Chapter Five: Results

The survey described in the previous chapter was partially designed as an ex-post analysis to estimate the economic benefit of the post-Edwards Dam Kennebec River fishery. In addition to this estimate, the survey has also yielded significant information regarding general angler activity in Maine, angler perceptions of the post-dam fishery, and fishing activity in the lower Kennebec River from the Milstar Dam in Waterville to Chops Point on Merrymeeting Bay.

Included in the previous chapter were descriptive statistics from a selection of questions which appeared on the survey. Descriptive statistics for responses to all of the survey questions can be found in Appendix B. This chapter presents a brief discussion of post-dam removal perceptions and some quantitative comparisons between the results of the study done by Boyle et al. (1991) and the present study. Some econometric analyses of the data obtained from the survey, a review of some respondent comments, and a discussion of some issues of concern are also presented.

Respondent Perceptions

The four perception questions included in the present survey were aimed at general feelings toward the post-Edwards Dam river and fishery. Respondents were asked to report their perceptions on whether or not removal was beneficial, how water quality has changed, how the amount of wildlife surrounding the river has changed, and finally how the numbers and types of fish in the river have changed. Response statistics for these questions are shown in Tables 4-3 through 4-6 in the previous chapter and also in Appendix B.

In regards to perceptions of whether or not removal of the Edwards Dam was beneficial, 83.30% of respondents responded that they did indeed think removal was beneficial. In total, 59.86% of respondents felt that water quality has improved since removal, with only 10.29% indicating they felt it has remained the same or worsened. 48.71% of respondents felt that the amount of wildlife surrounding the river had increased, while 13.72% indicated they felt the amount wildlife has remained the same or decreased. Finally, 66.55% of all respondents reported that they felt the numbers and types of fish in the river have increased; only 8.58% of respondents felt these numbers had decreased or remain the same.

Quantitative Comparisons

It should be noted here that the survey samples used in this study and those used in the study conducted by Boyle et al. in 1991 are different. Whereas the present survey was sent to a sample of Trout Unlimited (TU) and Maine Coastal Conservation Association (CCA) members, the survey by Boyle et al. was sent to a sample of Maine inland fishery license holders, separated into three groups: resident anglers living in communities adjacent to the lower Kennebec River; resident anglers from all other communities in the state; and nonresident anglers (Boyle et al., 1991). Indeed TU and CCA members fall into these three categories, but which particular group they lie in was not determined. Thus the comparisons made hereafter are between all respondents of each survey, not by each study's survey samples. Statistics of all respondents of Boyle et al.'s study were found by taking a weighted average of the three survey samples, when appropriate. The tables used for comparison in this chapter use the labels BOYLE et AL. to represent data from the study by

Boyle et al. (pre-Edwards Dam removal), and 2006 STUDY to represent data from the current study (post-Edwards Dam removal).

As mentioned above, the survey by Boyle et al. was sent to adjacent, non-adjacent and nonresident anglers. 270 surveys were sent to each sample for a total of 810 surveys. The present survey was sent to 1080 TU members and 450 CCA members, for a total of 1530 surveys sent. The total final response rate for Boyle et al.'s survey was 66.33%, and the total response rate for this survey was 39.59%. These comparisons are shown in Table 5-1. The difference in response rates may be attributed to the fact that respondents of Boyle et al.'s study were sent a letter asking them to look for the survey in the mail prior to receiving it, a reminder to return the survey after they had received it, a second copy of the survey if they had not returned it, and also a third copy was sent to those who had not responded within two weeks. Limited funds and time available for this study did not allow for these additional mailings to be made.

	BOYLE et AL.	2006 STUDY
Total Surveys Sent	810	1530
Total Response Rate	66.33%	39.59%

Table 5-1: Total Surveys Sent and Response Rates

Both the present survey and the survey by Boyle et al. included a final section aimed at the demographic characteristics of the respondents. In both surveys, it was stressed that all answers were optional and were kept strictly confidential. These demographic characteristics are used later in this analysis as explanatory variables in regression analyses. A comparison of these demographic characteristics is shown in Table 5-2; dollar amounts are in 2005 U.S. Dollars (Dollar amounts adjusted for inflation using CPI data from the Bureau of Labor Statistics).

	BOYLE et AL.	2006 STUDY

Average Age	43	55
Sex (Percent Male)	81.48%	97.44%
Average Years of Education	14	16
Average Income	$49,500	$100,000 or more

Table 5-2: Demographic Characteristics

It is clear that the present study consisted of significantly more and older male respondents. The present respondents also had a slightly higher average completed amount of education and a dramatically higher 2005 income. This large difference in average income could have resulted in some sample bias; i.e. higher reported willingness-to-pay. The effect of respondent income on willingness-to-pay is investigated in the Econometric Analysis section of this chapter. The question may arise regarding whether or not the respondents of the present survey are a representative population of Maine fishing license holders. Simply judging from the statistics above, one might conclude that this is not the case. This issue of potential bias in the present study's survey sample will be discussed in more length in the Issues of Concern section of this chapter.

Other indicators of potential differences between the two survey samples could be the samples' fishing experience and types of water most often fished in Maine. As noted earlier, the study by Boyle et al. did not distinguish between the respondent's first year fishing fresh and saltwater, as the present survey did. Comparisons of total respondents' first year fishing in Maine show that the present study's respondents began fishing freshwater slightly later than Boyle et al.'s respondents, and on average, began saltwater fishing almost a decade after respondents from the Boyle et al. study. In regards to respondents' type of water most often fished in Maine, the present sample fished more often in

Rivers and Coastal of Ocean Waters than did the sample of Boyle et al. Table 5-3 summarizes these results:

	BOYLE et AL.	2006 STUDY
Year First Fished in Maine	1969	N/A
Year First Fished Freshwater in Maine	N/A	1970
Year First Fished Saltwater in Maine	N/A	1975
Type of Water Most Often Fished:	1. Lakes or Ponds	1. Lakes or Ponds
	2. Streams or Brooks	2. Rivers
	3. Rivers	3. Coastal or Ocean Waters
	4. Coastal or Marine	4. Streams or Brooks

Table 5-3: Fishing Experience in Maine

One difference can be noted based on the comparisons above: the survey sample of Boyle et al. included only Maine inland fishery license holders. Anglers who fish only in coastal or ocean waters (saltwater) are not required to purchase a fishing license; therefore, the survey sample of Boyle et al. did not include any anglers who fish strictly in saltwater. An individual's membership to the Coastal Conservation Association is not an indicator that they fish only in saltwater, but it does signify their interest in fishing in saltwater areas. Inclusion of these anglers in the survey sample was most likely the reason for the difference in coastal or ocean water fishing activity.

Another useful comparison measure of the two survey samples is between the fish species most sought after by each sample. The survey by Boyle et al. asked respondents to report which fish species they targeted while

fishing both the freshwater (Milstar Dam to transmission line crossing) and tidal water (transmission line crossing to Chops Point) sections of the Kennebec River. For each section of the river, a list of fish species was presented to the respondent. The present study did not distinguish between fish species targeted in the freshwater and tidal water sections, but rather general fish species targeted in Maine. By constraining the sample to respondents who reported having fished the fresh and tidal water section of the river, and investigating their targeted fishing activity for the species listed in the study by Boyle et al. for each section, comparable data is obtained. Table 5-4 presents the five most heavily sought after fish species from both survey samples in the two river sections.

In the freshwater section of the Kennebec, I find very similar targeted fishing. For the tidal water section, I would emphasize that Atlantic salmon are currently an endangered species of the Kennebec River, thus making it illegal to target them while fishing. The addition of small and largemouth bass to this list may be because of increased habitat for these species created from dam removal.

	BOYLE et AL.	2006 STUDY
Most Sought After Fish Species in Maine	N/A	1. Brook Trout
		2. Landlocked Salmon
		3. Striped Bass
		4. Brown Trout
		5. Smallmouth Bass
Fish Species Most Sought After by Anglers Fishing Between Milstar Dam and Transmission Line Crossing	1. Brown Trout	1. Brook Trout
	2. Largemouth Bass	2. Landlocked Salmon
	3. Smallmouth Bass	3. Brown Trout
	4. Brook Trout	4. Smallmouth Bass

	5. Chain Pickerel	5. Largemouth Bass
Fish Species Most Sought After by Anglers Fishing Between Transmission Line Crossing and Chops Point	1. Striped Bass	1. Striped Bass
	2. Rainbow Smelt	2. Bluefish
	3. Bluefish	3. Brown Trout
	4. Atlantic Salmon	4. Smallmouth Bass
	5. Brown Trout	5. Largemouth Bass

Table 5-4: Targeted Fish Species

These two comparisons must be taken with a grain of salt in that the five most targeted fish species in the fresh and tidal water sections reported above were not obtained in the same manner as those from the study by Boyle et al. Rather, the reported fish species for the present study is a ranking of targeted fish species in Maine, limited to the sample of species listed on the study by Boyle et al.

Comparisons can also be made between the lower Kennebec River fishing experience and activity of both survey samples. The stretch of the Kennebec River between the Milstar Dam in Waterville and Chops Point on Merrymeeting bay is defined as the lower Kennebec River. Table 5-5 presents these comparisons. From these data, it appears that more respondents of the present study have fished the lower Kennebec River in general. However, while more respondents from the present survey sample have fished the lower Kennebec River, it seems that the survey sample of Boyle et al.'s study began fishing this stretch earlier.

	BOYLE et AL.	2006 STUDY
Anglers who Have Fished the Lower Kennebec River (Milstar Dam to Chops Point)	19.36%	51.85%
First Time Fished the Lower Kennebec River	1973	1978
Anglers who Fish *Only* from Milstar Dam to Transmission Line Crossing (Former Edwards Dam Site)	6.87%*	9.93%
First Time Fished from Milstar Dam to Transmission Line Crossing	N/A	1998

Average Fishing Days Per Year on this Stretch	9.4*	6.19
Anglers who Fish *Only* from Transmission Line Crossing to Chops Point	20.62%*	22.05%
First Time Fished from Transmission Line Crossing to Chops Point	N/A	1992
Average Fishing Days Per Year on this Stretch	7.5*	5.37
Anglers Fishing Both from Milstar Dam to Transmission Line Crossing and Transmission Line Crossing to Chops Point	8.68%*	19.86%
First Time Fished either from Milstar Dam to Transmission Line Crossing or Transmission Line Crossing to Chops Point	N/A	1987

*Data was available only for adjacent anglers

Table 5-5: Lower Kennebec River Fishing Experience and Activity

In regards to the section of the Kennebec between the Milstar Dam and the transmission line crossing in Augusta, respondents from the Boyle et al. study fished more often. This is also the case for the stretch of river between the transmission line crossing and Chops Point. It should be noted though that these frequency statistics were not available for the nonadjacent or nonresident anglers of Boyle et al.'s survey sample.

One might be quick to conclude from these data that fishing frequency has decreased since removal of Edwards Dam. I do not dismiss that conclusion here, but I rather emphasize the difference in samples and sample sizes. Only adjacent angler responses were used in the calculation of statistics corresponding to average fishing days per year in both the stretch of river from Milstar Dam to the transmission line crossing (the stretch called 'freshwater' in the present survey), and the stretch from the transmission line crossing to Chops Point (the section called 'tidal water' here). This results in a sample size of 98 observations. The sample size from the current study is 308. A much more accurate measure of average trips per year can be obtained with a larger sample size. Also, each of these 98 observations came from adjacent anglers.

These anglers have very short travel times to the river, so are much more likely to visit the river more frequently than nonadjacent anglers, or nonresident anglers. The statistics from the present study include data from all respondents, not just adjacent anglers.

Some very important comparisons remain: the average direct economic impact per angler per trip; the annual direct economic impact per angler; and finally, the total annual economic impact. Each value is determined for both the freshwater and tidal water section of the Kennebec River. By following the methodology presented in the study by Boyle et al., I have tried to create the most accurate estimates for comparison.

To find the average direct economic impact per angler, Boyle et al. found the sum of the per-person expenditures reported on their travel cost question. I have done the same here. The annual direct economic impact per angler was found by multiplying the average per-person direct economic impact by the average number of trips taken to each stretch of the Kennebec per year. Finally, because Boyle et al. used data only from adjacent anglers for these estimates, the estimate for the total annual economic impact was determined by multiplying the annual direct economic impact per angler by an estimate of the total number of adjacent anglers in Maine fishing each section of the river. Boyle et al. found these estimates to be 1539 and 2898 anglers fishing the fresh and tidal water sections, respectively. In one calculation of my estimate for the total annual economic impact, I have used these estimates for the numbers of anglers fishing each section (1). In the other (2), I have used a ten-year average of total Maine fishing licenses sold, multiplied by the percentages of respondents who have fished each section. For comparison, I conducted this

calculation using the total annual economic impact estimate from Boyle et al. as well. Maine fishing license statistics were for years 1993 – 2004, and were provided by the Maine Department of Inland Fisheries and Wildlife. The ten-year average of Maine fishing licenses sold was 270,222. Table 5-6 details the results from these calculations; all amounts are in 2005 U.S. Dollars (Dollar amounts adjusted for inflation using CPI data from the Bureau of Labor Statistics).

	BOYLE et AL.		2006 STUDY	
	Freshwater Section	Tidal Water Section	Freshwater Section	Tidal Water Section
Average Economic Impact Per Trip	$12.13	$21.73	$52.47	$56.80
Annual Economic Impact Per Angler	$103.69	$136.59	$332.66	$371.47
Total Annual Economic Impact (1)	$159,595.00	$395,787.00	$511,963.43	$1,076,525.86
Total Annual Economic Impact (2)	$2,782,323.54	$8,138,586.93	$8,926,291.77	$22,133,810.40

Table 5-6: Economic Impacts

A significant increase in total annual economic impacts is found, which stems directly from the difference in average economic impact per trip. Looking at the breakdown of expenses in this economic impact per trip, respondents to the present survey reported higher costs in every category, but especially for transportation, food and beverage, lodging, guide fees and boat fuel. When aggregated to the estimated number of freshwater anglers used by Boyle et al., I find the total annual economic benefits to be $511,963.43; more than triple the amount estimated by Boyle et al. in 1991. Similar results follow for the tidal water section of the Kennebec: I estimate the total annual economic impact to be $1,076,525; a 2.7 times increase from the estimate of Boyle et al. Using the ten-year average of Maine fishing licenses sold, I estimate the total annual economic impact accruing from recreational use between Milstar Dam in

Waterville and the transmission line crossing in Augusta to be $2,782,323.54; I estimate the total annual economic impact of the tidal water stretch, from the transmission line crossing to Chops Point on Merrymeeting Bay, to be $8,138,586.93.

The comparisons above strongly suggest that the total annual economic benefits currently accruing from the post-Edwards Dam fishery is substantially greater than the estimate made by Boyle et al. (1991). It must be noted again that the data from the survey by Boyle et al. used for these comparisons was based only on adjacent anglers. Of the three survey samples, these adjacent anglers would most likely have the least total travel costs, as they live in the communities closest to the fishery. It would be logical to assume that nonadjacent and nonresident anglers would have higher travel costs, and thus a greater direct economic impact.

Econometric Analysis

Econometric analysis, by way of equation estimation (or, regression analysis), provides insight into how a dependent variable is affected by other explanatory variables, such as demographic characteristics. Regression analyses estimate functions which attempt to explain the dependent variable in question. A constant (y-intercept) and coefficients of the explanatory variables are estimated, and thus, the weight each has in respect to the dependent variable. For example, a respondent's willingness-to-pay for a day of fishing might depend on the fish species they prefer to target, their previous fishing

activity and other demographic characteristics, such as income, education or age.

Using the data collected from the present Kennebec River Survey, regression analysis was used in an attempt to explain what factors affect respondents' fresh and tidal water fishing per year, and also respondents' willingness-to-pay for one-day fishing trips targeting brown trout, smallmouth bass, striped bass and finally, Atlantic salmon.

Following a similar travel-cost model presented by Young (2005) and Layman et al. (1996), average number of freshwater and tidal water fishing trips per year were estimated. Regression analysis was used to explain fishing days per year as a function of travel costs, how recently the respondent had fished the respective section of the river, respondent income, years of education and age. Gender was not included in this set of demographic characteristics because 97.44% of all respondents were male. Inclusion of this variable could possibly lead to severely skewed coefficient estimates. The results from the regression of freshwater fishing days per year are shown in Figure 5-1.

The results from this regression suggest several things: First, it seems that total travel costs (FRSH_TTL) have no effect on fishing days per year. The coefficient for total travel costs is not found to be significant at the 5% significance level, as shown by the probability of t-statistic of 0.5947; that is to say, the coefficient of total travel costs is not statistically different from zero (total travel costs are not shown to have an effect on fishing days per year).

Dependent Variable: FRSH_DPY		
Method: Least Squares		
Sample (adjusted): 7 594		
Included observations: 163 after adjustments		

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	17.95749	7.024750	2.556317	0.0115
FRSH_TTL	-0.005505	0.010699	-0.514520	0.6076
2006-FRSH_LST_FSH	-0.651388	0.290443	-2.242738	0.0263
INCM	-0.000128	3.74E-05	-3.425515	0.0008
EDUC	-0.366705	0.382539	-0.958610	0.3392
AGE	0.110782	0.084176	1.316075	0.1901
R-squared	0.162179	Mean dependent var		6.401840
Adjusted R-squared	0.135497	S.D. dependent var		11.50669

Figure 5-1: Estimated Freshwater Fishing Days Per Year

The insignificance of the effect of total travel costs on fishing days per year sheds light into actual angler behavior though. Fundamental economic theory suggests that increasing costs to use a good (in this case, to reach a fishing destination) should result in less use of the good (fewer fishing trips). This is not the case here, however. The insignificance of total travel costs reflects the inelastic demand for fishing on the freshwater parts of the Kennebec River; that is, respondents' fishing days per year were not affected by increasing travel costs to the river. This inelastic demand for fishing on the freshwater section of the river suggests that respondents have a very high value for fishing the river in general.

The second explanatory variable used in the regression was a measure of how recently, in years, the respondent had fished the freshwater section of the river (2006-FRSH_LST_FSH). This variable was found by subtracting the last year the respondent had fished the freshwater section from the current year. The negative sign on the coefficient for this variable signifies that respondents who have fished the river more recently visit it more often. The p-value of 0.0237 indicates statistical significance at the 5% significance level.

Another interesting result from this regression can be seen in the effect of respondent income to fishing days per year. I find a statistically significant, negative correlation between income and fishing days per year; that is, respondents with higher incomes reported lower fishing days per year. This could be partially explained by the high percentage (40.22%) of respondents with an annual income of $100,000 or more.

The average number of tidal water fishing trips per year was estimated using the same model as above. Figure 5-2 presents the regression statistics.

Dependent Variable: SLT_DPY				
Method: Least Squares				
Sample (adjusted): 1 600				
Included observations: 219 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	18.49475	6.407601	2.886377	0.0043
SLT_TTL	-0.003665	0.010677	-0.343255	0.7317
2006-SLT_LST_FSH	-0.934355	0.331873	-2.815402	0.0053
INCM	-2.10E-05	3.45E-05	-0.607534	0.5441
EDUC	-0.505342	0.374054	-1.350986	0.1781
AGE	0.003110	0.074027	0.042019	0.9665
R-squared	0.054379	Mean dependent var		6.383562
Adjusted R-squared	0.032181	S.D. dependent var		12.85804

Figure 5-2: Estimated Tidal Water Fishing Days Per Year

Again, it is seen that total travel costs have an insignificant effect on fishing trips per year, indicating that those anglers who fish the stretch consider fishing if of high importance. Also of note is the explanatory variable which represents the number of years that have passed since the respondent has fished the tidal water section of the Kennebec River (2006-SLT_LST_FSH). The statistically significant, negative coefficient of this explanatory variable represents decreased fishing days per year as the amount of years since fishing

the tidal water stretch increase. In other words, the more recently the respondent has fished the tidal water section, the more annual trips they take. This final statement suggests that those anglers who have fished the tidal section of the river recently have found it to be an enjoyable and beneficial fishery; one they like returning to.

The four contingent valuation questions contained in the present Kennebec River Survey asked respondents to report their willingness-to-pay for an all-day guided fishing trip. In the freshwater section of the survey, respondents were asked to value two trips: one targeting brown trout, and another targeting smallmouth bass. In the tidal water section, respondents were asked to value trips targeting striped bass and also Atlantic salmon. Because Atlantic salmon are currently an endangered species in the Kennebec River, the question for the Atlantic salmon trip was described as a hypothetical situation.

Regression analysis was used in an attempt to explain these four willingness-to-pay variables. The basic equation estimated willingness-to-pay as a function of the number of years the respondent had fished the section of river, whether or not they targeted certain fish species, whether or not they felt fish numbers had increased since removal, and other demographic characteristics.

Average willingness-to-pay for the brown trout fishing trip was found to be significantly affected by four explanatory variables: whether the respondent targets brown trout, their income, years of education and also age. The regression statistics for this equation are shown in Figure 5-3.

Those respondents who indicated they have targeted brown trout (BN_TRT) also reported higher willingness-to-pay for the brown trout fishing trip. This result is not too surprising, but the fact that the coefficient of this variable was significant and positive is comforting. Also included in this regression was a variable revealing whether or not the respondent had targeted smallmouth bass while fishing in Maine (SM_BASS). It was my initial thought that the coefficient on this variable would be negative; that is, respondents who targeted smallmouth bass but not brown trout would report lower willingness-to-pay for the brown trout fishing trip. The coefficient was indeed found to be negative, but was not significant.

Dependent Variable: FRSH_BN_TRT				
Method: Least Squares				
Sample (adjusted): 3 601				
Included observations: 480 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	106.0015	47.78549	2.218278	0.0270
YRS_FRSH	-0.576337	0.373825	-1.541730	0.1238
BN_TRT	34.74218	13.58559	2.557281	0.0109
SM_BASS	-4.011851	12.23826	-0.327812	0.7432
FSH_NMBS_BINARY	13.76803	20.60235	0.668275	0.5043
INCM	0.000677	0.000230	2.940973	0.0034
EDUC	5.517734	2.519057	2.190397	0.0290
AGE	-1.470919	0.537031	-2.738983	0.0064
R-squared	0.089991	Mean dependent var		185.6719
Adjusted R-squared	0.076495	S.D. dependent var		126.5805

Figure 5-3: Brown Trout Willingness to Pay

Another variable included in this regression was a binary variable indicating whether or not the respondent felt that fish types and numbers had increased since removal (FSH_NMBS_BINARY). This variable was created using the responses to the corresponding perception question on the survey. I

thought that those respondents who indicated they felt fish numbers had increased would report higher willingness to pay. The estimated coefficient of this variable was indeed positive, but was not significant.

In regards to the demographic characteristics income (INCM), years of education (EDUC) and age (AGE), each estimated coefficient was found to be significant. Income was found to be positively correlated with willingness-to-pay; respondents with higher incomes reported higher willingness-to-pay values. The same was true for years of education. The respondent's age, however, was negatively correlated to willingness-to-pay.

The same equation used to model the brown trout fishing trip was used to estimate the smallmouth bass fishing trip willingness-to-pay. Figure 5-4 displays these results.

I thought that respondents who targeted smallmouth bass but not brown trout would report willingness-to-pay in a similar manner that those respondents who target brown trout and not smallmouth reported willingness-to-pay for the brown trout fishing trip. This was indeed the case. The regression reported a significant, negative coefficient for the brown trout variable, and a significant, positive coefficient for the smallmouth bass variable.

Dependent Variable: FRSH_SM_BASS				
Method: Least Squares				
Sample (adjusted): 3 601				
Included observations: 479 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	107.6834	46.26320	2.327626	0.0204

YRS_FRSH	-0.418326	0.365653	-1.144051	0.2532
BN_TRT	-31.07712	13.18524	-2.356962	0.0188
SM_BASS	62.59317	11.88144	5.268149	0.0000
FSH_NMBS_BINARY	-35.33383	19.80339	-1.784231	0.0750
INCM	0.000479	0.000224	2.140431	0.0328
EDUC	2.288548	2.448779	0.934567	0.3505
AGE	-0.742861	0.523510	-1.419001	0.1566
R-squared	0.096517	Mean dependent var		112.8967
Adjusted R-squared	0.083090	S.D. dependent var		123.3144

Table 5-4: Smallmouth Bass Willingness to Pay

As was the case in the brown trout regression, the coefficient of the variable indicating whether or not the respondents felt fish types and numbers had increased since removal was insignificant. This insignificance in both freshwater regressions might arise from the fact that both brown trout and smallmouth bass inhabited the Kennebec River between Milstar Dam and the transmission line crossing prior to removal of Edwards Dam. Because these fish species were present before removal, willingness-to-pay for a fishing trip targeting them might not be affected by a variable which depicts respondents' perceptions of increased types and numbers of fish. If this is indeed true, then I would expect to see a significant, positive coefficient on this variable when used in the regressions estimating striped bass and Atlantic salmon willingness-to-pay, because these fish species were not able to reach the section of river between Milstar Dam and the transmission line crossing prior to removal.

This was not the case, however. Regressions estimating willingness-to-pay for both the striped bass and Atlantic salmon fishing trips reported insignificant coefficients for the variable which represents respondent perception of increased fish numbers (FSH_NMBS_BINARY). Regression

statistics of willingness-to-pay for the striped bass and Atlantic salmon fishing days are shown in Figures 5-5 and 5-6, respectively.

Dependent Variable: SLT_ST_BASS				
Method: Least Squares				
Sample (adjusted): 1 600				
Included observations: 222 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	104.6351	77.78610	1.345164	0.1800
2006-SLT_LST_FSH	-7.036735	2.943723	-2.390421	0.0177
ST_BASS	27.77977	32.46938	0.855568	0.3932
FSH_NMBS_BINARY	-2.288820	29.71077	-0.077037	0.9387
INCM	0.000730	0.000369	1.977802	0.0492
EDUC	7.170442	3.954443	1.813262	0.0712
AGE	-1.468027	0.788232	-1.862430	0.0639
R-squared	0.091819	Mean dependent var		202.5991
Adjusted R-squared	0.066474	S.D. dependent var		140.4402

Figure 5-5: Striped Bass Willingness to Pay

Dependent Variable: SLT_AT_SLMN				
Method: Least Squares				
Sample (adjusted): 1 600				
Included observations: 224 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.

C	171.1221	82.81726	2.066261	0.0400
2006-SLT_LST_FSH	-7.609593	3.310344	-2.298732	0.0225
FSH_NMBS_BINARY	-7.571905	33.22245	-0.227915	0.8199
INCM	0.000933	0.000410	2.274043	0.0239
EDUC	8.116796	4.452182	1.823105	0.0697
AGE	-1.846996	0.880738	-2.097100	0.0371
R-squared	0.090953	Mean dependent var		248.4643
Adjusted R-squared	0.070103	S.D. dependent var		158.3094

Figure 5-6: Atlantic Salmon Willingness to Pay

Two explanatory variables were found to have a significant effect on both willingness-to-pay variables. The number of years that have passed since the respondent has fished the tidal water section of the river (2006-SLT_LST_FSH) had a significant, negative impact on reported willingness-to-pay. It seems that respondents who have fished the section more recently reported higher willingness-to-pay for the trips. Respondent income (INCM) also was found to have a significant, positive effect on the willingness-to-pay for both fishing trips, meaning that as respondent income increased, willingness-to-pay increased as well.

The only other variables which had a significant effect on either series was age (AGE). Respondent age had a significant, negative effect on the willingness-to-pay for the Atlantic salmon trip.

Respondent Comments

As mentioned in the previous chapter, the last page of the present survey left space for respondents to leave their name and address if they wished to receive a copy of the final report, and also to leave any comments or concerns they had. These personal comments were very intriguing to read, as many detail personal accounts of fishing on the Kennebec River, changes that occurred to the river after dam removal or simply thoughts regarding the survey

or particular questions in it. Many of these were very sincere, honest accounts of personal experiences on the river. Some of these personal accounts were positive; some were negative. Appendix C presents five such comments.

Comments detailing positive outcomes of dam removal cite immediate increases in striped bass populations, increased wildlife surrounding the river, and dramatically increased water quality. Increased striped bass populations were mentioned by several respondents, with a few also discussing smaller average size.

Testaments to decreased fishing opportunities and quality cite a shift in striped bass activity from Augusta to Waterville and decreased average size, leading to decreased revenues for local guides. Also noted was decreased general fishing activity in the Augusta area. One nonresident respondent reported that for the first time in ten years, they would not be returning to the Kennebec River this coming year because of poor fishing.

Many comments were received regarding the question of whether or not the respondent would purchase a saltwater fishing license, and if so, how much they would pay for it. One repeated comment was that the respondent would buy the license only if they had to; in other words, they might not have felt strongly for the adoption of a saltwater license, but they would have purchased it in order to continue fishing in marine, coastal or tidal water areas. A good number of respondents expressed strong opinions against the idea of a saltwater fishing license. One respondent reiterated the fact that they would pay only if they had to, but also mentioned their concern for increased saltwater fisheries management in general.

Although these comments were not used for any formal analysis in this study, they do provide interesting personal accounts related to the removal of Edwards Dam and the Kennebec River fishery.

Issues of Concern

At several points in this report, the potential for bias resulting from the survey sample used in the present study has been mentioned. The present study was sent out to a sub-sample of two mailing lists: Maine Coastal Conservation Association (CCA) members and also Maine Trout Unlimited (TU) members. CCA is a non-profit organization dedicated to the conservation, promotion and enhancement of coastal resources for the general public (www.joincca.org). TU is also a non-profit organization, whose mission is to conserve, protect and restore the trout and salmon fisheries of North America (www.tu.org). Membership to each organization requires an annual fee.

A case for potential bias in responses might arise from the argument that each respondent to the present survey is a member to one of these organizations, and therefore places a larger value on the fisheries in question than an individual who is not a member does, as evidenced by their willingness to pay for membership to the organization. Membership to either CCA or TU denotes an individual's concern for marine or coldwater fisheries, and thus their interest in these types of fisheries. It is clear then that the respondents to this survey already had interest in the types of fisheries that this study concerned: tidal water fisheries and freshwater, river fisheries. The study conducted by Boyle et al. surveyed anglers who might not necessarily have a strong interest in tidal or river fisheries, but rather simply held a Maine inland fishing license.

Along the same lines, however, membership to either CCA or TU does not classify an individual as an angler who holds an abnormally large value for the Kennebec River fishery (or any fishery, for that matter). Rather, membership denotes an interest in the conservation and enhancement of coastal or coldwater fisheries. Determining whether a correlation between CCA or TU membership and holding an extremely high value for a fishery exists is beyond the realm of this study.

Also, it should be kept in mind that the fresh and tidal water travel costs reported on this survey were from anglers who indicated that they had fished those respective sections of the Kennebec River. The same is true for the study by Boyle et al. Thus, it can be said that the responses to the travel cost questions of the present survey were given by anglers who have fished the designated stretches of the Kennebec, and not simply a group of anglers who are members of CCA or TU. I think it is reasonable to say that travel costs (transportation, public transportation, food and beverages, lodging, etc.) do not differ according to which (if any) fisheries conservation organization an individual belongs to.

Another issue of concern arising from the present survey is the potential for protest zeros as responses to the willingness-to-pay questions of the survey. Discussed briefly before, a 'protest zero' is a response of zero to a question for the simple reason that the respondent rejected some portion of the survey, even though they may still hold a value for the question (Boyle, 1991). For example, it may have been the case that some respondents simply did not like the wording or format of the survey and in following simply reported willingness-to-

pay values of zero for the fresh and tidal water fishing trips. These zeros would then be protest zeros.

The present study did not include any concrete measures by which to judge if zero responses were indeed protest zeros or not. It may be possible to distinguish some zeros as protest zeros by reading the comments written on the survey, if any.

Tables 4-8, 4-10 and Appendix B present the mean willingness-to-pay for each of the four proposed one-day fishing trips. These means are calculated three ways: with all zero responses included, half of the zero responses included, and finally none of the zero responses included. By performing these three different calculations, upper and lower bounds to mean willingness-to-pay are found.