

AK LEGISLATURE SPECIAL COMMITTEE FILES SCOMM 156 3326

Weights and measures (metric)		General		Measures (fisheries)	
centimeter	cm	Alaska Administrative		fork length	FL
deciliter	dL	Code	AAC	mideye to fork	MEF
gram	g	all commonly accepted		mideye to tail fork	METF
hectare	ha	abbreviations	e.g., Mr., Mrs., AM, PM, etc.	standard length	SL
kilogram	kg			total length	TL

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kilogram	kg			total length	TL
kilometer	km	all commonly accepted			
liter	L	professional titles	e.g., Dr., Ph.D., R.N., etc.	Mathematics, statistics	
meter	m			<i>all standard mathematical signs, symbols and abbreviations</i>	
milliliter	mL	at	@	alternate hypothesis	H _a
millimeter	mm	compass directions:		base of natural logarithm	e
		east	E	catch per unit effort	CPUE
		north	N	coefficient of variation	CV
		south	S	common test statistics	(F, t, Z ² , etc.)
		west	W	confidence interval	CI
		copyright	©	correlation coefficient	
		corporate suffixes:		(multiple)	R
		Company	Co.	correlation coefficient	
		Corporation	Corp.	(simple)	r
		Incorporated	Inc.	covariance	cov
		Limited	Ltd.	degree (angular)	°
		District of Columbia	D.C.	degrees of freedom	df
		et alii (and others)	et al.	expected value	E
		et cetera (and so forth)	etc.	greater than	>
		exempli gratia		greater than or equal to	≥
		(for example)	e.g.	harvest per unit effort	HPUE
		Federal Information Code	FIC	less than	<
		id est (that is)	i.e.	less than or equal to	≤
		latitude or longitude	lat. or long.	logarithm (natural)	ln
		monetary symbols		logarithm (base 10)	log
		(U.S.)	\$, ¢	logarithm (specify base)	log ₂ etc.
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		registered trademark	®	not significant	NS
		trademark	™	null hypothesis	H ₀
		United States (adjective)	U.S.	percent	%
		United States of America (noun)	USA	probability	P
		U.S.C.	United States Code	probability of a type I error (rejection of the null hypothesis when true)	α
		U.S. state	use two-letter abbreviations (e.g., AK, WA)	probability of a type II error (acceptance of the null hypothesis when false)	β
				second (angular)	"
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				standard error	SE
				variance	
				population	Var
				sample	var

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PROFESSIONAL PUBLICATION NO. 08-01

ECONOMIC IMPACTS AND CONTRIBUTIONS OF SPORTFISHING IN ALASKA, 2007

by

Southwick Associates, Inc.

and

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Allen E. Bingham

Gretchen B. Jennings

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Alaska Department of Fish and Game, Division of Sport Fish, Anchorage

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Alaska Department of Fish and Game
Division of Sport Fish, Research and Technical Services
333 Raspberry Road, Anchorage, Alaska, 99518-1565

December 2008

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EXECUTIVE SUMMARY

In 2007, 475,534 resident and nonresident licensed anglers fished 2.5 million days in Alaska and spent nearly \$1.4 billion on licenses and stamps, trip-related expenditures, pre-purchased packages, and equipment and real estate used for fishing. An input-output model of Alaska and the study regions was used to estimate the total economic contributions that the spending created through the economic multiplier effect. The \$1.4 billion of angler spending in Alaska supported 15,879 jobs in Alaska and provided \$545 million of income (Table E1). As the anglers' dollars moved from business to business in the Alaska economy, government revenues were generated through personal income taxes, local property taxes, sales taxes, business taxes, and excise taxes. In total, \$123 million in tax revenues were generated for state and local governments in Alaska and \$123 million for the Federal government.

Table E1.—Economic contributions of sportfishing in Alaska, 2007.

	Resident Anglers	Nonresident Anglers	All Anglers
Licensed anglers	190,644	284,890	475,534
Days fished*	1,459,380	1,080,438	2,539,818
Angler purchases:			
<i>Licenses and Fees</i>	\$6,627,558	\$16,536,955	\$23,164,513
<i>Trip-related (non-package)</i>	\$219,829,151	\$347,358,999	\$567,188,150
<i>Packages</i>	NA**	\$137,519,700	\$137,519,700
<i>Equipment</i>	\$433,693,104	\$41,385,450	\$475,078,554
<i>Real Estate (construction & repair)</i>	\$73,139,537	\$109,697,619	\$182,837,156
Total dollars spent	\$733,289,349	\$652,498,723	\$1,385,788,072
Total economic contribution, including multiplier effects:			
<i>Industry output</i>	\$668,729,829	\$938,863,856	\$1,607,593,685
<i>Income provided</i>	\$223,373,937	\$321,882,151	\$545,256,088
<i>Jobs supported</i>	6,442	9,437	15,879
<i>Taxes contributed</i>	\$123,142,404	\$123,172,709	\$246,315,114

* Totals reported here do not exactly match published statewide and regional totals from the 2007 SWHS due to the fact that it is not possible to identify the water type or guided/unguided status of some Statewide Harvest Survey (SWHS) responses. The totals reported in this table reflect the summary of all days fished within a region that could be assigned to a specific residency, water type, and guided/unguided category. Approximately 4,177 days fished (0.16% of 2.5 million days) could not be assigned to a stratum and were not included in these totals.

** Package expenditures refer specifically to purchases of travel packages made by nonresidents prior to departing on their trip to Alaska.

These findings are the result of a study undertaken in 2007 and 2008 to measure the economic contribution that sportfishing makes to the state of Alaska and its regional economies. The development and management of sustainable recreational fisheries requires decision-makers to integrate both biological and socio-economic information associated with use of fishery

resources. In late 2006, the Alaska Department of Fish and Game's Division of Sport Fish (DSF) issued a request for proposals to conduct a study of the economic impact of sportfishing in Alaska that would cover the 2007 calendar year. This report presents the detailed results of that assessment, including estimates of angler spending and the associated economic activity that provides jobs and income for the residents of Alaska. The results are presented for the entire state of Alaska, with regional breakdowns for the three primary DSF management regions (Southeast, Southcentral and Interior) and for two subregions (Cook Inlet and Southeast marine¹). The locations of the primary study regions are shown in Figure E1.

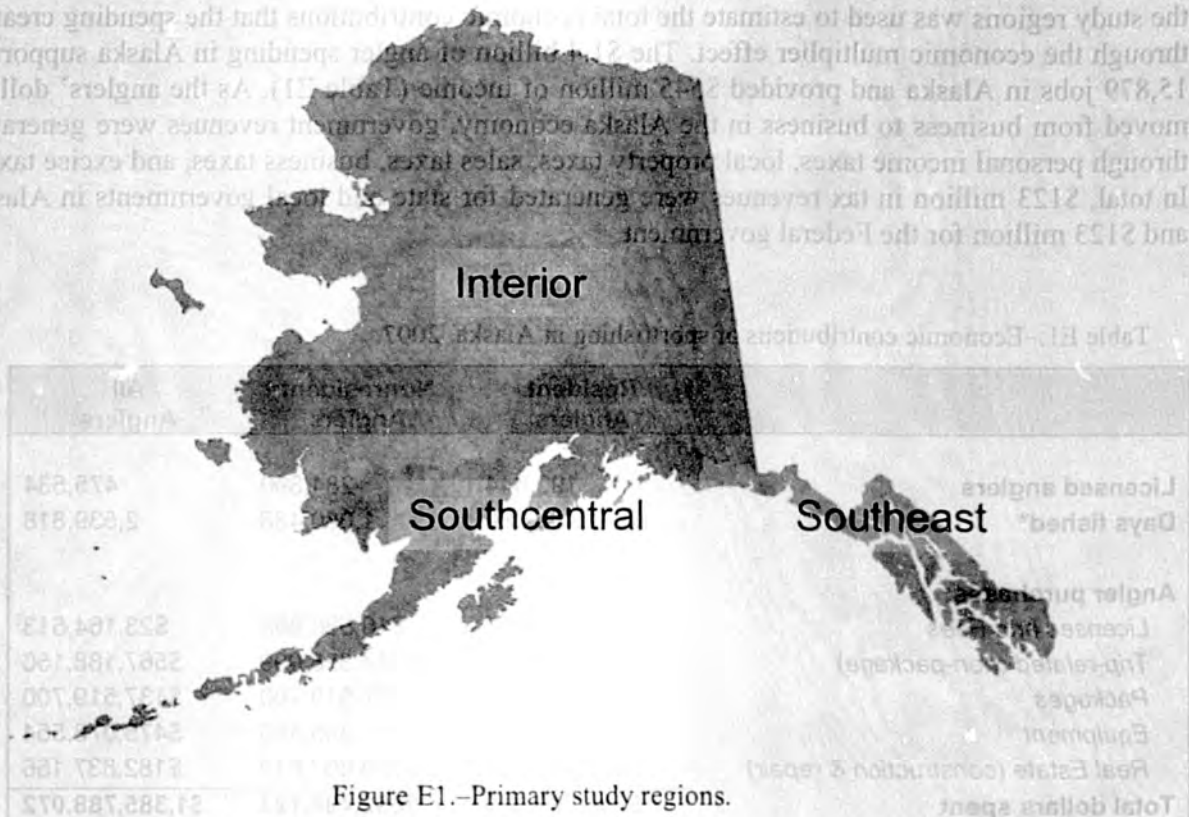
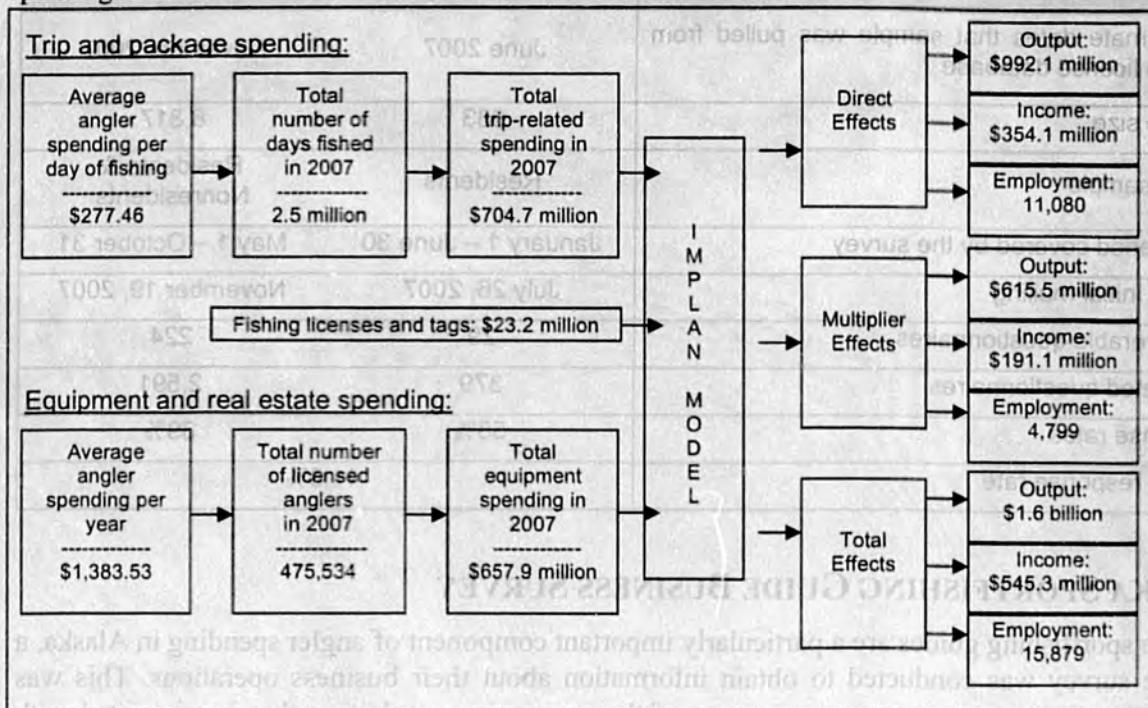


Figure E1.—Primary study regions.

The objectives of the study were accomplished by conducting mail surveys of anglers and sportfishing guide businesses. During 2007 and 2008, licensed resident and nonresident recreational anglers were surveyed to estimate the expenditures that they made related to their sportfishing activities in 2007. The results of that survey were coupled with counts of licensed anglers and estimates of fishing activity (angler-days) provided by the DSF Statewide Harvest Survey (SWHS) to estimate the total amount of fishing-related spending by anglers, the specific goods and services purchased, and the regional locations of the spending. A survey of sportfishing guide businesses was done to accurately account for the money spent by anglers on guided fishing trips. Input-output models of the regional and statewide Alaska economies were then used to estimate the economic multiplier effects of anglers' spending (Figure E2).

¹ Defined as all saltwater sportfishing areas within ADF&G-DSF's Southeast region.

Figure E2.—Conceptual framework for estimation of the economic contributions of angler spending in Alaska.



ANGLER SURVEY

A mail survey was used to collect the information about angler spending. An online questionnaire option was also provided to sampled anglers as an alternative method for completing the expenditure questionnaire. In all, 7,500 names were drawn from the pool of residents and nonresidents who bought a fishing license in 2007. The angler expenditure survey was conducted in two waves. In each wave, nonrespondents were sent up to two additional follow-up surveys, for a total of three mailings within each wave. The first wave of surveys (Wave I) included a random sample of 683 Alaska residents who purchased a sportfishing license or were issued a PID/DAV² between January 1 and April 30, 2007. The second wave of surveys (Wave II) was sent to a random sample of 2,517 resident anglers and 4,300 nonresident anglers who purchased a sportfishing license or were issued a PID/DAV between January 1 and October 31, 2007 (Table E2). Overall, 2,970 completed, usable surveys were returned.

². These are lifetime hunting, fishing, and trapping licenses valid for the remainder of the recipient's life. DAVs are Alaskan Disabled American Veteran permits. Both PIDs and DAVs are provided free of charge to eligible applicants.

Table E2.—Angler survey timeline and highlights.

Survey Attribute	WAVE I	WAVE II
Approximate dates that sample was pulled from ADF&G license database	June 2007	November 2007
Sample size	683	6,817
Target sample	Residents	Residents & Nonresidents
Time period covered by the survey	January 1 – June 30	May 1 – October 31
Date of initial mailing	July 26, 2007	November 19, 2007
Undeliverable questionnaires	29	224
Completed questionnaires	379	2,591
Response rates	58%	39%
Overall response rate	41.0%	

ALASKA SPORTFISHING GUIDE BUSINESS SURVEY

Because sportfishing guides are a particularly important component of angler spending in Alaska, a separate survey was conducted to obtain information about their business operations. This was necessary to ensure an accurate assessment of the economic contribution that is associated with anglers' spending on guided fishing trips. A brief survey was mailed to 500 sportfishing guide businesses. Three mailings of the guide business surveys were made beginning with the first mailing on December 3, 2007. Of the 500 surveys that were mailed, 29 were returned as undeliverable and 162 were completed for an overall response rate of 34.4%. The information collected in the surveys was used to adjust the IMPLAN economic models that were used in the study to better reflect the actual expenditure patterns of guide businesses in Alaska.

ECONOMIC ANALYSIS/MODELING

The expenditures made by anglers for sportfishing activities generated additional economic benefits throughout the Alaska economy beyond the initial angler spending. These additional economic benefits were estimated with IMPLAN regional input-output models that relate changes in specific industries to impacts in other industries within the regional economy. For this study, separate regional models were created to estimate the economic contributions for the statewide Alaska economy and in each of the study regions and subregions. The models produced estimates of the total economic multiplier effects (indirect and induced) from the spending by sport anglers. The **direct effect** of angler spending refers to the dollars that are captured by Alaska business that provide the goods and services purchased by anglers. Much of the equipment purchased by anglers was manufactured outside of the state and did not have a direct effect on the Alaska economy. In that case, the direct effect consists primarily of retail trade margins and typically is less than the total amount spent by anglers. **Indirect effect** refers to the economic activity (e.g., output, employment, income) that occurred in the industries that supply those businesses that were stimulated by the direct effect. The **induced effect** measures the economic activity that resulted from the household spending of salaries and wages by employees whose jobs were supported by the direct and indirect effects.

INDUSTRY SECTOR ASSIGNMENT

Interpretation of the model results depends on the spending under consideration. The term "economic impact" is normally reserved to describe some level of economic activity that would not occur but for the economic stimulus. In the case of recreational activities like sportfishing, it is generally agreed that economic impact comes from spending by visitors to the region. If not for their presence, their spending would never occur in Alaska. If quality sportfishing was no longer available in Alaska for example, nonresident anglers might choose to fish and spend their money elsewhere and thus not generate economic activity in the Alaskan economy. Most resident anglers, on the other hand, choose fishing as an activity on which to spend their recreational dollars locally. If quality sportfishing was no longer available, an unknown portion of residents would likely choose some other local recreational activity on which to spend their money in place of fishing and their spending would still remain in the Alaska economy. This study focused on the total economic contribution from spending by residents and nonresidents. However, the analysis presents the results of angler spending separately for resident and nonresidents to distinguish the total economic impact of sportfishing from its total economic contribution. Additional breakdowns by type of water fished and use of guides are also provided in the full report.

ECONOMIC CONTRIBUTIONS OF SPORTFISHING

In 2007, nearly 476,000 anglers were licensed for recreational fishing in Alaska, including residents and nonresidents who purchased a fishing license, and residents who were issued a fishing privilege at no cost (PIDs and DAVs). Approximately 60% of all sportfishing licenses were purchased by nonresidents and 40% were issued to residents of Alaska. Nearly three-quarters of all resident licenses were issued to people who lived in the Southcentral region (Table E3).

Table E3.—Number and percentage of licensed sport anglers in Alaska, by residence, 2007*.

	# Licensed Anglers*	% of Total
Southeast	22,370	4.7%
Southcentral	134,415	28.3%
Interior	33,859	7.1%
<i>Subtotal of Alaska residents</i>	<i>190,644</i>	<i>40.1%</i>
Nonresidents	284,890	59.9%
Statewide Total	475,534	100.0%

Source: Alaska Department of Fish and Game.

*Includes purchased licenses and issued PIDs (Personal Identification cards) and DAVs (Alaska Disabled American Veteran permits).

In 2007, resident anglers accounted for 57.5% of the total angler days of fishing in Alaska, while nonresident anglers accounted for 42.5% of total angler days in the state (Table E4). Two-thirds (66%) of all nonresident fishing effort (in angler-days) occurred in the Southcentral region, followed by Southeast Alaska (30%) and then the Interior Region (4%). The distribution of resident fishing effort by region is similar with approximately 74% of resident angler days occurring in the Southcentral region, followed by the Southeast region (15%) and then the Interior region (11%). In Alaska overall, and in the Southcentral and Interior regions, residents accounted for the majority of angler days. However, in the Southeast region, nonresidents accounted for nearly 60% of the total angler days.

Table E4.—Estimated number and percent distribution of angler days, by residency*, by region and subregion, 2007.

	RESIDENT		NONRESIDENT		TOTAL	
	Angler-Days	% of Region	Angler-Days	% of Region	Angler-Days	% of Region
Southeast	219,115	40.6%	321,148	59.4%	540,263	100.0%
Southcentral	1,085,962	60.4%	710,843	39.6%	1,796,805	100.0%
Interior	154,303	76.1%	48,447	23.9%	202,750	100.0%
Statewide Total	1,459,380	57.5%	1,080,438	42.5%	2,539,818	100.0%
Subregions						
Southeast Marine	179,873	41.3%	255,465	58.7%	435,338	100.0%
Cook Inlet	761,221	61.2%	481,877	38.8%	1,243,098	100.0%

Source: 2007 Statewide Harvest Survey, Alaska Department of Fish and Game.

* Totals reported here do not exactly match published statewide and regional totals from the 2007 SWHS due to the fact that it is not possible to identify the water type or guided/unguided status of some SWHS survey responses. The totals reported in this table reflect the summary of all days fished within a region that could be assigned to a specific residency, water type, and guided/unguided category. Approximately 4,177 days fished (0.16% of 2.5 million days) could not be assigned to a strata category and thus were not included in these totals.

Sportfishing was an important part of the Alaska economy in 2007, providing jobs and income to many of Alaska's residents. Including the economic multiplier effects, sportfishing supported 15,879 jobs and provided \$545 million of income. By these measures, sportfishing accounted for 2.6% of all income earned in the state and 3.6% of all jobs. The relative contribution of sportfishing to the regional economies varied. It made the greatest relative contribution in the Southeast region where it accounted for approximately 4.8% of the total income and 6.4% of all jobs in the region. In the Interior region, it provided only 0.6% and 1.0% of all income and jobs, respectively (Table E5).

Table E5.—Economic contributions from sportfishing in Alaska compared to total economic activity in each region.

		Total Economic Contribution			
		Angler Spending	Output	Income	Employment
Southeast					
Sportfishing-related		\$273,504,80	\$295,260,010	\$99,141,694	3,063
All economic activity**			\$4,927,726,000	\$2,047,290,000	47,799
% sportfishing-related			6.0%	4.8%	6.4%
Southcentral					
Sportfishing-related		\$988,558,11	\$1,165,545,513	\$386,463,733	11,535
All economic activity**			\$38,271,608,000	\$14,289,604,000	300,535
% sportfishing-related			3.0%	2.7%	3.8%
Interior					
Sportfishing-related		\$100,560,63	\$86,712,709	\$28,563,882	923
All economic activity**			\$12,568,651,000	\$4,784,721,000	88,667
% sportfishing-related			0.7%	0.6%	1.0%
Statewide Total					
Sportfishing-related		\$1,385,788,07	\$1,607,593,685	\$545,256,088	15,879
All economic activity**			\$55,766,476,000	\$21,121,616,000	437,001
% sportfishing-related			2.9%	2.6%	3.6%

*Including direct and multiplier effects.

**Source: 2006 IMPLAN economic models (for comparison purposes only).

Statewide Spending and Economic Contributions

In total, residents and nonresidents spent nearly \$1.4 billion on sportfishing activities, including licenses, trip and package spending, fishing and fishing-related equipment, and real estate construction and maintenance used primarily for sportfishing. More than one-third (\$567 million) of the total was non-package trip spending. When combined with fishing packages, trip-related spending accounted for one-half (\$705 million) of all sportfishing expenditures. Spending on fishing equipment and fishing-related equipment was \$475 million, and anglers spent a total of \$183 million on maintenance and construction of real estate that was used primarily for sportfishing (Table E6).

Table E6.—Statewide expenditures by resident and nonresident anglers, 2007.

	Resident Anglers		Nonresident Anglers		All Anglers	
	Total	Per angler-day	Total	Per angler-day	Total	Per angler-day
Licenses and stamps	\$6,627,558	\$4.54	\$16,536,955	\$15.31	\$23,164,513	\$9.12
Trip Expenditures	\$219,829,151	\$150.63	\$347,358,999	\$321.50	\$567,188,150	\$223.32
Package Expenditures	NA*	NA*	\$137,519,700	\$127.28	\$137,519,700	\$54.15
Trips & Packages	\$219,829,151	\$150.63	\$484,878,699	\$448.78	\$704,707,849	\$277.46
	Total	Per angler	Total	Per angler	Total	Per angler
Equipment Expenditures	\$433,693,104	\$2,274.88	\$41,385,450	\$145.27	\$475,078,554	\$999.04
Real Estate Expenditures	\$73,139,537	\$383.64	\$109,697,619	\$385.05	\$182,837,156	\$384.49
Equipment & Real Estate	\$506,832,641	\$2,658.53	\$151,083,069	\$530.32	\$657,915,710	\$1,383.53
Total Expenditures	\$733,289,349		\$652,498,723		\$1,385,788,072	

*Package expenditures refer specifically to travel packages purchased by nonresidents prior to departing on their trip to Alaska.

Generally, residents spent a higher proportion of their fishing dollars on equipment, compared to nonresidents, while nonresidents spent more of their money on trip-related purchases. This is true both in total dollars and on average. Overall, residents accounted for \$733 million of sportfishing spending in Alaska in 2007, compared to \$652 million of spending by nonresidents.

The nearly \$1.4 billion of spending by anglers in Alaska in 2007 directly generated \$354 million of income to 11,080 full and part time employees and proprietors who worked in the Alaska businesses whose products were purchased by anglers. Spending by nonresidents accounted for 6,549 of the jobs and \$208 million of income (Table E7). In addition to the economic activity directly attributable to spending by anglers are the economic multiplier effects (indirect plus induced effects) of that consumer spending. Including both direct and multiplier effects, the nearly \$1.4 billion of spending by anglers produced \$545 million of income, supported 15,879 full and part-time jobs, and provided \$246 million of tax revenues to local, state and federal governments.

Table E7.—Statewide economic contributions of all spending for sportfishing, by residency, 2007.

	Resident Anglers	Nonresident Anglers	All Anglers
Direct effects			
Income	\$146,134,921	\$208,000,960	\$354,135,881
Employment	4,531	6,549	11,080
Multiplier effects			
Income	\$77,239,016	\$113,881,191	\$191,120,207
Employment	1,911	2,888	4,799
Total effects			
Income	\$223,373,937	\$321,882,151	\$545,256,088
Employment	6,442	9,437	15,879
Tax revenues	\$107,433,532	\$138,881,581	\$246,315,114
Local and state	\$56,509,573	\$66,632,831	\$123,142,404
Federal	\$50,923,959	\$72,248,750	\$123,172,709

Angler Spending and Economic Contributions in the Southeast Region

Residents and nonresidents visiting Alaska spent nearly \$274 million in the Southeast region on sportfishing activities (these numbers do not include spending on license and stamps because those purchases are made from state government and are not attributed to any specific place). Approximately 41% (\$112 million) of the total spending in the region was non-package trip spending. When combined with fishing packages, trip-related spending accounted for more than one-half (55.6%) of all sportfishing expenditures. Spending on fishing equipment and fishing-related equipment was \$68 million, and anglers spent a total of \$54 million on maintenance and construction of real estate that was used primarily for sportfishing (Table E8).

Generally, residents spent a higher proportion of their fishing dollars on equipment, compared to nonresidents, while nonresidents spent more of their money on trip-related purchases. This is true both in total dollars and on average. Nonresident fishing is especially important in the Southeast region where they accounted for more than 85% of all trip-related spending. Overall, nonresidents spent \$175 million for sportfishing in the Southeast region in 2007, compared to \$99 million of spending by residents.

Table E8.—Expenditures in the southeast region by resident and nonresident anglers, 2007.

	Resident Anglers		Nonresident Anglers		All Anglers	
	Total	Per angler-day	Total	Per angler-day	Total	Per angler-day
Trip Expenditures	\$22,467,571	\$102.54	\$89,857,056	\$279.80	\$112,324,626	\$207.91
Package Expenditures	NA*	NA*	\$39,866,502	\$124.14	\$39,866,502	\$73.79
Trips & Packages	\$22,467,571	\$102.54	\$129,723,558	\$403.94	\$152,191,129	\$281.70
	Total	Per angler	Total	Per angler	Total	Per angler
Equipment Expenditures	\$56,606,233	\$296.92	\$10,871,728	\$38.16	\$67,477,961	\$141.90
Real Estate Expenditures	\$19,540,190	\$102.50	\$34,295,525	\$120.38	\$53,835,714	\$113.21
Equipment & Real Estate	\$76,146,422	\$399.42	\$45,167,253	\$158.54	\$121,313,675	\$255.11
Total Expenditures	\$98,613,993		\$174,890,811		\$273,504,804	

*Package expenditures refer specifically to travel packages purchased by nonresidents prior to departing on their trip to Alaska.

The \$274 million of spending by anglers in the Southeast region in 2007 directly generated \$71 million of income to 2,243 full and part time employees and proprietors who worked in the Alaska businesses whose products were purchased by anglers. Spending by nonresidents accounted for 1,662 of the jobs and \$51 million of income (Table E9). In addition to the economic activity directly attributable to spending by anglers are the economic multiplier effects (indirect plus induced effects) of that consumer spending. Including both direct and multiplier effects, the \$274 million of spending by anglers produced \$99 million of income, supported 3,063 full and part-time jobs, and provided \$44 million of tax revenues to local, state and federal governments.

Marine recreational fishing is particularly important in the Southeast region, where 80.6% of all angler-days were in saltwater. Equipment and real estate spending were not allocated by type of water fished, but 86.5% of all trip and package spending in the Southeast region was geared toward saltwater fishing trips. Trip and package spending for saltwater fishing in the Southeast region contributed \$54 million of income, supported 1,897 jobs, and contributed \$26 million of tax revenues. These represent 54.3%, 61.9%, and 60.6% of angler-supported income, jobs and tax revenues in the Southeast region, respectively.

Table E9.—Economic contributions of angler spending in the southeast region, 2007.

	Resident Anglers	Nonresident Anglers	All Anglers
Direct effects			
Income	\$20,284,669	\$50,987,336	\$71,272,005
Employment	582	1,662	2,243
Multiplier effects			
Income	\$7,031,339	\$20,838,350	\$27,869,689
Employment	209	611	820
Total effects			
Income	\$27,316,008	\$71,825,686	\$99,141,694
Employment	791	2,273	3,063
Tax revenues	\$12,227,368	\$31,368,564	\$43,595,932
Local and state	\$6,376,236	\$15,686,783	\$22,063,019
Federal	\$5,851,132	\$15,681,782	\$21,532,913

Angler Spending and Economic Contributions in the Southcentral Region

Residents and nonresidents visiting Alaska spent \$989 million in the Southcentral region on sportfishing activities (these numbers do not include spending on license and stamps because those purchases are made from state government and are not attributed to any specific place). Approximately 42% (\$418 million) of the total spending in the region was non-package trip spending. When combined with fishing packages, trip-related spending accounted for slightly more than one-half (51.4%) of all sportfishing expenditures. Spending on fishing equipment and fishing-related equipment was \$357 million, and anglers spent a total of \$123 million on maintenance and construction of real estate that was used primarily for sportfishing (Table E10).

Table E10.—Expenditures in the southcentral region by resident and nonresident anglers, 2007.

	Resident Anglers		Nonresident Anglers		All Anglers	
	Total	Per angler-day	Total	Per angler-day	Total	Per angler-day
Trip Expenditures	\$181,889,019	\$167.49	\$236,024,061	\$332.03	\$417,913,080	\$232.59
Package Expenditures	NA*	NA*	\$90,130,556	\$126.79	\$90,130,556	\$50.16
Trips & Packages	\$181,889,019	\$167.49	\$326,154,617	\$458.83	\$508,043,635	\$282.75
	Total	Per angler	Total	Per angler	Total	Per angler
Equipment Expenditures	\$328,171,050	\$1,721.38	\$29,013,940	\$101.84	\$357,184,990	\$751.12
Real Estate Expenditures	\$50,895,003	\$266.96	\$72,434,491	\$254.25	\$123,329,493	\$259.35
Equipment & Real Estate	\$379,066,052	\$1,988.35	\$101,448,431	\$356.10	\$480,514,483	\$1,010.47
Total Expenditures	\$560,955,071		\$427,603,048		\$988,558,119	

*Package expenditures refer specifically to travel packages purchased by nonresidents prior to departing on their trip to Alaska.

Generally, residents spent a higher proportion of their fishing dollars on equipment, compared to nonresidents, while nonresidents spent more of their money on trip-related purchases. This is true both in total dollars and on average. Overall, nonresidents spent \$175 million for sportfishing in the Southcentral region in 2007, compared to \$99 million of spending by residents.

The \$989 million of spending in the Southcentral region in 2007 directly generated \$240 million of income to 7,897 full and part time employees and proprietors who worked in the Alaska businesses whose products were purchased by anglers. Spending by nonresidents accounted for 4,329 of the jobs and \$131 million of income (Table E11). In addition to the economic activity directly attributable to spending by anglers are the economic multiplier effects (indirect plus induced effects) of that consumer spending. Including both direct and multiplier effects, the \$989 million of spending by anglers produced \$386 million of income, supported 11,535 full and part-time jobs, and provided \$180 million of tax revenues to local, state and federal governments.

The Cook Inlet subregion is a key fishing and economic component of the Southcentral region. Fishing in the Cook Inlet subregion accounts for 69.2% of all angler-days and 74.1% of all spending that takes place in the Southcentral region. Spending by anglers within the Cook Inlet subregion contributed \$279 million of income and 8,056 jobs to the larger Southcentral region economy, including the economic multiplier effects. That spending also provided \$111 million of the tax revenues generated by angler spending. These represented 72.1%, 69.8%, and 61.9% of all angler-supported income, jobs and tax revenues in the Southcentral region, respectively.

Table E11.—Economic contributions of angler spending in the southcentral region, 2007.

	Resident Anglers	Nonresident Anglers	All Anglers
Direct effects			
Income	\$109,015,231	\$130,743,922	\$239,759,153
Employment	3,569	4,329	7,897
Multiplier effects			
Income	\$65,814,765	\$80,889,815	\$146,704,580
Employment	1,601	2,036	3,637
Total effects			
Income	\$174,829,996	\$211,633,737	\$386,463,733
Employment	5,170	6,365	11,535
Tax revenues			
Local and state	\$45,612,530	\$45,187,101	\$90,799,631
Federal	\$40,950,668	\$48,504,967	\$89,455,636

Angler Spending and Economic Contributions in the Interior Region

Residents and nonresidents visiting Alaska spent \$101 million in the Interior region on sportfishing activities (these numbers do not include spending on licenses and stamps because those purchases are made from state government and are not attributed to any specific place). Approximately 37% (\$37 million) of the total spending in the region was non-package trip spending. When combined with fishing packages, trip-related spending accounted for less than one-half (44.2%) of all sportfishing expenditures. This is compared to slightly more than one-half of total spending statewide that is due to trip and package spending. The substantial difference is largely a result of the lower proportion of nonresident anglers who fish in the Interior region (23.9% of angler-days in the Interior compared to 42.5% statewide). Spending on fishing equipment and fishing-related equipment was \$50 million, and anglers spent less than \$8 million on maintenance and construction of real estate that was used primarily for sportfishing (Table E12).

Table E12.—Expenditures in the interior region by resident and nonresident anglers, 2007.

	Resident Anglers		Nonresident Anglers		All Anglers	
	Total	Per angler-day	Total	Per angler-day	Total	Per angler-day
Trip Expenditures	\$15,472,561	\$100.27	\$ 21,477,883	\$443.33	\$ 36,950,444	\$182.25
Package Expenditures	NA*	NA*	\$ 7,522,641	\$155.28	\$ 7,522,641	\$37.10
Trips & Packages	\$15,472,561	\$100.27	\$ 29,000,524	\$598.60	\$ 44,473,085	\$219.35
	Total	Per angler	Total	Per angler	Total	Per angler
Equipment Expenditures	\$48,915,821	\$256.58	\$1,499,781	\$5.26	\$50,415,603	\$106.02
Real Estate Expenditures	\$2,704,345	\$14.19	\$2,967,604	\$10.42	\$5,671,949	\$11.93
Equipment & Real Estate	\$51,620,166	\$270.77	\$4,467,386	\$15.68	\$56,087,552	\$117.95
Total Expenditures	\$67,092,727		\$33,467,910		\$100,560,637	

* Package expenditures refer specifically to travel packages purchased by nonresidents prior to departing on their trip to Alaska.

Generally, residents spent a higher proportion of their fishing dollars on equipment, compared to nonresidents, while nonresidents spent more of their money on trip-related purchases. This is true both in total dollars and on average. Overall, nonresidents spent \$33 million for sportfishing in the Interior region in 2007, compared to \$67 million of spending by residents.

The \$101 million of spending in the Interior region in 2007 directly generated \$21 million of income to 720 full and part time employees and proprietors who worked in the Alaska businesses whose products were purchased by anglers. Spending by nonresidents accounted for 407 of the jobs and \$11 million of income (Table E13). In addition to the economic activity directly attributable to spending by anglers are the economic multiplier effects (indirect plus induced effects) of that consumer spending. Including both direct and multiplier effects, the \$101 million of spending by anglers produced \$29 million of income, supported 923 full and part-time jobs, and provided \$13 million of tax revenues to local, state and federal governments.

Table E13.—Economic contributions of angler spending in the interior region, 2007.

	Resident Anglers	Nonresident Anglers	All Anglers
Direct effects			
Income	\$9,940,774	\$10,605,086	\$20,545,860
Employment	313	407	720
Multiplier effects			
Income	\$3,322,932	\$4,695,090	\$8,018,022
Employment	\$86	\$117	203
Total effects			
Income	\$13,263,706	\$15,300,176	\$28,563,882
Employment	399	524	923
Tax revenues	\$6,710,270	\$6,708,875	\$13,419,146
Local and state	\$3,825,310	\$3,396,831	\$7,222,141
Federal	\$2,884,961	\$3,312,044	\$6,197,005

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	Resident Anglers	Nonresident Anglers	All Anglers
Direct effects			
Income	\$6,940,774	\$10,602,086	\$20,542,860
Employment	313	407	720
Multiplier effects			
Income	\$3,322,932	\$4,662,060	\$8,018,022
Employment	286	217	503
Total effects			
Income	\$13,263,706	\$15,300,176	\$28,563,882
Employment	399	524	923
Tax revenues			
Local and state	\$3,622,310	\$3,396,631	\$7,225,141
Federal	\$2,684,961	\$3,312,044	\$6,197,005
	\$6,307,271	\$6,708,675	\$13,419,146

ECONOMIC IMPACTS AND CONTRIBUTIONS OF SPORTFISHING IN ALASKA, 2007

ABSTRACT

The economic contribution of sportfishing in Alaska is an important consideration for natural resource managers who must evaluate fishery projects, assist in planning for land and water resource management, and provide input to regulatory or policy decision-makers regarding management or allocation of aquatic resources. This report presents the results of a detailed assessment contracted by the Alaska Department of Fish and Game to measure the economic contribution that sportfishing makes to the state of Alaska and its regional economies. During 2007 and 2008, licensed resident and nonresident recreational anglers were surveyed to estimate the expenditures that they made related to their sportfishing activities in 2007. The results of that survey were coupled with counts of licensed anglers and estimates of fishing activity (angler-days) provided by the ADF&G Statewide Harvest Survey (SWHS) to estimate the total amount of fishing-related spending by anglers, the specific goods and services purchased, and the regional locations of the spending. A survey of sportfishing guide businesses was also conducted to accurately account for the money spent by anglers on guided fishing trips. Input-output models of the regional and statewide Alaska economies were then used to estimate the economic multiplier effects of anglers' spending.

In 2007, 475,534 resident and nonresident licensed anglers fished 2.5 million days in Alaska and spent nearly \$1.4 billion on licenses and stamps, trip-related expenditures, pre-purchased packages, and equipment and real estate used for fishing. The \$1.4 billion of angler spending in Alaska resulted in economic activity that supported 15,879 jobs in Alaska, provided \$545 million of income, and resulted in \$123 million in state/local tax revenues. Nonresident angler spending in Alaska in 2007 (economic impact) was \$653 million, and this supported 9,437 jobs and \$67 million in state/local tax revenues.

The regional distribution of spending by anglers generally followed the distribution of total days fished, with most angler spending occurring in the Southcentral region (72%), followed by the Southeast and the Interior regions with 20% and 7% of total angler spending respectively. Total expenditures on guided sportfishing activities in 2007 totaled \$416 million, which resulted in \$641 million in total economic activity and supported 7,183 jobs. Resident anglers spent an average of \$150 per day of sportfishing activity on trip-related expenses in 2007, while nonresident anglers spent an average of \$448 per day in Alaska on trip-related expenses in 2007.

Keywords: Alaska, sportfishing, economic impact, economic contribution, jobs, income, expenditures, IMPLAN models, angler days, economic survey, guide-business survey, Southwick Associates

INTRODUCTION

The development and management of sustainable recreational fisheries requires fishery decision-makers to integrate both biological and socio-economic information associated with the use of fishery resources. This report provides estimates of direct expenditures for sportfishing activities in Alaska in 2007 and the associated economic effects of such spending on the Alaska economy. Up to date information is needed by natural resource managers and policy-makers to make informed fishery management decisions. Statewide estimates of the economic impact of sportfishing in Alaska are available every five to seven years as part of the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (FHWAR)². However, the FHWAR

² U.S. Department of the Interior, Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau. 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

economic estimates are based upon a relatively small sample of Alaskan households that cannot provide the level of precision desired by the Division of Sport Fish (DSF). Moreover, the FHWAR does not provide estimates of economic impact at the region or subregion level within Alaska as needed by managers and regulatory or policy decision-makers. The last detailed economic impact assessment conducted by the Alaska Department of Fish and Game (ADF&G) DSF was completed in 1999 with estimates for 1993 fishing activity.

In late 2006, DSF issued a request for proposals to conduct a study of the economic impact of sportfishing in Alaska that would cover the 2007 calendar year, and would establish a repeatable protocol to provide periodically-updated estimates of these impacts. The request for proposals was limited to an assessment of the economic impacts and contribution of licensed anglers to Alaska's regional and state economies. Although other types of economic information could have been estimated with additional resources and a different focus for the study, the emphasis on economic impact and economic contribution was directed at providing managers, regulators, or policy makers with basic economic expenditure data and associated economic effects for sportfishing in Alaska. This report presents the detailed results of this assessment, including estimates of the following economic measures (see Figure 1 for definitions) corresponding to sportfishing activities in Alaska on a statewide basis, within the primary DSF management regions (Southeast, Southcentral, and Interior), and for two subregions (Cook Inlet and Southeast marine³) in 2007⁴:

1. **The total resident and nonresident expenditures;**
2. **The total direct, indirect and induced economic effects of resident and nonresident expenditures** for sportfishing by sector on the Alaska economy in terms of economic output, income, employment, and government revenues
3. **The mean trip-related expenditures per angler-day and mean annual equipment expenditures per angler in Alaska for residents and nonresidents** for the purpose of approximating changes in economic activity related to changes in fishery participation over time.

Moreover, this assessment sought to establish a consistent and repeatable methodology for collecting and reporting estimates of the economic contribution of sportfishing in Alaska on a periodic basis (every 3-5 years) at the statewide, regional, and subregional level for the purposes of tracking and comparing such estimates over time, as well as making reasonably current estimates available to planning and regulatory decision-makers.

The objectives of the study were accomplished by conducting a survey of resident and nonresident recreational anglers in 2007 and 2008 to estimate the expenditures made by anglers related to their sportfishing activities in 2007. That survey was the basis for estimating the total amount of fishing-related spending by anglers, the specific goods and services purchased, and the regional locations of the spending. Input-output models of the regional and statewide Alaska economies were then used to estimate the multiplier effects of the angler spending. The following sections provide details of the angler survey, the analytical procedures used to estimate statewide and regional angler expenditures from the results of the survey, and the statewide and regional economic models that were developed to estimate the total economic contributions that arose from the angler expenditures.

³ Defined as all saltwater sportfishing areas within ADF&G-DSF's Southeast region (Figure 3).

⁴ The specific region and subregion boundaries are defined in the Questionnaire Design section (Figures 2 and 3).

Figure 1.—Key terms and concepts used throughout this report.

Angler: anyone who holds a current Alaska sportfishing license to engage in sportfishing and/or personal use fishing in 2007, dipnetters and shellfish fishermen included. Only the economic effects of sport and personal use fishing (e.g., dipnetting) are captured in this study.

PID: Alaska residents 60 or older are not required to purchase sportfishing licenses, but can apply for an ADF&G Permanent Identification Card (PID). These are free lifetime hunting, fishing, and trapping licenses valid for the remainder of the recipient's life.

DAV: a disabled American veteran license allowing participation in sport and personal use fishing, hunting, and trapping in Alaska

Economic contribution: the total economic activity resulting from expenditures made by resident and nonresident anglers. In other studies, this is sometime termed economic significance or economic importance.

Economic impacts: the effects from nonresident anglers whose expenditures within Alaska represent new dollars or dollars that would otherwise be lost to the state economy.

Economic impacts versus economic contribution: in many circles, there is a difference between these terms. Economic impact typically refers to the new economic activity created within a defined region from dollars originating from outside the region. This includes the dollars brought into Alaska by nonresident anglers, or the dollars brought in by businesses from sales to people and businesses outside of the region. Economic contribution relates to the total economic activity within a region. This would include expenditures by residents and businesses selling to people within the region. In theory, if these dollars were not spent on sportfishing within the region, they would be spent on other activities within the region and therefore would still stimulate economic activity. It is not possible to accurately predict if people would spend dollars within or outside of the region if sportfishing were not available. This study includes both economic impact estimates (nonresidents) as well as economic significance (resident-based) estimates.

Angler Expenditures: the dollars spent for the primary reason of sportfishing. Such expenditures include travel-related expenses for fishing, fishing tackle and other fishing equipment, ancillary equipment that may have multiple uses including supporting the angler's sportfishing activities (e.g., coolers, binoculars), and development and management expenditures for real estate used primarily for the pursuit of sportfishing.

Economic Multipliers: the response of a regional economy to some economic stimulus, such as spending by anglers.

Direct effect: the changes in the businesses that are directly affected by angler spending. In the case of consumer purchases, some products are supplied by businesses and industries from outside of the region and the direct effect does not necessarily equal total consumer spending. These direct expenditures initiate other rounds of activity within the economy.

Indirect effect: the changes in inter-industry purchases as suppliers respond to the new demands of those businesses that are directly affected by the angler spending.

Induced effect: the economic activity that results from household spending of labor income associated with the economic activity generated by the direct and indirect effects.

Economic Activity: the various metrics that are used to represent the ways in which angler expenditures affect a regional economy. Each of the metrics can be used as measures of the direct, indirect or induced effects.

Output: the total value of an industry's production. Included in output is the value of an industry's inputs plus value added by the industry (payroll, profits, and indirect business taxes).

Income: total payroll, including salaries and wages, as well as benefits such as insurances, retirement benefits paid to employees and business proprietors.

Employment: the total number of both full-time and part-time jobs.

Tax revenues: estimates of all local, state and federal taxes paid by individuals and business (e.g., income taxes, excise taxes, business profits taxes, payroll taxes).

STUDY DESIGN AND METHODS

An accurate assessment of the economic impacts and significance of Alaskan sportfishing requires estimates of all sportfishing activity in Alaska and the spending by anglers that is associated with that activity. The total expenditures made by anglers are then analyzed with a model of the Alaska and regional economies to determine the total contribution that angler spending has on the respective economies, including the multiplier effect. The overall process utilized in this study is depicted in Figure 2.

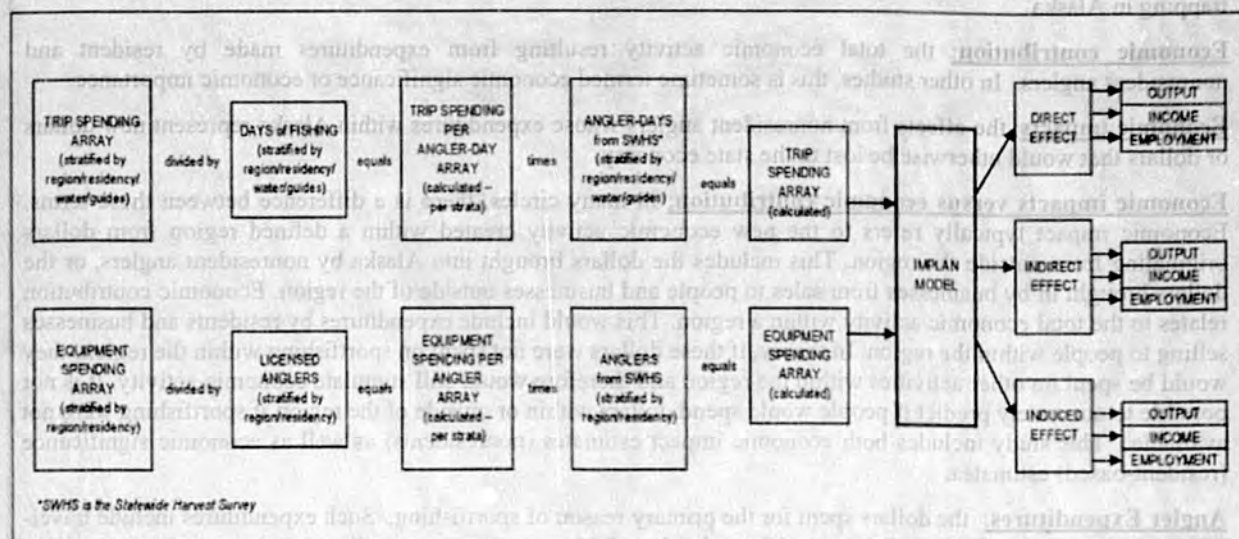


Figure 2.—Generalized process used to estimate the total economic contribution of sportfishing in Alaska.

Several independent sources of angler expenditures are available, such as the FHWAR and previous ADF&G economic studies of sportfishing in Alaska. All of these studies are either several years old, do not provide the requisite data at the regional or subregional level, and/or do not describe the full range of expenditures made by Alaskan anglers. To obtain current and regionally detailed information needed for a full assessment of the economic contributions of Alaska sportfishing, a survey was conducted of people who obtained some form of resident or nonresident Alaska recreational fishing license in 2007.

The angler survey was conducted in two waves. The first wave surveyed resident anglers for fishing activity and expenditures made during the Winter and Spring fisheries in 2007. The second wave measured fishing activity and expenditures made by residents and nonresidents during late Spring and Summer in 2007. Both surveys were structured so that statewide and regional expenditures could be estimated for guided and unguided fishing trips, in fresh and salt water, by resident and nonresidents. The analysis of the survey data provided detailed estimates

for trip-related spending on an angler-day basis, and for annual equipment and real estate⁵ expenditures on a per licensed angler basis.

The estimated number of total licensed anglers in 2007 was obtained independently from the DSF license database. Estimates of total days of fishing activity by region and strata were provided by the DSF Statewide Harvest Survey (SWHS), an annual survey administered to a stratified random sample of resident and nonresident households containing at least one licensed Alaska angler. It provides estimates of the days of fishing at detailed regional levels and by residency, water type (fresh and salt water), and use of guides (guided/unguided).

Total annual trip-related expenditure estimates by residency, water type, and use of guides were calculated by multiplying the average trip-related expenditures from the angler surveys by the estimates of days of fishing from the SWHS. Equipment and real estate can be associated with multiple types of sportfishing and are not easily assigned by anglers to a particular type of water or guided/unguided fishing. For that reason, annual equipment and real estate spending was estimated by multiplying the average annual expenditure per angler by the total number of licensed anglers.

The detailed estimates of total annual expenditures were then analyzed with regional and statewide input-output models to estimate total economic significance. The input-output models used in the study are IMPLAN models provided by MIG, Inc. of Stillwater, Minnesota. IMPLAN economic models are widely used for economic impact analyses. These models trace the flow of dollars within an economy to measure how an initial change in one or several economic activities affects an entire economy. The difference between the initial economic change and overall effect across the entire economy is the result of the multiplier effects (known as indirect and induced effects). These multiplier effects are measured in several ways including economic output, employment, and income. In this study, the initial economic change (angler expenditures), coupled with the multiplier effect, represents the total economic contribution of sportfishing.

DATA COLLECTION

A mail survey of anglers was conducted to collect information on fishing activity and expenditures sufficient to provide reliable estimates of total expenditures in the study regions by residency, water type, and guided/unguided fishing. The following sections describe the development of the survey instruments, the implementation of the survey, and the compilation and treatment of the collected data.

SURVEY DESIGN

A mail survey and a phone survey were initially considered for the angler survey. However, recognizing the need for survey participants to identify the regions where they fished and spent money, a map was needed to define regional boundaries. This prevented the use of a telephone survey. Another reason favoring the use of a mail survey was the lack of phone numbers in the Alaska sportfishing license database and the uncertainty associated with accurately matching addresses to phone numbers using third party data sources. Therefore, a mail survey approach was selected. An online questionnaire option was also provided, with mail survey recipients told

⁵ The economic assessment includes expenditures for construction and maintenance of real estate (e.g., cabins, docks, sheds) used primarily for sportfishing, but does not include any purchases or leasing of real estate.

of the online questionnaire option if they preferred to respond via the internet⁶. Each survey recipient was provided a unique access code to prevent others from taking the survey and compromising the project's scientific random sampling framework. Key dates and sample highlights are shown in Table 1.

Table 1.—Angler survey sample size, target sample and time period, mailing timeline, and overall response rate by survey wave.

	WAVE I	WAVE II
Dates that sample was pulled from ADF&G license database	June 2007	November 2007
Sample size	683	6,817
Target sample	Residents	Residents & Nonresidents
Time period covered by the survey	January 1 – June 30	May 1 – October 31
Date of initial mailing	July 26	November 19
Date of 1 st follow-up mailing	August 27	December 26
Date of 2 nd follow-up mailing	September 27	January 25
Overall response rate	58%	39%

The angler expenditure survey was conducted in two waves. In each wave, nonrespondents were sent up to two additional follow-up surveys, for a total of three mailings of each wave. The first wave of surveys (Wave I) included a random sample of 683 Alaska residents who purchased a sportfishing license or were issued a PID/DAV between January 1 and April 30, 2007. This first wave of surveys were sent out on July 26, 2007, with follow-up mailings to nonrespondents on August 27, 2007 and September 27, 2007. The second wave of surveys (Wave II) were sent to a random sample of 2,517 resident anglers and 4,300 nonresident anglers who purchased a sportfishing license or were issued a PID/DAV between January 1 and October 31, 2007. The first mailing of the second wave of surveys was sent out over a three-day period (November 19-21, 2007) due to the large volume of surveys. Follow-up mailings to second wave nonrespondents took place on December 26, 2007 and January 25, 2008. A shorter recall period was not possible due to a significant lag time between the date of license purchase and when license records become available in the state license database for sampling purposes.

⁶ Foreign anglers were provided only with the online option for responding to the survey.

There were two major reasons to not use a single wave of surveys:

1. **Seasonal variations in average trip expenditures:** The amount spent by anglers can vary depending on the time of year. For example, winter fisheries in many places are oriented towards ice fishing and a different mix of gear is required. Even during the summer fishing season, expenditures for early season Chinook salmon *Oncorhynchus tshawytscha* fisheries were expected to possibly differ from later season fisheries which range from river to lake fisheries for salmon *Oncorhynchus* spp., rainbow trout *Oncorhynchus mykiss*, Arctic grayling *Thymallus arcticus*, and other species, to saltwater fishing for salmon, Pacific halibut *Hippoglossus stenolepis* and other groundfish (e.g., lingcod *Ophiodon elongatus*). To capture these differences, anglers were asked to report their expenditures for a specific trip within defined time periods. This was expected to result in greater recall accuracy of the final expenditure estimates. The time periods covered in the surveys were:
 - a. January 1 through April 30 - for residents only, recognizing that few nonresidents participate in fishing in Alaska during this time of year.
 - b. May 1 through June 30 - for residents and nonresidents. This period covers early season fisheries for Chinook salmon, steelhead, groundfish and other species.
 - c. July 1 through October 31 - for residents and nonresidents.
2. **Recall Error** – an annual survey may force some anglers to report expenses for trips that occurred 12 or more months earlier. Research⁷ has shown that anglers can have significant difficulty recalling specific amounts spent a year earlier. This problem is more severe for items with lower prices and/or items that are purchased frequently such as terminal tackle, gasoline and other similar items. Sending two waves of surveys, each with recall periods shorter than annual recall, was expected to help reduce recall error.

Wave I inquired about fishing activity and expenditures for trips taken January 1 through April 30 and May 1 through June 30. Only residents who were issued a sportfishing license or PID/DAV between January 1 and April 30, 2007 were included in the first wave as few nonresidents typically fish in the winter months. To aid in properly assigning expenditures to 2007 resident trips, the Wave I resident survey inquired about the number of trips residents took from January 1 through April 30. The May 1 through June 30 period was included in the Wave I survey to ensure that sufficient responses were received for the early summer fishing time periods, particularly in the event that a survey participant who bought a license between January and April did not actually fish during the January through April time frame. The expenditure profile from this wave was used to estimate expenditure profiles for all winter fisheries, including the November 1 through December 31, 2007 period.⁸ The Wave I survey was initiated on July 26, 2007 based on the expected availability of angler mailing lists from the license database and the time required for surveys to be prepared for mailing.

⁷ Stynes, Daniel J. and Eric M. White, "Reflections on Measuring Recreation and Travel Spending". *Journal of Travel Research*, Vol. 45, No. 1, 8-16 (2006)

⁸ The expenditure of anglers fishing in November and December are assumed to be very similar to angler expenditures made January through April.

The Wave II survey inquired about fishing activity and expenditures for May 1 through October 31. Residents and nonresidents were sampled in this wave. Separate resident and nonresident survey instruments (questionnaires) were produced. The trip-related questions asked about the expenditures made for the respondent's most recent trip taken in two time periods: May 1 through June 30 and July 1 through October 31. The Wave II survey was initiated on November 19 based on the expected availability of angler mailing lists from the license database. It was expected that the majority of sportfishing licenses issued during January 1 through October 31 would be entered into the license database by that date. As a result of the timing of the mailing, the Wave II survey likely missed some November and December 2007 fishing trips. To remedy this situation, survey participants were asked about their days of fishing in November through December of 2006. These data from 2006 were used to estimate anglers' distribution of fishing effort in November and December of 2007.

Both survey waves requested anglers report trip-related expenditures by type of angler trip (i.e., guided/unguided), type of water fished (fresh or saltwater) and by region for three key reasons:

1. To better capture the differences in angler expenditures for specific types of fishing days.
2. To better pair the survey results to the estimates of days of fishing from the SWHS,
3. To ensure adequate responses to meet objective criteria for accuracy and precision of expenditure data.

The second wave included nonresident anglers, including foreign anglers. Based on problems associated with sending surveys overseas, non-Canadian foreign anglers were sent a single postcard inviting them to take the survey online. Not knowing the nationalities and languages of people drawn, all surveys and postcards were provided only in English. This approach was taken based on several uncertainties associated with mailing surveys overseas:

- Non-Canadian foreign nonresidents represent a small portion of the nonresident angler population (3-4%)⁹,
- Very high and variable postage costs for 8.5 x 11 mailing envelopes,
- Additional weeks required between survey mailings to send and receive surveys via postal services of other nations with the exception of Canada.

Surveying foreign anglers presented other unique challenges. First, asking respondents to report expenditures in U.S. dollars might dissuade some anglers from completing the questionnaire due to the added burden of making the currency conversion. Second, changes in currency exchange rates during 2007 create uncertainty in the then-current value of the reported expenditures. Finally, fishing trips for non-Canadian foreign anglers are often a part of a larger travel package and it may be difficult for foreign anglers to identify their fishing-related expenditures. For these reasons, it was expected that non-Canadian foreign anglers would not respond at rates comparable to other nonresident anglers who fished in Alaska. Expenditures made by non-Canadian foreign anglers can be expected to be somewhat higher than expenditures made by U.S. anglers based on the additional attention needed by many to overcome language and cultural differences. Therefore, there is potential for underestimating total nonresident spending if foreign anglers are under-represented in the nonresident sample. However, foreign anglers

⁹ DSF License Database

represent approximately three percent of all nonresident anglers and any potential underestimation of their expenditures was not expected to have a significant impact on the final results.

SAMPLING FRAME AND SAMPLE SIZES

The 2007 ADF&G sportfishing license database was used as the sampling frame for the expenditure surveys. PIDs and DAVs were included in the license database.¹⁰ To reduce the probability of sampling individuals who may not have fished in 2007, only persons that applied for a PID or DAV license in 2007 were included in the sample frame. There were about 3,800 PIDs and DAVs issued in 2007 and they were proportionally represented in the final sample lists drawn for each survey wave.

From year to year, the percentage of annual license sales entered into the license database by any specific date varies based on the delivery of license sales records by vendors and the workload within the Licensing Section of ADF&G. An analysis was conducted by DSF to examine when 2001-2006 licenses were entered into the license database. Specifically, Table 2 shows the percentage of licenses sold prior to April 30 that were entered into the database by June 21. The results were used as a general guideline as to when licenses were expected to be entered in 2007. Based on trends regarding license data entry dates, a sample selected on June 21 of licenses issued by April 30 was regarded as sufficiently complete for the first wave of resident surveys.

Table 2.—Percentage of sportfishing licenses sold prior to April 30 that had been entered into the license database by June 21, 2001-2006.

Year	Residents	Nonresidents
2001	49.1%	29.7%
2002	66.2%	53.1%
2003	50.2%	44.5%
2004	93.1%	86.4%
2005	75.2%	69.4%
2006	97.4%	89.7%

To help ensure the final sample was representative of the population of anglers active in Alaska in terms of residency (e.g., resident/nonresident), spatial distribution of effort (i.e., fishing regions), water type (salt versus freshwater), and time of fishing (i.e., fishing seasons); and, to help ensure the size of the initial sampling draw (7,500) would result in cell sizes large enough for analyses of specific angler strata, ADF&G licensing and response rate data were used to design the sampling strategy. Details of the data used and of the calculations made are presented in Appendix K.

¹⁰ Limited survey data indicates residents holding PIDs may be less likely to go sportfishing in a given year than residents who purchase a license (59% vs. 90%), but it is assumed that those who apply for a PID in a given year are similar in terms of likelihood of going sportfishing as residents who purchase a license.

Using response rates from the past five years of the SWHS and results showing where fishing activity occurred, (including response rates for early and late survey periods), the following sample sizes were allocated by wave:

Wave I = 683 surveys

Wave II = 6,817 surveys

Total N = 7,500 surveys

Based on experience from the SWHS during 2001-2006 and the recommended sample sizes for Waves I and II, surveys sent to randomly-selected licensed anglers in Alaska were expected to generate the distribution of responses presented in Table 3. Even though fewer numbers of responses were expected for the lesser-fished regions and subregions, and recognizing that the Southcentral region may be a major source of fishing by anglers from Southeast and Interior, stratifying the sample to under-sample Southcentral and over sample Southeast and Interior was not recommended as information needed to further stratify the sample was not available.

Table 3.—Expected number of responses by region and residency strata based upon sampling scheme and response rates to the ADF&G Statewide Harvest Survey.

Study Region	Residents	Nonresidents
Southeast	164	595
Southeast Marine	124	497
Southcentral	928	1,324
Cook Inlet	480	669
Interior	129	80

Without the information to accurately estimate the response rate for a survey of the size and complexity of the planned economic survey, the response rates from previous SWHS efforts were considered the best measure available. The response rates that were obtained from the resident and nonresident angler surveys are presented in Appendix F.

Prior to drawing the resident-only sample for Wave I survey from the June 21 incomplete¹¹ sportfishing license file, we conducted a general evaluation of the coverage quality of this file compared to previous years' complete sportfishing license files. This general evaluation involved a comparison of the distribution of license sales by geographic groupings of license vendors between the incomplete file with complete files in previous years. This comparison for the Wave I sampling involved only license sales to Alaska residents prior to May 1. The grouped vendor location categories used for the comparison were the same groupings used by the annual SWHS¹². We tested for differences with a chi-square contingency test for the independence of

¹¹ The sportfishing license file is termed "incomplete" because not all licenses that are purchased Jan 1-Jun 21 actually appear in the license database due to a lag time that exists between the sale of license, delivery of license books to ADF&G from vendor, and data entry by the Division of Licensing.

¹² For the purposes of SWHS sampling, fishing and hunting license vendors in Alaska are placed into one of 15 geographic groups that correspond to collections of SWHS reporting areas (A-Z).

license sales among years by grouped license vendor location ($\alpha = 0.10$). The incomplete license file at the time of sampling was determined to be representative of expected license sales by location of license vendors. The coverage quality was acceptable and the sample draw from the incomplete file was a simple random sample, with equal probability for all licenses to be drawn.

Similar evaluations and determinations were conducted for the Alaska resident and the nonresident Wave II sample draws in November 2007. The samples were drawn using a constrained¹³ stratified random approach based on residency.

In addition to the pre-survey coverage quality determination, we tested the sample for coverage errors. This was done recognizing some level of bias could have been introduced by excluding records from vendors who were late in submitting their licensing sales books. This test was conducted starting on November 1 for the Wave I sample when most of the early period licenses (January 1–April 30) had been entered into the license database. The tests on the version of the license file that was to be used for Wave II sampling were completed by the end of January 2008. They consisted of comparing the license samples drawn June 21 to the complete list (completed by November) to determine the percentage that were actually available on June 21. In addition, the grouped vendor locations (noted in the pre-survey coverage evaluation above) that were used to draw the sample in June were compared to the vendor distribution in the complete 2007 file provided by ADF&G in February 2008 to identify any potential gaps or biases caused by late-reporting vendors. The same tasks were conducted again for the Wave II sample. In both cases, the observed differences were minor and no changes were necessary. If significant differences existed, weights would have been developed and applied to the data post-survey by region.

Three complete mailings (survey, map and cover letter) within each survey wave were conducted to maximize survey response rates. Past experience with the SWHS has shown that total survey response rate is increased by this survey protocol. Responses from the third mailing were used to help identify the presence of non-response bias (described later in this section). Dates associated with each mailing were:

Wave I:

Mailing 1 = July 26, 2007

Mailing 2 = August 27, 2007

Mailing 3 = September 27, 2007

Wave II:

Mailing 1 = November 19–21, 2007

Mailing 2 = December 26–27, 2007

Mailing 3 = January 25, 2008

¹³As noted earlier any residents selected for sampling during the first wave were excluded from the sampling frame used for the second wave sample selection, accordingly the sampling approach was not completely random.

QUESTIONNAIRE DESIGN

The Wave I resident questionnaire and Wave II resident and nonresident questionnaires and corresponding cover letters are presented in Appendices A, B and C, respectively. The maps that accompanied each questionnaire are presented in Appendix D. The questionnaire was designed to provide data on a per angler-day basis, versus a household basis. The SWHS is household-based, but the results are reported 'per angler-day,' so it was necessary to pair the survey expenditure data with SWHS effort data as accurately as possible to develop estimates of Alaska's total sportfishing-related expenditures.

Due to the sampling frame utilized, the sample was limited to licensed anglers only. However, economic impacts are also generated from purchases associated with unlicensed youth anglers under 16 years of age. To account for some youth-related purchases, recognizing youth under 16 years of age do not need a license, survey respondents were asked to report their total expenditures, which could include purchases made for unlicensed youth anglers in their fishing party.

Many trip-related expenditures are made at the group level versus individual level. Examples include a family's restaurant or hotel bills, and fuel for transportation. Economic research by the U.S. Forest Service indicates that it is difficult for many people to separate their share of group expenditures and will report the group's total expenditures rather than their own share¹⁴. Based on this experience, the survey questionnaires inquired about total expenditures made by the survey respondent (i.e. what they actually spent), without regard to the size of the group or whether the expenditure covered one person or multiple people. Coming from a random sample of licensed anglers, the respondents include a representative sample of people who made expenditures that covered others in a group as well as anglers with few expenditures to report because their costs were paid by someone else.

For subsistence fishers, only expenditures they made for sportfishing trips within the periods noted in each survey were included in the estimation of sportfishing expenditures. Their trips regarded as subsistence fishing were excluded. Persons who purchased a sportfishing license, but may have engaged in both subsistence and sportfishing activities were only asked to report expenditures for sportfishing-related trips and equipment expenditures.

The study questionnaires were designed to collect sportfishing trip and equipment expenditures that could be used to estimate the economic impacts and contributions of sportfishing within each of the three DSF management regions: Southeast, Southcentral, and Interior (Figure 3). In addition to these three regions of the state, the survey was designed to provide data for two additional areas that are subsets of the primary study regions: Cook Inlet – a subregion of Southcentral; and, Southeast marine – based solely on saltwater fishing in the Southeast.

¹⁴ Styne, Daniel and White, Eric. Spending Profiles of National Forest Visitors, NVUM Four Year Report, May 2005

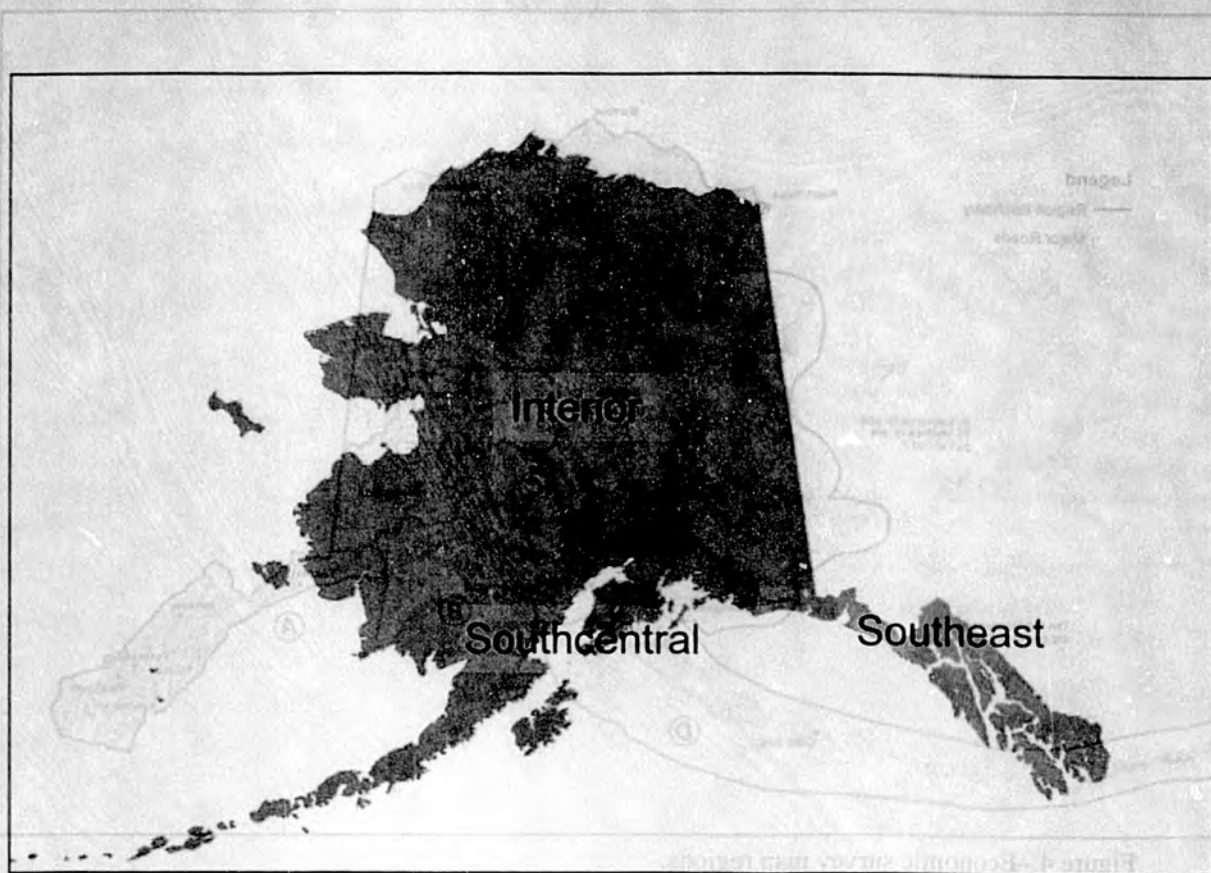


Figure 3.—Primary study regions.

For purposes of collecting data, the state was divided into six areas and survey participants were asked to report trip and equipment expenditures incurred in one or more of the six geographic areas. The six data collection areas were defined as (Figure 4):

- A= Southeast
- B= Prince William Sound/North Gulf Coast
- C= Cook Inlet
- D= Bristol Bay/Aleutians
- E= Tanana/Copper River Valleys
- F= Arctic-Yukon-Kuskokwim

Based on expected sample sizes and response rates, economic impact and contribution estimates were tabulated and reported only for the three DSF management regions plus the Cook Inlet and Southeast marine subregions. The six data collection areas were included in the survey and shown on the map that accompanied the questionnaires primarily to help survey respondents more easily identify where they fished and spent money.

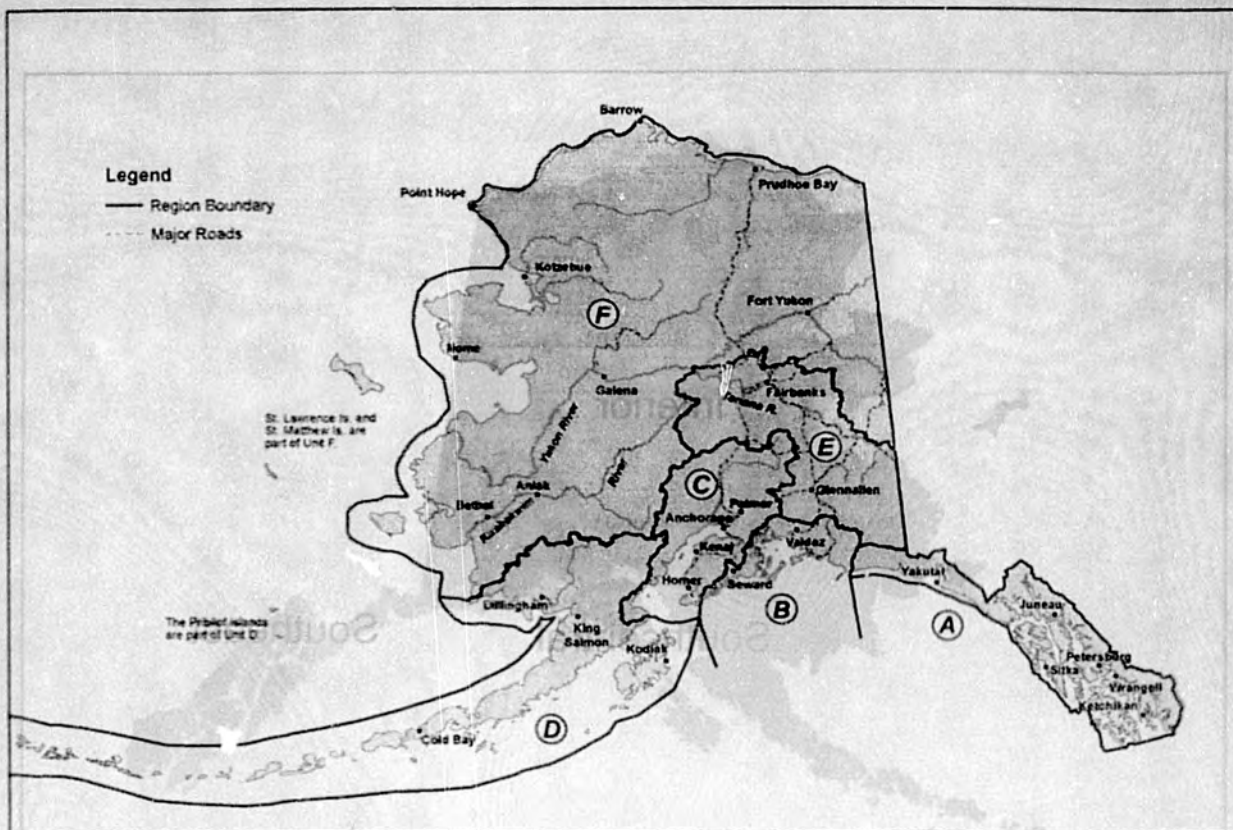


Figure 4.—Economic survey map regions.

For purposes of collecting data, the state was divided into six areas and survey participants were asked to report trip and equipment expenditures incurred in one or more of the six geographic areas. The six data collection areas were defined as (Figure 4):

- A = Southeast
- B = Prince William Sound/North Gulf Coast
- C = Cook Inlet
- D = Bristol Bay/Aleutians
- E = Tanana/Copper River Valleys
- F = Arctic/Yukon-Kuskokwim

Based on expected sample sizes and response rates, economic impact and contribution estimates were tabulated and reported only for the three DSR management regions plus the Cook Inlet and Southeast marine subregions. The six data collection areas were included in the survey and shown on the map that accompanied the questionnaire primarily to help survey respondents more easily identify where they fished and spent money.

The Wave I and II study questionnaires were constructed to collect a variety of expenditure and fishing-related information needed to meet the project objectives. The following categories of questions were included (see Appendices A, B and C for example questionnaires):

1. *Demographics* – age and gender data already captured in the ADF&G license database were also collected in the survey. The results were used to help ensure that respondents adequately represented the statewide licensed population. If the survey responses did not adequately match the demographics of all license holders, then the demographic data would have been used to weight the survey data. Statistical tests indicated no bias in the sample on the demographic measures.
2. *Total number of trips & days for each survey time period* (Jan 1-April 30, May 1-June 30, and July 1-October 31) per stratum (resident/nonresident, freshwater/saltwater, guided/charter or unguided, and per region/subregion). These items were critical in creating seasonal weights for the calculation of annual expenditures for each stratum.
3. *Whether a fishing license was purchased primarily for sportfishing activities* (“Did you purchase your license primarily so that you could participate in ‘personal use’ fisheries?”). This was required to separate types of fishing during the data analysis stage.
4. *Whether fishing was the primary purpose of trip reported on* (“Would you have taken this trip even if you were unable to go fishing?”) This question was used to determine whether certain non-fishing expenditures (e.g., restaurants, souvenirs) should be attributed to the fishing trip.
5. *Trip-related information* was also sought for the respondent’s most recent trip within the specified time periods, including:
 - a. The trip’s subregion (where fishing took place, and where expenditures took place)
 - b. Guided/chartered or unguided
 - c. Freshwater or saltwater
 - d. Targeted species
 - e. Number of days in the trip & number of days actually fished
 - f. Region where the last trip occurred
 - g. Was the trip for personal use or subsistence fishing?
6. *Detailed trip expenditures (fuel, travel costs, ice, bait, guide/charter fees, etc.)* Respondents were asked to indicate the amount spent on and regions(s) of purchase for a range of consumable, trip-related goods and services.
7. *Travel package spending:* To include fishing expenditures in Alaska that some nonresident anglers make prior to visiting the state, nonresidents were asked to report any pre-arranged fishing trips they may have purchased and to indicate the amenities that were included in the package price. Because this question focused specifically on expenditures made prior to visiting Alaska, it was not included in the resident survey.
8. *Annual equipment expenditures:* Equipment can be used during more than one trip. Therefore, equipment expenditures were not included in the ‘most recent trip’ questions.

Equipment expenditures over the past 12 months were requested in both survey waves. For multi-purpose equipment, respondents were asked to indicate the percentage of time the equipment item was used for sportfishing, and only that percentage of the item's cost was used in the equipment expenditure analysis. Nonresidents were asked to report their expenditures for equipment only purchased in Alaska; all respondents were asked to indicate the region in which the equipment was purchased. The list of items included in the survey was reviewed with industry representatives and ADF&G staff in June of 2007 to help ensure items commonly used in Alaska by anglers were properly listed.

9. *Real estate:* Respondents were asked to report expenses related to real estate in Alaska that was used primarily for sportfishing purposes. Expense categories included purchase, lease, maintenance and construction of real estate.¹⁵

10. *Satisfaction:* a question about the respondent's satisfaction with Alaska's sportfishing was added to assist ADF&G staff in assessing satisfaction as a measure of performance. This question was not included in the analysis of economic contribution.

In June 2007, the draft resident angler questionnaires were pre-tested in-person with anglers and industry representatives. A pre-testing session with anglers was scheduled at an Anchorage tackle retailer, Sportsmen's Warehouse. During the night of the pre-test, several anglers did not show and others were recruited directly from the store's sales floor. A private meeting room was used. Each angler was given a \$50 gift certificate from the hosting retailer for participating. Two sessions were held that night, one at 5:30 and the other at 7:00 pm. The session was led by Southwick Associates with assistance by ADF&G staff.

The Wave I and Wave II surveys were both pre-tested. The anglers first took the survey without any input or background provided by the session hosts besides being told they were helping to test and refine an upcoming survey. Once anglers completed the test survey, they were gathered to discuss their impressions in a focus group style setting. The review included:

1. Did they have difficulty understanding any of the specific questions?
2. How did they interpret any questions suspected as being problematic?
3. Did any of the response mechanisms to any specific questions not allow the respondent to provide a full response? In other words, did they feel there was something more we should know about their response that the survey did not record?

Based on feedback received during the pre-test phase, the survey questionnaires were revised as necessary.

The nonresident questionnaires were tested using a different format. Nonresident anglers were recruited in-person by Southwick Associates. One participating nonresident was recruited from the retail floor during the resident pre-test sessions and sent a survey to complete. For the others, the survey was administered in person, then the respondent was interviewed to gain the same type of feedback collected in the resident pre-test sessions. The nonresident recruited from the sales floor was interviewed by phone. Four nonresident pre-test surveys were conducted; three of the participants were Florida residents and one was a resident of Michigan. When the nonresident surveys were revised, feedback from the resident pre-tests was also considered.

¹⁵ Data analysis revealed that the lack of specificity in the purchase and lease questions yielded unreliable data. Subsequently, expenditures for purchase or lease of real estate were omitted from the estimation of angler expenditures.)

After the final written questionnaires were developed and pre-tested, an online version was developed presenting the same questions, wording and order. In the mailed cover letter and at the beginning of the mail questionnaire, survey recipients were offered the opportunity to take the survey online. The online survey was offered as a convenience that could potentially help boost response rates. The draft online survey was pre-tested internally by Southwick Associates and ADF&G staff and made available for review prior to the mail survey's first mailing. The online survey was activated upon the distribution of the mail survey. Each survey was assigned a code to track responses for the second and third round mailings, and survey respondents were required to use this code to access the survey and prevent from taking it again. This code also prevented survey recipients from encouraging friends to take the survey and potentially biasing the results.

After the survey instruments were complete, they were reviewed and approved by the ADF&G Commissioner, as is done for all public surveys issued by the ADF&G.

Questionnaire Mailing and Response Processing Protocols

Recognizing some residents may be more likely to respond to a survey sent from Alaska and returned to an Alaska address, a mail house in Alaska was used to mail out and receive the mailed survey questionnaires. The mail house was hired by Southwick Associates using a competitive bid process. Criteria for selection included comments from current and past clients, availability to handle the workload during the specified timeframes, the ability to handle complex surveys requiring unique codes and tracking mechanisms per survey, business reply mail capabilities, and printing capabilities. In May, mail houses were identified and contacted by Southwick Associates and provided with desired project specifications. The mail houses that appeared capable were visited in June 2007 by Southwick Associates during a scheduled project trip to Anchorage and the final selection of the mail house contractor was made during this visit. Initial mailing instructions and arrangements were discussed with the selected mail house during this same visit, including contract issues, arrangements for delivery of master copies and more.

For each survey wave, the following protocols were used to administer the questionnaires:

1. A complete survey packet consisting of cover letter and questionnaire with map insert was mailed to survey participants by the mail house. Advance notice postcards or letters were not used.
2. First class outbound mail and business reply mail was used for all three mailings.
3. Three complete mailings (cover letter, questionnaire and map insert) were conducted with a 30-day lag between each mailing.
4. First, second and third mailings were distinguished by using different colors of paper stock.
5. Unique cover letters were used for each mailing. The cover letters are presented in Appendices A, B and C.
6. A survey response incentive was used. All survey participants were notified that their name would be entered into a random drawing for a \$1,000 gift certificate upon receipt of a completed questionnaire.
7. Surveys completed online were tracked to prevent mailing a second or third survey to online respondents.

8. The mail house received all returned surveys and forwarded them to Southwick Associates, Inc. for processing. Each returned survey had the respondent's unique code on the envelope to track who responded. This code was only used to determine who was not to receive a second or third mailing.

Questionnaires were returned to the mail house. Returned questionnaires were sorted into two categories: "deliverables" and "undeliverables". "Deliverables" were defined as questionnaires successfully delivered by the U.S. Postal Service (total mailed surveys minus undeliverable surveys). "Undeliverables" were defined as questionnaires the U.S. Postal Service was unable to deliver to the addressee and were returned to the mail house. First class postage was used to ensure undeliverable surveys were returned by the U.S. Postal Service. "Undeliverables" were ultimately sent to Southwick Associates to aid in determining final response rates.

When a questionnaire was received, the unique code on the return mailing label was checked and entered into a database by the mail house. This was used to determine who not to send a second or third mailing. When possible, the mail label database was updated with correct addresses for those questionnaires forwarded by the Post Office personnel as undeliverable. Periodic reports of response numbers were provided to Southwick Associates by the mail house. To ensure confidentiality, no surveys were opened by the mail house. The logged-in and still unopened surveys, as well as the undeliverable surveys, were then packed and shipped on a regular basis to Southwick Associates for data entry. Surveys were sent in batches via overnight delivery services to prevent significant impact if a package was lost in transit. Once received, the surveys were re-checked to ensure proper mail lists were being used by the mail house for the second and third mailings of surveys.

The sampling frame was developed based on historical response rates obtained by the ADF&G of the annual Statewide Harvest Survey (SWHS). Utilizing those surveys as a guide, the expected response rate for this survey was estimated to be 42.9%. The overall response rate achieved by the Alaska Sportfishing Economic Survey was 41.0%. Details of the response rate, broken down by wave and target group, are provided in Appendix F.

An issue developed during the Wave II mailings that may have affected response rates to an unknown degree. In the development of the mailing lists, unique, random alphanumeric ID codes were generated by the online survey contractor and assigned to each recipient of the survey. The codes were required for access to the online version of the questionnaire to ensure that only members of the survey sample had access to the online survey and no person could complete more than one online questionnaire. The same ID numbers were included on each return envelope as the mechanism for tracking mail respondents. Unknown to the survey administrators, every resident was assigned an ID code with a duplicate counterpart in the nonresident sample. As a result, some surveys from the mailing of the Wave II surveys were returned to the mail house with an ID code on the envelope that provided no way for the mail house to determine whether the respondent was from the resident or nonresident mailing list. In many cases, the postmark provided an indication of residency. When no postmark appeared on the envelope, the mail house was instructed to send the unopened surveys to Southwick Associates to be opened and examined to determine the residency of the respondent. This information was then sent to the mail house to adjust the mailing list for the second mailing. However, the duplicate ID issue was not detected until well after the first mailing of Wave II had occurred and it was later determined that not all surveys were correctly logged.

Prior to the second mailing, a prefix was added to the ID code on the return envelopes to distinguish resident and nonresident returns from the second and third mailings. Nevertheless, some respondents received a second or third survey mailing despite having responded to the first mailing. It is also likely that an unknown number of people who did not respond to the first survey were not given a second or third opportunity to respond.

Data Entry and Quality Controls

Data entry was completed by Southwick Associates personnel. Microsoft Access was used to build the data entry screens and manage the data entry tasks. Data entry instructions were developed and provided to each data entry clerk explaining the parameters to use for each variable including:

1. Format – alpha, numeric or alphanumeric, including when to use symbols such as “\$” and other seldom-used characters.
2. Zeros and blank – proper values to enter if no response (typically -999) or if a zero is provided as a response.
3. Out-of-bounds and text responses – how to handle response to questions that do not fit the specific format, such as text replies to numeric questions, responses that are clearly out-of-bounds, protest responses, etc.
4. Special cases – instructions were provided about how to handle surveys that required close examination by a project statistician or economist.
5. Comments – when the respondent provides comments outside of established response areas, the capability for these to be entered was provided.

Multiple steps were taken to ensure data quality:

Account for multiple surveys received from the same individual: Due to the initial confusion that resulted from the duplicate IDs, an unknown number of anglers were included in the second and third rounds of the Wave II mailings despite having responded to the first mailings. This is not unusual in most mail surveys due to time lags in adjusting mailing lists while mail is in transit. In this case, 127 people returned a second completed survey. These were identified by the ID code and survey type (resident or nonresident). In each case, the first survey received was retained and subsequent surveys were removed from the data base entirely.

Out-of-Bounds Checks: Microsoft® Access routines and Excel procedures were used to review each variable in the data files to ensure each response fit within an acceptable range. For example, it would not be possible for someone to have fished 62 days within the May to June period. Data entry validation was employed in the data entry screens to block responses that fell outside of accepted parameters. Results that were within accepted parameters but of questionable validity were marked for review by the project statistician and economists. Each was adjusted accordingly, or deleted if a proper response could not be reasonably deduced. Acceptable parameters were reviewed in-person by ADF&G and Southwick Associates prior to finalization. Upon completion of the data entry process, all variables were sorted to examine the upper range of values. All upper level values were compared against the original survey questionnaires to ensure they were not the result of manual data entry error. The resulting maximum values used in the analyses are reported in Appendix I with the detailed mean expenditure estimates.

Outliers: Some responses, while plausible, had a significant impact on the resulting estimates. For example, boats are produced that cost hundreds of thousands of dollars and more. It is reasonable to assume that, while rare, some of these boats were purchased primarily for sportfishing. However, including a survey response that reports a purchase in the hundreds of thousands of dollars has a significant effect on the calculated average expenditures reported in this report and can greatly skew the results upward. Adjustments were needed for these outlier observations.

Several steps were taken to identify and adjust outliers. The first was a sort of all variables to identify high values. ADF&G and Southwick Associates conducted a joint examination of the high values to assess plausibility based on personal knowledge of fishing in Alaska and considering additional data provided by individual respondents. For example, a high expenditure for lodging by itself may appear as a potential outlier, but considered in concert with high values for length of trip and other trip spending such as groceries and meals, then the high lodging value appears reasonable. Finally, each remaining potential outlier was tested to determine its effect on the overall mean. If any single observation increased the statewide mean for that variable by 25 percent or more then it was deemed an outlier and the observed value for that observation was dropped from the analysis to prevent skewing the average. The outliers that were removed from the data as a result of this step are listed in Appendix H.

Assignment of "Other" expenses: In addition to explicit categories of trip and equipment expenses, the questionnaires included an "other" write-in blank to allow respondents to include fishing-related expenses that were not included in the list of specific expenditure items. Every write-in response was individually reviewed for proper categorization in the data set. In most cases, a write-in response could be appropriately assigned to an existing category of trip or equipment expense. For example, several respondents listed items of clothing as "other" trip expenses. These were assigned to the equipment clothing category. Likewise, some items listed as "other" equipment were more properly counted as trip expenses (e.g., groceries) and assigned accordingly. In each case, care was taken to ensure that any expenses were not double-counted (e.g., assigning a write-in expense for groceries to the groceries trip category if an identical value was already entered as a groceries trip expense. This was a particular issue with respect to package expenditures. Several respondents wrote-in "package" as an "other" expense while also including an identical value in the package section of the questionnaire. In each case of potential double-counting, the write-in value was set to missing. In all, 250 of 271 "other" trip expenses were assigned to more appropriate categories and 110 of 127 "other" equipment expenses were assigned to a more appropriate category prior to calculating economic estimates.

Non-response bias: To the extent possible, the survey responses were examined for non-response bias. In any survey, there is always the possibility that the persons who chose to respond are systematically different from the persons who did not respond. If such is the case, then extrapolating the results obtained from the sample to the survey population may produce inaccurate results unless appropriate adjustments are made. Tests for such bias can be made by comparing the responses of people who respond to the first mailing to those who respond to later mailings under the assumption that later responders are more like non-responders. The surveys for each mailing were to be

printed on different colored paper as the means for determining to which mailing people responded. In the Wave II survey, the mail house incorrectly printed both the second and third mailings on the same color paper. The resulting inability to distinguish between responses to the second and third mailings limited our statistical test to comparing only the first mailing responders to all other later responders. An analysis of variance on all expenditure variables found a statistically significant difference (at the 95% confidence level) in the mean expenditure between mailings for only two expenditure categories among the more than 60 expenditure variables in the surveys (ice purchased between May and June, and equipment expenditures for rods and reels). The lack of extensive differences between mailings, especially for expensive items such as boats and vehicles, indicates there was no systematic bias in the mean expenditures of anglers who responded to the first mailing compared to those who responded to subsequent mailings.

DATA ANALYSIS

There were three main categories of fishing expenditures used in this study: trip expenditures,¹⁶ equipment expenditures and real estate expenditures. Trip expenditures are the most complicated to calculate because they are based upon expenditures made during the most recent fishing trip taken during one of three fishing seasons (winter: January through end of April; spring: May/June; and summer/fall: July through end of October).¹⁷ Because average trip expenditures by anglers in November and December are likely to be similar to those in January through April, total trip expenditures during November and December were estimated based on the number of trips reported during those months and the average trip expenditures reported by those who reported fishing January through April. As a result, trip expenditures needed to be summed across seasons. Equipment and real estate estimates are based on annual expenditures and do not need to be summed across seasons.

Separate analyses were conducted for resident and nonresident anglers, freshwater and saltwater, guided and unguided trips, for each geographic region. These analyses were performed after data manipulations as described below were completed. Resident and nonresident analyses were determined by the residency of the license holder.¹⁸

Further complicating the analysis of trip expenditures was that these expenditures could vary depending upon: whether the trip was guided or unguided, whether the trip was purchased as part of a package, whether the type of water being fished was saltwater or freshwater, and the subregion of the state being fished. As a result, trip expenditures were analyzed at each relevant combination of factors and then aggregated. The next several subsections explain each procedure for estimating expenditures in greater detail.

NON-PACKAGE TRIP EXPENDITURES

Trip expenditures were calculated on a per-fishing-day basis. These per-day trip expenditures¹⁹ were calculated based upon specific types of fishing trips (e.g., saltwater versus freshwater).

¹⁶ Trip expenditures include both package (trip expenditures bundled together as a 'package trip') and non-package spending.

¹⁷ Data to derive expenditure estimates for November/December fishing trips were not collected because 1) these responses to the first wave survey would likely suffer from recall bias and 2) the second wave survey was fielded before November/December.

¹⁸ The guided and unguided analyses were determined by responses to questions 13 (Appendix A), 10, 20 (Appendix B), 9 and 20 (Appendix C). Analyses by subregion were based upon responses to questions 14 (Appendix A), 11 and 21 (Appendix B), and 10 and 21 (Appendix C).

¹⁹ The trip expenditure question is question 17 in Appendix A, questions 13 and 23 in Appendix B, and questions 13 and 24 in Appendix C.

Because of this, the average per-day trip expenditures could be multiplied by the total number of specific types of fishing days²⁰ to arrive at regional and state aggregates. In addition to waters fished, type of trip included whether the trip was guided or unguided, whether the trip was purchased as part of a package, and the subregion of the state being fished. Separate analyses were made for each type combination.

The procedures used to calculate per-day trip expenditures were the same across all three time periods/seasons referred to in the angler survey (Jan-Apr, May-June, July-October). The procedure described below uses a resident angler fishing during the Spring season time period as an example.

The first step was to allocate fishing days²¹ to type of water (freshwater or saltwater). The survey asked anglers about the types of water they fished on their last spring fishing trip.²² Anglers were allowed three responses: 'saltwater', 'freshwater' or 'both'. Fishing days were allocated to freshwater or saltwater if the angler stated the trip was either fresh or saltwater. Expenditures for survey responses that identified 'both' water types had to be apportioned to either freshwater or saltwater because later we need to multiply our per-day trip expenditures by the total number of anglers days taken in Alaska during 2007, and angler days are collected by ADF&G as being either freshwater or saltwater days.

To allocate fishing days to freshwater or saltwater for those anglers who stated 'both', the following procedure was used. For each observation, the number of freshwater and saltwater fishing days the angler stated they took in Alaska *during the spring fishing season* was summed.²³ Then, for each 'both' observation, freshwater (F/T) and saltwater (S/T) fishing-day ratios were calculated:

$$(1a) \quad F/T = \frac{\text{(total number of spring freshwater fishing days)}}{\text{(total number of spring fishing days)}}$$

$$(1b) \quad S/T = \frac{\text{(total number of spring saltwater fishing days)}}{\text{(total number of spring fishing days)}}$$

These ratios were then multiplied by the total number of days (DAYS)²⁴ the angler fished *during their last spring fishing trip* to allocate these 'both' fishing days to either fresh (FRESHDAYS) or saltwater (SALTDAYS).

$$(2a) \quad \text{FRESHDAYS} = F/T * \text{DAYS}$$

$$(2b) \quad \text{SALTDAYS} = S/T * \text{DAYS}$$

Once days of 'both' fishing were allocated to either freshwater or saltwater, any observations where freshwater days or saltwater days were missing or zero were deleted from further analysis.²⁵ This was done for two reasons. First, the above variables begin to form the

²⁰ The number of fishing days for each specific type of fishing by data analysis region was provided by the State of Alaska, Department of Fish and Game from the 2007 Statewide Harvest Survey (SWHS).

²¹ Based on responses to question 6, Appendix B.

²² Based on responses to question 9, Appendix B.

²³ Based on responses to question 3, Appendix B. This question was also used to calculate similar ratios for summer/fall fishing.

²⁴ Based on responses to question 6, Appendix B.

²⁵ Zero or missing responses for days fished for a specific season are valid since a person could have 1) not fished during a particular season but did fish during another season, or 2) may not have fished at all during 2007 yet made non-trip expenditures (e.g. equipment, real estate) and they filled out the survey.

denominator that will be used to divide trip expenditures to generate a per-day trip expenditure. Second, per-day trip expenditures will be later multiplied by the total number of fishing days to generate total trip spending during 2007; the total number of fishing days includes, by definition, only anglers active²⁶ during 2007. In turn, any non-active anglers in the above calculation were eliminated. However, if trip expenditure information was missing but the angler did fish, the missing expenditures were converted to zero.

The next step was to allocate each trip expenditure line item (e.g., bait, fuel, etc.) to either freshwater or saltwater fishing. To do this, for each observation, two ratios were calculated: one to measure the percent of fishing days on the trip allocated to freshwater (FRAT), and another to measure the percent of fishing days on the trip allocated to saltwater (SRAT).

$$(3a) \quad \text{FRAT} = \text{FRESHDAYS}/\text{DAYS}$$

$$(3b) \quad \text{SRAT} = \text{SALTDAYS}/\text{DAYS}$$

Note that FRESHDAYS and SALTDAYS in equations 3a and 3b include all of the observations whereas FRESHDAYS and SALTDAYS in equations 2a and 2b only include 'both' fishing days.

Each expenditure line item was then multiplied by FRAT and SRAT to allocate the expenditure to fresh and saltwater fishing:

$$(4a) \quad \text{FEXP} = \text{EXP} * \text{FRAT}$$

$$(4b) \quad \text{SEXP} = \text{EXP} * \text{SRAT};$$

where EXP denotes one of the expenditure line items.

The next step in constructing per-day trip expenditures was to allocate total fishing days (freshwater or saltwater) to the subregions fished (using question 11, Appendix B)²⁷. First, for each observation, the total number of subregions fished during the trip (RGDAYS) was calculated. To calculate a per subregion number of freshwater days (PRFDAYS), the number of freshwater days was divided by the total subregions fished during the trip. Similarly, to calculate a per subregion number of saltwater days (PRSDAYS) the number of saltwater days was divided by the total subregions fished.

$$(5a) \quad \text{PRFDAYS} = \text{FRESHDAYS}/\text{RGDAYS};$$

$$(5b) \quad \text{PRSDAYS} = \text{SALTDAYS}/\text{RGDAYS};$$

The total number of per-subregion freshwater or saltwater fishing days was allocated to the subregions visited by multiplying the per-subregion days by a series of binary (0/1) variables that represented whether the respondent indicated fishing in that subregion. The end result of these calculations is an allocation of the number of per-subregion freshwater or saltwater fishing days occurring in each subregion.

Although fishing could occur in a subregion, it does not mean that was the subregion where the expenditures took place. For example, an angler could have fished in subregion B but bought fuel for the trip in subregion C.²⁸ Thus, a fishing day in subregion B could have a spillover

²⁶ Active anglers are those who stated they actually fished at least one day (question 9, Appendix A; questions 6 and 16, Appendix B; questions 5 and 16, Appendix C).

²⁷ Based on responses to question 11, Appendix B.

²⁸ Anglers were asked to report the subregion(s) they made each of their purchases (question 13, Appendix B)

economic impact into subregion C – and we wanted to capture all of these impacts. Thus, the next step of the analysis was to allocate each trip expenditure line item to the subregion where the purchase occurred. To do this, the number of subregions (RGEXP) where each expenditure took place (if no location information was available we deleted the observation from further analysis) was calculated. Freshwater and saltwater trip expenditures were then divided by the total number of subregions where the expenditure took place. For example the per-region salt and freshwater expenditures were calculated as:

$$(6a) \quad PRFEXP = FEXP / RGEXP$$

$$(6b) \quad PRSEXP = SEXP / RGEXP$$

The next calculation was to use a set of binary variables to allocate per-subregion fresh (PRFEXP) and saltwater (PRSEXP) expenditures to the specific subregion where the expenditures took place. These location-specific freshwater and saltwater expenditures were then divided by the per-subregion number of freshwater or saltwater fishing days (PRFDAYS, PRSDAYS) to arrive at final location-specific, per-subregion, per-day, freshwater and saltwater fishing estimates for each expenditure line item.

Because fishing trips can include non-fishing activities, and non-fishing trips may include fishing, it was important when performing this impact analysis to focus the trip-expenditure analysis to only include expenditures where fishing was the primary purpose of the trip, and exclude expenditures when the trip was not primarily taken to fish. Otherwise, the end result would have been an overestimate of the economic impact of sportfishing. In other words, non-fishing expenditures (e.g., *fuel, airfare, travel, rentals, ice, groceries, meals, lodging, gifts, and amusements*) of any trip that would have occurred even if the angler was unable to go fishing were not included. To exclude non-fishing expenditures from trips that would have been taken if the person would not have been able to go fishing, positive responses to question 7 (Appendix B) were used to eliminate the following expenditure categories: *fuel, airfare, travel, rentals, ice, groceries, meals, lodging, gifts, amusements, and other expenditures*. Specifically, when the angler stated they would have taken the trip even if they were unable to go fishing, then the above expenditures were converted to zeros.

PACKAGE TRIP EXPENDITURES

Package spending refers specifically to pre-arranged travel packages that nonresidents purchased prior to departing on their trip to Alaska. Package trip expenditures were calculated using procedures similar to that used for non-package expenditures with several important differences. First, package trip expenditure information was only collected from nonresidents²⁹ (question 12, Appendix C) because, in general, nonresidents are much more likely to purchase a travel package for sportfishing than residents. Second, it was not known where the expenditures were actually made; however, it was known which subregions of the state were visited by the angler on their package trip. Third, it was not known how much money was spent for specific line items; only the total amount spent on the package was known. Finally, a change to the treatment of package trip expenditures when the trip was not taken primarily to fish (question 6, Appendix C) was made. How the latter three items impact the calculation procedures is explained below.

²⁹ Based on responses to question 12, Appendix C.

With respect to estimating the distribution of expenditures across subregions, the 'subregion visited' variable was used the same way the 'subregion of trip expenditure' variable (RGEXP) was used. That is, the number of subregions visited was used to calculate the number of subregions (RGEXP).

With respect to estimating expenditures by line item, total package spending (TOTPKGEXP) was allocated to individual line items (spending on transportation to or from Alaska, transportation once the angler arrived in Alaska, guide fees, lodging, and food) in the following manner. First, for both the spring and summer/fall time seasons/periods,³⁰ the average spending patterns on these expenditure items for nonresident, non-package, guided fishing trips was calculated (Table 4). The nonresident, non-package, guided spending profile was used as it was assumed it most closely reflected the spending structure of a nonresident package trip.

Table 4.—Average spending profile for specific non-package trip expenditures for nonresident, guided trips by time period, 2007.

	Spring	Summer/Fall
Transportation to or from Alaska	\$583	\$594
Transportation within Alaska	\$122	\$78
Fishing guides &/or charter boats	\$485	\$502
Lodging	\$377	\$387
Meals	\$223	\$246
Total of profile	\$1,790	\$1,807

A set of variables (PEXPTMP) were calculated by multiplying the averages above (EXPAVG) by the set of binary variables (BINEXP) that indicate whether the respondent checked the boxes associated with the spending categories in the package expenditure question.

$$(7) \quad \text{PEXPTMP} = \text{EXPAVG} * \text{BINEXP}$$

For each of the five expenditure categories above, PEXPTMP was either equal to the average noted in Table 5 (if the category box was checked) or was equal to zero (if the category box was not checked). Next, for each observation, the five variables were summed to obtain a total (TOTTMP). If TOTTMP was zero (meaning the angler did not check any category boxes) then the percent of package spending (PCNTEXP) allocated to each expenditure category reflected the percent of spending indicated by the averages shown in Table 4. If TOTTMP = 0 then:

$$(8a) \quad \text{PCNTEXP} = \text{EXPAVG} / \text{TOTAVG};$$

where TOTAVG = 1,790 (the sum of column labeled 'Spring' in Table 4) for spring fishing and TOTAVG = 1,807 (the sum of column labeled 'Summer/Fall' in Table 4) for summer/fall fishing.

If TOTTMP was greater than zero, (meaning the angler did check at least one of the category boxes) then the percent of package spending (PCNTEXP) allocated to each expenditure category

³⁰ Note: We asked about three fishing seasons for residents but only two for nonresidents; we did not ask nonresidents any questions about their winter fishing since relatively few nonresidents fish in Alaska during the winter months (source: DSF).

reflected the percent of spending indicated by the averages shown in Table 4, taking into account that some of the categories are zero:

$$(8b) \quad PCNTEXP = PEXPTMP / TOTTMP.$$

The total spent on package expenditures (TOTPKGEXP) was then allocated to each expenditure category as:

$$(9) \quad PCKGEXP = PCNTEXP * TOTPKGEXP.$$

Finally, all of the package trip expenditures for any trip that would have occurred if the angler was unable to go fishing were excluded. Otherwise, the end result would be an overestimate of the economic impact of sportfishing. This is similar to the procedure used for non-package trip expenditures except with non-package expenditures guide fees were not excluded; here all of the package trip expenditures, including the guide fee portion were excluded.

FISHING EQUIPMENT EXPENDITURES

Fishing equipment expenditures³¹ (expenditures for fishing equipment and fishing-related equipment) were calculated based on all observations of the data; that is, any missing fishing equipment expenditure observations were assumed to be equal to zero. Similarly, the missing location-of-purchase codes for these observations were also coded to zero. This allowed the mean per-angler estimates to be multiplied by the total number of licensed anglers in Alaska to represent total fishing-related equipment expenditures. Separate analyses were conducted for nonresident and resident anglers.

Fishing equipment expenditures were allocated to the separate subregions by multiplying the respondent's expenditure by a set of binary variables reflecting the stated location of purchase. If a respondent denoted that their purchase was located in multiple subregions, then the relevant expenditures were divided equally across the subregions. Expenditures from respondents who did not provide a location for their purchase were not included in the analysis.

There were two main types of fishing equipment (Table 5); those that are only used for fishing (e.g. fishing tackle) and those that can be used for fishing and other activities (e.g., boats or other watercraft). One-hundred percent of the stated expenditure for the former type of equipment (hereafter, fishing equipment) was allocated to fishing and used in the estimation procedures. For the latter type of expenditure (hereafter, fishing-related equipment), the respondent's stated expenditure for each line item was multiplied by the relevant stated "percent used for sportfishing" provided by respondent³² (e.g., question 24, Appendix B).

³¹ The fishing equipment questions are listed as question 17 in Appendix A, question 24 in Appendix B and 25 in Appendix C.

³² For example, using responses to question 24, Appendix B.

Table 5.—Categories of fishing and fishing-related equipment.

Fishing Equipment:

Licenses and stamps
 Rods, reels, & components
 Fishing tackle (lines, leaders, lures, creels, stringers etc)
 Tackle boxes, cases to protect fishing equipment
 Depth finders, fish finders, other electronics
 Landing nets, dipnets & gillnets
 Miscellaneous fishing equipment (knives, scales, etc.)
 Shellfish fishing equipment (shovels, pots, buckets, etc.)
 Fish mounting (taxidermy)
 Books and magazines devoted to fishing

Fishing-related Equipment:

Items to store/preserve fish (smoker, vacuum sealer, etc.)
 Coolers, fish boxes
 Outdoor Clothing (fishing vest, raingear, head net, etc.)
 Boots, shoes, waders and other footwear
 Life jackets, survival suits or other PFDs
 Boats, canoes, rafts, kayaks and other watercraft
 Boat motors
 Trailers, hitches, and accessories
 Other boat parts and accessories
 Bear spray, bug spray, sun screen
 Firearms for personal protection
 Cameras, binoculars, sun glasses
 Tents, screen rooms, tarps, backpacks, sleeping bags
 Camping trailer (pop-up, self-contained, 5th wheel)
 Other camping equipment (stoves, grills, lanterns, etc.)
 Vehicles (trucks, SUVs, motorhomes, etc.)
 Airplanes and related equipment
 ATVs, snowmachines
 Boat/camper registrations and excise taxes
 Vehicle, boat or airplane repair/maintenance

However, many of the respondents who provided a fishing-related equipment expenditure did not provide an answer to the "percent used for sportfishing" question. For each missing line item, the average response for the "percent used for sportfishing" part of the question was calculated based upon responses from those who did complete the question (Table 6). Separate calculations were made for residents and nonresidents. These average percentages were then substituted for the missing data. That is, for each observation, when the respondent provided a fishing-related expenditure but the "percent used for sportfishing" was missing, the missing value was replaced with the appropriate average percentage across all respondents in that group (e.g., residents). Finally, the stated fishing-related expenditure was multiplied by the new "percent used for sportfishing" variable.

Table 6.—Estimates of the average percent allocation to fishing activities for fishing-related equipment expenditures, 2007.

Items	Resident Anglers	Nonresident Anglers
Items to store/preserve fish	77.5%	72.9%
Coolers, fish boxes	76.6%	67.4%
Outdoor Clothing	70.2%	58.6%
Boots, shoes, waders	75.4%	65.9%
Life jackets, survival suits	76.6%	87.8%
Boats, canoes, other watercraft	73.6%	50.0%
Boat motors	78.1%	71.4%
Trailers, hitches, and accessories	66.4%	55.1%
Other boat parts and accessories	79.9%	80.0%
Bear spray, bug spray, etc.	58.9%	59.8%
Firearms	51.8%	33.3%
Cameras, binoculars	50.5%	52.4%
Tents, backpacks, sleeping bags	53.2%	24.6%
Camping trailer	53.8%	1.2%
Other camping equipment	57.1%	44.4%
Vehicles (trucks, SUVs, etc.)	45.1%	46.6%
Airplanes and related equipment	51.2%	57.9%
ATVs, snowmachines	36.1%	0.0%
Boat/camper registrations	76.2%	64.7%
Vehicle, boat or airplane repair	62.5%	57.5%
Other	66.7%	35.4%

REAL ESTATE EXPENDITURES

Fishing-related real estate expenditures³³ (expenditures for owning or leasing real estate and maintenance or construction expenditures) were calculated based on the entire data set; where any missing real estate expenditure observations were assumed to be equal to zero. Similarly, the missing location codes for these observations were also coded to zero. This allowed the average per-angler estimates to be multiplied by the total number of licensed anglers in Alaska to represent total angler-related real estate expenditures. Separate analyses were conducted for resident and nonresident anglers.

Real estate expenditures were allocated to the separate subregions by multiplying the respondent's stated real estate expenditure by a set of binary variables reflecting the location of the real estate. If a respondent denoted that their real estate was located in more than one subregion, then the relevant expenditures were divided equally across subregions. Real estate expenditures from respondents who did not provide a location for their real estate were not included in the analysis.

³³ The real estate questions are listed as question 18 in Appendix A, 25 in B and 26 in C. The respondent was asked to only report expenditures for real estate used primarily for fishing.

Although information on four types of real estate expenditures was collected, the IMPLAN modeling treats ownership and leasing of real estate similarly; in turn these two expenditures were added together. However, after examining the lease/ownership data collected in the surveys, additional discussion revolved around two key issues: 1) the reliability of the data reported in the surveys to these questions; and, 2) the appropriateness of attributing 100% of real estate spending to sportfishing activity.

With regard to the first issue, the intent of the question was to ascertain average annual costs associated with owned or leased properties. As examples, the question included parenthetical references to mortgage payments, insurance, property taxes, etc. A review of the responses made it clear that many respondents included full purchase prices for real estate. With no way to deduce the true intent of the respondents, there was no mechanism for estimating annual costs associated with real estate or determine the appropriate IMPLAN sectors for analyzing the impacts of those expenditures. Given the lack of specificity in the question and resulting data, it was decided to take a more conservative approach and eliminate entirely any purchase or lease costs from the estimates of angler spending and their multiplier effects. It should be noted a purchase of real estate, while producing a large spending figure, has little impact on the regional economy because it represents simply a transfer of existing assets from one owner to another. The economic impact in such transactions generally derives from the fees paid for the services of intermediaries such as a real estate brokers, lawyers or financial institutions.

The second issue relates to the allocation of real estate construction and maintenance costs to go sportfishing when a portion of that spending might have other attributions. People reported purchasing real estate, constructing structures and maintaining the property for the primary purpose of sportfishing. However, it is reasonable to assume that an unknown portion of these expenditures would not have been made if the survey respondents were not allowed to sell their property for a profit at some later time. Some properties are likely purchased in part for investment purposes.

To find a solution, other economists outside of the project were consulted to discuss options. This included posting the issue and questions on the IMPLAN internet forum, reviewing previous economic studies, and direct phone conversations with IMPLAN economists. No clear solutions were identified from any source. An adjustment to reduce the reported amounts of real estate maintenance and construction attributed to sportfishing by some arbitrary percentage was considered, however, the project team agreed that: 1) the wording of the question asking participants to record real estate maintenance and construction expenditures primarily for sportfishing was sufficiently clear; 2) that actual expenditures reported seemed appropriate and easy to interpret; and, 3) that such expenditures were more likely made to facilitate use of the property for sport fishing activities (than to maintain future profit) and to occur within Alaska. Thus, for the purposes of this analysis and report, we assumed that 100% of the reported real estate maintenance and construction expenses were related to sportfishing and total real estate maintenance and construction expenditures were included in the IMPLAN analysis.

AGGREGATION OF SEASONAL PER-DAY TRIP EXPENDITURES TO REFLECT TOTAL ANGLER DAYS.

There were three fishing time periods (seasons) included in the trip expenditure analyses: winter fishing (January to the end of April); spring fishing (May-June) and summer/fall fishing (July through the end of October). The survey collected expenditure data on winter fishing trips only

from resident anglers. Spring and summer/fall trip data were collected from both resident and nonresident anglers.

For Wave I, information about the number and types of trips the angler took between January 1 and the end of June was collected for each subregion.³⁴ Information about the last trip (number of days fishing, spending amount and location, subregions visited, types of water fished, etc.) the angler took in this time period was also collected. Similar information was collected in Wave II concerning the number and types of trips the angler took between May 1 and the end of October, was collected for each region³⁵ as was information about the last trip the angler took in both the spring and summer/fall seasons.

In the analyses of trip data, January through April information from Wave I was treated as one unit of analysis; May-June information from Waves I and II were pooled as a unit of analysis, and July-October information from Wave II was a unit of analysis.

After generating all of the various combinations (e.g., resident, saltwater, guided in subregion A) of season-specific trip expenditure estimates, these estimates were aggregated to represent annual fishing-related activity. Estimates of the total number of fishing days occurring during 2007 from the SWHS were obtained from ADF&G, for the following combinations: saltwater/freshwater, guided/unguided, resident/nonresident, for each subregion. The distributions of season-specific fishing days for each possible freshwater/saltwater, resident/nonresident, and subregion trip combination were then calculated using the responses from specific questions in the survey instrument.³⁶ These distributions were then applied to the appropriate ADF&G estimate of angler-days to calculate the number of fishing days occurring during each fishing season (Table 7). Since the survey information about the seasonal distribution of guided/unguided trips was not available, the distributions in Table 7 were applied equally to guided and unguided trips.

³⁴ For example, see questions 5 and 6, Appendix A.

³⁵ For example, question 3, Appendix B and question 2, Appendix C.

³⁶ Using the responses from questions 5 and 6, Appendix A, question 3, Appendix B and question 2, Appendix C.

Table 7.—Estimated percent of fishing days from angler responses, by season, residency, watertype and area of the state, during 2007.

Residency and Water Type	Winter	Spring	Summer/Fall
Resident freshwater	%	%	%
Southeast	16	51	33
Prince William Sound /N. Gulf Coast	5	50	45
Cook Inlet	9	45	46
Bristol Bay/Aleutians	5	51	44
Tanana/Copper River Valleys	8	47	46
Arctic-Yukon-Kuskokwim Areas	11	42	47
Resident saltwater			
Southeast	9	51	40
Prince William Sound /N. Gulf Coast	4	40	56
Cook Inlet	8	55	36
Bristol Bay/Aleutians	5	60	35
Tanana/Copper River Valleys	NA	NA	NA
Arctic-Yukon-Kuskokwim Areas	0	13	88
Nonresident freshwater			
Southeast	0	31	69
Prince William Sound /N. Gulf Coast	0	21	79
Cook Inlet	0	26	74
Bristol Bay/Aleutians	0	29	71
Tanana/Copper River Valleys	0	35	65
Arctic-Yukon-Kuskokwim Areas	0	23	77
Nonresident saltwater			
Southeast	0	39	61
Prince William Sound /N. Gulf Coast	0	27	73
Cook Inlet	0	39	61
Bristol Bay/Aleutians	0	25	75
Tanana/Copper River Valleys	NA	NA	NA
Arctic-Yukon-Kuskokwim Areas	0	100	0

NA denotes not applicable as there is no saltwater fishing available in the Tanana/Copper River Valleys.

* Winter refers to months November – April.

** Spring refers to months May – June.

*** Summer/Fall refers to month July – October.

ECONOMIC ANALYSIS/MODELING

The expenditures made by anglers for sportfishing activities generate additional economic benefits throughout the Alaska economy beyond the initial angler spending. These additional economic benefits are typically estimated with regional input-output models that relate changes in some specific industry to impacts on other industries in the regional economy. The IMPLAN input-output software provides a flexible tool for conducting economic impact analyses at various geographic levels and was used in this study to estimate the additional economic benefits to the Alaska economy generated by resident and nonresident direct spending on sportfishing activities in Alaska. For the purposes of this study, separate regional models were created to estimate the economic contributions generated at the regional levels and for the statewide Alaska economy. In its base form, the model includes 509 economic sectors, or industries.

Input-output models are driven by some change in economic activity, usually sales. The model produces estimates of the total multiplier effects (indirect and induced) that arise from the spending by sport anglers (the direct effect). Several measures of the economic effects are available, with the most commonly used being output, employment and income. The **direct effect** refers to the initial stimulus to the economy. In this study, it refers specifically to the dollars spent by sport anglers for trip-related purchases, fishing equipment, and other spending that is immediately attributable to their fishing activity. In the strictest sense, the direct effect does not always equate with angler spending due to economic leakages. Because much of the equipment purchased by anglers is manufactured outside of the state, some of the dollars spent by anglers in Alaska leak immediately beyond the state's borders and do not have a direct effect on the Alaska economy. In that case, angler spending may not equal direct effect in the language of input-output models (the amount of goods and services imported directly to meet the demands of angler spending is shown in Append L). In other cases, the amount of angler spending is the direct effect. For example, spending for lodging and restaurant meals represents purchases of goods and services that are produced entirely where they are bought and the entire purchase is captured in the direct effect on the regional economy. The economic figures reported in the results section include both total angler spending and its associated direct effects on the Alaska economy.

Indirect effect refers to the economic activity (e.g., output, employment, income) that result from the activity in other businesses that supply the industries stimulated by the direct effect. Those indirectly affected industries, in turn, stimulate additional activity among their local suppliers, and so on. For example, if an angler spent \$100 to purchase the services of a guide, the guide uses a portion of the \$100 paid by the angler to purchase boat fuel, equipment, bait, utilities, etc. from local sources. In addition, a portion of the \$100 pays for goods and services from out-of-state providers. In the next round, the in-state business that supplies bait to the guide (as well as all of the other in-state businesses that supply goods and services to the guide), in turn, must use part of the money that it receives from the guide to pay its own business expenses (e.g., fuel, gear, utilities). Their suppliers, in turn, also pay in-state and out-of-state suppliers to support their increased business activity. This indirect activity continues in this way until the effect becomes negligible as a portion of each round of payments for goods and services eventually leaks out of the local economy.

The **induced effect** measures the economic activity that results from the household spending of salaries and wages that were generated from the business activity associated with the direct and indirect effects.

The interpretation of the results of the economic models depends on the changes that drive the model. The term "economic impact" is normally reserved to describe some level of economic activity that would not occur except for the initial economic activity. In the case of recreational activities like sportfishing, it is generally agreed that economic impact comes from spending by visitors to the region. If not for their presence, their spending would never occur. If quality sportfishing was no longer available in Alaska for example, nonresident anglers may choose to fish elsewhere and their spending would not occur in Alaska and thus not generate additional economic effects in the Alaska economy. Most resident anglers, on the other hand, choose fishing as an activity on which to spend their recreational dollars locally. If quality sportfishing was no longer available some residents would likely choose some other local recreational activity on which to spend their money in place of fishing and their spending would still remain in the Alaska economy.

It is generally acknowledged that retained economic activity can also represent a real economic impact. For example, the quality of fishing opportunities in Alaska is such that some anglers choose to fish in Alaska rather than go elsewhere. If the quality of Alaska fishing were to decline, then some dedicated resident anglers may choose to travel outside of the state for sportfishing and their dollars would be lost to the Alaska economy. It is unclear what portion of resident anglers would fall into that category. In another retention scenario, it may be the case in Alaska that there are few recreational alternatives to fishing, so that if the quality of fishing as a recreational activity declined, some portion of anglers may choose to travel outside of the state to pursue an alternative recreational activity (e.g., a Caribbean vacation). It was beyond the scope of this study to investigate either of those scenarios and for purposes of this project any reference to economic impact should be based on the expenditures of nonresident anglers.

The focus of this study was on the total economic activity associated with sportfishing as a measure of its overall contribution to the state's economy. In that case, it was appropriate to include all spending for sportfishing, including both resident and nonresident anglers. That measure is alternately called "economic contribution" or "economic significance", among others. This study was concerned with measuring the economic significance of sportfishing and therefore includes resident spending as part of the direct effect. To help understand the relative contributions that residents and nonresidents make to the economy, results in this report were broken out separately by residency.