

Report as of FY2005 for 2005ME56B: "Valuing Environmental Changes for Decision Making: Dam Removal and Restoration on the Penobscot and Kennebec Rivers"

Publications

- Articles in Refereed Scientific Journals:
 - Lewis, L., Bohlen, C., Wilson, S. (submitted 2006) "Dams, Dam Removal and River Restoration: A Hedonic Property Value Analysis." *Journal of Contemporary Economic Policy*.
- Other Publications:
 - Robbins, J., Lewis, L. (2006) "Demolish it and they will come: Economic Benefits of Restoring a Recreational Fishery." Executive Summary report to the George J. Mitchell Center for Environmental and Watershed Research. June 2006.

Report Follows

**Demolish it and They Will Come:
Economic Benefits of Restoring a Recreational Fishery**

Executive Summary

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Submitted as part of a draft progress report to the George J. Mitchell Center for
Environmental and Watershed Research

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full paper in prep. for submission to *J.Env. Management*

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Project Summary:

In the fall of 1999, the Edwards Dam was removed from the Kennebec River in Augusta, Maine. When the dam was built in 1837, it consequently blocked off seventeen miles of river spawning habitat to the anadromous fish species which inhabit the river. These species include alewives, American shad, blueback herring, Atlantic sturgeon, shortnose sturgeon, rainbow smelt, Atlantic salmon, striped bass and American eel.

In June of 2006, 4 Atlantic salmon entered the brand new fish lift at the Lockwood Dam (approximately 22 miles above the former Edwards Dam site). This marked the first time in 162 years that Atlantic salmon swam in the upper Kennebec (Maine Department of Marine Resources). This was called a “landmark event” for the river. While the Federal Energy and Regulatory Commission (FERC) calls for economic analysis prior to renewing a hydropower license (or allowing a license to be given up) and dam removal experts call for post-dam analysis, rarely is the economic analysis continued beyond approval of the removal. In other words, the important *ex-post* economic analysis is rarely performed. This paper presents the results of an *ex-post* analysis of the recreational fishery on the lower Kennebec River. The results are compared to the estimates presented to FERC prior to removal (Boyle et al 1991, and Freeman 1996).

In a report submitted to the Federal Energy and Regulatory Commission (FERC), prior to the decision to remove Edwards Dam, Freeman (1996)¹ reviewed and critiqued FERC’s benefit-cost analysis for the Edwards Dam project. In this report, Freeman emphasized why non-power values must be included in benefit-cost analysis. FERC did not include any non-power values in its study. (Typically these values are excluded from FERC analyses due to the difficulty of estimation.) As Freeman states, “this is a fatal methodological flaw”(Freeman 1996, p.5). By ignoring and excluding these non-power values in its benefit-cost methodology, FERC made it impossible for the dam removal alternative to ever show a net economic benefit to society. Freeman (1995) estimated the present value of benefits to recreational anglers alone would be at least \$36.2 - \$48.2 million. This estimate was based on a study by Boyle (1991).² This, of course, is a lower bound as it does not include other potential economic benefits. For example, whitewater boating benefits were expected to increase with removal. Additionally, there are other nonmarket benefits and costs, such as habitat enhancements and overall water quality improvements that were not estimated. Evidence to date, suggests that these numbers were, in fact, underestimates.

¹ Freeman, A. Myrick. “The Economic Benefits of Removing Edwards Dam.” Unpublished paper, Bowdoin College, May 1995 and Freeman, A. Myrick. “Review and Critique of FERC’s Benefit-Cost Analysis for the Edwards Dam Project.” Report to the Federal Energy Regulatory Committee, Bowdoin College, March, 1996.

² Boyle, Kevin J., Mario F. Teisel, John R. Moring, and Stephen D. Reiling. “Economic Benefits Accruing to Sport Fisheries on the Lower Kennebec River from the Provision of Fish Passage at Edwards Dam or from the Removal of Edwards Dam.” Report prepared for the Maine Department of Marine Resources. 1991.

Since removal of Edwards Dam, little data collection or monitoring has been done regarding the actual economic benefits the post-dam fishery provides. The present study is an economic valuation of the post-Edwards Dam Kennebec River fishery. In essence, it is an *ex-post* analysis of the Kennebec River fishery, which can be used not only as an indication of the economic benefits of the fishery itself, but also can be used in comparison to the predictions of recreational benefits made prior to removal. We explore whether the removal of Edwards Dam has led to increased economic recreational fisheries benefits.

During the fall of 2005, we designed and tested an economic valuation survey. This survey included questions concerning actual expenditures on trips to the Kennebec River, willingness-to-pay questions for an eight-hour day on the river, and also questions regarding respondents' perceptions of the post-Edwards Dam river and general fishing activity in Maine.

The mail survey, entitled *Kennebec River Survey* was sent to a total of 1,530 anglers in January 2006. We were given one-time access to the mailing lists of the Maine Coastal Conservation Association (CCA) and Maine Trout Unlimited (TU). 450 surveys were sent to CCA members, and 1,080 were sent to TU members. 45.76% of CCA members returned the survey, as did 37.01% of TU members, resulting in a total response rate of 39.59%.

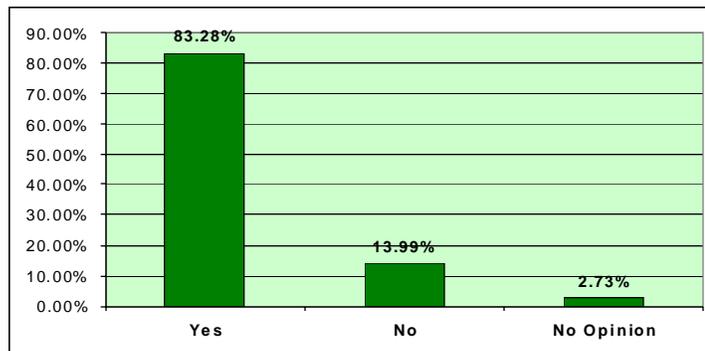
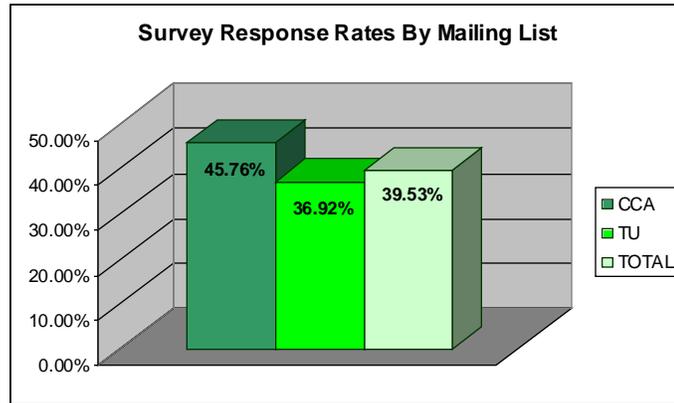
The first section of the survey contained questions investigating general angler perceptions of the post-Edwards Dam Kennebec River. These questions asked respondents whether or not they thought removal of the dam was a beneficial project; how they felt water quality has changed since removal; how they felt the amount of wildlife has changed since removal; and finally, how they felt the numbers and types of fish have changed since removal.

Responses to these questions suggest that most respondents held positive perceptions of the dam removal decision. 83.30% of respondents responded that they did indeed think removal was beneficial; 59.86% of respondents felt that water quality has improved since removal; 48.71% of respondents felt that the amount of wildlife surrounding the river had increased; and 66.55% of all respondents reported that they felt the numbers and types of fish in the river have increased since removal of Edwards Dam.

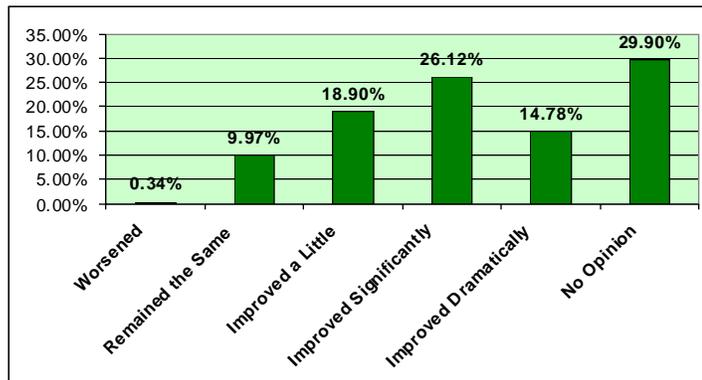
The estimate of total travel costs to the freshwater section (Milstar Dam in Waterville to the transmission line crossing in Augusta) of the lower Kennebec River was \$332.66. For the tidal water section (transmission line crossing to Chops Point) of the river, total travel costs were estimated by the present study to be \$371.47. Total annual economic impacts from the freshwater section were estimated to be \$511,963.00. Total annual economic impacts accruing from the tidal water section were estimated at \$1,076,526.00.

The estimates made in this report suggest that the post-Edwards Dam Kennebec River fishery is indeed valuable. Quantitative comparisons of our results to previous predictions indicate that economic benefits to the lower Kennebec River recreational fishery have increased since removal of the Edwards Dam.

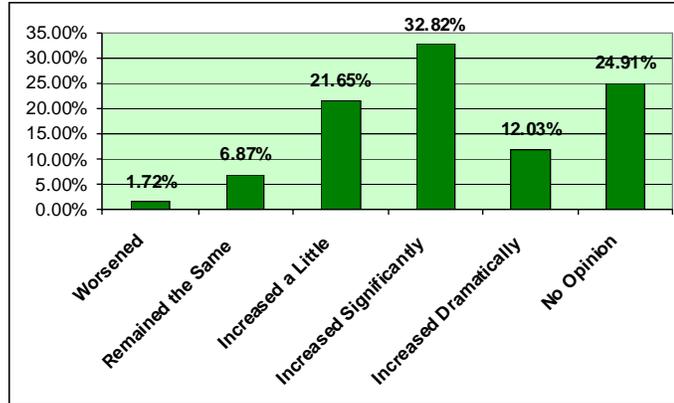
The following pages present some of the results from the study.



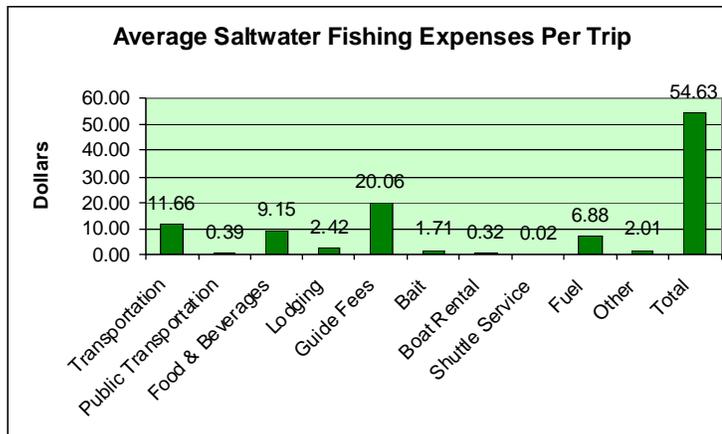
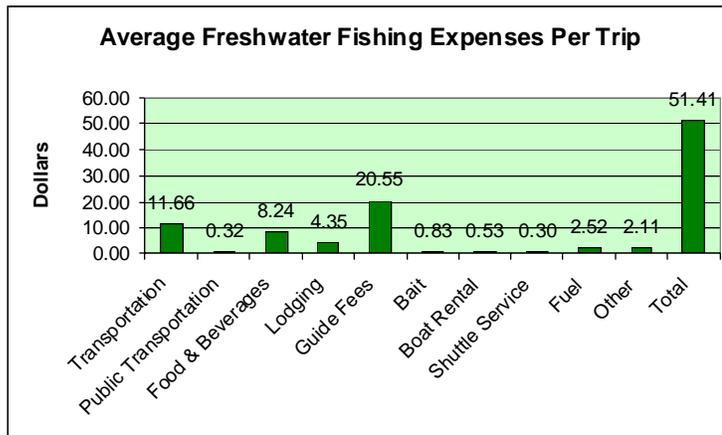
Do you think removal of Edwards Dam has been beneficial?

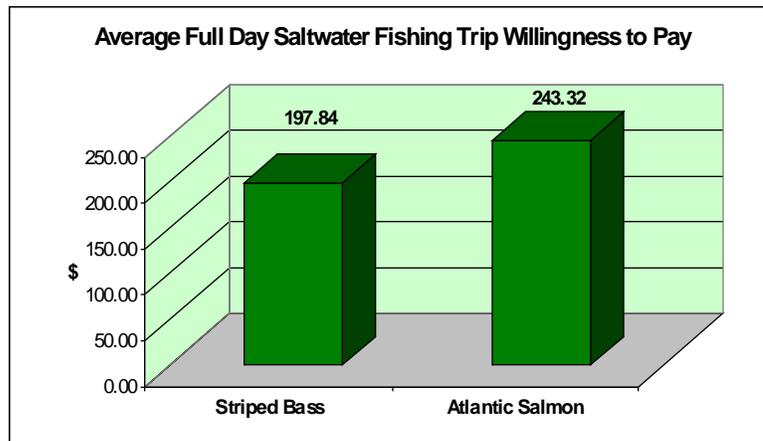
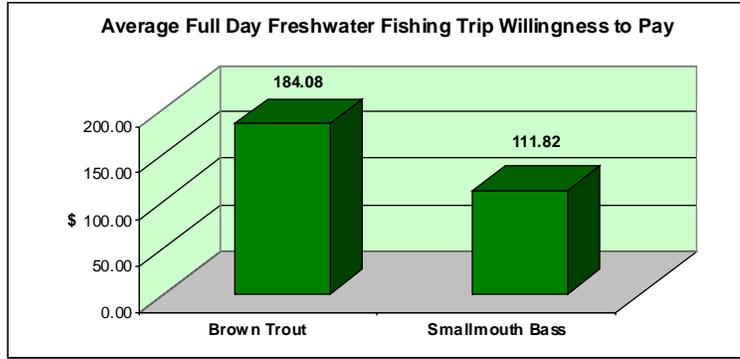


Since removal, how has water quality changed?



Since removal, how has the numbers and types of fish changed?





	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

Economic Impacts

Freshwater Average Travel Costs							
	Boyle et al.				2006 Study		
	A	NA	NR		A	NA	NR
Transportation	\$6.43	\$17.43	\$55.04		\$7.67	\$14.96	\$17.45
Public Transportation	\$0.00	\$0.00	\$0.00		\$0.00	\$0.58	\$0.00
Food and Beverage	\$4.23	\$28.50	\$104.21		\$6.75	\$9.70	\$5.00
Lodging	\$0.00	\$0.00	\$42.33		\$0.00	\$7.73	\$7.19
Guide Fees	\$0.00	\$0.00	\$48.85		\$4.87	\$33.45	\$71.14
Bait	\$2.20	\$5.86	\$12.05		\$0.67	\$1.15	\$0.00
Boat Rental					\$0.06	\$1.04	\$0.00
Shuttle Service					\$0.00	\$0.64	\$0.00
Fuel					\$2.06	\$2.81	\$3.59
Other	\$0.00	\$0.00	\$0.00		\$2.09	\$2.17	\$0.00
Total	\$12.87	\$51.79	\$262.48		\$24.37	\$76.85	\$121.72
	n = 36	n = 8	n = 4		n = 77	n = 99	n = 3

A. = adjacent anglers

N.A = non-adjacent anglers

N.R = non resident anglers

Tidal Water Average Travel Costs							
	Boyle et al.				2006 Study		
	A	NA	NR		A	NA	NR
Transportation	\$12.52	\$21.99	\$34.52		\$6.78	\$15.08	\$33.46
Public Transportation	\$0.00	\$0.00	\$0.00		\$0.05	\$0.15	\$14.10
Food and Beverage	\$7.82	\$21.34	\$130.26		\$7.18	\$10.70	\$16.54
Lodging	\$0.12	\$1.63	\$48.85		\$0.33	\$4.24	\$0.00
Guide Fees	\$0.00	\$0.00	\$0.00		\$8.67	\$25.48	\$103.77
Bait	\$3.61	\$4.72	\$5.21		\$1.93	\$1.64	\$0.00
Boat Rental					\$0.01	\$0.55	\$0.00
Shuttle Service					\$0.00	\$0.03	\$0.00
Fuel					\$8.02	\$6.27	\$10.91
Other	\$1.75	\$2.85	\$0.00		\$1.15	\$2.55	\$3.55
Total	\$25.80	\$52.52	\$349.10		\$32.08	\$69.58	\$206.60
	n = 70	n = 16	n = 2		n = 98	n = 140	n = 5