to calculate the trip costs to sites not visited as well as the visited sites. These costs are included in the individual trip data and are copied into the model along with other trip data.

Site Data Variables: Site data variables that don't change over time are included in the selected trip data. Fishing quality variables, which both change over time and are necessary to change for various policy models, are included on several pages in the model workbook. Each variable is assigned a rectangular array, with 30 rows for possible sites and 6 columns for months. The site choice equation cell refers to the proper cell of each array with an "=INDEX" function.

EQUATIONS

The expenditure equations are not present in these models. We include the result of the expenditure equation for each possible site for each trip exogenously to this model.

The site choice equation uses the estimated trip cost from the expenditure equations, along with exogenous site variables, to estimate the distribution of trips across sites.

The participation equation: We did not have information from nonresidents who did not fish in Alaska, and therefore we couldn't estimate a participation equation.

NONRESIDENT SOUTHEAST INCIDENTAL ANGLER SITES

Site #	Site Name	Site #	Site Name
104	Tongass Narrows	601	Skagway Area Salt
155	Ketchikan Area Fresh	602	Haines Area Salt
158	Other Ketchikan Area Salt	605	Chilkoot Lake
259	Prince of Wales Area	606	Chilkoot River
359	Wrangell and Petersburg Area	655	Other Haines & Skagway Area Fresh
404	Sitka Sound	701	Icy Straits
455	Sitka Area Fresh	702	Glacier Bay
458	Other Sitka Area Salt	855	Yakutat Area Fresh
555	Juneau Area Fresh	858	Yakutat Area Salt
558	Juneau Area Salt	5059	Other Alaska

SOUTHCENTRAL INCIDENTAL ANGLERS

Southcentral Incidental Anglers are nonresident anglers who did not visit friends or relatives in Alaska, who would have come even if they hadn't been able to fish, and who fished in areas outside Southeast Alaska.

As discussed above, the nonresident models don't simulate all anglers though each week of the season. Each model selects a random sample of trips we actually observed. For each trip, we have the household data for the anglers taking the trip and site data for all available sites. The model predicts the destination for the trip. The better the model fit, the more often the predicted site will be the site actually chosen.

RELEVANT WORKBOOK FILES

Main Model: MICROMDL3.xls
Trip Data: EQN3TRIPS.xls

VARIABLES

Household Variables: Variables pertaining to households (e.g., income and boat ownership) are included as part of the individual data of the selected trips.

Site-Origin Variables trip cost, travel cost, and travel time were estimated from survey data and other data we collected (such as Cooperative Extension Service information on gasoline prices). As part of the estimation process for the site choice equation, we estimated a cost equation (Appendix C) to calculate the trip costs to sites not visited as well as the visited site. These costs are included in the individual trip data and copied into the model along with other trip data.

Site Data Variables: Site data variables that don't change over time are included in the selected trip data. Fishing quality variables, which change over time and which have to change for various policy models, are included on several pages in the model workbook. Each variable is assigned a rectangular array, with 30 rows for possible sites and 6 columns for months. The site choice equation cell refers to the proper cell of each array with an "=INDEX" function.

EQUATIONS

The expenditure equations are not present in these models. We include the result of the expenditure equation for each possible site for each trip exogenously to this model.

The site choice equation uses the estimated trip cost from the expenditure equations, along with exogenous site variables, to estimate the distribution of trips across sites.

The participation equation: We did not have information from nonresidents who did not fish in Alaska, and therefore we couldn't estimate a participation equation.

NONRESIDENT SOUTHCENTRAL INCIDENTAL ANGLER SITES

Site #	Site Name
559	Southeast Alaska
956	Glennallen Rivers and Streams
957	Glennallen Lakes
1058	Prince William Sound
1155	Mat-Su Area
1220	Bird Creek
1255	Other Anchorage Area Lakes and Streams
1307	Talkeetna River and Tributaries
1308	Sheep Creek
1355	Other E. Susitna Area Lakes and Streams
1459	W. Sustina and W. Cook Inlet
1501	Anchor River, Deep Creek. & Whiskey Gulch
1505	Kachemak Bay
1506	Resurrection Bay
1507	Lower Cook Inlet and Outer Gulf
1513	Kasilof River
1514	Anchor River
1524	Russian River
1527	Resurrection Creek
1542	Kenai River
1555	Other Kenai Fresh
1558	Other Kenai Salt
1655	Kodiak Fresh
1658	Kodiak Salt
1707	Naknek River and Tributaries
1710	Brooks River
1755	Other Area R
1855	Area S
1955	Area T
2055	Area U (Fairbanks)
5059	Other Northern and Western Alaska

Estimating Net Economic Value

As discussed in Appendix C, we modeled net economic value by dividing the change in the inclusive value by coefficients from the model equations. Exactly what change in inclusive value we use, and what coefficients make up the divisor, vary with the sub-model and also with what we want to value.

Net Economic Value of Sites

The theoretical basis of this calculation is discussed in Appendix C. WTPSites calculates the inclusive value from the participation equation (second stage inclusive value) and also calculates what that value would be if each site in turn were removed from the model. Comparing the two provides an estimated change in (second stage) inclusive value for each site for the week to which model is set. This change in inclusive value is divided by both the coefficient on travel cost in the site choice equation and the coefficient on the site choice inclusive value (first stage inclusive value) in the participation equation. The result is an estimate of the net economic benefit of each site to each fishing household in the population in a given week. When the model is run through several weeks, WTPSites repeats the calculations for each week, stores the results, and sums the stored results across weeks.

For models without a participation equation, there is no second stage inclusive value. In this case, we use the inclusive value from the site choice equation (first stage inclusive value) in the calculations. We divide the change in this value by the coefficient on travel cost.

Modeling Fishery Values

To model the net economic value of a fishery, we look at the change in second stage inclusive value when we change selected site data. We can only model fisheries for which there are relevant variables in the model equations. For example, to model the Kenai River early king fishery in the Southcentral Resident equation, we can use the king quality, peak, fishing report, and target variables in the site choice, on-site time, and expenditure equations to model the absence of this fishery.

We set those variables to 0 for Kenai River sites for the weeks of the early king fishery, run the model over the relevant weeks, and calculate the new, lower second stage inclusive value for each week. As with the site values above, the change in second stage inclusive value is divided by the coefficient on travel cost in the site choice equation and the coefficient on the site choice inclusive value (first stage inclusive value) in the participation equation. The result is the estimated net economic value of the fishery for Southcentral residents. We must model the net values in each sub-model in which there are relevant variables and sites, and sum the results.

Again, as with the site example, in sub-models without a participation equation we use the change in the first stage inclusive value divided by the travel cost coefficient.

Appendix E. Descriptive Statistics for Survey Variables

Summer Trip File: SUMTRIPS.SAV

Descriptive Statistics	N	Minimum	Maximum	Mean	Std. Deviation
STUDYNO STUDY NUMBER	5330	1003	9284	5099.78	2780.79
SEQNO mail or phone trip number	5164	1	552	39.65	98.32
LOGNO	5269	-9	16	1.26	3.24
NOTRIPS number of trips this log represents	2330	1	184	4.92	9.78
MO TRIP MONTH	5330	4	99	7.81	9.15
DAY TRIP DAY	5330	1	99	55.59	42.10
ZONE FISHING SITE ZONE	5330	1	25	10.43	6.54
SITE FISHING SITE	5330	101	2506	1051.98	657.38
SCSITE site, southcentral aggregation	5330	917	5059	3373.76	1839.57
YSPA 1ST SPECIES	4118	1	95	10.47	15.96
YSPB 2ND SPECIES	372	1	95	11.91	14.55
YSPC 3RD SPECIES	32	2	46	19.94	14.85
YSPD 4TH SPECIES	8	22	37	35.13	5.30
YWATR SALT OR FRESH	5321	1	2	1.51	.50
LDIP USE DIPNET	1099	-9	2	1.94	.40
MAILPHON Mail Log or Phone Log	5330	1	2	1.79	.41
STRATA SAMPLE STRATA	5330	1	11	5.12	2.99
COMMTY COMMUNITY OF RESIDENCE	5269	110	3590	1659.32	980.20
ORIGIN trip origin community	5330	110	9999	1687.23	1065.97
OSNUM origin-site match variable	377	.00	45.00	4.3528	7.3467
OSMTCH origin-site match variable	1466	.00	51.00	3.8806	6.5151
MTCHSN STUDY NUMBER for LOGS	291	1005	9268	3366.62	2479.47
MTCHLGNO log number for log info	291	1	9	1.92	1.10
MTCHLEVL trip matched to log info by...	5330	1	5	2.45	1.03
LOGMO month of log matched in	4044	5	10	6.55	1.38
LOGDAY day of log matched in	1564	1	31	12.97	9.17
WATERTP Salt or Fresh	5178	1	2	1.50	.50
ORIGINTP Where Trip Start	5145	1	99	5.91	21.21
ORIGZONE zone of origin community	5330	1	99	10.50	7.95
BTVLHRS2 boat travel hours to site	5257	.00	50.00	.7401	2.7157
ELSELOC Cmty of Origin, if trip origin not home	105	140	9996	1568.93	1497.51
HRSTRAVL total travel time to site	5199	.00	50.00	3.7923	10.1264
B_OR_C Tvl Benefit or Cost	5178	1	99	4.63	17.46
REASNPCT fishing what pcnt reason for trip	5130	0	100	87.14	25.34
COMTRANS use commercial transp?	1087	1	2	1.98	.14
COMAIR use commercial air	4059	1	2	1.99	9.25E-02
FERRY use commercial ferry	4049	1	2	1.99	.12
TRAIN use commercial train	4041	1	2	2.00	2.72E-02
OTHRTRAN use other commercial transport	4040	1	2	1.99	8.59E-02
TYPOTHER type of other transport	28	1	2	1.89	.31
TRANS$ $ Spent on commercial transport	5097	0	1200	3.71	40.10
CHARTER use guide/charter services?	5133	1	99	1.97	1.37
AIRCHART use air charter services?	138	1	9	1.89	.96
BOATCHAR use boat charter services?	196	1	9	1.11	.62
OTHRCHAR use other charter services?	134	1	9	1.99	.93
GUIDE use guide services?	157	1	9	1.82	.93
EQUIP use equipment charter services?	165	1	9	1.39	.96
LODGING use lodging charter services?	131	1	9	1.98	.94
FOOD use food charter services?	131	1	9	1.95	.96
CHARLOC community where charter service located	213	140	3610	2129.60	1066.73
CHAR$2 money spent on charter svcs	5114	0	1200	8.87	59.09
EAT$ money spent on food and drink	5072	0	750	28.13	75.66
LODG$2 money spent on lodging	5114	0	1500	6.08	44.96
BAITETC$ money spent on bait & misc. expenditures	5048	0	1500	29.59	66.47
VEHICLE use vehicle to travel to site?	5176	1	2	1.32	.46
VEHMI2 one way miles vehicle driven	5259	.00	1500.00	49.3452	122.3089
VCOST$2 vehicle cost, when not hhs vehicle	5183	0	2100	1.77	39.52
BOAT use boat to travel to site?	5176	1	2	1.39	.49
FISHHRS hours boat run while fishing	2897	.00	98.00	3.2875	6.0875
BOAT$2 boat cost, when not hh boat	5183	0	300	.88	8.63
PLANE use plane to travel to site?	5164	1	2	1.99	9.40E-02
PTRAVHRS one way plane hrs to site	5264	.00	6.00	1.045E-02	.1502
PCOST$2 plane cost, when not HH plane	5183	0	400	.20	7.53
TRIPLGTH Length of Trip in days	5176	1	99	2.66	10.10
HHSITEMO numbe of logs, same hh site mo	985	1	8	1.44	1.04

HHSITE number of logs, same hh site	1052	1	12	2.33	2.15
NOHHSITE number of logs, same origin site	1071	1	51	8.63	12.61
HSMDMTCH match hh site mo day	1089	1	6	1.02	.26
HSMMTCH match by hh site mo	1089	1	8	1.21	.66
HSMTCH match by hh site	1089	1	12	1.61	1.31
HHAVGMPG Average MPG of HHs vehicles	4166	5.00	60.00	17.1225	5.4764
BAVGGPH hh average gal per hour for HH boats	2058	.00	38.00	4.2055	4.5401
POPPGPH avg plane log fuel use rec fishing	291	6.75	6.75	6.7500	.0000
POPBGPH avg boat log fuel use rec fishing	291	3	3	3.00	.00
POPVMPG avg vehicle log fuel use rec fishing	291	16	16	15.60	.00
VEHMPG2 veh mpg with assigned pop avg to unk	3364	.00	60.00	16.2731	5.3425
BOATGPH2 boatgph w pop avg assigned to unk	2271	0	38	4.37	3.91
PLANGAL2 plangals w pop avg assigned to unk	31	6	40	17.34	12.02
AVGEARN$ avrg amt R could've earned in trips logged	5221	.00	5000.00	67.3545	271.4160
PWT1_95 HH weight, post season	5330	56	297	133.11	78.87
EARN$2 amr R could've earned this trip	5183	0	8000	66.06	375.60
TRANS$2 money spent commercial transp	5233	0	950	3.45	36.00
AVGREASN average % fishing was trip reason	424	.00	100.00	85.0974	17.5770
AVGGRP average group size, this HH logs	424	1.00	5.00	2.0399	.8585
NUMDUPLS no of dupls by SN site mo day	727	1	6	1.08	.53
VEHID which vehcile HH used	3272	0	99	7.55	20.78
BOATID2 which boat HH used	4832	1	97	56.46	45.21
PLANEID which plane HH used	41	1	990	79.02	259.26
PREFIX TELEPHONE PREFIX	4885	224	895	467.05	229.71
A1 OWN FISHING BOAT	4885	1	2	1.45	.50
A4 OWN 1/MORE PLANES	4844	1	2	1.97	.16
A8 OWN/LEASE CABIN OR LAND	4885	1	5	4.62	1.15
A10 LOCATION OF CABIN/LAND	435	110	3590	2042.29	1101.90
C4 FISHING SKILLS/MOST EXP IN HH	4882	1	4	3.08	.79
C9A HH MEMBERS UNDER 18	4834	0	6	1.14	1.21
C9B HH MEMBERS 18 TO 49	4885	0	6	1.79	.90
C9C HH MEMBERS 50 AND OVER	4885	0	3	.35	.71
C14 HH TOTAL INCOME 1992	4637	0	250	63.95	37.33
C15 RETIRED MEMBERS OF HH	4885	0	2	.18	.51
A7TYPE Vehicle type	2736	1	12	2.17	1.66
A3TYPE BOAT LOG #	1645	1	11	3.46	1.59
A6TYPE PLANE #1 DESCRIPTION	23	1	95	12.78	26.15
ELSEEARN could've R earned money if didn't take trip?	3814	0	2	1.90	.30
THRSFISH total person-hours fished by party	4838	.00	99.97	7.6195	11.0074
TRPCOST	4856	0	4503	108.10	261.47
NPEOPLE number of HH members on trip	4877	1	12	2.03	1.27
TPWT94 trip wt for CI panel sample w/94 data, est trps=5	581	.4266	5.8123	1.580625	.670565
TPWT5 wt w/est 93 trips=5	5097	.4616	28.0298	1.232479	.761896
TPWGT wt w/ est 93 trips=10	5097	.3485	22.6481	.972296	.608583
MODTRPWT wt5 multiplies by avg (by month) wtratio	5097	.5657	38.2887	1.493801	.976215
TOTWT FINAL WGT - trip and HH weights combined	5330	38	5655	201.03	200.56
SITEFUEL community near site for fuel purchases	3151	140	3520	1895.87	1039.12
FRSHBOAT Owns boat to go to freshwater sites	5330	0	3	.56	.67
SALTBOAT Owns boat to go to saltwater sites	5330	0	3	.43	.63
PLANEOWN Owns plane	5330	0	1	3.56E-02	.19
CAMPER Owns camper vehicle or trailer	5330	0	2	7.11E-02	.27
OWNERSHI Plane and boat Ownership	5330	1.00	4.00	1.4827	.6201
ROADMI	2111	5.00	506.00	67.1556	78.6767
BOATHRS	2111	.00	1.50	5.625E-02	.2150
AIRHRS	2111	.00	62.50	.2153	3.3085
COMMERC$	2111	.00	125.00	1.4803	13.5255
HRSTVL est 1-way time to site, fm regression	2111	1.32	8.43	2.1880	1.1232
FUELCMT1	5330	110	9999	1687.23	1065.97
FUELCMT2	5326	110	9999	1795.68	979.47
FUEL$1	5292	$1.09	$2.73	$1.3623	$.2378
FUEL$2	5005	$1.09	$2.73	$1.3860	$.2232
VBFUEL$	5297	$1.09	$2.73	$1.3666	$.2307
PFUEL$	5297	$2.72	$6.83	$3.4164	$.5768
TOTFUEL$	5264	$.00	$445.90	$7.5498	$26.9324
BOATDUM	5330	0	1	.54	.50
PLANDUM	5330	0	1	8.63E-03	9.25E-02
LEFTHRS	2111	-28	8	1.70	2.20
Valid N (listwise)	0				

Pre-Season Survey: WINSVY.SAV

Variable	N	Minimum	Maximum	Mean	Std. Deviation
STUDYNO STUDY NUMBER/WINTER LOGS	1355	1001	9284	4436.76	2906.98
PREFIX TELEPHONE PREFIX	1355	224	985	490.52	214.14
PHONENO PHONE NUMBER/WINTER LOGS	1355	30	9971	4545.35	2414.91
STRATA SAMPLE STRATA	1355	1	11	4.49	3.21
INTVID INTERVIEWER ID	1333	1	56	11.41	5.22
COMMTY COMMUNITY OF RESIDENCE	1355	70	3610	1531.86	1100.56
A1 OWN FISHING BOAT	1354	1	2	1.57	.49
A2 ACCESS TO FISHING BOAT	760	1	2	1.50	.50
A3A BOAT #1 DESCRIPTION	577	1	11	3.72	1.97
A3B BOAT #2 DESCRIPTION	161	1	10	3.57	1.90
A3C BOAT #3 DESCRIPTION	45	1	11	3.91	2.43
A4 OWN 1/MORE PLANES	1353	1	2	1.97	.18
A5 ACCESS TO PLANE FOR FISHING	1281	0	2	1.88	.32
A6A PLANE #1 DESCRIPTION	43	1	95	10.81	19.41
A6B PLANE #2 DESCRIPTION	2	5	15	10.00	7.07
A7A VEHICLE #1 DESCRIPTION	1352	0	95	2.08	3.22
A7B VEHICLE #2 DESCRIPTION	328	1	12	3.20	2.63
A7C VEHICLE #3 DESCRIPTION	58	1	12	4.33	2.99
A7D VEHICLE #4 DESCRIPTION	9	1	12	4.22	3.56
A8 OWN/LEASE CABIN OR LAND	1353	1	5	4.62	1.14
A9 ACCESS TO CABIN/LAND	1203	1	2	1.77	.42
A10 LOCATION OF CABIN/LAND	135	110	9995	2151.93	1427.79
A11 TRANSPORTATION TO CABIN/LAND	137	1	7	2.52	2.08
A12 HOURS GETTING TO CABIN/LAND	136	.25	36.00	2.9062	3.7664
A13 YEAR CABIN/LAND ACQUIRED	133	31	93	80.56	10.54
A14 VALUE OF CABIN/LAND TODAY	109	1	550	56.72	79.74
A15 $ SPENT MAINTAINING CABIN/LAND 1992	130	0	9996	966.68	2006.94
A16 CABIN/LAND FOR FISHING OPPS	138	0	3	2.17	.72
A17 VALUE FISHING EQUIP TODAY	1281	0	9996	1159.02	1726.87
A18 $ SPENT FISHING EQUIP 1992	1315	0	9996	257.84	609.18
A19 COMMTY SUPPLIES/EQUIP PURCHASED	1066	70	9995	1845.38	2009.70
A20 VALUE OF CAMPING EQUIP TODAY	1281	0	9996	974.92	1425.66
A21 % USE OF CAMPING EQUIP/FISHING	1129	0	100	47.09	37.92
B1A1 DAYS GUIDE FISHING/SUMMER 92	1352	0	50	.35	2.47
B1A2 TRIPS GUIDE FISHING/SUMMER 92	1351	0	50	.27	2.04
B1B1 DAYS CHRTR BOAT/PLANE SUMMER 92	1353	0	24	.57	2.05
B1B2 TRIPS CHRTR BOAT/PLANE SUMMER 92	1354	0	24	.37	1.31
B1C1 DAYS FISHED ROD/REEL SUMMER 92	1349	0	375	21.26	29.46
B1C2 TRIPS FISHED ROD/REEL SUMMER 92	1347	0	375	17.06	26.35
B1D1 DAYS CLAMS/SHELLFISH SUMMER 92	1352	0	45	1.03	3.39
B1D2 TRIPS CLAMS/SHELLFISH SUMMER 92	1351	0	60	.95	3.50
B1E1 DAYS DIPNET/SUMMER 92	1352	0	21	.53	1.95
B1E2 TRIPS DIPNET/SUMMER 92	1351	0	21	.42	1.70
B2A DAYS FISHING ACTIVITIES/WINTER	1346	0	60	1.48	4.87
B2B TRIPS FISHING ACTIVITIES/WINTER	1345	0	60	1.30	4.52
C1A BEAUTIFUL AREA/FISH REASON	1336	1	3	1.75	.70
C1B ABUNDANT FISH/FISH REASON	1341	1	3	1.51	.62
C1C TROPHIES/FISH REASON	1340	1	3	2.42	.70
C1D FLY FISHING/FISH REASON	1336	1	3	2.66	.56
C1E DERBY/FISH REASON	1340	1	3	2.56	.61
C1F CATCH & RELEASE/FISH REASON	1337	1	3	2.52	.61
C1G FEW ANGLERS/FISH REASON	1333	1	3	1.71	.70
C1H TRAVEL TIME/FISH REASON	1336	1	3	1.91	.71
C1I INEXPENSIVE/FISH REASON	1333	1	3	1.65	.69
C1J ROAD ACCESS/FISH REASON	1336	1	3	1.77	.75
C1K FLY-IN ACCESS/FISH REASON	1338	1	3	2.62	.58
C1L BOAT LAUNCH/FISH REASON	1337	1	3	2.09	.77
C1M MARINE ANCHORAGE/FISH REASON	1325	1	3	2.44	.69
C1N FEW BEARS/FISH REASON	1332	1	3	2.20	.81
C1O NO CLEARCUTS/FISH REASON	1309	1	3	2.17	.84
C1P NO MINING/FISH REASON	1320	1	3	2.27	.84
C1Q NO COML DEVELOPMENT/FISH REASON	1329	1	3	2.08	.81
C1R NO HUMAN SETTLEMENT/FISH REASON	1331	1	3	2.25	.70
C1S SHORT WALK/FISH REASON	1333	1	3	2.22	.72
C2A GET FOOD/FISH REASON	1347	1	3	1.90	.77

C2B HAVE FUN/FISH REASON	1348	1	3	1.11	.35
C2C DO SOMETHING W FRIENDS/FISH REASON	1347	1	3	1.52	.56
C2D DO SOMETHING W FAMILY/FISH REASON	1346	1	3	1.44	.60
C2E DO SOMETHING CHALLENGING/FISH REASON	1342	1	3	1.88	.73
C3A FRIENDS/RELATIVES SOURCE OF INFO	1342	1	3	1.73	.71
C3B NEWSPAPERS SOURCE OF INFO	1343	1	3	2.41	.66
C3C BOOKS/MAGAZINES SOURCE OF INFO	1342	1	3	2.48	.64
C3D DEPT F&G SOURCE OF INFO	1339	1	3	2.00	.76
C3E TV OR RADIO SOURCE OF INFO	1341	1	3	2.41	.66
C4 FISHING SKILLS/MOST EXP IN HH	1341	1	4	2.62	.87
C5 IDEA OF BEST FISH LOCATIONS	1348	0	3	1.21	.44
C6 FISHING TRIPS MAY-OCT 1993	1337	0	400	18.44	25.80
C7 %AGE MEAT/FISH FROM HH HUNTING/FISHING	1330	0	100	36.06	36.07
C8 %AGE MEAT/FISH FROM OTHER HH	1334	0	100	7.79	16.15
C9A HH MEMBERS UNDER 18	1352	0	6	1.10	1.29
C9B HH MEMBERS 18 TO 49	1352	0	7	1.74	1.06
C9C HH MEMBERS 50 AND OVER	1353	0	3	.42	.74
C10 YEARS LIVED IN ALASKA	1353	1	91	19.50	14.25
C11 YEARS LIVED IN COMMUNITY	1352	1	67	14.50	12.21
C12 HUNT/FISH OPPS/REASON FOR RESIDENCE	1349	1	5	1.91	.83
C13 HUNT/FISH OPPS/RELOCATION REASON	1327	0	3	2.12	1.02
C14 HH TOTAL INCOME 1992	1229	0	250	52.34	33.30
C15 RETIRED MEMBERS OF HH	1351	0	2	.21	.52
C16 SELF-EMPLOYED MEMBERS OF HH	1350	0	5	.37	.65
TIME TOTAL MINUTES OF INTERVIEW	1343	7	83	21.24	9.26
PREWGT2	1355	37.47	198.85	107.9930	57.8560
WTJAN95 hh weight preseason jan 95	1355	37	200	106.26	55.56

Post Season Survey: POSTSVY.SAV

Variable	N	Minimum	Maximum	Mean	Std. Deviation
STUDYNO STUDY NUMBER	918	1001	9280	4363.44	2854.68
ZA1 PURCHASE BOAT SINCE JUNE	899	1	2	1.97	.16
ZA2A 1ST BOAT DESCRIPTION	21	1	5	2.71	1.23
ZQA3 REPT BOATS ON PROFILE	916	1	3	1.57	.50
ZA3 STILL HAVE JUNE BOATS	355	1	2	1.06	.24
ZA3A 1ST BOAT DONT HAVE	7	1	3	1.57	.79
ZA3B 2ND BOAT DONT HAVE	1	2	2	2.00	.
ZA4 PURCHASE PLANE SINCE JUNE	898	1	2	1.99	7.45E-02
ZA5A 1ST PLANE DESCRIPTION	1	1	1	1.00	.
ZQA6 REPT PLANE ON PROFILE	916	1	2	1.97	.18
ZA6 STILL HAVE JUNE PLANES	27	1	2	1.15	.36
ZA6A 1ST PLANE DONT HAVE	0				
ZA7 PURCHASE VEHICLE SINCE JUNE	890	1	2	1.97	.18
ZA8A 1ST VEHICLE DESCRIPTION	33	1	8	2.97	2.34
ZA8B 2ND VEHICLE DESCRIPTION	2	1	8	4.50	4.95
ZQA9 REPT VEHICLE ON PROFILE	917	1	2	1.13	.34
ZA9 STILL HAVE JUNE VEHICLES	709	1	2	1.07	.26
ZA9A 1ST VEHCILE DONT HAVE	30	1	18	2.37	4.27
ZA9B 2ND VEHICLE DONT HAVE	1	2	2	2.00	.
ZA10 PURCHASE LEASE CABIN LAND SINCE JUNE	889	1	5	4.94	.50
ZA11 CABIN LAND LOCATION	13	1	9998	2867.62	2402.22
ZA12 HOW GET TO CABIN LAND	12	1	5	2.42	1.08
ZA13 HOURS TO CABIN LAND	11	.20	8.00	2.1409	2.6385
ZA14 COST CABIN LAND	12	20	15000	2157.92	4947.72
ZA15 FISH OPPORTUNITIES REASON HAVE CABIN LAND	12	1	2	1.58	.51
ZQA16 REPT CABIN LAND ON PROFILE	914	1	99	2.13	4.55
ZA16 FISHING TRIP NIGHTS AT CABIN	65	0	997	25.31	123.83
ZQB1 MAY TRIP DATA STATUS	917	1	4	2.44	.90
ZB1 HH FISH IN MAY	658	1	2	1.73	.45
ZQB3 JUNE TRIP DATA STATUS	917	1	4	2.39	.91
ZB3 HH FISH JUNE	638	1	2	1.63	.48
ZQB5 JULY TRIP DATA STATUS	917	1	9	2.48	.90
ZB5 HH FISH JULY	665	1	2	1.63	.48
ZQB7 AUGUST TRIP DATA STATUS	917	1	3	2.60	.79
ZB7 HH FISH AUGUST	739	1	2	1.68	.47
ZB9 HH FISH SEPT	892	1	2	1.84	.37
ZB11 HH FISH OCT TO DATE	898	1	2	1.96	.21
ZB13 WILL HH FISH REST OCT	536	1	2	1.96	.19
ZB13A EXPEXTEC REST OCT TRIPS	20	1	3	1.65	.67
ZC1 LODGE CAMP FEES	894	-9	7300	61.19	313.86
ZC2 HH STAY OVERNIGHT	918	1	2	1.95	.21
ZC3A 1ST LODGING LOC	38	140	3960	2189.79	1180.42
ZC3B 1ST FISHING SITE	40	98	2525	1239.67	486.58
ZC3C 1ST LODGE FEES	39	0	700	58.62	118.65
ZC3D 2ND LODGING LOC	7	680	3520	2114.29	1062.35
ZC3E 2ND FISHING SITE	6	917	1513	1260.67	279.52
ZC3F 2ND LODGE FEES	7	0	105	22.57	37.34
ZC3G 3RD LODGING LOC	3	1630	3470	2686.67	949.96
ZC3H 3RD FISHING SITE	3	1007	1506	1339.33	287.81
ZC3I 3RD LODGE FEES	4	0	95	37.25	42.86
ZC3J 4TH LODGING LOC	1	680	680	680.00	.
ZC3K 4TH FISHING SITE	1	905	905	905.00	.
ZC3L 4TH LODGE FEES	1	24	24	24.00	.
ZC4 AMT HH SPENT ON TACKLE	874	0	3500	140.63	294.86
ZC5 BUY TACKLE OUTSIDE	538	1	2	1.88	.33
ZC5A AMT SPENT ON TACKLE OUTSIDE	65	0	3200	280.29	546.29
ZC6 AMT SPENT ON TACKLE IN AK OUTSIDE COMMUNITY	532	0	600	36.12	83.53
ZC7A 1ST LOC IN AK BUY TACKLE	191	140	3590	1925.76	1271.58
ZC7B 1ST LOC IN AK TACKLE COST	186	2	600	85.95	106.19
ZC7C 2ND LOC IN AK BUY TACKLE	54	140	3560	2006.48	1190.32
ZC7D 2ND LOC IN AK TACKLE COST	49	4	215	44.67	43.63
ZC7E 3RD LOC IN AK BUY TACKLE	14	140	3520	2308.29	1133.20
ZC7F 3RD LOC TACKLE COST	10	2	100	37.70	34.83
ZC7G 4TH LOC IN AK BUY TACKLE	2	1080	3560	2320.00	1753.62
ZC7H 4TH LOC TACKLE COST	2	5	50	27.50	31.82

ZC8 SPEND RESTAURANTS ON FISH TRIPS	885	0	1800	47.73	134.15
ZC9 SPEND GROCERIES ON FISH TRIPS	879	0	2500	122.75	250.21
ZC9A SPEND GROCERIES OUTSIDE RES COMMUNITY	479	0	1200	48.13	122.28
ZC10 PCNT TRIP FUEL OUTSIDE RES CMTY	886	0	100	14.94	27.70
ZC11A SPEND FISH AIR CHARTERS	896	0	1500	14.90	100.12
ZC11B SPEND FISH BOAT CHARTERS	895	0	3000	37.28	177.82
ZC11C SPEND OTHER GUIDE SERVICES	897	0	400	1.83	22.30
ZC11D SPEND COMMERCIAL TRANSPORTATION	896	0	1600	10.85	99.68
ZC11E SPEND FISH EQUIP RENTAL	897	0	300	1.06	13.00
ZD1 MEMBER SPORT FISH ORGANI ZATION	849	1	2	1.96	.19
ZD1A 1ST SPORT FISH ORGANIZATION	31	11	29	17.65	4.94
ZD1B 2ND SPORT FISH ORGANI ZATION	4	12	24	18.75	5.74
ZD2 FISH SE KINGS PAST 3 YRS	889	1	2	1.77	.42
ZD3A FISH SE KS FOR FOOD	208	1	3	1.61	.71
ZD3B FISH SE KS FOR CHALLENGE	208	1	3	1.73	.69
ZD3C FISH SE KS FOR TROPHY	208	1	3	2.35	.77
ZD3D FISH SE KS FOR ENJOYMENT	208	1	3	1.20	.47
ZD4A IMPROVE ENJOYMENT CATCH LIMIT KS	208	1	4	2.09	.85
ZD4B IMPROVE ENJOYMENT CATCH TROPHY KS	208	1	4	1.98	.89
ZD4C IMPROVE ENJOYMENT CATCH WILD KS	208	1	4	2.40	.80
ZD5 EFFECT ENJOYMENT LOWER KS BAG 2 TO 1	208	1	4	2.04	.79
ZD5A1 WHY: 1ST KS KS LOWER BAG	1	3	3	3.00	.
ZD5A2 WHY: 2ND KS LOWER BAG	1	4	4	4.00	.
ZD6 EFFECT ENJOYMENT KS MIN 28 TO 30	208	1	4	2.20	.84
ZD6A1 WHY: 1ST KS MIN 28 TO 30	2	5	5	5.00	.00
ZD7 EFFECT ENJOYMENT BAN DOWNRIGGERS KS	206	1	4	2.48	.71
ZD7A1 WHY: 1ST KS BAN DOWNRIGGERS	2	1	1	1.00	.00
ZD7A2 WHY: 2ND KS BAN DOWNRIGGERS	1	3	3	3.00	.
ZD8 EFFECT ENJOYMENT CATCH & RELEASE KS> 40	205	1	4	2.07	.61
ZD8A1 WHY: 1ST KS CATCH & RELASE >40	2	2	2	2.00	.00
ZD9 HH FISH SE KS THIS YR	207	1	2	1.44	.50
ZD10 NO. HH FISH SE KS THIS YR	114	1	5	2.02	1.04
ZD11 NO. HH <16YRS FISH SE KS THIS YR	72	0	4	.61	.96
ZD12 NO. HH >=60 YRS FISH SE KS THIS YR	69	0	2	.19	.52
ZD13 1ST OPTION REDUCE SE KS HARVEST	113	1	3	2.16	.83
ZD14 LAST OPTION REDUCE SE KS HARVEST	110	1	3	1.99	.87
ZD15 1ST OPTION REDUCE SE KS HARVEST MORE	110	1	5	2.49	.67
ZD16 LAST OPTION REDUCE SE KS HARVEST MORE	108	1	3	1.80	.86
ZD17 SE KS DOWNRIGGER BAN-GUIDES	108	1	2	1.60	.49
ZD18 SE KS REDUCE BAG 2 TO 1-GUIDES	110	1	2	1.49	.50
ZD19 SE KS HH FISH LESS DUE LOWER BAG	114	1	2	1.89	.32
ZD20 SE KS HH DAYS LESS DUE LOWER BAG	13	1	998	82.69	275.08
ZD21 SE KS HH FISH LESS DUE TO DWNRIGR BAN	113	1	2	1.85	.36
ZD22 SE KS HH DAYS LESS DUE TO DWNRIGR BAN	17	1	998	68.00	239.82
ZD23 NO. KS TAGS HH BOUGHT	114	0	10	1.69	1.12
ZD24 HH FISH KENAI RS LAST 3 YRS	884	1	2	1.79	.41
ZD25A FISH KENAI RS FOR FOOD	190	1	3	1.59	.68
ZD25B FISH KENAI RS FOR TROPHY	190	1	3	2.55	.67
ZD25C FISH KENAI RS FOR CHALLENGE	190	1	9	1.90	.91
ZD25D FISH KENAI RS FOR ENJOYMENT	190	1	2	1.16	.37
ZD26A EFFECT ENJOYMENT CATCH LIMIT KENAI RS	189	1	3	1.70	.82
ZD26B EFFECT ENJOYMENT CATCH TROPHY KENAI RS	190	1	5	2.13	.89
ZD26C EFFECT ENJOYMENT NOT WALK FAR KENAI RS	190	1	3	2.18	.79
ZD26D EFFECT ENJOYMENT GOOD TRAIL KENAI RS	190	1	3	1.82	.78
ZD26E EFFECT ENJOYMENT PARKING LOT KENAI RS	190	1	3	1.90	.88
ZD26F EFFECT ENJOYMENT RESTROOM KENAI RS	189	1	94	2.40	6.75
ZD26G EFECT ENJOYMENT FEW ANGLERS KENAI RS	190	1	3	1.41	.69
ZD27A EFFECT ENJOYMENT LOTS OF ANGLERS KENAI RS	190	1	3	1.51	.67
ZD27B EFFECT ENJOYMENT CATCH NO KENAI RS	190	1	3	1.77	.71
ZD27C EFFECT ENJOY SEE LOTS GUIDED ANGLERS K. RS	190	1	3	1.97	.80
ZD27D EFFECT ENJOYMENT ASKED FR LICENSE KENAI RS	189	1	3	2.72	.59
ZD27E EFFECT ENJOY SEE PEOPLE CATCH > LIMIT K. RS	189	1	3	1.36	.66
ZD27F EFFECT ENJOY SEE PEOPLE SNAG FISH KENAI RS	190	1	8	1.41	.82
ZD27G EFFECT ENJOYMENT SEE LITTER KENAI RS	190	1	2	1.04	.20
ZD28 HH FISH KENAI RS THIS YR	190	1	2	1.52	.50
ZD28B NO. HH FISH KENAI RS THIS YR	85	1	9	2.11	1.32
ZD29 EFFECT ENJOYMENT LOWER KENAI RS BAG 3 TO 2	91	1	4	1.90	.87
ZD29A1 WHY: 1ST KENAI RS LOWER BAG 3 TO 2	2	1	1	1.00	.00
ZD29A2 WHY: 2ND KENAI RS LOWER BAG 3 TO 2	1	3	3	3.00	.
ZD30 EFFECT ENJOYMENT LOWER KENAI RS BAG 2 TO 1	92	1	4	1.95	.60

ZD30A1 WHY: 1ST KENAI RS LOWER BAG 2 TO 1	1	1	1	1.00	.
ZD31 EFFECT ENJOY C&R KNI RS FM LIM 1	92	1	3	1.99	.50
ZD31A1 WHY: 1ST KENAI RS CATCH & RELEASE	0				
ZD32 EFFECT ENJOY RS KNI TIME CLOSE 11PM to 6AM	92	1	3	2.28	.75
ZD32A1 WHY: 1ST KENAI FISHING TIME CLOSURE	0				
ZD33 START KNI RS BAG LIM LO or HI	91	1	2	1.79	.41
ZD34 KENAI RS LOWER HARVEST PREFERENCE	89	1	2	1.40	.49
ZD35A KENAI RS 1ST DAY CLOSURE	30	1	95	24.90	39.38
ZD35B KENAI RS 1ST TIME CLOSURE	28	.00	1900.00	94.2789	355.2329
ZD35C KENAI RS 2ND DAY CLOSURE	30	2	95	26.30	38.58
ZD35D KENAI RS 2ND TIME CLOSURE	28	5.00	99.95	27.1632	31.1488
CLOSEDAY Day of Closure	30	1	5	2.47	1.53
CLOSTIME Time of Closure	28	1	5	2.29	1.41
ZD36 KENAI RS DIPNET 6 FISH VS SPORT 3 FISH	89	1	4	1.70	1.06
ZD37 KENAI RS DIPNET 6 FISH VS SPORT 2 FISH	67	1	2	1.12	.33
ZD38A KENAI RIVER NON-MOTOR AREAS	87	1	4	2.15	1.09
ZD38B KENAI RIVER WORK WINTER MONTHS	85	1	5	1.89	1.04
ZD38C KENAI RIVER ROTATE BANK CLOSURES	92	1	4	2.00	1.05
ZD38D KENAI RIVER BOARDWALKS OR PATHS	91	1	4	1.90	1.01
ZD38E KENAI RIVER BUILD ROADS ELSEWHERE	91	1	4	1.52	.87
ZD38F KENAI RIVER NO BANK FISHING ZONES	91	1	5	2.76	1.15
ZD39 HH FISH CHENA GR THIS YR	898	1	2	1.97	.17
ZD40 CHENA GR IMPORTANCE OF KEEPING FISH	26	1	4	2.81	1.13
ZD41 CHENA GR BAG PREFERENCE	23	1	3	1.83	.49
ZD42 HH FISH STOCKED LAKES IN AK	882	1	2	1.71	.46
ZD43 MANAGE LAKES FOR HARVEST OF BIG FISH	250	1	5	1.17	.44
ZD44 SPECIES: MANAGE LAKES FOR HVST OF BIG FISH	204	1	95	18.56	18.40
ZD45 SPECIES: MIN LENGTH BIG FISH	175	5	95	17.10	14.41
ZD46 SPECIES: DAILY BAG BIG FISH	187	1	95	6.52	16.27
ZD47A FISH STOCKED LAKES FOR FOOD	259	1	3	1.90	.75
ZD47B FISH STOCKED LAKES FOR CHALLENGE	259	1	3	1.73	.69
ZD47C FISH STOCKED LAKES FOR TROPHY	259	1	3	2.32	.75
ZD47D FISH STOCKED LAKES FOR ENJOYMENT	258	1	3	1.11	.36
ZD48A INCREASE ENJOYMENT CATCH LIMIT STOCKED L	259	1	3	1.99	.83
ZD48B INCREASE ENJOY CATCH TROPHY STOCKED L	259	1	9	1.95	.94
ZD48C INCREASE ENJOY NOT TO WALK FAR STOCKED L	258	1	94	2.41	5.78
ZD48D INCREASE ENJOYMENT GOOD TRAIL STOCKED L	259	1	5	1.77	.78
ZD48E INCREASE ENJOY CAMPGROUND NEAR STOCKED L	259	1	3	2.00	.83
ZD48F INCREASE ENJOY RESTROOM STOCKED LAKE	258	1	94	2.34	5.79
ZD48G INCREASE ENJOYMENT BOAT LAUNCH STOCKED L	257	1	3	2.25	.81
ZD49A DECREASE ENJOY LOTS OF ANGLERS STOCKED L	259	1	3	1.42	.63
ZD49B DECREASE ENJOY NOT CATCH FISH STOCKED L	259	1	3	1.85	.72
ZD49C DECR. ENJOY PEOPLE CATCH > LIMIT STOCKED L	258	1	3	1.26	.55
ZD49D DECR. ENJOY ASKED SHOW LICENSE STOCKED L	257	1	3	2.77	.51
ZD49E DECREASE ENJOY SEEING LITTER STOCKED L	258	1	3	1.12	.36
ZTIME TOTAL INTERVIEW TIME	918	1	999	104.88	280.19
PREFIX TELEPHONE PREFIX	917	224	985	488.01	213.44
STRATA SAMPLE STRATA	918	1	11	4.41	3.14
COMMTY COMMUNITY OF RESIDENCE	917	110	3590	1524.19	1095.48
HHWGT Pre-Season HH Wgt	918	35.56	192.94	104.6949	55.0842
POSTHHWT Post Season HH Wgt	918	53.88	282.16	156.0662	81.6353
POSTWGT2 Revised Post Season HH Wgt	918	56.77	295.92	160.6087	86.9936
WTCHK	918	.87	1.12	1.0246	4.461E-02

Winter Trips: WINTRIP.SAV

Variable	N	Minimum	Maximum	Mean	Std. Deviation
STUDYNO STUDY NUMBER/WINTER LOGS	491	1026	9284	4763.24	2897.17
FLWGT Number of Trips Log Represents	491	1.00	60.00	3.5173	6.0025
HHDAYS DAYS FISHING ACTIVITIES/WINTER	486	1	60	8.01	9.24
HHTRIPS TRIPS FISHING ACTIVITIES/WINTER	485	1	60	7.17	9.02
MONTH TRIP1 MONTH	472	1	96	7.19	13.77
SITE TRIP1 FISH SITE	483	101	9898	1210.57	812.72
SITECOMM TRIP1 NEAREST COMMUNITY	483	90	3610	1764.24	1075.63
TYPEFISH TRIP1 TYPE FISH	486	1	2	1.70	.46
ZONE TRIP1 FISH ZONE	483	1	24	11.59	5.87
FL1 LOG1 NUMBER	491	1	6	1.63	1.05
FL2 HH MEMBERS/SITE1	485	1	6	1.90	1.14
FL3A DAY1/NUMBER FISHING/SITE1	485	0	6	1.71	1.00
FL3B DAY2/NUMBER FISHING/SITE1	57	0	4	1.82	.91
FL3C DAY3/NUMBER FISHING/SITE1	24	1	4	1.87	.85
FL3D DAY4/NUMBER FISHING/SITE1	8	1	3	1.75	.89
FL4 TIME SPENT FISHING/SITE1	480	.00	144.00	6.6214	9.8051
FL5 TIME GETTING THERE/SITE1	482	.00	12.00	1.4117	1.7337
FL6 PLACE OF ORIGIN/SITE1	485	1	3	1.05	.31
FL6A OTHER PLACE OF ORIGIN/SITE1	10	140	2960	1338.00	855.54
FL7 BENEFIT OR COST/SITE1	427	1	4	1.39	.54
FL8 FISHING WHAT % REASON/SITE1	479	0	100	82.38	27.42
FL9 TARGET SPECIES/SITE1	475	1	95	15.98	15.86
FL10 TARGET SPECIES CAUGHT/SITE1	460	0	996	18.10	78.37
FL11 TARGET SPECIES KEPT/SITE1	464	0	996	13.60	62.97
FL12A 2ND SPECIES CAUGHT/SITE1	147	1	36	14.60	8.91
FL12B NUM 2ND SPECIES CAUGHT/SITE1	136	0	275	9.07	32.91
FL12C NUM 2ND SPECIES KEPT/SITE1	139	0	275	5.78	31.37
FL12D 3RD SPECIES CAUGHT/SITE1	30	2	31	17.87	8.38
FL12E NUM 3RD SPECIES CAUGHT/SITE1	23	0	275	27.35	78.34
FL12F NUM 3RD SPECIES KEPT/SITE1	24	0	275	24.96	77.05
FL13 FISHING VS WORKING/SITE1	481	1	2	1.90	.30
FL14 $ EARNED IF NOT FISHING/SITE1	41	10	4000	318.73	625.62
FL15A USED AIRLINE/SITE1	485	1	2	1.99	.10
FL15B USED TRAIN/SITE1	485	2	2	2.00	.00
FL15C USED FERRY/SITE1	485	1	2	2.00	4.54E-02
FL16 $ SPENT COML TRANSPORT/SITE1	6	0	500	280.50	214.79
FL17 USED GUIDE/CHARTER FOR SITE1	484	1	2	1.99	7.86E-02
FL18 $ SPENT ON GUIDE/CHARTER/SITE1	3	20	250	106.67	125.03
FL19 LOCATION OF GUIDE/CHARTER/SITE1	3	820	1750	1216.67	479.83
FL20A PLANE TRANSP/SITE1 (GUIDE/CHARTER)	3	1	2	1.33	.58
FL20B BOAT TRANSP/SITE1 (GUIDE/CHARTER)	3	1	2	1.67	.58
FL20C OTHER TRANSPORT/SITE1 (GUIDE/CHARTER)	3	1	2	1.67	.58
FL20D GUIDE SERVICE/SITE1 (GUIDE/CHARTER)	3	1	1	1.00	.00
FL20E PROVIDE TACKLE/SITE1 (GUIDE/CHARTER)	3	1	2	1.33	.58
FL20F LODGING/SITE1 (GUIDE/CHARTER)	3	2	2	2.00	.00
FL20G PROVIDED FOOD/SITE1 (GUIDE/CHARTER)	3	2	2	2.00	.00
FL21 USED BOAT AT SITE1	485	1	2	1.73	.45
FL22 BOATING HOURS TO SITE1	128	.00	11.00	1.2434	1.5228
FL23 BOATING HOURS FISHING/SITE1	127	.00	18.00	3.5354	3.5978
FL24 HH OWN BOAT/SITE1	132	1	2	1.37	.48
FL25 $ TO RENT/LEASE BOAT/SITE1	20	0	125	18.00	38.50
FL26 WHICH HH BOAT USED/SITE1	81	1	6	1.20	.66
FL27 USED PRIVATE PLANE/SITE1	485	1	2	1.99	.11
FL28 FLYING HOURS/SITE1	6	.25	1.50	.8750	.4402
FL29 HH OWN PLANE/SITE1	6	1	2	1.33	.52
FL30 $ TO RENT/LEASE PLANE/SITE1	1	0	0	.00	.
FL31 WHICH PLANE USED/SITE1	4	1	2	1.25	.50
FL32 USE OF VEHICLES/SITE1	485	1	2	1.12	.32
FL33 MILES DRIVEN TO SITE1	420	0	370	34.18	46.42
FL34 HH OWN VEHICLE/SITE1	426	1	2	1.13	.34
FL35 $ TO RENT/LEASE VEHICLE/SITE1	11	0	250	22.73	75.38
FL36 WHICH VEHICLE(S) USED/SITE1	364	1	6	1.50	1.20
FL37 ADDL $ SPENT FOOD/DRINK SITE1	473	0	500	18.71	44.89
FL38 ADDL $ SPENT LODGING/SITE1	481	0	75	.96	7.15
FL39 ADDL $ ON MISC COSTS/SITE1	474	0	500	9.46	35.09

A10 LOCATION OF CABIN/LAND	64	110	3560	2119.62	1064.47
COMMTY COMMUNITY OF RESIDENCE	491	110	3610	1661.54	1160.89
STRATA	491	1	11	4.85	3.27
PREWGT2 HH wgt: preseason svy (calc feb 95)	491	37	199	109.08	57.15
TOTWT wgt (prewgt2 * flwgt)	491	37	9943	374.18	735.77

Non-Resident Survey: NRSVYCL3.SAV

Variable	N	Minimum	Maximum	Mean	Std. Deviation
STUDYNO fishing license number (string variable)					
DUPL temp variable to eliminate duplilcates	104	1	1	1.00	.00
MAILING which mailing responded to	4278	1	3	1.33	.60
FISH93 hh fish in ak in 93?	4278	1	2	1.04	.19
A1 no HH trips to Ak in 93	3893	1	50	1.31	1.58
A2 main purpose trip	4060	1	6	2.32	1.40
A2A other putpose trip - 1	486	1	6	3.43	.91
A2B other purpose trip - 2	65	1	6	4.06	.85
A3 month trip started	4123	1	99	9.56	14.44
A4 trip length days	4041	1	365	15.92	21.09
A5 addtl days to fish?	3868	0	99	1.26	4.53
A6 make trip if couldnt fish?	4011	1	2	1.41	.49
A7 no. HH mbrs on trip	4052	1	14	1.86	1.13
A8 commty entry to ak	4007	140	6006	948.36	1117.50
A9 pkg tour spending	780	150	50000	4431.27	4201.71
PKGTOUR part of pkg tour?	4120	1	2	1.23	.42
A9A amt HH spent in AK	3187	0	30000	2122.43	2471.24
A9B amt hh spent daily food & lodging	2883	.00	7500.00	144.1722	376.3451
A10A1 comm air to ak	4113	1	2	1.36	.48
A10A2 comm air fm ak	4111	1	2	1.38	.49
A10A3 cost comm air	2625	0	24000	965.76	961.19
A10B1 cruise to ak	4110	1	2	1.95	.21
A10B2 cruise fm ak	4110	1	2	1.96	.19
A10B3 cost cruise	99	0	60000	3591.15	6285.94
A10C1 ferry to ak	4110	1	2	1.98	.15
A10C2 ferry fm ak	4110	1	2	1.98	.14
A10C3 cost ferry	157	0	3500	739.85	695.42
A10D1 bus to ak	4110	1	2	2.00	5.83E-02
A10D2 bus fm ak	4110	1	2	2.00	4.41E-02
A10D3 cost bus	14	0	2000	220.50	516.83
A10E1 camper to ak	4110	1	2	1.93	.26
A10E2 camper fm ak	4110	1	2	1.93	.26
A10E3 cost camper	339	0	17050	2062.20	2198.49
A10F1 auto to ak	4111	1	2	1.96	.20
A10F2 auto fm ak	4111	1	2	1.96	.19
A10F3 cost auto	283	0	16000	804.68	1523.30
OTHTRAVE other mode of travel	127	1	9993	82.00	886.44
A10G1 other to ak	4110	1	2	1.98	.15
A10G2 other fm ak	4110	1	2	1.98	.15
A10G3 cost other	134	0	12000	906.22	1528.62
CHK10G3	4278	0	1	1.50E-02	.12
A11A where: beauty	3785	1	3	1.62	.68
A11B where: catch lots	3814	1	3	1.40	.61
A11C where: trophies	3731	1	3	2.09	.82
A11D where: fly fishing	3602	1	3	2.77	.54
A11E where: derbies	3611	1	3	2.92	.32
A11F where: catch & release	3585	1	3	2.71	.57
A11G where: few other anglers	3664	1	3	1.92	.74
A11H where: no long travel	3662	1	3	2.14	.72
A11I where: not expensive trip	3673	1	3	1.93	.70
A11J where: road access	3657	1	3	2.17	.81
A11K where: no evidence settled	3618	1	3	2.38	.71
A11L where: not walk far	3666	1	3	2.42	.70
A12A why: food	3715	1	3	2.54	.66
A12B why: fun	3899	1	3	1.11	.33
A12C why: friends	3721	1	3	1.61	.77
A12D whyh: family	3646	1	3	1.68	.83
A12E why: challenge	3746	1	3	1.77	.74
A13A info: tour brochures	3633	1	3	2.29	.76
A13B info: books_magazines	3579	1	3	2.27	.72
A13C info: friend_relative	3792	1	3	1.48	.74
A13D info: TV_Radio	3512	1	3	2.67	.56
A13E info: fish & game	3581	1	3	2.22	.78
A13F info:newspaper	3540	1	3	2.58	.63
A14 skills best in HH	3958	1	4	2.56	.87

A15 1992 HHtotal pretax income	3448	0	7200000	89165.76	217114.19
WT1 26.6842, weight for this survey	4278	26.68	26.68	26.6842	.0000
CHK10C3	36	1	1	1.00	.00
CHK10D3	8	1	1	1.00	.00
CHK10E3	56	1	1	1.00	.00
CHK10F3	120	1	1	1.00	.00
R1TRIPS HH reported fishing trips to region 1	2618	0	7	.30	.66
R1DAYS HH reported fishing days in region 1	2618	0	74	1.11	3.39
R2TRIPS HH reported fishing trips to region 2	2618	0	9	.93	1.07
R2DAYS HH reported fishing days in region 2	2618	0	105	3.02	7.24
R3TRIPS HH reported fishing trips to region 3	2618	0	7	.12	.43
R3DAYS HH reported fishing days in region 3	2618	0	60	.48	2.18
R4TRIPS HH reported fishing trips to region 4	2618	0	4	8.37E-02	.36
R4DAYS HH reported fishing days in region 4	2618	0	36	.20	1.26
R9TRIPS HH reported fishing trips to unknown region	2618	0	3	.10	.32
R9DAYS HH reported fishing days in unknown region	2618	0	180	.24	4.50
TOTTRIPS total trips reported by HH	2618	1	10	1.54	.95
FISHDAYS total days HH fished in Alaska	2618	0	285	5.05	9.61
FDAYS Days charter expenditures included food	2613	.00	15.00	7.998E-02	.6869
LDAYS Days charter expenditures included lodging	2613	.00	15.00	8.381E-02	.6958
LODG$ Total reported lodging expenditures	2605	.00	21000.00	56.9317	466.1531
CHAR$ Total Charter expenditures	2618	.00	.00	.0000	.0000
ALLTRIP$ Total fishing trips expenditures	2618	.00	25200.00	243.1730	740.5899

Non-Resident Trips: NRTRIP4.SAV

Variable	N	Minimum	Maximum	Mean	Std. Deviation
STUDYNO fishing license number (String Variable)					
SITE	6285	101	2506	1,246.16	529.44
HHSTART	5346	20	5052	1,661.74	1,260.16
DUPLTRIP	3	1	1	1.00	-
MAILING	6676	1	3	1.30	0.58
TA1 trip number	6601	1	10	1.63	1.02
ZONE	6281	1	25	12.31	5.24
TA4 water type	6263	1	9	1.55	0.51
TA6 days fished	6237	1	180	3.17	5.77
TA7 times fished	5948	1	180	3.02	5.29
TA8 how many HH mbrs fished	6265	1	99	1.78	2.38
TA9 tgt species 1	6274	1	95	15.09	18.81
TA10 tgt 1 caught	5560	0	2020	9.76	42.04
TA11 tgt 1 kept	5674	0	720	4.51	16.07
TA9A tgt species 2	1346	1	95	14.16	14.97
TA10A tgt 2 caught	750	0	750	10.48	33.47
TA11A tgt 2 kept	838	0	144	4.46	9.25
TA9B tgt species 3	274	1	95	15.96	13.92
TA10B tgt 3 caught	108	0	200	13.28	31.26
TA11B tgt 3 kept	133	0	144	4.96	13.74
TA9C tgt species 4	75	1	50	15.03	11.57
TA10C tgt 4 caught	27	0	150	22.70	34.06
TA11C tgt 4 kept	31	0	150	9.77	27.14
TA10D lumped catch	375	1	500	22.46	53.19
TA11D lumped kept	310	0	84	7.05	10.09
TA12 other catch	5413	0	300	2.72	12.47
TA13 trip part of package	5976	1	9	1.86	0.36
TAFLAG catch_kept off	141	1	2	1.99	0.12
TB1 spending on guide_charter	2454	0	12000	620.82	1,121.64
TB3 air charter	2681	1	2	1.81	0.39
TB4 boat charter	2681	1	2	1.17	0.37
TB5 guiding svcs	2681	1	2	1.24	0.43
TB6 fishing tackle	2681	1	2	1.20	0.40
TB7 lodging	2681	1	2	1.74	0.44
TB8 food	2681	1	2	1.69	0.46
TBFLAG charter spending off	124	1	2	1.66	0.48
TC1 commercial transp spending	2323	0	3000	74.34	247.67
TC2 boat spending	2508	0	3500	60.63	202.49
TC3 vehicle spending	2908	0	4000	77.87	184.54
TC4 lodging_camping fees	2962	0	14000	112.42	460.32
TC5 fish processing spending	2891	0	3500	34.18	100.71
TC6 tackle_equip spending	2986	0	1500	30.01	68.90
TC7 other spending	2713	0	5000	99.98	248.94
TCFLAG trip spending off	606	1	2	1.41	0.49
CHRTCMTY location of charter company	2498	95	3610	1,903.02	914.60
TGT1	6186	1	99	4.53	4.35
TGT2	1341	1	14	5.38	3.75
TGT3	271	1	14	6.83	3.82
TGT4	73	1	12	6.58	3.35
A2 main purpose trip	6438	1	9	2.30	1.40
A2A other putpose trip - 1	856	1	6	3.40	0.89
A2B other purpose trip - 2	137	1	6	4.08	0.93
A8 commty entry to ak	6374	140	6006	944.48	1,161.56
FISHTRIP	6674	0	99	3.99	18.28
ORIGZONE	5660	0	99	14.00	12.13
WEIGHT	6676	26.6842	26.6842	26.68	-

Guide and Charter Survey: GUIDE4.SAV

Variable	N	Minimum	Maximum	Mean	Std. Deviation
STUDYNO STUDY NUMBER/GUIDE & CHARTER	485	1	487	243.35	140.60
DISP DISPOSITION CODE	485	1	35	6.54	8.67
SERVICE1 1ST SERVICE PROVIDED	334	1	7	1.93	1.67
SERVICE2 2ND SERVICE PROVIDED	130	1	97	4.56	8.43
SERVICE3 3RD SERVICE PROVIDED	18	1	7	4.00	1.85
SPECIES1 1ST SPECIES TARGETED	171	1	97	31.75	19.42
SPECIES2 2ND SPECIES TARGETED	115	1	53	28.88	16.81
SPECIES3 3RD SPECIES TARGETED	43	1	51	30.37	16.94
REGION1 1ST REGION TAKE CLIENTS	332	1	4	3.15	.81
R1AREA1 1ST AREA IN REGION1	174	99	3005	1163.65	623.27
R1AREA2 2ND AREA IN REGION1	49	102	1902	1228.33	473.04
R1AREA3 3RD AREA IN REGION1	21	311	3007	1324.95	573.21
REGION2 2ND REGION TAKE CLIENTS	11	2	4	2.45	.69
R2AREA1 1ST AREA IN REGION2	5	1606	1810	1669.80	90.80
R2AREA2 2ND AREA IN REGION2	0				
R2AREA3 3RD AREA IN REGION2	0				
REGION3 3RD REGION TAKE CLIENTS	1	3	3	3.00	.
R3AREA1 1ST AREA IN REGION3	0				
R3AREA2 2ND AREA IN REGION3	0				
R3AREA3 3RD AREA IN REGION3	0				
MONTH STARTING MONTH/REPORTING PERIOD	302	1	97	3.70	8.08
YEAR STARTING YEAR/REPORTING PERIOD	301	89	97	92.89	.59
A1 GROSS REVENUES	319	0	9999997	376120.39	1583734.86
A2 % OF GROSS DERIVED FROM SPFISH	323	.00	999.97	89.7428	93.4042
A3 GUIDING (% OF SPFISH ACTIVITIES)	272	2.00	999.97	120.9395	199.4437
A4 TRANSPORTATION (% OF SPFISH ACTIVITIES)	144	.50	999.97	130.4651	276.8966
A5 LODGING (% OF SPFISH ACTIVITIES)	100	1.00	999.97	150.0906	330.5379
A6 EQUIPT RENTAL (% OF SPFISH ACTIVITIES)	47	.33	999.97	224.8249	407.6477
A7 TACKLE/GEAR (% OF SPFISH ACTIVITIES)	36	.33	999.97	286.9706	448.7740
A8 FOOD SALES (% OF SPFISH ACTIVITIES)	44	.34	999.97	239.1686	417.5458
A9 OTHER REVS (% OF SPFISH ACTIVITIES)	34	.10	999.97	307.4465	454.0699
A9_1 1ST OTHER REVENUE	23	1	97	9.26	19.43
A9_2 2ND OTHER REVENUE	2	1	13	7.00	8.49
B1 TOTAL FULL-TIME EMPLOYEES	291	1	95	7.92	20.32
B1A SOUTHCENTRAL/FULL-TIME EMPLOYEES	136	1	35	3.27	4.77
B1B SOUTHEAST/FULL-TIME EMPLOYEES	88	1	30	2.73	4.31
B1C SOUTHWEST/FULL-TIME EMPLOYEES	24	1	25	3.00	5.06
B1D AYK/FULL-TIME EMPLOYEES	14	1	5	1.86	1.41
B1E OUTSIDE AK/FULL-TIME EMPLOYEES	55	1	23	3.31	3.75
B2 TOTAL MO. WORKED/FULL-TIME EMPLOYEES	268	.5	175.0	13.104	22.096
B2A SOUTHCENTRAL/MONTHS WORKED	120	1.0	175.0	13.571	22.791
B2B SOUTHEAST/MONTHS WORKED	80	1.0	90.0	8.712	10.857
B2C SOUTHWEST/MONTHS WORKED	18	1.0	77.0	11.806	18.507
B2D AYK/MONTHS WORKED	11	.5	12.5	8.636	4.359
B2E OUTSIDE AK/MONTHS WORKED	31	1.0	96.0	13.258	20.585
B3 TOTAL PART-TIME EMPLOYEES	159	1	95	11.46	26.92
B3A SOUTHCENTRAL/PART-TIME EMPLOYEES	60	1	20	2.43	3.06
B3B SOUTHEAST/PART-TIME EMPLOYEES	47	1	78	4.13	11.50
B3C SOUTHWEST/PART-TIME EMPLOYEES	11	1	4	1.82	.98
B3D AYK/PART-TIME EMPLOYEES	12	1	8	2.50	2.11
B3E OUTSIDE AK/PART-TIME EMPLOYEES	25	1	15	3.00	3.63
B4 TOTAL MOS WORKED/PART-TIME EMPLOYEES	142	.5	81.0	6.708	9.302
B4A SOUTHCENTRAL/MOS PART-TIMERS WORKED	55	.5	36.0	5.064	4.978
B4B SOUTHEAST/MONTHS PART-TIMERS WORKED	45	1.0	40.0	5.111	6.324
B4C SOUTHWEST/MONTHS PART-TIMERS WORKED	8	1.0	8.0	3.563	2.382
B4D AYK/MONTHS PART-TIMERS WORKED	12	.5	999.0	87.375	287.139
B4E OUTSIDE AK/MONTHS PART-TIMERS WORKED	14	1.0	24.0	4.679	6.815
C1 PROPTY1 KIND	127	1	97	4.80	14.21
C1A PROPTY1 LOCATION	122	90	3610	1827.30	919.17
C1B AGE OF PROPTY1	117	1	66	13.20	11.51
C1C VALUE OF PROPTY1	118	4000	10532942	422294.42	1206076.20
C2 PROPTY2 KIND	29	1	7	2.90	2.04
C2A PROPTY2 LOCATION	26	145	3520	2156.96	889.29
C2B AGE OF PROPTY2	28	1	43	11.00	9.73
C2C VALUE OF PROPTY2	29	2000	350000	92431.03	101162.68

C3 PROPTY3 KIND	11	1	7	4.55	2.25
C3A PROPTY3 LOCATION	10	1542	3220	2140.20	521.62
C3B AGE OF PROPTY3	10	3	20	10.10	6.31
C3C VALUE OF PROPTY3	11	500	475000	77500.00	140314.47
C4 PROPTY4 KIND	3	1	4	3.00	1.73
C4A PROPTY4 LOCATION	3	140	2350	1100.00	1133.18
C4B AGE OF PROPTY4	3	3	30	16.00	13.53
C4C VALUE OF PROPTY4	3	10000	180000	73333.33	92915.73
D1 LEASES/MTGS EXPENSES	121	0	999997	35269.95	140815.61
D2 PROPERTY TAX EXPENSES	121	0	99997	2301.47	9233.37
D3 UTILITIES EXPENSES	119	0	99997	5361.52	13172.81
D4 MAINTENANCE EXPENSES	117	0	999997	16015.53	94263.93
D5 INSURANCE EXPENSES	119	0	999997	14793.63	92444.25
D6 OTHER EXPENSES	121	0	999997	39942.32	142363.36
E1 1ST EQUIPT/CAPITAL EXPEND	316	1	96	4.65	9.85
E1A EQUIPT1/YEAR PURCHASED	310	1965	9997	2014.98	454.83
E1B EQUIPT1/PLACE PURCHASED	305	140	9997	4933.54	4183.60
E1C EQUIPT1/INITIAL COST	308	700	9999997	88173.44	574124.96
E1D EQUIPT1/REPLACEMENT YEAR	243	0	9997	1949.08	653.47
E1E EQUIPT1/COML SPFISH USE (%)	310	0	997	82.42	60.89
E2 2ND EQUIPT/CAPITAL EXPEND	234	1	96	7.74	12.89
E2A EQUIPT2/YEAR PURCHASED	227	1973	1994	1990.37	2.56
E2B EQUIPT2/PLACE PURCHASED	221	140	9997	4310.76	4194.37
E2C EQUIPT2/INITIAL COST	229	100	465000	22973.43	44878.84
E2D EQUIPT2/REPLACEMENT YEAR	178	0	2012	1907.56	414.99
E2E EQUIPT2/COML SPFISH USE (%)	227	0	100	77.71	32.51
E3 3RD EQUIPT/CAPITAL EXPEND	176	1	96	10.51	19.86
E3A EQUIPT3/YEAR PURCHASED	172	1973	1994	1990.39	2.85
E3B EQUIPT3/PLACE PURCHASED	169	140	9997	3950.40	4003.07
E3C EQUIPT3/INITIAL COST	173	435	206555	13041.79	24865.77
E3D EQUIPT3/REPLACEMENT YEAR	142	0	2015	1941.65	331.76
E3E EQUIPT3/COML SPFISH USE (%)	170	0	100	82.64	29.23
E4 4TH EQUIPT/CAPITAL EXPEND	144	1	90	9.93	16.84
E4A EQUIPT4/YEAR PURCHASED	143	1980	1994	1991.07	2.33
E4B EQUIPT4/PLACE PURCHASED	140	140	9997	3360.87	3751.08
E4C EQUIPT4/INITIAL COST	141	200	210000	12251.05	24548.59
E4D EQUIPT4/REPLACEMENT YEAR	112	0	2020	1944.36	324.05
E4E EQUIPT4/COML SPFISH USE (%)	141	0	100	82.04	29.32
E5 5TH EQUIPT/CAPITAL EXPEND	88	1	90	13.42	20.62
E5A EQUIPT5/YEAR PURCHASED	87	1974	1994	1990.93	2.59
E5B EQUIPT5/PLACE PURCHASED	87	140	9997	3918.24	4124.25
E5C EQUIPT5/INITIAL COST	86	400	400000	16499.53	48003.97
E5D EQUIPT5/REPLACEMENT YEAR	66	1993	2020	1998.45	3.89
E5E EQUIPT5/COML SPFISH USE (%)	84	0	100	81.56	29.05
E6 6TH EQUIPT/CAPITAL EXPEND	67	1	90	12.28	19.07
E6A EQUIPT6/YEAR PURCHASED	63	1985	1993	1991.06	2.05
E6B EQUIPT6/PLACE PURCHASED	65	140	9997	3611.45	4105.13
E6C EQUIPT6/INITIAL COST	66	700	487000	21267.06	71756.80
E6D EQUIPT6/REPLACEMENT YEAR	55	0	2235	1929.60	379.65
E6E EQUIPT6/COML SPFISH USE (%)	67	0	999	110.90	159.31
E7 7TH EQUIPT/CAPITAL EXPEND	53	1	90	19.21	28.86
E7A EQUIPT7/YEAR PURCHASED	52	1988	1997	1991.17	2.07
E7B EQUIPT7/PLACE PURCHASED	51	140	9997	4089.06	4322.35
E7C EQUIPT7/INITIAL COST	52	300	175000	18069.00	36992.56
E7D EQUIPT7/REPLACEMENT YEAR	45	1992	2010	1998.09	3.61
E7E EQUIPT7/COML SPFISH USE (%)	51	0	100	87.90	25.62
E8 8TH EQUIPT/CAPITAL EXPEND	36	1	96	27.28	32.82
E8A EQUIPT8/YEAR PURCHASED	35	1987	1994	1991.57	1.77
E8B EQUIPT8/PLACE PURCHASED	34	140	9997	5081.44	4531.97
E8C EQUIPT8/INITIAL COST	34	300	450000	22578.18	76702.95
E8D EQUIPT8/REPLACEMENT YEAR	30	1992	2005	1997.73	3.31
E8E EQUIPT8/COML SPFISH USE (%)	35	0	100	89.71	25.81
F1 TOTAL FISHING EQUIPT EXPENSES ($)	305	100	9999997	45911.09	572229.34
F1A SOUTHCENTRAL/FISH EQUIPT SPENT (%)	162	5	100	81.93	27.47
F1B SOUTHEAST/FISH EQUIPT SPENT (%)	112	5	100	67.54	31.40
F1C SOUTHWEST/FISH EQUIPT SPENT (%)	24	0	100	67.79	39.74
F1D AYK/FISH EQUIPT SPENT (%)	12	12	100	63.08	35.77
F1E OUTSIDE AK/FISH EQUIPT SPENT (%)	138	5	100	50.31	26.85
G1 TOTAL PAYROLL	290	0	9999997	137534.00	1015500.52
G1A SOUTHCENTRAL/PAYROLL	109	0	800000	48738.35	117760.65

G1B SOUTHEAST/PAYROLL	73	100	1032562	50512.97	167568.24
G1C SOUTHWEST/PAYROLL	22	100	210000	49436.91	64174.26
G1D AYK/PAYROLL	10	0	58000	14309.30	18958.74
G1E OUTSIDE AK/PAYROLL	19	500	139248	21351.42	31920.49
G2 PAYROLL RELATED TO SPFISH (TOTAL %)	271	0	997	73.87	69.91
G2A SOCENTRAL % PAYROLL RELATED TO SPFISH	107	1	100	89.33	24.76
G2B SOUTHEAST % PAYROLL RELATED TO SPFISH	64	1	100	80.00	31.31
G2C SOUTHWEST % PAYROLL RELATED TO SPFISH	14	3	100	74.14	33.94
G2D AYK % PAYROLL RELATED TO SPFISH	7	2	100	35.57	44.68
G2E OUTSIDE AK % PAYROLL RELATED TO SPFISH	9	10	100	54.44	35.13
G3 TOTAL EMPL NONPAYROLL EXPENSES	241	0	999997	13468.02	92269.89
G3A SOCENTRAL EMPL NONPAYROLL EXPENSES	64	10	165000	8906.67	21551.50
G3B SOUTHEAST EMPL NONPAYROLL EXPENSES	30	24	171095	11183.43	32620.74
G3C SOUTHWEST EMPL NONPAYROLL EXPENSES	11	100	35000	9031.82	11856.82
G3D AYK EMPL NONPAYROLL EXPENSES	7	500	14000	5185.14	4479.59
G3E OUTSIDE EMPL NONPAYROLL EXPENSES	13	216	36828	9936.38	10910.36
G4 TOTAL TRANSPORT EXPENSES	309	0	999997	34242.18	107452.31
G4A SOCENTRAL/TRANSPORT EXPENSES	142	50	720000	24660.44	66501.94
G4B SOUTHEAST/TRANSPORT EXPENSES	101	35	633676	27794.41	77139.50
G4C SOUTHWEST/TRANSPORT EXPENSES	28	270	205000	27069.21	43200.49
G4D AYK/TRANSPORT EXPENSES	17	300	110000	19433.18	32498.48
G4E OUTSIDE AK/TRANSPORT EXPENSES	41	300	68327	12396.73	13917.60
G4_1 TOTAL VEHICLE LEASES/LOANS	145	0	300000	12684.68	28894.32
G4A1 SOCENTRAL/VEHICLE LEASES/LOANS	57	0	135000	10747.21	19101.52
G4B1 SOUTHEAST/VEHICLE LEASES/LOANS	39	220	65000	9840.62	12705.65
G4C1 SOUTHWEST/VEHICLE LEASES/LOANS	9	1000	78000	18298.89	26749.93
G4D1 AYK/VEHICLE LEASES/LOANS	6	350	10400	4772.00	3340.34
G4E1 OUTSIDE AK/VEHICLE LEASES/LOANS	16	3000	40000	12921.25	10828.61
G4_2 TOTAL FUEL & OPERATIONS	290	30	160000	9068.17	19330.68
G4A2 SOCENTRAL/FUEL & OPERATIONS	131	200	125000	7897.89	14268.81
G4B2 SOUTHEAST/FUEL & OPERATIONS	96	35	160000	8161.74	21894.39
G4C2 SOUTHWEST/FUEL & OPERATIONS	25	270	95000	16507.48	27655.92
G4D2 AYK/FUEL & OPERATIONS	8	300	2000	1067.50	512.02
G4E2 OUTSIDE AK/FUEL & OPERATIONS	12	300	6487	1868.58	1691.86
G4_3 TOTAL MAINTENANCE EXPENSES	280	0	360000	8792.41	27415.02
G4A3 SOCENTRAL/MAINTENANCE EXPENSES	126	25	125000	7286.16	15912.99
G4B3 SOUTHEAST/MAINTENANCE EXPENSES	92	50	170000	7417.96	20235.25
G4C3 SOUTHWEST/MAINTENANCE EXPENSES	21	200	37000	6145.76	10179.47
G4D3 AYK/MAINTENANCE EXPENSES	7	200	3000	1286.29	994.63
G4E3 OUTSIDE AK/MAINTENANCE EXPENSES	20	40	47086	6484.90	10495.68
G4_4 TOTAL OTHER TRANSPORT EXPENSES	143	0	456205	9675.00	40851.50
G4A4 SOCENTRAL/OTHER TRANSPORT EXPENSES	53	8	30604	3810.17	6288.74
G4B4 SOUTHEAST/OTHER TRANSPORT EXPENSES	44	50	456205	15695.89	69549.41
G4C4 SOUTHWEST/OTHER TRANSPORT EXPENSES	12	100	21657	5635.67	6767.71
G4D4 AYK/OTHER TRANSPORT EXPENSES	11	70	110000	18198.91	34934.28
G4E4 OUTSIDE AK/OTHER TRANSPORT EXPENSES	11	200	55114	11918.73	16839.35
G5 TOTAL SERVICES	306	0	999997	15383.00	83927.26
G5A SOCENTRAL/SERVICES	128	100	215000	7774.05	21126.59
G5B SOUTHEAST/SERVICES	82	30	85650	6503.77	15915.87
G5C SOUTHWEST/SERVICES	16	63	30992	6796.75	8735.86
G5D AYK/SERVICES	17	0	14000	2999.12	3881.00
G5E OUTSIDE AK/SERVICES	62	50	178418	11654.73	29598.40
G5_1 TOTAL ADVERTISING EXPENSES	247	0	233863	7002.67	20902.32
G5A1 SOCENTRAL/ADVERTISING EXPENSES	112	35	90000	4432.35	9602.37
G5B1 SOUTHEAST/ADVERTISING EXPENSES	74	30	61416	4108.82	11885.61
G5C1 SOUTHWEST/ADVERTISING EXPENSES	14	63	10067	2857.79	3442.19
G5D1 AYK/ADVERTISING EXPENSES	12	50	8200	2118.50	2456.68
G5E1 OUTSIDE AK/ADVERTISING EXPENSES	55	200	175398	12178.00	30380.13
G5_2 TOTAL LEGAL/ACCT EXPENSES	200	0	54000	2119.59	5148.78
G5A2 SOCENTRAL/LEGAL & ACCT EXPENSES	92	20	12000	1430.96	2177.11
G5B2 SOUTHEAST/LEGAL & ACCT EXPENSES	50	0	27185	2068.94	4717.57
G5C2 SOUTHWEST/LEGAL & ACCT EXPENSES	9	150	12000	2435.22	3747.84
G5D2 AYK/LEGAL & ACCT EXPENSES	8	0	1700	654.75	526.68
G5E2 OUTSIDE AK/LEGAL & ACCT EXPENSES	26	45	4500	1229.54	1089.08
G5_3 TOTAL OTHER SERVICES	103	0	112000	4779.38	12830.18
G5A3 SOCENTRAL/OTHER SERVICES	47	0	112000	5282.06	16790.49
G5B3 SOUTHEAST/OTHER SERVICES	30	100	48000	3833.63	9114.22
G5C3 SOUTHWEST/OTHER SERVICES	7	200	16975	5853.00	6069.77
G5D3 AYK/OTHER SERVICES	3	75	800	491.67	374.44
G5E3 OUTSIDE AK/OTHER SERVICES	10	145	13945	2409.00	4154.93

G6 TOTAL SUBCONTRACTS	307	0	999997	12151.41	83882.37
G6A SOCENTRAL/SUBCONTRACTS	26	0	177000	28642.19	50204.16
G6B SOUTHEAST/SUBCONTRACTS	12	300	128058	37229.67	45411.86
G6C SOUTHWEST/SUBCONTRACTS	3	2000	14640	6880.00	6794.35
G6D AYK/SUBCONTRACTS	2	2000	3000	2500.00	707.11
G6E OUTSIDE AK/SUBCONTRACTS	2	2000	10000	6000.00	5656.85
G7 TOTAL ADMIN. COSTS	307	0	999997	17170.43	86872.80
G7A SOCENTRAL/ADMIN. COSTS	127	5	400000	10950.86	37425.42
G7B SOUTHEAST/ADMIN. COSTS	81	50	202000	8090.28	24490.95
G7C SOUTHWEST/ADMIN. COSTS	20	150	18267	4312.00	5528.21
G7D AYK/ADMIN. COSTS	13	100	50000	7045.23	13544.30
G7E OUTSIDE AK/ADMIN. COSTS	57	160	160500	9778.44	28477.63
G7_1 TOTAL OFFICE EXPENSES	185	0	66468	3643.14	7982.10
G7A1 SOCENTRAL/OFFICE EXPENSES	84	1	27000	2880.17	4576.09
G7B1 SOUTHEAST/OFFICE EXPENSES	48	0	66468	3408.00	9929.69
G7C1 SOUTHWEST/OFFICE EXPENSES	13	100	15000	2522.77	3892.34
G7D1 AYK/OFFICE EXPENSES	10	20	10000	2402.90	3547.23
G7E1 OUTSIDE AK/OFFICE EXPENSES	15	20	8000	2101.13	2278.08
G7_2 TOTAL INSURANCE COSTS	268	150	410000	8682.15	31134.63
G7A2 SOCENTRAL/INSURANCE COSTS	111	280	83515	6476.95	13104.55
G7B2 SOUTHEAST/INSURANCE COSTS	65	200	165000	6182.00	20742.72
G7C2 SOUTHWEST/INSURANCE COSTS	9	150	7015	1927.11	2068.95
G7D2 AYK/INSURANCE COSTS	6	500	6000	2709.83	2451.18
G7E2 OUTSIDE AK/INSURANCE COSTS	49	400	160500	10232.53	29702.59
G7_3 TOTAL OTHER ADMIN COSTS	100	0	26000	3043.52	4862.69
G7A3 SOCENTRAL/OTHER ADMIN COSTS	45	0	16000	2412.20	3519.48
G7B3 SOUTHEAST/OTHER ADMIN COSTS	27	0	26000	3178.11	6391.03
G7C3 SOUTHWEST/OTHER ADMIN COSTS	6	1000	8562	3516.67	3244.57
G7D3 AYK/OTHER ADMIN COSTS	3	100	1000	433.33	493.29
G7E3 OUTSIDE AK/OTHER ADMIN COSTS	12	75	8000	2408.33	2942.63
G8 TAXES/TOTAL DOLLARS	296	0	999997	8483.80	82134.50
G8A SOCENTRAL/MISC. TAXES	71	0	50000	3688.51	7604.06
G8B SOUTHEAST/MISC. TAXES	40	40	67000	3023.98	10699.63
G8C SOUTHWEST/MISC. TAXES	3	450	3300	2020.00	1446.96
G8D AYK/MISC. TAXES	3	180	564	414.67	205.73
G8E OUTSIDE AK/MISC. TAXES	9	0	16200	3394.44	5171.46
G9 TOTAL OTHER EXPENSES	299	0	999997	12808.89	87595.46
G9A SOCENTRAL/OTHER EXPENSES	50	0	87190	8403.56	15946.68
G9B SOUTHEAST/OTHER EXPENSES	34	50	255748	12846.24	43997.94
G9C SOUTHWEST/OTHER EXPENSES	6	2500	77631	23588.67	27544.08
G9D AYK/OTHER EXPENSES	6	600	27000	8402.50	9897.14
G9E OUTSIDE AK/OTHER EXPENSES	18	300	255748	19377.72	59618.89
NAME NAME PROVIDED BY R	371	1	2	1.17	.37
TELE_AC AREA CODE (IF OUTSIDE AK)	43	0	999	435.42	307.53
TELE_PRE TELEPHONE PREFIX OF R	368	7	999	514.66	238.90
TELE_NO TELEPHONE SUFFIX OF R	368	1	9999	4754.27	2541.37
CNTRL_NO original tracking no 1st mail	474	2.00	10012.00	1209.2511	1640.6327
MAIL2 included in smpl, 2nd mailing	485	.00	1.00	.4165	.4935
RESPOND responded before 2nd mail	42	1.00	1.00	1.0000	.0000
BIGGIES self-representing gp	485	.00	1.00	.1093	.3123
DUPL duplicate control no	485	0	1	2.68E-02	.16
GROUP	485	0	2	.53	.68
WGT	331	1	4	3.48	.65

Appendix F. Detailed Tables:
Economic Significance
Of Sport Fishing in Alaska

Part A:
TOTAL: RESIDENTS + NONRESIDENTS

Part B:
RESIDENTS

Part C:
NONRESIDENTS

Part D
RESIDENTS: SUMMER TRIP RELATED

Part E
RESIDENTS: WINTER TRIP RELATED

Part F
RESIDENTS: NON-TRIP RELATED

Part G
GUIDE AND CHARTER AND PACKAGE: TOTAL

Part H
GUIDE AND CHARTER AND PACKAGE: NON-RESIDENT

Appendix G. Data Reliability and Model Resolution

Introduction

The estimates in this report are based on many sources of data and many modeling assumptions. How good are these data and assumptions, and how useful are the resulting estimates? To interpret and use the estimates well, we must develop some perspective on the types and magnitudes of potential errors. The discussion that follows is in three parts: survey data, non-survey data, and modeling.

For survey data there are two types of error: sampling error and non-sampling error. Sampling error is susceptible to statistical estimates of magnitude, or confidence intervals. The first section below reports confidence intervals for key data tables in Chapters 3 and 4. Non-sampling errors, such as non-response bias, validity of the survey instrument, respondent recall, and errors in coding and data cleaning, are discussed in the second section.

The next part addressing non-survey data discusses issues of availability, coarseness, and coding of secondary data used in the travel cost and input-output models.

The third part on model estimation has four sections, addressing the statistical power of the estimated equations to predict the variance in the underlying survey data; sensitivity testing; the effects of model structure on what is measured; and general issues of economic theory and assumptions.

The final section summarizes and concludes the discussion of reliability.

Survey Data

Sampling Error

The study objective for reliability of expenditure and net economic value (consumer surplus) estimates at the statewide and regional levels was to be within 20 percent of actual values 90 percent of the time. Survey sample sizes would be designed to predict participation rates for particular specie/site combinations at confidence levels to be agreed upon in the research plan. The research plan targeted a resident stratified telephone sample of 1,350, and a non-resident mail-back sample of 2,000.

The finished survey samples of 1,355 residents and 4,278 nonresidents are very large and robust data sets; the estimated margins of error, ±4% and ±2% respectively, are small. This standard measure, however, refers to the 95 percent confidence interval for a dichotomous question with maximum variance (50 percent affirmative) across all anglers surveyed. The survey sizes for sub-groups of respondents and other types of data, such as fishing households in Kodiak, or trips to the Salcha River, or Ketchikan Area king salmon harvest, are very much smaller, and the margins of error correspondingly much larger.

Resident Survey

Table G-1 shows the 90 percent confidence intervals for survey estimates of numbers of resident fishing households and numbers of summer fishing trips by sample strata. The strata with double digit percentage confidence intervals for *households* are the strata with

Table G-1. 90% Confidence Intervals for Households and Summer Trips by Sample Strata

	Survey ScreenedHH	Non Fishing HH	Fishing HH	std. err. of propor-tion	CI +/-%	Post-season HH	Sample Summer Trips	Trips per HH	std.err. of mean	CI +/-%
1 ANCHORAGE MUNICIPALI	483	149	334	10.15	5.0%	225	831	3.69	0.37	16.3%
2 FAIRBANKS BOROUGH	312	105	207	8.35	6.6%	145	435	3.00	0.52	28.3%
3 KENAI PENINSULA BORO	191	38	153	5.52	5.9%	112	798	7.13	1.22	28.2%
4 MAT-SU BOROUGH	198	41	157	5.70	6.0%	107	556	5.20	0.83	26.2%
5 KODIAK	73	23	50	3.97	13.1%	36	243	6.75	2.13	51.9%
6 SOUTHCENTRAL REMAIND	60	10	50	2.89	9.5%	40	232	5.80	3.00	85.0%
7 JUNEAU BOROUGH	207	50	157	6.16	6.5%	112	646	5.77	1.02	29.1%
8 KETCHIKAN BOROUGH*	158	50	108	5.85	8.9%	67	1060	15.82	8.42	87.5%
9 SITKA	74	15	59	3.46	9.6%	32	155	4.84	1.24	42.1%
10 SOUTHEAST REMAINDER	78	25	53	4.12	12.8%	32	131	4.09	1.32	53.1%
11 REST OF ALASKA	159	71	88	6.27	11.7%	56	243	4.34	1.16	44.1%
Non fishing HH total		577		20.25	5.8%					
Total	1993	577	1416	20.25	2.4%	964	5330	5.53	0.66	19.6%

The formula for standard error of proportions (fishing vs nonfishing) is SEp=SQRT[p(1-p)/n].
The formula for standard error of a mean is SEmean=STDEV/SQRT(n).
Total trips and the SE of the total are proportional to the mean and SE of the mean by the factor n; in percentage terms, the confidence interval is identical.

*One individual reported three trip logs with 184 trips each (every day all summer season).
Deleting this individual yields more moderate numbers:

8 KETCHIKAN BOROUGH						66	508	7.70	2.25	48.1%

small samples and high proportions of non-fishing households. Still, all strata have confidence intervals under ±15 percent. For *trips*, however, only the largest strata—Anchorage—has a confidence interval under ±25 percent. There are two factors at work: small sample sizes in the post-season survey, and very high variance in the underlying variable. Trips per household range from zero for a third of the households to 552 summer trips—three per day every day—for one Ketchikan household. This one observation skews the Ketchikan mean to 15.8 trips and the confidence interval to ±88 percent. If this household were deleted, the average for Ketchikan would fall to 7.7 and the confidence interval narrowed to ±48 percent. But there is no basis for deleting this household from the sample. Furthermore, it is a purely random event that the extreme value turned up in Ketchikan and not some other strata.

Table G-2 shows the 90 percent confidence intervals corresponding to Table 3-14, Summer Trips by ADF&G Area. Only the Kenai Peninsula shows a confidence interval smaller than ± 20 percent. Here again, the wide confidence intervals are the result of small samples (households) by area, and high variance in fishing activities across households.

Table G-3 shows the confidence intervals for resident summer trip expenditures by region. The confidence intervals are much wider because the sample size—post-season survey households who reported trip logs—is much smaller, and the variation in expenditures per household—particularly for low frequency events like chartering a plane—is much larger. This aggregate formula for sampling error overestimates the true uncertainty in this case because it ignores information about the origins and destinations of the trips; controlling for origin and destination, the variance in expenditures across households would be dramatically less.

Table G-2. 90% Confidence Intervals for Summer Resident Trips by Management Area

ZONE FISHING SITE ZONE	Sample Trips	Weighted Sample Trips	SE of sum	CI +/- %
1 KETCHIKAN AREA (A)	1004	366.6	334.91	150%
2 PRINCE OF WALES AREA (B)	39	15.6	9.96	105%
3 KAKE, PETERSBURG, WRANGELL, STIKINE AREA (C)	111	118.9	34.77	48%
4 SITKA AREA (D)	171	91.2	25.83	47%
5 JUNEAU AREA (E)	621	302.3	70.87	39%
6 HAINES-SKAGWAY AREA(F)	8	6.7	2.54	63%
7 GLACIER BAY AREA (G)	11	11.0	0.04	65%
8 YAKUTAT AREA (H)	3	2.8	1.66	97%
9 GLENNALLEN AREA (I)	157	161.9	20.66	21%
10 PRINCE WILLIAM SOUND AREA (J)	106	98.1	16.87	28%
11 KNIK ARM DRAINAGE AREA (K)	369	388.2	66.26	28%
12 ANCHORAGE AREA (L)	131	236.1	42.98	30%
13 EAST SIDE SUSITNA DRAINAGE AREA (M)	177	214.7	28.77	22%
14 WEST SIDE COOK INLET (N)	122	189.1	41.11	36%
15 KENAI PENINSULA AREA (P)	1378	1499.9	124.81	14%
16 KODIAK AREA (Q)	293	184.5	67.83	60%
17 NAKNEK DRAINAGES (R)	42	50.6	10.07	33%
18 KVICHAK RIVER DRAINAGE AREA (S)	4	6.4	2.88	73%
19 NUSHAGAK AREA (T)	2	2.0	0.01	116%
20 TANANA RIVER AREA (U)	390	341.4	110.10	53%
21 KUSKOKWIM RIVER AREA (V)	88	114.3	37.65	54%
22 SEWARD PEN- NORTON SOUND(W)	74	92.3	39.56	71%
23 NORTHWEST ALASKA AREA (X)	23	28.0	5.24	31%
24 YUKON RIVER AREA (Y)	3	4.4	2.08	78%
25 NORTH SLOPE BROOKS RANGE AREA (Z)	3	3.0	1.71	95%
Total	5330	4523.6	406.84	15%

Method: for households with trips, mean and variance of number of trips per household were calculated by strata and management area, across strata with at least one trip to the area.; then the mean and variance were adjusted to include households in the same strata without trips to the area, using the formulas p*mean and p*var+p*(1-p)*mean, where p is the proportion of the strata households with trips to the management area; a weighted sum and variance of that sum were then calculated across strata; finally, the standard error of the sum was calculated as the square root of the variance of the sum.

Table G-3. 90% Confidence Intervals for Resident Summer Trip Expenditures

	weighted to N HH w/ Logs	Mean per HH	Std. Error of Mean	Conf Interval Width
Southeast				
EAT$ money spent on food and drink	27.2	178.34	111.43	102.8%
LODG$2 money spent on lodging	27.7	24.59	37.17	248.6%
CHAR$2 money spent on charter svcs	27.6	24.47	23.28	156.4%
BAITETC$ money spent on bait & misc. expenditures	26.8	275.11	145.96	87.3%
TRANS$2 money spent commercial transp	28.4	8.61	11.86	226.5%
VCOST$2 vehicle cost, when not hhs vehicle	27.7	0.73	0.81	182.1%
BOAT$2 boat cost, when not hh boat	27.7	5.32	4.39	135.8%
PCOST$2 plane cost, when not HH plane	27.7	0.35	0.97	459.8%
Southcentral				
EAT$ money spent on food and drink	158.7	217.55	40.52	30.6%
LODG$2 money spent on lodging	160.3	43.38	9.57	36.3%
CHAR$2 money spent on charter svcs	161.1	115.64	23.21	33.0%
BAITETC$ money spent on bait & misc. expenditures	158.4	226.34	58.91	42.8%
TRANS$2 money spent commercial transp	164.0	12.57	6.48	84.8%
VCOST$2 vehicle cost, when not hhs vehicle	163.7	28.82	17.35	99.0%
BOAT$2 boat cost, when not hh boat	163.7	7.90	2.86	59.5%
PCOST$2 plane cost, when not HH plane	163.7	0.26	0.27	170.9%
Southwest				
EAT$ money spent on food and drink	7.9	182.67	104.85	94.4%
LODG$2 money spent on lodging	7.9	34.11	51.78	249.7%
CHAR$2 money spent on charter svcs	7.9	0.00	0.00	
BAITETC$ money spent on bait & misc. expenditures	7.9	229.01	127.51	91.6%
TRANS$2 money spent commercial transp	7.6	26.14	43.01	270.6%
VCOST$2 vehicle cost, when not hhs vehicle	7.9	0.60	0.85	234.6%
BOAT$2 boat cost, when not hh boat	7.9	2.48	4.75	314.9%
PCOST$2 plane cost, when not HH plane	7.9	13.25	27.15	337.1%
Northern				
EAT$ money spent on food and drink	33.4	184.81	207.63	184.8%
LODG$2 money spent on lodging	33.7	45.17	114.79	418.0%
CHAR$2 money spent on charter svcs	33.7	7.35	9.44	211.3%
BAITETC$ money spent on bait & misc. expenditures	33.1	185.45	125.14	111.0%
TRANS$2 money spent commercial transp	34.3	42.32	112.69	437.9%
VCOST$2 vehicle cost, when not hhs vehicle	33.7	1.44	1.42	162.1%
BOAT$2 boat cost, when not hh boat	33.7	5.55	3.33	98.7%
PCOST$2 plane cost, when not HH plane	33.7	6.46	9.88	251.4%
Total				
EAT$ money spent on food and drink	227.2	206.83	43.48	34.6%
LODG$2 money spent on lodging	229.7	41.06	18.52	74.2%
CHAR$2 money spent on charter svcs	230.2	84.90	16.80	32.5%
BAITETC$ money spent on bait & misc. expenditures	226.2	226.24	48.31	35.1%
TRANS$2 money spent commercial transp	234.3	16.89	17.04	166.0%
VCOST$2 vehicle cost, when not hhs vehicle	233.1	20.56	12.21	97.6%
BOAT$2 boat cost, when not hh boat	233.1	7.07	2.13	49.6%
PCOST$2 plane cost, when not HH plane	233.1	1.61	1.68	172.2%

Nonresident Survey

Table G-4 shows the confidence intervals for the month of the most recent trip to Alaska for nonresident angling households (corresponds to Table 3-25). The estimates are quite robust for the summer months when the numbers are high. Taken month by month, the winter estimates do not meet the target threshold for reliability; added together, the confidence interval for winter anglers would be acceptable.

Table G-4. 90% Confidence Intervals for Month of Nonresident Trip to Alaska

	Frequency	Binomial std. err.	CI +/-%
1 January	8	3	58.1%
2 February	5	2	73.5%
3 March	10	3	52.0%
4 April	22	5	35.0%
5 May	216	14	10.9%
6 June	801	25	5.2%
7 July	1292	30	3.8%
8 August	1091	28	4.3%
9 September	478	21	7.1%
10 October	57	7	21.6%
11 November	18	4	38.7%
12 December	21	5	35.8%

Table G-5 shows the confidence intervals for nonresident trips by management area, corresponding to Table 2-16. For areas V through Y the numbers of trips were so small they had to be combined.

Table G-6 shows the confidence intervals for nonresident trip expenditures by region. The confidence intervals are acceptably narrow for all types of expenditures in Southeast and Southcentral where there are lots of trips, but consistently above the target threshold in the Northern and Southwestern regions. In all regions the intervals are narrower than for resident expenditures because the sample is much larger.

In summary, the sampling error is within the target range for statewide data and the largest sites and fisheries. It does not, however, provide the desired precision for smaller sites or fisheries—the level of analysis required for many types of management decisions. This is the direct result of sample size relative to the number of potential fishing sites. The survey site coding provided for about 400 different sites statewide. Even after aggregating to about 75 sites represented in the modeling, any one site represents a very small proportion of the fishing effort. The top 10 sites represent 34 percent of summer resident trips; the remaining sites average one percent of trips each. A sample of 5,000 fishing trips representing 1,000,000 trips statewide will represent the “average” angler reasonably well but cannot support meaningful analysis of the difference between stocking Cheney or Jewel Lakes with lake trout or rainbows.

Table G-5. Confidence Intervals for Non-resident Trips by Management Area

Management Area	Sample Trips	CI of sum +/-%
1 KETCHIKAN AREA (A)	380	8.9%
2 PRINCE OF WALES AREA (B)	133	16.7%
3 KAKE, PETERSBURG, WRANGELL, STIKINE AREA (C)	100	21.1%
4 SITKA AREA (D)	241	11.4%
5 JUNEAU AREA (E)	303	11.0%
6 HAINES-SKAGWAY AREA(F)	119	17.9%
7 GLACIER BAY AREA (G)	52	25.2%
8 YAKUTAT AREA (H)	110	19.8%
9 GLENNALLEN AREA (I)	138	16.6%
10 PRINCE WILLIAM SOUND AREA (J)	244	11.4%
11 KNIK ARM DRAINAGE AREA (K)	136	15.6%
12 ANCHORAGE AREA (L)	100	18.0%
13 EAST SIDE SUSITNA DRAINAGE AREA (M)	200	13.3%
14 WEST SIDE COOK INLET (N)	208	12.0%
15 KENAI PENINSULA AREA (P)	3044	3.4%
16 KODIAK AREA (Q)	157	16.3%
17 NAKNEK DRAINAGES (R)	109	17.5%
18 KVICHAK RIVER DRNGE AREA (S)	151	16.2%
19 NUSHAGAK AREA (T)	78	21.2%
20 TANANA RIVER AREA (U)	178	15.7%
21 KUSKOKWIM RIVER AREA (V)	34	28.1%
22 SEWARD PEN- NORTON SOUND(W)	23	47.2%
23 NORTHWEST ALASKA AREA (X)	8	58.1%
24 YUKON RIVER AREA (Y)	21	43.8%
25 NORTH SLOPE/BROOKS R.AREA (Z)	14	52.9%
Total	6281	1.8%
HH w/o trips	395	

Table G-6. 90% Confidence Intervals for Nonresident Trip Expenditures

Southeast	N	Mean	Std. Error of Mean	CI +/- %
TB1 spending on guide_charter	587	701.925	48.31273	11.3%
TC1 commercial transp spending	498	115.3414	13.35989	19.1%
TC2 boat spending	556	108.8741	13.65872	20.6%
TC3 vehicle spending	546	37.76007	4.019863	17.5%
TC4 lodging_camping fees	592	139.25	14.08345	16.6%
TC5 fish processing spending	622	45.50965	3.583999	13.0%
TC6 tackle_equip spending	594	31.70875	2.740934	14.2%
TC7 other spending	574	117.9094	9.756557	13.6%
Southcentral				
TB1 spending on guide_charter	1542	403.9092	16.35791	6.7%
TC1 commercial transp spending	1484	37.35782	4.260878	18.8%
TC2 boat spending	1640	46.5372	3.424842	12.1%
TC3 vehicle spending	2007	89.80369	4.483874	8.2%
TC4 lodging_camping fees	2019	88.13076	5.371132	10.0%
TC5 fish processing spending	1945	33.73265	2.472892	12.1%
TC6 tackle_equip spending	1991	28.17529	1.376018	8.0%
TC7 other spending	1780	84.53652	4.619527	9.0%
Southwest				
TB1 spending on guide_charter	162	2083.932	166.6306	13.2%
TC1 commercial transp spending	172	244.3663	30.14565	20.3%
TC2 boat spending	142	70.00704	20.86804	49.0%
TC3 vehicle spending	159	54.45283	11.16777	33.7%
TC4 lodging_camping fees	155	306.3161	107.7697	57.9%
TC5 fish processing spending	145	22.55862	6.23968	45.5%
TC6 tackle_equip spending	190	46.97368	9.707839	34.0%
TC7 other spending	177	164.7401	36.27345	36.2%
Northern				
TB1 spending on guide_charter	53	1277.547	248.1127	31.9%
TC1 commercial transp spending	115	64.43478	22.82656	58.3%
TC2 boat spending	111	8.972973	3.476997	63.7%
TC3 vehicle spending	122	49.18852	9.069866	30.3%
TC4 lodging_camping fees	128	148.8984	96.97631	107.1%
TC5 fish processing spending	111	3.108108	2.226942	117.9%
TC6 tackle_equip spending	142	19.69718	3.027559	25.3%
TC7 other spending	121	78.44628	19.82234	41.6%
Total				
TB1 spending on guide_charter	2344	614.4049	22.4928	6.0%
TC1 commercial transp spending	2269	71.53812	4.938832	11.4%
TC2 boat spending	2449	60.3479	4.081935	11.1%
TC3 vehicle spending	2834	76.04517	3.374822	7.3%
TC4 lodging_camping fees	2894	112.9613	8.637714	12.6%
TC5 fish processing spending	2823	34.54942	1.913318	9.1%
TC6 tackle_equip spending	2917	29.70655	1.273449	7.1%
TC7 other spending	2652	96.83484	4.572006	7.8%

Non-Sampling Error

Sampling error is the most important benchmark of data reliability both because in a properly designed survey it is the largest source of error, and because it is the only quantifiable measure of error. Sampling error is a low-end estimate of total error because the sampling and the (unquantified) non-sampling errors are additive. While sampling error erodes the precision of an estimate, it does not introduce any expected bias, since the errors are random. Non-sampling error, however, introduces non-random errors and therefore potentially biases the survey results. Potential non-sampling errors include sample frame, non-response, coding and data cleaning, misleading questions, and bias in recall or response.

The sample frame for the resident survey is residential telephones. (Details on the sample design are provided in Appendix A.) Since more than 92 percent of Alaska households have telephones, this sample frame is highly representative of Alaskan households overall. Of the 2,301 households called, our interviewers never reached 12 percent of them, and another four percent refused to participate. While we have no way of predicting how those households who do not have phones, could not be reached, or refused to participate might differ from the ones we did interview, neither do we have any reason to expect that they differ significantly in their fishing activities. In the post-season follow-up, 32 percent of the pre-season respondents could not be reached or declined. Statistical analysis of the household characteristics from the pre-season survey found no statistically significant demographic differences between post-season respondents and non-respondents. This finding supports the assumption that non-response did not substantially bias the survey estimates of fishing activities. (Thirty two percent non-response does, however, compromise the precision of the estimates as reflected in the estimates of sampling error.)

The nonresident mail survey had a non-response rate of 39 percent. With no supporting evidence and therefore less confidence, we make the standard assumption that those households that moved with no forwarding address or declined to respond were substantially similar in their Alaska fishing activities to the 61 percent who did respond. We note however, that for every five percentage points difference between respondents and non-respondents, the sample mean for a variable would be biased by two percentage points.

ISER’s survey procedures include a number of steps to help insure that we collect accurate, meaningful data. We pre-test survey questions, to find and clarify unclear or ambiguous questions. A data editor reviews the completed survey forms for completeness and consistency; whenever possible, our interviewers call back respondents to resolve any problems we find. We configure our data entry programs to reject some types of incorrect data. We enter a sample of surveys twice and compare the two entries to measure the accuracy of data entry. Once all the survey data is on the computer, we review it and correct for missing or unreasonable values. ISER conducted the pre-season resident survey.

ADF&G conducted the post-season survey and did the coding and data entry on the non-resident survey in-house. There was a very high non-response rate (32 percent) for the post-season telephone survey and a high error rate in the keyed data as well.[1] For example, the data incorrectly showed Arctic grayling in Southeast and halibut in the Russian River. When we checked the original survey forms, we found that the grayling catch cited in Area C was a Bethel resident who caught 20 grayling on a fishing trip originating at a cabin near Slana. The site was miscoded three times: ADF&G's site code, ISER's site code, and area. This sort of error should have been corrected in editing immediately after the interview was conducted. ISER invested hundreds of hours in ex-post data cleaning efforts, including re-coding and keying the non-resident site and origin information from the original survey forms. Still, we were not able to find or correct all the data errors. Because of the large weights on the small sample of data, the effect of such errors is greatly magnified in the survey estimates. Coding errors do not, however, compromise the integrity of the econometric models. They add random noise to the estimated equations but do not bias the coefficients. They represent a loss of information and a marginal decrease in the precision of the estimates.

Other non-sampling problems loom larger, including potential misinterpretation of survey questions, bias in response, or bias in recall. Despite our pre-testing of the instrument, some nonresidents evidently had difficulty interpreting the format of the mail survey. In some cases, the information provided for trip 1 part A did not appear to match the information for trip 1 part B or trip 1 part C. We also suspect that respondents did not uniformly understand and consistently use our definition of a multi-day trip. As a result, our survey results show fewer "trips" than ADF&G estimates, yet similar numbers of angler days. Operational definitions of "location fished," "vehicle expenses," and other words in the survey may also vary. Respondents themselves make errors in recall or have biases based on judgmental heuristics. Accuracy in recall of expenditures may erode quickly. Nonresidents especially may be unable to accurately identify the location of their trips.

The largest problem we encountered was the apparent under-reporting of resident trips. Recall always has a downward bias, since it is easier to forget a trip that occurred than it is to invent a trip that did not occur. We suspect, however, that there may have been some strategic "forgetting" as well. The telephone respondents quickly learned that most every trip they mentioned precipitated a long series of log questions eliciting details. Some frequent anglers may have tired of answering questions and short circuited the interview. Appendix A explains how we tried to correct for under reporting with trip weights.

While the types of non-sampling errors discussed above deserve consideration when interpreting the survey results, they should also be weighed in perspective. These types of error are common to every survey enterprise. ISER's protocol and efforts to prevent and mitigate non-sampling error meet or surpass professional standards for survey research, and the resulting quality of our data is correspondingly high.

[1] On the non-resident survey, approximately one in every ten surveys had errors in site coding. Errors and high non-response rates are primarily the result of unskilled interviewers and poor quality control. The interviewers evidently lacked the persistence, sense of timing, and persuasiveness needed to reach busy households and elicit their cooperation. They did not effectively use the opportunity to probe and clarify answers and frequently did not correctly code and edit responses.

Non-Survey Data

The heart of an input-output model is the table of trade coefficients which describes the relationship between the outputs and inputs for each industry in the regional economy. The model coefficients capture this relationship at one point in time and one would expect this relationship to change over time as well as to differ for each region. Two methods are available to quantify this relationship--a survey of the industrial sectors within the region and the adaptation of a table from another region, usually the national economy. Since a survey is very expensive and inexpensive adaptation methods have been shown to give results that are not significantly different from those using surveys, virtually all regional input-output models are based on an adaptation of the national input-output model.

The appendix describing the Alaska input-output model (Appendix B) includes a discussion of the possible sources of error that are introduced into the regional trade coefficients table constructed using an adaptation of the national table. The potential error is bounded by the fact that each column of the table must sum to less than one, so that overestimation of one coefficient is likely to be offset by underestimation of other coefficients within that column. This also implies that the output of the model, the employment and income multipliers, will be more accurate in the aggregate than for particular industries. For the reasons described in Appendix B we feel that the potential margin of error in the table of trade coefficients is small. In addition, the multipliers generated by the model are similar in magnitude to multipliers calculated independently by other methods.

Extensive site and travel cost data was developed from secondary sources, coded and keyed for use in the travel cost models. Non-survey data is subject to some of the same types of error as survey data, specifically coding and data cleaning, and inconsistency or bias in the definition and measurement of variables. It may also be subject to sampling error, biases in sample frame or non-response, or coding and keying inherited from the underlying data collection methodology. We have not analyzed the types and sources of error inherited in our secondary data.

ISER did not apply the same quality control protocol to non-survey data coding that we apply to survey data. The only coding problem we are aware of is that the coder was unfamiliar with Alaska sport fishing sites. Using the names of geographic features and information coded in the *Alaska Atlas and Gazetteer* and the *Milepost* did not permit the coder to accurately locate the standard fishing access points on the maps, and therefore estimate mileage accurately. The Little Susitna River, for example, is quite long and encounters the road system at widely different points. The mileage coded was a rough average for the access points close to Houston and Wasilla, where the fish symbol appears in the Gazetteer, rather than a precise estimate for the most commonly used access point at the Little Sustina River boat ramp and public use area at the end of the Knik-Goose Bay Road.

Inconsistency and bias in the definition and measurement of variables occurs because secondary data collection is opportunistic: the original data is developed and reported for some other purpose, not tailored to the requirements of the current research application.

Fish reports, for example, were coded from the *Anchorage Daily News*, *Fairbanks News Miner*, and the ADF&G telephone hotline in Juneau. These sources are neither comprehensive nor consistent across sites and weeks, nor are the widely varying verbal descriptions of fishing quality easily translated into a consistent metric.

While these sorts of errors may erode the precision of our model estimates, they did not introduce any identifiable bias.

Model Resolution

Errors can be introduced into the economic significance analysis during the application of the input-output model. First, the expenditure by commodity profiles of the sport fishermen must be converted into expenditures by industry for use with the input-output model. Incorrect identification of the industry or industries which supply particular goods and services to the economy can result in error in the model output. We base this conversion on national data which may not be representative of the relationship between commodities and industries in Alaska. However, we have no reason to believe that a bias is introduced by this procedure, which is standard procedure in applying input-output models. Second, the particular industries impacted by sport angler spending may not be representative, in terms of their trade coefficients, of the industry as a whole. For example the air transport industry in the model is an average of all types of operation ranging from bush pilot operations using single engine planes to the international air carriers with fleets of 747s. Sport angler purchases of air transport industry services are unlikely to exactly mirror the composition of the industry, but rather to be more heavily weighted toward the bush operators. As with the commodity by industry conversion, this introduces no obvious bias, and the size of the potential error is likely to be modest.

The travel cost method is a standard technique frequently used to estimate anglers' future fishing decisions and their willingness to pay (WTP) for fishing. It involves a detailed analysis of where anglers go fishing and how much it costs them to get there. Net economic value (consumer surplus) is the difference between the estimated willingness to pay for a fishing experience (demand) and the estimated cost of that experience (price). Estimates of net economic value (NEV) are generated from discrete choice regression equations based on a sample of actual fishing trips and a constructed set of alternative trips that were not chosen. Variables that explain anglers' choices about how often and where to go fishing include site and angler characteristics and the travel cost to the site.

Confidence intervals cannot be analytically estimated for the travel cost models.[2] We can, however, identify a couple useful benchmarks and discuss qualitatively the various types of error. The following discussing is organized under three topics: unexplained variance; model sensitivity; model structure; and model assumptions.

[2] Bootstrapping is a computational technique for estimating confidence intervals for travel cost model estimates. The computational requirements, however, for a data set of this size and models of this complexity make it infeasible in the present application.

Unexplained Variation

Regression equations are a type of average: they explain the central tendency well but do not necessarily represent the extremes. Regression estimates always show less variation than the underlying data from which they were estimated. The distribution of trips our model projects is flatter across time and across sites than the underlying sample. Our travel cost models explain roughly a third of the variation in trips by site and week in the survey data. Some of the unexplained variation may be random noise in the underlying angler behavior, but the largest part is likely to be omitted or poorly measured variables.[3]

In theory, the key variable to explaining angler behavior is fishing quality. Our efforts to model resident and nonresident angler behavior were handicapped by limited information on the quality of fishing at particular sites. In most fisheries, quality is very time sensitive as well as site specific. While we made use of a large number of data sources, including published fishing report and ADF&G publications, the available measures provided neither the level of detail nor the comprehensiveness desired. In particular, variables representing weekly fishing quality and crowding were coarse. Nor are there variables representing aesthetic values of the site. And the quality of the social interaction afforded by a site is poorly measured by crowding and facilities variables.

Anglers have information about fishing sites. That information we are not able to measure at all, although the model structure assumes that anglers know about the full menu of fishing alternatives; anglers may not have complete information. The information from friends and relatives or advertising may be limited to a narrow menu of sites; additional information may be costly to obtain; or some information may have more salience and marketing appeal for reasons not correlated with actual fishing quality. In theory these “errors” are temporary disequilibria that correct themselves over time as anglers discover alternatives and optimize their choices. In practice, many anglers may be new to the scene or fish too infrequently for this learning and adjustment process to have played out at the time they answered our survey.

The practical effect of omitted and coarsely measured variables is that the model explains less of the overall variation in angler choices than we might wish for and the estimates of value it produces are less precise in absolute terms. For policy analysis, however, as long as the model represents the key management variables well, the omitted variables and the amount of explained variation overall are not very important. The model still can provide reliable comparative measures of the effects of management alternatives. In applying the model results we assume that the unmeasured dimensions of choice are orthogonal to the measured dimensions and therefore do not bias our estimates of value.

[3] Sampling error does not contribute to the unexplained variance in trips by site. Whichever households end up in the sample, the model is calibrated to predict their decision calculus and behavior. Sampling error and modeling error are cumulative, however, when predicting *actual* (unobserved) trips by site.

Model Sensitivity

A second benchmark for thinking about the coarseness or fineness of model resolution is sensitivity testing. We conducted sensitivity tests on the estimated coefficient for the most important explanatory variable in the Southcentral site choice equation: the Kenai River sonar count.[4] We ran the model using the estimated coefficient at the high and low ends of the 90 percent confidence interval, and compared the results to the most likely value. Specifically, we were estimating the change in net economic value to resident sport anglers resulting from a change in the management target count. We found the estimates of NEV varied on the order of ±50 percent from the central estimate. And this is the confidence interval on one parameter alone. Varying all the parameters together (as would be done in a bootstrap analysis) would yield an even wider confidence interval.

Clearly the model is not very precise. At this level of resolution, model results may be useful for understanding the dynamics of large effects in major fisheries, but it is not likely to be more reliable than professional judgement for assessing the existence of positive or negative effects, or assessing the effects on small and mid-range fisheries.

Although no sensitivity testing was done, we expect that the non-resident model is even less reliable for a variety of reasons: first and foremost because it was not feasible to collect information and model the participation decision of nonresidents.

Model Structure

Model results are sensitive to model structure and the variables represented. The precise meaning of the NEV estimates depends on the choice structure imposed on the model in the process of estimation, as well as the method used for calculating NEV and the definitions used for costs and fishing amenities. The resident and nonresident estimates of NEV, for example, are not strictly commensurate because the models differ considerably in choice structure (the total number of nonresident trips is fixed since nonresidents do not have a participation equation), site aggregation, time (weekly versus monthly) and definition of costs (time and capital depreciation are included for residents but not for nonresidents).[5] Specifically, the resident model allows onsite time as well as the total number of trips to change, reflecting substitution between fishing and non-fishing activities. For nonresidents, however, the total number of trips and days is fixed, constraining total demand to be inelastic.

Because the nonresident model considers only one margin of choice, it is inelastic in its projections, and systematically underestimates changes in trips and net economic value across model scenarios.[6] This bias is not thought to be large, however, because nonresidents are less flexible in their fishing choices anyway. Trips to Alaska are usually

[4] The pattern of variables in the equation may inadvertently overstate the importance and sensitivity of the sonar count variable. The sonar count variable ranges from 1,400 to 17,000 for the six weeks from July 1 to August 13 for the Kenai and Russian River sites, and is coded zero for other sites and weeks. It represents more than just the marginal effect of additional fish in the river: it also proxies as a dummy variable for the most famous fishing grounds in the state.

[5] There is also the question of whether a dollar of travel cost has the same value for residents and nonresidents.

[6] It may under or over estimate the change in expenditures, depending on the relative costs of the site.

planned months or even years in advance, and with far less information about alternatives than is available to residents.

To estimate the model on office computers (as opposed to a Cray), the number of choices had to be limited. Aggregation of small sites was the method we chose to accomplish this. The values assigned to the variables characterizing the aggregate site were the averages--or another representative measure--across the sites aggregated. This process of aggregation decreased the particularities, variance, and precision in the site data; this loss of information eroded the precision in the resulting coefficient estimates. Late in the project we realized that there was a better way: we figured out how to randomly select on each choice occasion which of the small individual sites to include as the representative for the group. We did not go back and re-build the data sets and re-estimate all the models. While this innovation might have marginally improved the precision of the estimated coefficients, it would not have materially improved the power of the model to reliably estimate numbers of trips or NEV for small sites.

We also aggregated across species to decrease the total number of variables in the equation and improve the robustness of each. (Eight of our fishing quality variables are coded by species; reducing the number of species from 46 to 13 reduced the potential number of species variables from 368 to 104.) Had we separately represented each minor species it is likely that none of them would have proved significant.

Model Assumptions

Professional disagreement remains regarding the proper interpretation and use of travel cost model estimates of NEV. In theory, these are robust measures of angler net benefits that can appropriately be used in benefit cost analysis in conjunction with measures derived from other models or by other methods. For example, angler net benefits from an enhancement project might be compared with the costs to taxpayers of supporting the project. But some economists doubt that different types of costs and benefits, let alone different methods or models for estimating them, are calibrated to the same unit of value such that they can be meaningfully aggregated or compared.[7] We all agree, however, that the estimates generated by a travel cost model can usefully be compared with other estimates from the same model. Therefore the estimated NEV of one enhancement project can be compared to the NEV of alternative projects estimated from the same model. This type of comparison is sufficient for a broad range of policy and planning applications.

[7] There are many other critiques of benefit cost analysis as well. The most familiar criticism is of the assumption that a dollar has the same value across different population groups, specifically rich and poor. Another concerns the assumption that a dollar has the same value whether gained or lost.

Conclusions

This is study provides the only comprehensive and detailed economic data that exists on recreational fishing in Alaska. The state-of-the-art survey design and methods of analysis for this study provide independent estimates of effort and rigorous measures of value not available elsewhere.[8] This snapshot in time provides a valuable benchmark for understanding fishery values.

The value of the data for contemporary management decision-making—the original purpose of the study—is limited, however, not only by the passage of time, but also the level of model resolution inherent in the design. The model robustly represents the largest fisheries and aggregations of sites, but is less reliable for smaller fisheries or sites—the level of analysis commonly required for management decisions. Three factors contribute to the coarseness of resolution: survey size, computational limits, and omitted or poorly measured variables.

The sorts of problems discussed in this appendix are common to every complex modeling exercise. The quality of the data and modeling decisions in this study compare favorably with those in other studies, many of which are being used by public agencies for policy analysis. With 20/20 hindsight, our data and model might have been improved, but none of the improvements would materially change the fundamental questions of survey scale and coarse or nonexistent site data.

Despite the uncertainties, our survey and model provide new and valuable information that has never before been collected or reported, and careful interpretation of it generates new insight. Internal consistency in our methodology and data definitions allows useful comparisons to be made and inferences to be drawn. The model is most useful for analyzing management alternatives that affect major sites or fisheries. It yields meaningful estimates of economic effects where the affected fishery is large and distinct: specifically, where there are many trips in the sample, the target is singular, the sites are few and the seasons are distinct. We have more confidence in the estimates of economic significance than in the NEV or economic impact estimates. The NEV and economic impact estimates depend on our ability to model the decision calculus of anglers to predict behavioral responses to changes in conditions, which is inherently challenging for fisheries as diverse and complex as Alaska's. The economic significance estimates rely only on our ability to describe the pattern of expenditures in 1993 and the structure of the Alaskan economy. Indeed, these models have already been used to analyze sockeye allocation issues in Cook Inlet, halibut charter limitation issues under consideration by the North Pacific Fishery Management Council, and the economics of wildlife refuges in the Bristol Bay region. Even where the estimates are not used in decision making, there is valuable learning and insight gained from the application.

[8] Our peer reviewer for the Cook Inlet policy analysis said, "well done… rigorous and sophisticated… state of the art modeling using a large, rich and unique data base… good judgement… robust." (Letter from James Wilen, June 15, 1996)