

Washington Law Review

Volume 74
Number 3 *Symposium on Salmon Recovery*

7-1-1999

The Role of Rights in Benefit Cost Methodology: The Example of Salmon and Hydroelectric Dams

Richard O. Zerbe Jr.
University of Washington School of Law

Linda J. Graham

Follow this and additional works at: <https://digitalcommons.law.uw.edu/wlr>



Part of the [Law and Economics Commons](#), and the [Natural Resources Law Commons](#)

Recommended Citation

Richard O. Zerbe Jr. & Linda J. Graham, Symposium, *The Role of Rights in Benefit Cost Methodology: The Example of Salmon and Hydroelectric Dams*, 74 Wash. L. Rev. 763 (1999).

Available at: <https://digitalcommons.law.uw.edu/wlr/vol74/iss3/7>

This Symposium is brought to you for free and open access by the Law Reviews and Journals at UW Law Digital Commons. It has been accepted for inclusion in Washington Law Review by an authorized editor of UW Law Digital Commons. For more information, please contact cnyberg@uw.edu.

THE ROLE OF RIGHTS IN BENEFIT COST METHODOLOGY: THE EXAMPLE OF SALMON AND HYDROELECTRIC DAMS*

Richard O. Zerbe Jr.[†] & Linda J. Graham[#]

Abstract: Benefit cost analysis is a well-established technique for assessing the impacts of proposed actions. Accurate benefit cost analysis is essential to making informed decisions through an understanding of the trade-offs involved in alternative actions. This Article presents a methodology for improving current benefit cost techniques and hence the usefulness of benefit cost analysis to decisionmakers. The proposed methodology is based on recognition of the roles of legal rights and psychological expectations in benefit cost analysis. Proper consideration of these rights and expectations is critical to an accurate determination of how benefits and costs are measured and whose interests are included in the analysis. Addressing these issues will provide more accurate and comprehensive information to decisionmakers. Application of the proposed methodology may significantly affect the outcome of a benefit cost analysis and hence impact the decisionmaking process.

The decision of March 1999 to order new protections for nine threatened salmon¹ populations in the Pacific Northwest, combined with those previously established, will likely result in the largest and most expensive rescue effort in the twenty-six-year history of the Endangered Species Act.² Reportedly, significant contributors to Northwest salmon mortality are the numerous hydroelectric dams on the Columbia and Snake Rivers.³ Fishery experts were concerned about the effect of dams

* The authors would like to thank Ron Conner, Eric Espenhorst, Daniel Huppert, Jacoba Johnson, William Rodgers, Mark Plummer, Jack L. Knetsch, Gary Ellis, John Loomis, The Inter-Tribal Fish Commission, Ed Woodruff, and librarians at the Walla Walla branch of the Army Corps of Engineers. We alone are responsible for analyses and conclusions.

[†] Professor of Public Affairs, Daniel J. Evans School of Public Affairs, University of Washington; Adjunct Professor of Law, University of Washington School of Law.

[#] J.D. expected 2001, University of Washington School of Law; M.P.A. expected 2001, Daniel J. Evans School of Public Affairs, University of Washington.

1. For purposes of this Article, the term "salmon" includes all affected salmonoid species and steelhead trout.

2. See, e.g., Editorial, *Saving a Regional Icon*, N.Y. Times, Mar. 18, 1999, at A24.

3. See, e.g., Henry B. Lacey, *New Hope for Pacific Salmon?* Northwest Resource Information Center v. Northwest Power Planning Council, Idaho Department of Fish & Game v. National Marine Fisheries Service, and *the Aftermath of Judicial Impatience*, 3 Hastings West-Northwest J. Envtl. L. & Pol'y 19, 21 (1995) (citing Michael C. Blumm & Andy Simrin, *The Unraveling of the Parity Promise: Hydropower, Salmon, and Endangered Species in the Columbia Basin*, 21 Envtl. L. 657, 663-64 (1991); National Marine Fisheries Serv., National Oceanic & Atmospheric Admin., *Factors for Decline: A Supplement to the Notice of Determination for Snake River Spring/Summer Chinook*

on fish as early as 1924. For instance, the 1924 report of the Washington State Supervisor of Fisheries noted, "The damming of our larger streams, the ones most frequented by the anadromous fishes, is rapidly becoming a serious menace to the existence of the latter."⁴ In his 1925 report, the Supervisor of Fisheries further stated that "the decline of the runs has been constant, and has approached the danger point."⁵ In 1931, the following appeared in the biennial report:

Practically all established power and irrigation projects have already taken a large toll on fish life. No matter how carefully developed any fish saving device may be[,] . . . any dam or diversion at once changes the natural conditions of any stream and thus to a greater or lesser extent depletes the fish life contained therein.⁶

Snake and Columbia River salmon runs have continued to decline, resulting in listings under the Endangered Species Act.⁷

Current proposals to mitigate the impacts of hydroelectric dams on Northwest salmon include increasing the quantity and flow of river water, constructing bypass channels, and breaching dams. Such mitigation efforts will likely impact hydropower operators, electricity consumers, commercial navigators, irrigators, water consumers, fishing interests, recreational and tourism interests, and the general public. As final decisions are made regarding strategies for salmon protection, it is important that decisionmakers consider and properly measure all consequences faced by these interests. Benefit cost analysis will necessarily be an integral part of the decisionmaking process. The contribution of benefit cost analysis depends, of course, on the quality of

Under the Endangered Species Act 8 (1991); Northwest Power Planning Council, *Compilation of Information on Salmon and Steelhead Losses in the Columbia River Basin* 121-72 (1987)).

4. 32-33 *Washington Supervisor of Fisheries Biennial Rep.* 11 (1924).

5. 34-35 *Washington Supervisor of Fisheries Biennial Rep.* 4 (1926).

6. 40-41 *Washington Supervisor of Fisheries Biennial Rep.* 28 (1932).

7. The following species are listed under the Endangered Species Act as threatened or endangered: Snake River sockeye, 50 C.F.R. § 222.23 (1998); Snake River spring/summer and fall chinook, 50 C.F.R. § 227.4(g), (h) (1998); Snake River Basin steelhead, 50 C.F.R. § 227.4(l) (1998); lower Columbia River steelhead, 50 C.F.R. § 227.4(m) (1998); and upper Columbia River steelhead, 50 C.F.R. § 222.23(a) (1998); lower Columbia River chinook, 64 Fed. Reg. 14,308, 14,321 (1998) (to be codified at 50 C.F.R. § 223.102(a)(17)); upper Columbia River chinook, 64 Fed. Reg. 14,308, 14,324 (to be codified at 50 C.F.R. § 224.101(a)); Columbia River chum, 64 Fed. Reg. 14,508, 14,513 (1999) (to be codified at 50 C.F.R. § 223.102(a)(13)); and middle Columbia River steelhead, 64 Fed. Reg. 14,517, 14,525 (1999) (to be codified at 50 C.F.R. § 223.102(a)(15)).

benefit cost analysis performed. Accurate and comprehensive benefit cost analysis is essential both to understanding the trade-offs involved and to making informed decisions.

Benefit cost analysis techniques have evolved over time, prompted by changes in sentiment, technique, and environmental law. Still, further evolution and refinement are needed.⁸ This Article suggests how benefit cost analysis can be refined by considering benefits and costs in relation to the legal rights and psychological expectations of parties impacted by salmon recovery efforts.⁹ Proper consideration of these factors is important in determining how benefits and costs are measured and whose interests are included in the analysis. Thus, the inclusion of these factors will likely produce a significant effect on the outcome of the analysis and the decisionmaking process.¹⁰

Part I of this Article outlines the history of hydropower development in the Northwest. Part II discusses the proposed methodology for applying legal rights and psychological expectations to benefit cost analysis in more detail. Part III explores the various interests that may be impacted by proposed alterations to Northwest hydroelectric projects. It also describes the relative certainty of the legal rights and psychological expectations involved and how these factors should be reflected in a benefit cost analysis. Part IV illustrates how a consideration of legal rights and psychological expectations would impact benefit cost analyses currently being conducted. This Article concludes that proper

8. See, e.g., Victor B. Flatt, *The Human Environment of the Mind: Correcting NEPA Implementation by Treating Environmental Philosophy and Environmental Risk Allocation as Environmental Values Under NEPA*, 46 *Hastings L. Rev.* 85 (1994). Further refinement of benefit cost analysis is particularly important for the Army Corps of Engineers, which performs these analyses for hydroelectric projects. The Corps currently relies on the U.S. Water Resources Council's Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies. This document has not been modified since 1983 and is in need of significant improvement in a number of areas. For example, there are clear errors in the application of discount rates, and the guidelines fail to consider income distributional effects. Of particular concern, the guidelines also fail to consider the rights of parties impacted by actions and how these rights affect the valuation of benefits and costs.

9. A path for further evolution is suggested in Richard O. Zerbe Jr., *Economic Efficiency in Law and Economics* (Edward Elgar ed., forthcoming 2000) and Richard O. Zerbe Jr., *Is Benefit Cost Analysis Legal? Three Rules for Benefit Cost Analysis*, 17 *J. Pol'y Analysis & Mgmt.* 419 (1998) [hereinafter Zerbe, *Is Benefit Cost Analysis Legal?*]. This Article expands upon one element of the suggestions made therein.

10. While proposals for dam modification and removal on Northwest rivers resulting from the listing of salmon under the Endangered Species Act provide the vehicle for our analysis, the basic technique is relevant to any benefit cost analysis.

consideration of rights and expectations may significantly impact the outcomes of benefit cost analyses.

I. HISTORICAL BACKGROUND OF HYDROPOWER DEVELOPMENT IN THE NORTHWEST

The U.S. Army Corps of Engineers provided the original analyses of Snake and Columbia River hydroelectric projects.¹¹ These analyses were simplistic and uncluttered by mention of ecological concerns, free-flowing river benefits, tribal interests, species preservation or habitat concerns, consideration of the winners and losers, or uncertainty of impacts. The primary benefits considered were power generation, flood control, navigation, and recreation. While the Corps noted that the fishery interests sought delay of development of the Columbia and Snake Rivers until the impact of the proposed dams on the fishing industry could be determined,¹² the primary costs considered were limited to dam construction and operating expenses.¹³

These early benefit cost analyses failed to provide sufficient justification for the dams¹⁴ even without considering the impacts on fish, fishermen, tribes, and other interests. The Corps' report to Congress as part of authorization for dam construction noted:

[T]he direct navigation and irrigation benefits that would accrue to the general public from the proposed improvements are not commensurate with its cost, but it is possible that sufficient surplus power from the dams can be sold within the next 50 years to make

11. See H.R. Doc. No. 75-704 (1945).

12. See *id.* at 25.

13. Report on Little Goose Lock and Dam concludes typically: "Based on the investigation and analyses presented in this report, it is concluded that locating Little Goose Lock and Dam . . . will most economically develop maximum power here, and will provide satisfactory navigation conditions." U.S. Army Corps of Engineers, *Design Memorandum No. 1: Site Selection and Upper Pool Determination: Little Goose Lock and Dam Lower Snake River Project* 3-46 (1961). This is typical of many analyses. See Michael C. Blumm et al., *Saving Snake River Water and Salmon Simultaneously: The Biological, Economic, and Legal Case for Breaching the Lower Snake River Dams, Lowering John Day Reservoir, and Restoring Natural Riverflows*, in *Northwest Water Law and Policy Project* 35 (1998) (on file with authors) ("[T]he perceived benefits of dams are fully quantified and often overstated, while the costs are greatly understated or ignored. Traditional cost-benefit analysis did not calculate true social costs, such as environmental damage Environmental damages were often dismissed as mere externalities, and systematically excluded from the economic cost-benefit balance sheet because their impacts were dispersed or more difficult to quantify than benefits.").

14. See H.R. Doc. No. 75-704, at 42.

the improvement economically sound. It is not safe to assume, however, that this can be done¹⁵

Inclusion and proper measurement of the benefits and costs of all affected interests would have provided more accurate information and allowed for a more thorough consideration of the true long-term effects of the hydroelectric projects. While the results of benefit cost analyses are only one element of the decisionmaking criteria, an accurate and comprehensive analysis has the potential to impact the end result of the decisionmaking process.

II. THE BENEFIT COST APPROACH

Benefit cost analysis is a well-established policy analysis technique used by all levels of government.¹⁶ The technique compares the benefits and costs of alternative actions. The purpose of benefit cost analysis is to provide useful information to the decisionmaker and not to furnish the decision itself.¹⁷ It is one tool in understanding the trade-offs involved in the decisionmaking process. The methodology presented in this Article is intended to improve the usefulness of this tool by considering how legal rights and psychological expectations should be included in the analysis and whose benefits and costs matter.

A. *The Relationship of Rights to Benefit Cost Analysis: The Legal and Psychological Nature of Gains and Losses*

Benefit cost analysis values benefits and costs in the form of gains and losses experienced by those impacted by a proposed action. Gains and losses are determined or experienced as deviations from a status quo reference point. What people own or feel they own determines the reference point. In other words, what people own or feel they own is a psychological state, a matter of psychological ownership or expectation. A major determinant of psychological ownership is legal rights. Most people feel psychological ownership of what they legally own. Hence, legal rights are important to the calculation of benefits and costs. Where legal rights and psychological perceptions of ownership diverge,

15. *Id.*

16. See Jonathan Lesser & Richard O. Zerbe Jr., *A Practitioner's Guide to Benefit Cost Analysis*, in *Handbook of Public Finance* 221–68 (Marcel Dekker ed., 1998).

17. See *id.*

however, psychological perceptions or expectations become important and should form the reference point from which to measure gains and losses.¹⁸ Benefit cost analysis will be most valuable when it is built upon the recognition of these legal rights and psychological expectations, and how these impact the values used to measure benefits and costs and the selection of parties to be included in the analysis.

B. Benefit Cost Measurements: Willingness to Pay and Willingness to Accept

Benefits and costs should be measured by the willingness to pay (WTP) and the willingness to accept (WTA) payment.¹⁹ The legal rights and psychological expectations of the parties affected by a proposed action should be used to select between the willingness to pay or the willingness to accept measures. The willingness to pay (WTP) reflects the price that someone who does not have a good or right would be willing to pay to buy it—the maximum amount of money one would give to buy a good or service or to avoid harm. Thus, the WTP value represents benefits in the form of gains, and costs in the form of gains foregone, to those who do not have a good or right. The willingness to accept (WTA) reflects the price that someone who has the good or right would accept to sell it—the minimum amount of money one would accept to forego a good or right or to bear harm. Thus, the WTA value represents benefits in the form of losses restored, and costs in the form of losses, to those who have a good or right. As a result, benefits and costs are the sum of the appropriate WTP and WTA measures:

Benefits: The sum of the willingness to pay (WTP) for changes that are seen as gains and of the willingness to accept (WTA) for changes that are seen as restoration of losses.

Costs: The sum of the willingness to accept (WTA) for changes that are seen as losses and of the willingness to pay (WTP) for changes that are seen as foregone gains.²⁰

18. Psychological expectations include the perception of or belief in ownership and the expectation of maintaining a chosen way of life. *See* discussion *infra* Part II.D.

19. *See* Richard O. Zerbe Jr. & Dwight Dively, *Benefit Cost Analysis in Theory and Practice* (1994). WTP and WTA are exact utility indicators that provide a complete ranking of choices for an individual.

20. It is important to note that benefits are not measured exclusively by the WTP, nor are costs by the WTA. Benefits are to be measured by the WTA when they include losses restored, and costs are

C. *Divergence Between Willingness to Pay and Willingness to Accept*

Until recently, it was thought that characterizing a particular benefit or cost as willingness to pay (WTP) or willingness to accept (WTA) made little difference in the values used in the benefit cost analysis. It is now recognized that the distinction between WTP and WTA can make a great difference.²¹ Researchers have demonstrated repeatedly that WTA questionnaires, which ask how much one would accept to sell a good or right, generate values three to nineteen times greater than those elicited by WTP questionnaires, which ask how much one would give to buy a good or right.²² Thus, recognition of the rights of the affected parties can greatly impact the outcome of a benefit cost analysis, as the value of benefits and costs to those with rights will be properly reflected by the use of the potentially higher value of WTA, not WTP.

There are three factors that affect the extent of the divergence between the willingness to pay and the willingness to accept values: income effect, substitution possibilities, and loss aversion.

1. *Income Effect*

The more valuable the good or right, the greater the difference between WTP and WTA. This is referred to as the income effect. Consider the value of a pleasant view from your home. Someone wishes to erect a building that will block your view. If you were considered to own the view, WTA would be used as the measure of value in recognition of your ownership—it is the price at which you are willing to sell your view. If you were not considered an owner of the view, WTP would be used to recognize your lack of ownership. It measures your

to be measured by the WTP where they include gains foregone. The difference between benefits and costs is simply their sign: positive for benefits and negative for costs. Thus, without loss of accuracy, costs can be counted as negative benefits and vice versa.

21. This has been demonstrated and noted in what is now a voluminous literature. See, e.g., Jack L. Knetsch, *Asymmetric Valuation of Gains and Losses and Preference Order Assumptions*, 33 *Econ. Inquiry* 134 (1995); Jack L. Knetsch, *Environmental Valuation: Some Problems of Wrong Questions and Misleading Answers*, 3 *Envtl. Values* 351 (1994); Daniel Levy & David Friedman, *The Revenge of the Redwoods? Reconsidering Property Rights and the Economic Allocation of Natural Resources*, 61 *U. Chi. L. Rev.* 493 (1994); Murray B. Rutherford et al., *Assessing Environmental Losses: Judgments of Importance and Damage Schedules*, 22 *Harv. Env'tl. L. Rev.* 51 (1998).

22. See Levy & Friedman, *supra* note 21, at 506; see also Donald Coursey & R.D. Roberts, *Aggregation and the Contingent Valuation Method for Evaluating Environmental Amenities* (1992) (stating that differences for environmental goods may be as much as 142 to 1).

willingness to buy the same view, for example, by paying the builder to erect a smaller building. The difference between WTA and WTP, as the consequence of owning or not owning a good, will be small in the case of an object of little worth. In the case of a poor view, ownership is inconsequential because the view has little value and its ownership does not much change your wealth. Thus, recognition of ownership in a benefit cost analysis through the use of WTA would have little effect on the outcome of the analysis. A great view, on the other hand, would be a different matter. The use of WTA would result in a much higher value than the use of WTP. Thus, proper recognition of your ownership of a great view will significantly impact the outcome of a benefit cost analysis.

2. *Substitution Possibilities*

Recently, it was shown that the poorer the substitutes for a good, the greater the divergence between WTP and WPA.²³ Put another way, the more unique the good, the greater the divergence will be between WTP and WTA. In general, the divergence between WTA and WTP can take any positive value for normal goods.²⁴ This concept is particularly important for environmental goods such as unique salmon runs, a unique grove of trees, and the Grand Canyon, because these goods have poor substitutes.

3. *Loss Aversion*

The essence of loss aversion—that individuals value losses more highly than they value gains—is well supported by empirical studies. Individuals appear to place a significantly higher value on the units of a good they already have than on getting additional units of the same good. Thus, higher values will result where losses of ownership or rights are properly valued using the WTA, as compared to gains valued using the WTP.

23. See W. Michael Hanneman, *Willingness to Pay and Willingness to Accept: How Much Can They Differ?*, 61 *Am. Econ. Rev.* 635 (1991).

24. Normal goods are those that become more desirable when income increases.

D. The Application of Legal Rights and Psychological Expectations to Determine the Reference Point

As discussed above, benefits and costs are measured as gains or losses from a reference point established by legal rights and psychological expectations.²⁵ Because psychological expectations are often based on having a legal right, the legal right in most cases establishes the reference point. The value of a good to one with a legal right is measured using the willingness to accept (WTA) while the value to one without a legal right is measured using the willingness to pay (WTP). Where legal rights and psychological expectations differ, the psychological expectations should generally be used to define the reference point and hence the use of WTA or WTP.²⁶

1. Where Legal Rights Are Clear and Correspond with Psychological Expectations

Where legal ownership or rights are clear, well recognized, and not contrary to well-ingrained social norms, they will generally correspond with accepted psychological concepts of ownership or expectation. When this is the case, legal ownership or right establishes a reference point from which losses and gains are measured. The value of goods or rights to owners is to be measured by the willingness to accept (WTA), including the value of previous losses restored. The value to nonowners is to be measured by the willingness to pay (WTP), including the value of gains foregone. For most cases, the legal rights will determine whether WTP or WTA will be used.

2. Where Legal Rights Are Uncertain or Diverge from Psychological Expectations

Where legal rights are not clear or diverge dramatically from the psychological precept of ownership, psychological expectations should be considered. This methodology recognizes the validity of psychological ownership or expectation in measuring gains and losses.

25. See discussion *supra* Part II.A.

26. See Zerbe, *Is Benefit Cost Analysis Legal?* and Zerbe, *Economic Efficiency in Law and Economics*, *supra* note 9, for an elaboration of the reasons why psychological expectations should be recognized.

A typical case would be one in which the legal rights are uncertain and each party has some incomplete psychological expectation of ownership. In this situation, the benefit cost allocation should be made based not only on the willingness to pay (WTP) but also on the willingness to accept (WTA) to the extent that each party has a subjective sense of psychological ownership. This is equivalent to examining not only WTP but also the divergence between WTP and WTA.²⁷ This result is interesting because it signifies that both the sense of psychological ownership and the divergence between WTA and WTP are relevant to the decision concerning who should receive the entitlement. While it may be difficult to represent accurately the sense of ownership or expectation, it is important for decisionmakers to understand its significance. Consider, for example, the question of whether or not the dams on the Elwha River should be removed. There is general uncertainty regarding a legal public right, but perhaps a strong psychological sense of entitlement to a free-flowing Elwha. The divergence between WTP and WTA should, therefore, be weighted by this sense of public entitlement (WTA), acknowledging the extent to which restoration of the Elwha is viewed as restoration of a previous loss rather than as a gain. This weight will include the effect of the substitution and income effects.²⁸

Consider also the Headwaters Grove in Northern California, the last major privately owned stand of ancient redwoods. Environmental groups have thwarted efforts to log the old-growth forests through a series of lawsuits.²⁹ In this example, the timber company, unlike the environmental groups, has a recognized legal ownership right. Furthermore, Headwaters Grove is of purely commercial value to the timber company and is measured by WTP. The WTP of the environmental groups is less than the WTP of the timber company, as evidenced by the environmental groups' inability to purchase the forest or pay the timber company to prevent logging. However, under the

27. Let P_a and P_b represent the subjective sense of psychological ownership by A and B respectively. Gains are represented by the WTP weighted by the extent to which the party does not have psychological ownership. Losses are measured using the WTA weighted by the extent to which a party does have psychological ownership. The good or right goes to A when the net benefit of having a good is greater to A than to B . The equation can be expressed as $WTP_a + P_a(WTA_a - WTP_a) > WTP_b + P_b(WTA_b - WTP_b)$, which considers both the WTP and the divergence between the WTA and the WTP.

28. See discussion *supra* Part II.C.

29. See Environmental Protection Info. Ctr., Inc., *A Headwaters Forest Chronology* (on file with authors).

proposed methodology, which recognizes psychological expectations, the inclusion of WTA will better measure the psychological effect of losing the redwoods on the environmental groups. The resulting value, which incorporates the environmental groups' psychological expectation, is presumably much higher than the WTP of the timber company, due in part to the unique quality of the grove (the substitution effect). In fact, the environmentalists' ability to delay the cutting of this timber appears to suggest that courts have recognized their psychological expectation and have given weight to the willingness to accept (WTA) valuation.³⁰

Providing some role for psychological expectations in benefit cost analysis is not entirely original. In some circumstances, the law has also recognized psychological expectations, noting at times the discrepancy between measures of legal and psychological values and wondering whether these values are gains or losses.³¹ In these instances, the law has evolved to recognize a psychological basis of valuation.³²

30. In addition, environmental groups succeeded in compelling the timber company to abandon certain logging rights or claims to rights in exchange for money and other rights, thereby furthering the recognition of the public's psychological ownership. However, some regarded this bargain as a demonstration of inept negotiating by government officials. The contention is that not only was too much money paid but that too many development rights were given to the timber company so that coho salmon in the South Fork of the Elk River, which is surrounded by Headwaters, may be imperiled. See Alexander Cockburn, *The Headwaters Deal: Less Than Meets the Eye*, Seattle Times, Mar. 4, 1999; Environmental Protection Info. Ctr., Inc., *EPIC Update and Alert* (1999); *The U.S. Assailed on Redwood Appraisal*, N.Y. Times, Nov. 27, 1998, at A26.

31. See Levy & Friedman, *supra* note 21, at 514.

32. Consider: The value calculated for the restoration of environmental health following an environmental harm recognizes a form of psychological expectation on the part of the public—that is, the price the public is willing to accept (WTA) in exchange for environmental health. This is different from a market measure of damages calculated by the diminution in value of the environment, which tends to be based on a lack of ownership—that is, the price the public is willing to pay (WTP) to protect environmental health. The law has recognized the cost of restoration as an appropriate measure of damage if the cost of restoration is reasonable in comparison to the diminution in the value of the land. Since restoration costs that are greater by 50% or more than the market diminution of value may be recognized as reasonable, restoration costs and psychological expectations clearly have been afforded special status. See *Heninger v. Dunn*, 101 Cal. App. 3d 858 (1980); *Newsome v. Billips*, 671 S.W.2d 252 (Ky. Ct. App. 1984); *Trinity Church v. John Hancock Mut. Life Ins.*, 502 N.E.2d 532 (Mass. 1987). Recently, a number of environmental statutes have been interpreted by the courts and regulatory agencies as stating a preference for evaluating environmental damages in terms of restoration costs (WTA) over diminution of economic value (WTP). See, e.g., *Ohio v. United States Dep't of the Interior*, 880 F.2d 432 (D.C. Cir. 1989). Moreover, in response to such judicial decisions, both the Department of the Interior (DOI) and the National Oceanographic and Atmospheric Administration (NOAA) adopted new regulations giving greater recognition to restoration costs. See 43 C.F.R. § 11.83 (1998).

3. *Valuation of Commercial Goods*

Commercial goods are those goods that are not valued for themselves; rather, they are valued for the monetary income they provide. Commercial goods present a special case in the valuation of benefits and costs. The issue of rights is unimportant for economic evaluation of commercial goods in a benefit cost analysis because the commercial value of an asset is represented by the present value of the income that the good provides, which is the equivalent of the market price of the asset.³³ This dollar value is properly represented by the willingness to pay (WTP).

E. The Relationship of Rights to Economic Standing:³⁴ Determining Whose Interests to Include in a Benefit Cost Analysis

Every benefit cost analysis involves two issues: (1) the value of the action being contemplated—in the current case, whether or not to modify the operations of or to breach hydroelectric dams; and (2) whose values are to count in addressing the first question. Economic standing refers to those interests who are counted in a benefit cost analysis.³⁵ Whether a party has economic standing is part of the fundamental question of the pattern of rights that are assumed extant in performing a benefit cost analysis. Under the proposed methodology, legal rights are one determinant of whose values count, that is, who has economic standing. Where law and public policy are unclear regarding which party is assigned a legal right or where the assignment differs substantially from generally accepted psychological expectations, the proposed methodology dictates that psychological expectations be considered.

33. The present value of a stream of earnings is the investment required to produce the stream of earnings at a specified interest rate. For an investment with an infinite time horizon and constant earnings, the present value formula is simply A/r , where A is the periodic earnings and r is the period interest or discount rate. Consider: The value of a machine that produces \$100 per year forever has a present value of \$1000 at a 10% discount (interest) rate. This should be the value to one who is either buying or selling. There is no divergence between the WTP and the WTA. Where one person can use the machine more effectively than another can, or if the discount rate for one person is less than for another, the machine would have greater value to that person and thus the person with the higher value would "win" the good in an auction.

34. Questions of standing are considered extensively in Richard O. Zerbe Jr., *Comment: Does Benefit Cost Analysis Stand Alone? Rights and Standing*, 10 J. Pol'y Analysis & Mgmt. 96 (1991) and Zerbe, *Is Benefit Cost Analysis Legal?*, *supra* note 9, at 419.

35. See Dale Whittington & Duncan MacRae Jr., *The Issue of Standing in Cost Benefit Analysis*, 5 J. Pol'y Analysis & Mgmt. 665 (1986).

The Role of Rights in Benefit Cost Methodology

Those interests with psychological expectations must necessarily be counted, that is, they must be granted economic standing, as these can significantly impact the outcome of the analysis.

F. Summary of Proposed Methodology

The following chart summarizes the proposed methodology for incorporating rights into benefit cost analyses.

	RIGHTS	SOLUTION
No Divergence Between Legal and Psychological Ownership	Rights are certain. Party A is the owner, party B is not the owner.	Use the WTA for party A and the WTP for party B.
	Rights are certain. Neither party is the owner.	Auction: Use WTP for Both Parties.
	Rights are uncertain. Both parties claim ownership.	Use both WTP and WTA for both parties weighted by the extent of psychological expectations or provide alternative calculations using WTP and WTA.
Divergence Between Legal and Psychological Ownership	Rights are as in categories above.	Solutions as above except weight is given to psychological expectations (WTA).
Commercial Goods	Property is valued as a commercial resource, regardless of rights.	Use market value, typically referred to by WTP, for all parties.
ECONOMIC STANDING		
Count values for all interests not excluded by law or custom. Where the law is unclear, provide alternative calculations.		

III. DEFINING RIGHTS AND THEIR IMPACT ON BENEFIT COST ANALYSIS: THE EXAMPLE OF SALMON AND HYDROELECTRIC DAMS

This section explores the legal rights and psychological expectations of those interests impacted and considered to have economic standing in salmon recovery efforts related to the dams on the Columbia and Snake Rivers.³⁶ Proposals to mitigate the impact of dams on salmon have

36. The authors have sought to include all of the major interests affected, whether legal or psychological, in their discussion of the proposals to alter Columbia and Snake River dams, but recognize that not every interest may be included in this discussion.

ranged from altering the quantity and flow of river water to constructing bypass channels to breaching dams. These measures would affect hydropower operators, electricity consumers, commercial navigators, irrigators, water consumers, fishing interests (commercial, tribal, and sport), recreational and tourism interests, and the general public. The nature of the legal rights and psychological expectations of these interests is assessed through an interpretation of case law, relevant statutes (principally the Endangered Species Act, the Federal Power Act, and the Pacific Northwest Electric Power Planning and Conservation Act (Northwest Power Act)), and a discussion of the psychological expectations of the affected interests. The proposed methodology is then applied to demonstrate the impact that these rights and expectations have on the measurement of benefits and costs.

A. *Hydropower Licensees*

Salmon recovery proposals related to hydroelectric dams would impact the rights of hydropower licensees. Requiring seasonal changes in river flow, reservoir drawdowns, construction of bypass channels, and the partial breaching of dam structures would reduce the capacity of a hydroelectric project to produce power.³⁷ Proposals for decommissioning would go further, resulting in the loss of a franchise to produce hydroelectricity.

The property interests and rights of nonfederal hydropower licensees are controlled, in part, by the Federal Power Act.³⁸ The Act empowers the Federal Energy Regulatory Commission (FERC) to regulate nonfederal hydroelectric projects through the issuance of licenses, and the Act establishes federal control over the operation of hydroelectric projects.³⁹ An existing license is in essence a contract between the licensee and the federal government, making the contract a property right to the licensee.⁴⁰ But once the license expires, the contract ends and the property right is terminated. The licensee may seek to extend its contract

37. The amount of energy a hydroelectric facility produces is dependent on the elevation of the reservoir. Several of the proposed scenarios result in changes to reservoir elevations, thereby affecting maximum energy production. See Northwest Power Planning Council, *Analysis of the Bonneville Power Administration's Potential Future Costs and Revenues* 33 n.5 (1998).

38. 16 U.S.C. §§ 791–823 (1994).

39. See 16 U.S.C. §§ 791–823.

40. See Katharine Costenbader, Comment, *Damning Dams: Bearing the Cost of Restoring America's Rivers*, 6 Geo. Mason L. Rev. 635, 657 (1998).

with the government under relicensing proceedings, but the government is under no obligation to renew a contractual relationship with the licensee.⁴¹ Under this analysis, the legal rights of the hydropower licensee are limited to the duration of the contract. United States Supreme Court decisions support the conclusion that licensees do not have a vested property interest in an expired license, the value of the waterpower, the franchise to produce electricity, or the hydropower development site.⁴²

The rights of hydropower operators are further limited by the authority of the federal government to control the operations of licensees. Under the Federal Power Act and subsequent amendments, FERC is obligated to give development and nondevelopment values equal consideration in deciding whether to issue a license.⁴³ New and renewal licenses are to be granted only if the proposed project is found to protect and enhance fish and wildlife, and satisfies other criteria.⁴⁴ Through the licensing process, FERC has the authority to impose conditions on the operation of hydroelectric projects to address these environmental and other criteria.⁴⁵ The rights of current license holders are also limited by the potential for the license contracts to be reopened and new conditions imposed.⁴⁶ FERC, with apparent congressional approval, has also announced that it possesses the authority to order dam decommissioning at relicensing.⁴⁷

41. *See id.*

42. *See* United States v. Grand River Dam Auth., 363 U.S. 229 (1960); United States v. Willow River Power Co., 324 U.S. 499 (1945); United States v. Chandler-Dunbar Water Power Co., 229 U.S. 53 (1913). In addition, these cases demonstrate that compensation for lost water power or lost franchise to produce hydroelectricity is not required under the Fifth Amendment. Nonfederal hydropower owners do acquire property rights associated with the project lands. However, the proposed scenarios for protecting salmon generally will not impact private property. Even a decommissioning order, which extinguishes the value of the property as a hydropower site, does not destroy all rights of the property. By decommissioning, FERC is ordering licensees to stop producing hydropower with existing dams. *See* Costenbader, *supra* note 40, at 657.

43. *See* 16 U.S.C. § 797(e).

44. *See* 16 U.S.C. § 797(e).

45. *See* 16 U.S.C. § 797(e).

46. Some licenses include specific re-opener clauses. FERC has also adopted a policy to use reserved authority in licenses to ameliorate cumulative impacts of projects in the same river basin through a relicensing process. However, FERC appears reluctant to use these devices and the FPA seems to suggest that licenses can be altered only upon mutual agreement. *See* State of Washington, Draft Statewide Salmon Recovery Strategy 10 (1998) (unpublished).

47. *See* Costenbader, *supra* note 40, at 652 ("If State or Federal fish and wildlife agencies report that a project's impacts . . . cannot be mitigated, FERC may have to conclude that issuance of the license, whether original or otherwise, may be inappropriate."); *see also* 60 Fed. Reg. 339 (1995) (codified at 18 C.F.R. pt. 2.24 (1997)); H.R. Rep. No. 99-597, at 32 (1986).

The provisions of the Endangered Species Act (ESA) also apply to the operation of federal dams and federal licensing of privately owned dams insofar as they affect listed species.⁴⁸ Therefore, it will likely have a significant impact on the legal rights and psychological expectations of dam licensees. Federal agencies that have control over hydroelectric projects, such as the Bonneville Power Administration, the Army Corps of Engineers, and the Bureau of Reclamation, are required to insure that any action they authorize will not likely jeopardize any endangered species.⁴⁹ The application of the ESA to hydroelectric projects is supported by judicial opinions that have upheld conditions placed on the operation of dams, including the requirement that water be released from dams to protect the habitat of endangered species.⁵⁰ One court has also mandated action after finding that agency failure to challenge status quo operations violated the ESA.⁵¹ Thus, while it is currently unclear what changes in operations the ESA may require, it is evident that changes to hydroelectric projects are likely to be mandated under the authority of the ESA.

The Northwest Power Act establishes the interstate Pacific Northwest Electric Power and Conservation Planning Council to develop a twenty-year plan, which has the potential to impact the rights of hydropower operators. This plan is required to balance the protection and enhancement of fish and wildlife with an "adequate, efficient, economical, and reliable power supply," essentially placing fish and wildlife concerns on "equal footing" with hydroelectric power generation.⁵² The Council theoretically possesses the ability to reject

48. See Lacey, *supra* note 3, at 47.

49. See 16 U.S.C. § 1536(a)(2) (1994).

50. See *Riverside Irrigation Dist. v. Andrews*, 758 F.2d 508, 513 (10th Cir. 1985).

51. See Lacey, *supra* note 3, at 47-48; see also *Idaho Dep't of Fish & Game v. National Marine Fisheries Serv.*, 850 F. Supp. 886 (D. Or. 1994). In its 1993 biological opinion, NMFS noted several impacts dams have on salmon and concluded that the Columbia River dams pose the largest single human-induced cause of salmon mortality. See National Marine Fisheries Serv., *1993 Draft Biological Opinion on the Operations of the Federal Columbia River Power System* (1993). Despite this, NMFS issued a "no jeopardy" opinion. The Idaho Department of Fish and Game challenged this finding. In 1995, NMFS responded by issuing a revised biological opinion which concluded that status quo operations of the hydroelectric system would jeopardize the listed stocks. See National Marine Fisheries Serv., *Endangered Species Act Section 7 Biological Opinion on the Reinitiation of Consultation and 1994-98 Operation of the Federal Columbia River Power System and Juvenile Transportation Program* (1995).

52. 16 U.S.C. § 839(1)(A), (1)(B), (2) (1994). See also *National Wildlife Fed'n v. FERC*, 801 F.2d 1505, 1514-15 (9th Cir. 1986); *Confederated Tribes & Bands of the Yakima Indian Nation v. Federal Energy Regulatory Comm'n*, 746 F.2d 466, 473 (9th Cir. 1984).

biologically beneficial measures on the basis of “economic” considerations.⁵³ However, the federal courts have ruled that the Council may not reject recommended measures simply because they reduce power production and impose economic costs on the region.⁵⁴ Thus, in order to comply with the equal footing principle, the Council may recommend changes in the operation of federal and nonfederal hydroelectric projects to balance power production with fish and wildlife protection.

No matter what measures are taken to protect salmon, hydroelectric operators will likely experience a loss. The correct measure of value for this loss to hydropower licensees is nevertheless the willingness to pay (WTP). There is two-fold support for this conclusion. First, and definitively, the value of a hydroelectric project is in its commercial value. Thus, the WTP measure is used, as this will not differ from the willingness to accept (WTA).⁵⁵ Second, this conclusion is supported as a matter of legal rights. The legal rights of licensees are clearly limited, thus requiring the use of WTP.⁵⁶ Hydropower licensees may argue a psychological expectation of a reasonable return on their investment particularly in light of FERC imposed requirements.⁵⁷ Acceptance of this argument would warrant the use of WTA as the measure of loss. This psychological expectation, however, is not enough to overcome the necessity of valuing the loss based on commercial value.⁵⁸ The potential cost to hydropower licensees should therefore be measured using the willingness to pay (WTP), which reflects the present value of their lost income.

B. Electricity Consumers

Salmon recovery proposals will also impact the rights of electricity consumers. Decreases in power generation are likely to cause increases in electricity rates to commercial and private consumers. In addition, as

53. See Lacey, *supra* note 3, at 44.

54. See *id.*; see also Northwest Resource Info. Ctr., Inc. v. Northwest Power Planning Council, 35 F.3d 1371, 1395 (9th Cir. 1994).

55. See discussion *supra* Part II.D.3.

56. See discussion *supra* Part II.D.

57. See Costenbader, *supra* note 40, at 656.

58. It is relevant to the discussion of compensation, which is a related issue but is not directly relevant to our discussion here.

mitigation conditions are imposed on hydroelectric projects, the cost of these mitigation actions may be passed on to electricity consumers.

The Northwest Power Planning Council is charged under the Northwest Power Act with providing an "adequate, efficient, economical, and reliable power supply."⁵⁹ This suggests some consumer rights to and expectations of a certain level of economical power costs. However, courts have stated that power losses and economic costs should not preclude restoration of the salmon runs as long as the Northwest Power Act's baseline condition of an "adequate, efficient, economical, and reliable power supply" remains in place.⁶⁰ Based on the courts' interpretation, the balancing of economic power production with salmon protection appears to allow for some changes in the current rates imposed on consumers.

In general, higher electricity prices will be experienced as a loss to commercial and private consumers. For commercial consumers, the willingness to pay (WTP) should be used to represent the loss because the value of the electricity lies solely in its commercial value. For private consumers, there will likely be some divergence between the willingness to pay and the willingness to accept as a result of the divergence between legal rights and psychological expectations. This divergence between the WTP and WTA for electricity users will depend on how great the increase is in electricity prices. If the increase in price is large enough to have a significant effect on income, the income effect will produce a significant discrepancy.⁶¹ In this case, the willingness to accept (WTA) measure should be used. The WTA should be measured by the additional income the customers would need to buy the same electricity at the new, higher prices.⁶²

C. *Commercial Navigation*

Proposals for reservoir drawdowns and changes in river flow have the potential to impact the rights of navigation interests because the navigation locks at one or more dams would become unusable. Insufficient depth in the river and in the locks would prohibit the locks

59. 16 U.S.C. § 839(1)(A), (1)(B), (2) (1994).

60. 16 U.S.C. § 839(1)(A), (1)(B), (2).

61. See discussion *supra* Part II.C.

62. This will slightly overvalue the WTA.

from lifting vessels into navigation pools. Breaching dams also has the potential to impact navigation as the level and flow of the resulting river could preclude vessel passage. Thus, commercial navigation interests, including port facilities and the economy in these areas, face the potential for the end of commercial navigation on at least portions of the Columbia and Snake Rivers.

According to legal opinion, the Columbia and Snake River ports, as well as the tug and barge industry, have congressionally granted legal rights in the navigability of these river systems.⁶³ The right of slack-water navigation was granted by Congress, under its Commerce Clause authority, to a depth of no less than fourteen feet, both in the river channels and through the navigation locks at each of the dams from Bonneville Dam to Lower Granite Dam.⁶⁴ Any alteration in the navigability, or slack-water, of the system is unlawful and prohibited unless Congress specifically authorizes such a change.⁶⁵ Congress has not granted specific authority to modify this right. Thus, neither the Endangered Species Act nor the Northwest Power Act currently confers any power to bring the navigation channels below the congressionally mandated fourteen-foot level.⁶⁶

Despite this interpretation of legal rights, the measurement of the loss to commercial navigation is a matter of commercial value, thus willingness to pay (WTP) is the correct measure.⁶⁷ This measure would apply for navigators as well as port facilities. To the extent economic standing is extended to economic impacts on port communities, the willingness to accept (WTA) should be used to represent the psychological loss of a way of life.

63. See Memorandum from Schwabe, Williamson & Wyatt, P.C., to Columbia River Tug Ass'n and Port of Morrow 2-3 (Apr. 29, 1997) (on file with authors).

64. See *id.* at 7 (citing 76 Stat. 1173 (1962)).

65. See *id.* at 8 (citing *United States v. Arizona*, 295 U.S. 174 (1934); *Wisconsin v. Duluth*, 96 U.S. 379 (1877)). Only Congress can modify what it has previously granted, as the separation of powers prevents the courts and federal agencies from acting unless the power to do so has been specifically delegated by Congress.

66. See *id.* at 9-12. Under section 7 of the Endangered Species Act, the power of federal agencies to enforce ESA's mandate for species preservation is limited to their statutory authorities. Recommendations of the Northwest Power Council plan are only advisory.

67. See discussion *supra* Part II.D.3.

D. *Irrigators and Other Water Users*

The rights of water users could be affected through changes in reservoir and river levels resulting from the release of water in order to maintain instream flows or from breaching of hydroelectric dams. Ample water levels, particularly in reservoirs, are crucial to ensure an adequate supply of water for the mid-April through late-September irrigation season in the Columbia River Basin.⁶⁸ Requiring changes in reservoir levels or other alterations to dam operations and structures could result in system modifications or the unavailability of water as it is diverted from current users to protect salmon. Impacts will likely include costly irrigation system modifications or the loss of farmland due to the unavailability of water, as well as impacts to municipal and industrial water consumers.

The allocation of water is governed by a state law appropriation system that determines the private rights to the use of water.⁶⁹ The system is based on the principle of "first in time, first in right," which governs the priority in water rights and allows water users to divert water from streams for beneficial uses.⁷⁰ A crucial question is the extent to which these rights can be abrogated by federal statutes and the impact of this on the assessment of rights.

The Endangered Species Act (ESA) requires federal agencies to cooperate with state agencies to resolve water resource issues.⁷¹ According to judicial interpretation, this cooperation does not preclude the federal government from overriding state water laws to protect a listed species. The ESA has been applied to uphold conditions placed on the operation of hydroelectric projects, such as the diversion of water for the conservation of endangered species at the expense of state water rights.⁷²

68. See Bonneville Power Admin. et al., *The Columbia River System: The Inside Story* 6-8 (1991); Joy Ellis, *Drafting from an Overdrawn Account: Continuing Water Diversions from the Mainstem Columbia and Snake Rivers*, 26 *Envl. L.* 299, 303 (1996).

69. See *Connecticut v. Massachusetts*, 282 U.S. 660 (1931); *Kansas v. Colorado*, 206 U.S. 46 (1907).

70. See Ellis, *supra* note 68, at 304.

71. See 16 U.S.C. § 1531(c)(2) (1994).

72. See *Riverside Irrigation Dist. v. Andrews*, 758 F.2d 508 (10th Cir. 1985); *Carson-Truckee Water Conservancy Dist. v. Watt*, 549 F. Supp. 704 (D. Nev. 1982), *aff'd in part and vacated in part sub nom. Carson-Truckee Water Conservancy Dist. v. Clark*, 741 F.2d 257 (9th Cir. 1984).

Congress established federal control over the use of waters for hydropower purposes with the enactment of the Federal Power Act.⁷³ Courts have interpreted this authority to include the ability to impose conditions when granting hydropower licenses that require maintenance of minimum stream flows to protect salmon runs, even where state-created water rights would be affected.⁷⁴ Water rights could be further impacted by the Northwest Power Act's mandate that the twenty-year regional plan include protection and enhancement of salmon.⁷⁵ This plan could recommend changes in water levels and water allocation, thereby affecting water rights.

From a legal perspective, it is clear that water users have a legal right to use appropriated water. However, the use of willingness to accept (WTA) is precluded in this case for two reasons. First, statutory authority for abrogation substantially limits these legal rights. Second, the value of water to farmers, municipalities, and industry as a productive resource necessitates the use of willingness to pay (WTP) to represent the loss of commercial value. Neither the income nor the substitution effect would operate here.⁷⁶ In the case of farmers, the loss would be reasonably measured by the diminished value of their land as a result of no longer having access to cheaper irrigation water. To the extent that the way of life for farmers is affected, either because they are no longer able to get any water or because equipment modifications are too expensive, the use of willingness to accept (WTA) is appropriate as a reflection of psychological expectation.

E. Commercial Fishing

The anticipated benefit of changes to hydroelectric projects is the restoration of salmon runs resulting in the removal of the species from the Endangered Species list. As a result, strict limitations on commercial fishing for salmon are likely to be reduced or eliminated, thereby increasing the potential of financial benefits to commercial fishermen and associated businesses.

73. See 16 U.S.C. §§ 791–823 (1994).

74. See Nicholas Targ, *Water Law on the Public Lands: Facing a Fork in the River*, 12 Nat. Resources & Env't 14, 18 (1997); see also *California v. FERC*, 495 U.S. 490 (1990); *California v. Federal Power Comm'n*, 345 F.2d 917 (9th Cir. 1965).

75. See 16 U.S.C. § 839(1)(A), (1)(B), (2) (1994).

76. See discussion *supra* Part II.C.

It is generally anticipated that in the short run, commercial fishing will experience a loss due to tighter restrictions on fishing as part of the efforts to restore salmon. Should salmon stocks increase in the long run, however, the net result will be a gain. Based on the purely commercial value of the interest, the willingness to pay (WTP) measure should be used. This is also correct from a rights perspective, as fishing licenses and permits are generally considered to confer a privilege, not a right, which is revocable at the discretion of the issuing agency.⁷⁷ The WTP measure should reflect the net long-term gain in income.

F. Tribal Fishing

Salmon play a central role in Northwest tribal activity, culture, and ceremony. They provide a source of food, commercial income, and a way of life. Thus, to the extent that changes to the operations of hydroelectric projects are successful in restoring the salmon, tribal interests will benefit.

Treaties between the Northwest tribes and the U.S. government contain provisions acknowledging the right of tribal members to "take fish in common with all citizens of the territory at all usual and accustomed places."⁷⁸ The tribal rights secured in such treaties have been defined in a long line of judicial decisions. The U.S. Supreme Court has concluded that treaties are a reservation of rights and that this reservation of rights created, in essence, a property right.⁷⁹ Lower courts have further interpreted the extent of this property right as "fair share"⁸⁰ and as fifty percent of the catch.⁸¹ The Supreme Court has affirmed these definitions⁸² and has also stated that tribal fishermen are immune from all federal and

77. See Joseph J. Kalo et al., *Coastal and Ocean Law* (photo. reprint of draft Sept. 1998) (3d ed. 1998).

78. Michael C. Blumm & Brett M. Swift, *The Indian Treaty Piscary Profit and Habitat Protection in the Pacific Northwest: A Property Rights Approach*, 69 U. Colo. L. Rev. 407, 409 (1998) (citing Treaty of Medicine Creek, Dec. 26, 1854, U.S.-Nisquallys-Puyallups, art. 3, 10 Stat. 1132, 1133; Treaty with the Nez Perces, June 11, 1855, U.S.-Nez Perces, art. 3, 12 Stat. 957, 958).

79. See *United States v. Winans*, 198 U.S. 371, 380-81 (1905) (citing *Jones v. Meehan*, 175 U.S. 1 (1899); *Choctaw Nation v. United States*, 119 U.S. 1 (1886)).

80. See *Sohappy v. Smith*, 302 F. Supp. 899, 911 (D. Or. 1969).

81. See *United States v. Washington*, 384 F. Supp. 312, 343 (W.D. Wash. 1974).

82. See *Washington v. Washington State Commercial Passenger Fishing Vessel Ass'n*, 443 U.S. 658, 686, *modified sub nom.* *Washington v. United States*, 444 U.S. 816 (1979) (stating that Indian treaty right "secures so much as, but no more than, is necessary to provide the Indians with a livelihood—that is to say, a moderate living").

state regulation of fishing locations and catch limits except that required for conservation.⁸³

Courts have also inferred that these treaties include protection for salmon habitat, stating that the tribes are entitled to more than the mere chance to dip their nets into empty waters.⁸⁴ One Washington district court reasoned that the treaties implied a right of protection for fish habitat necessary for the survival of the fish that were the primary purpose of the treaty.⁸⁵ While the fulfillment of this right to habitat protection has been controversial both in practice and in the courts,⁸⁶ lower courts have provided the tribes with relief. The treaty right has been interpreted to entitle tribes (1) to ask for changes in dam operations to maintain streamflows essential for fish habitat and migration,⁸⁷ (2) to enjoin dam construction,⁸⁸ and (3) to modify plans of the Federal Columbia River Power System for peaking power purposes.⁸⁹ In sum, these cases demonstrate that tribal treaty rights include the power to change dam operations to preserve salmon habitat.⁹⁰

The authority of Congress to abrogate treaty rights has been recognized by the U.S. Supreme Court.⁹¹ However, the Court has ruled that federal statutes do not abrogate treaty rights unless there is "clear evidence" that Congress actually considered the conflict and specifically

83. See *Washington State Commercial Passenger Fishing Vessel Ass'n*, 443 U.S. at 658; *Puyallup Tribe v. Department of Game*, 391 U.S. 392 (1968).

84. See *United States v. Washington*, 506 F. Supp. 187 (W.D. Wash. 1980).

85. See Blumm & Swift, *supra* note 78, at 415; see also *United States v. Washington*, 506 F. Supp. at 203-04.

86. See Blumm & Swift, *supra* note 78, at 415; see also *United States v. Washington*, 759 F.2d 1353, 1357 (9th Cir. 1985) (en banc). Upon appeal, an en banc panel of the Ninth Circuit noted that the legal standards governing the state's habitat protection duties under the treaty "will depend for their definition and articulation upon concrete facts which underlie a dispute in a particular case." The panel thus failed to reach a conclusion on the habitat issue.

87. See Michael C. Blumm, *Fulfilling the Parity Promise: A Perspective on Scientific Proof, Economic Cost, and Indian Treaty Rights in the Approval of the Columbia Basin Fish and Wildlife Program*, 13 *Envtl. L.* 103, 141 (1982).

88. See *id.*

89. See *id.*

90. See Blumm & Swift, *supra* note 78, at 467.

91. Because Congress exercises "plenary power" over Indian affairs, it has the power to unilaterally void or abrogate treaty rights. See Robert J. Miller, *Speaking with Forked Tongues: Indian Treaties, Salmon, and the Endangered Species Act*, 70 *Or. L. Rev.* 543, 563-64 (1991); see also *United States v. Wheeler*, 435 U.S. 313, 331 (1978); *Lone Wolf v. Hitchcock*, 187 U.S. 553, 565 (1903).

chose to abrogate the treaty.⁹² The ESA is silent in regards to treaties.⁹³ However, the protection of treaty fishing rights has been addressed in a 1997 order issued by the Secretaries of the Interior and Commerce on tribal rights, federal trust responsibilities, and the ESA.⁹⁴ United States Fish and Wildlife Service and the National Marine Fisheries Service provide further guidance.⁹⁵ These reports detail a set of principles which acknowledge tribal rights and define the government's trust obligation to protect treaty fishing rights.⁹⁶

A determination of the nature of tribal rights and their associated value involves two distinct measurements. The above analysis presents a strong argument that restoration of the rivers and larger salmon runs is a restoration of a loss for tribes. Interpretations of treaties as a reservation of legal rights suggest the use of willingness to accept (WTA) to represent the restoration of a loss. In addition, tribes appear to view the restoration of the rivers and salmon as not just a restoration of a treaty right, but a restoration of a right they are entitled to as a part of the earth and creation.⁹⁷ Thus, the WTA measurement recognizes not only the legal right but also the importance of this psychological expectation and the restoration of a way of life. The commercial value of the salmon to the tribes would be measured separately, using willingness to pay (WTP).

92. See *United States v. Dion*, 476 U.S. 734, 740 (1986).

93. See Mary Christina Wood, *Fulfilling the Executive's Trust Responsibility Toward the Native Nations on Environmental Issues: A Partial Critique of the Clinton Administration's Promises and Performance*, 25 *Envtl. L.* 733, 790 n.274 (1995).

94. See Blumm & Swift, *supra* note 78, at 495.

95. See Wood, *supra* note 93, at 792 (citing National Marine Fisheries Serv., *Proposed Recovery Plan for Snake River Salmon* (1995); Memorandum from the Director of U.S. Fish & Wildlife Serv. to the Assistant Secretary of Indian Affairs (Aug. 24, 1994)).

96. The principles would allow the government to impose restrictions on tribal activities only when: (1) the restrictions imposed on treaty fishing are "reasonable and necessary" for the conservation of the species; (2) the restrictions are the least restrictive alternative to achieve the benefits of development; (3) the restrictions do not discriminate in any way against treaty fishing; and (4) voluntary tribal conservation measures are not adequate to achieve the conservation purpose. See Blumm & Swift, *supra* note 78, at 495. There is disagreement regarding a fifth principle: the extent to which non-Indian activities must be restricted before regulation may be directed at Indian activities. See Wood, *supra* note 93, at 793. Blumm and Swift believe that developments should provide tribes with "just compensation" for the loss or diminishment of treaty rights if the proposed developments produce a significant loss of treaty fishing and impair the tribes' moderate living needs, despite efforts to satisfy these principles. See Blumm & Swift, *supra* note 78, at 497.

97. Telephone conversation with Randy Settler, Yakima Division of the Inter-Tribal Fish Comm'n (Mar. 30, 1999).

G. *Sport Fishing*

Sports fishermen, as well as associated businesses, would benefit from increased salmon runs, as limitations imposed on sport fishing are likely to be reduced or lifted. The sport fishermen are likely to experience a restoration or increase in a valued and unique way of life, while supporting businesses may realize financial benefits.

As with commercial fishing, sports fishermen and associated businesses are likely to experience an initial loss due to restrictions on fishing, followed by a long-term gain as the numbers of fish increase. For the supporting businesses to which sport fishing has a commercial value, the correct measure would be willingness to pay (WTP). This should reflect the net long-term gain. To the extent that sport fishing is a way of life that is highly valued and fairly unique, the measure should recognize a sense of psychological expectation. Both the income effect and substitution possibilities will result in large discrepancies between the WTA and the WTP.⁹⁸ In this case, the use of willingness to accept (WTA) is the appropriate measure.

H. *Recreation and Tourism*

The results of proposed changes in dam operations increase some recreational opportunities and diminish others. Activities related to rivers and riparian habitats include boating, fishing, and picnicking. Operators of existing recreational facilities and related businesses will likely feel the changes as an economic loss; however, opportunities for new recreational businesses will be valued as a gain. Due to the commercial value associated with recreational and tourism businesses, the correct measure is the willingness to pay (WTP). The value experienced by recreational users of the natural environment is not generally accounted for by economic or market values. Despite the challenge of estimating these values, they are an important element in assessing project benefits and costs.⁹⁹ Existing recreational users who would lose opportunities would experience a loss that should be valued by the willingness to accept (WTA), which recognizes the importance of their psychological expectation and their loss. Some recreation users will experience gains

98. See discussion *supra* Part II.C.

99. See Daniel D. Huppert et al., *River Economics: Evaluating Trade-Offs in the Columbia River Basin Fish and Wildlife Program* (manuscript at 24, on file with authors).

from new opportunities which should be valued using the WTA that recognizes a psychological expectation and the restoration of a previous loss. Gains experienced by those who simply value a free-flowing river or wild salmon are addressed in the following section.

I. Existence Value to the Public

In addressing the public as an affected party, we are referring to their "existence values," often called "non-use values" or "passive use values". These concepts represent the value people place on the very existence of a good.¹⁰⁰ Existence values are difficult to measure because they are not reflected by market values. Despite the difficulty of determining these nonmarket values, the values can be large, particularly for environmental goods, and may be crucial to rational preservation decisions.¹⁰¹

Three crucial questions arise when using existence values. First, what goods represent existence values that are to be included in a benefit cost analysis? That is, which goods are to be given economic standing? Usually, existence values are calculated only for such goods as species or habitat preservation. Many goods, however, have some existence value. In analyses of proposals to protect salmon, some studies do not consider existence values, others consider the existence value of salmon, while others consider both salmon and free-flowing rivers. No rationale is articulated for these choices. The rule should be to count all goods for which existence value is likely to be important.

Second, what are the groups of people for whom existence value should be counted? Analyses reflect differing assessments of the affected population. For example, in the case of the Nestucca oil spill, the populations of Washington and British Columbia were used for estimating damages, while in the case of the Exxon Valdez spill, the population of the entire United States was held to be the potentially affected population.¹⁰²

100. Typically, we do not speak in terms of rights of natural resources themselves. Natural resource rights are reflected through statutory protections such as the ESA that impose legal duties enforceable by others. In benefit cost analysis, a resource's right is reflected in both the use and non-use values we place on it. See Christopher D. Stone, *Should Trees Have Standing? Revisited: How Far Will Law and Morals Reach? A Pluralist Perspective*, 59 S. Cal. L. Rev. 1 (1985).

101. See Huppert et al., *supra* note 99, at 27.

102. See Richard W. Dunford et al., *Whose Losses Count in Natural Resources Damages?*, 15 Contemp. Econ. Pol'y 77, 80 (1997).

Related to this second question is the issue of whether or not existence values should be counted when the harm is not known. The argument has been made that without specific knowledge of the injury there can be no loss.¹⁰³ This argument fails, however, since it ignores the relation of wealth to value. People who care about salmon runs and free-flowing rivers care about environmental wealth. They care about the Elwha River salmon and the like as belonging to a class of goods that constitute this wealth. Those who put a non-use value on species preservation may not know about a particular species, but may be reasonably said to care about it as part of a genera or class of species they do care about. Thus, existence value should be counted regardless of whether the harm is known.

A thorough discussion of how to resolve these two issues is beyond the scope of this Article. In short, the determination of what goods represent existence values and what groups of people for whom existence value should be counted will involve consideration of the concepts of legal and economic standing. In addition, the proposed rights-based approach requires recognition of psychological expectations in making these determinations.

The third question, which is most relevant to the proposed methodology, is how to determine the correct measurement of existence values—willingness to pay (WTP) or willingness to accept (WTA). Surveys framed from a WTA perspective, asking how much one would be willing to accept to sell his or her right, tend to elicit much higher values than WTP questions, asking how much one would pay to obtain the right or protection.¹⁰⁴ The phrasing of the question reflecting ownership or a lack thereof can thus greatly impact the measurement of existence value. Resolution of these issues will depend in part on the definition of ownership of natural resources. Consider: If the public owns the right to clean air, then the use of WTA is appropriate. If polluters have the right to degrade the air, such as through pollution permits, then the use of WTP for the public reflects the lack of a public right.¹⁰⁵ The common law, statutes, and economic analyses have been inconsistent in regards to the legal rights associated with existence value but appear to be tending toward recognition of public ownership rights, both legal and

103. *See id.* at 81 (“[A] . . . criteria for economic standing for nonuse damages is that people must have knowledge of the specific injuries to the natural resources in their utility function.”).

104. *See Levy & Friedman, supra* note 21, at 496.

105. *See id.* at 514.

psychological.¹⁰⁶ Due to this recognition and the generally strong sense of psychological expectation on the part of the public, the use of both WTP and WTA is appropriate, using a weighted average that accounts for the degree of psychological expectation. In the case of Northwest dam policy, a crucial question in determining the appropriate measure is whether or not the public regards salmon and river restoration as an environmental gain or as loss restored. To the extent the public has always felt ownership, the weight of the willingness to accept (WTA) should reflect the loss restored. The magnitude of existence value will also be influenced by the divergence between the WTP and WTA due to the public sense of value of the salmon and the river (the income effect), and by the uniqueness of these resources (substitution possibilities).¹⁰⁷

Existence values reflect real values that merit consideration. In addition to the appropriate application of willingness to pay and willingness to accept values, the questions that surround existence value are essentially questions of economic standing: how broadly to define the public for which existence values are measured and how broad is the class of goods for which existence values exist? These questions are matters of law and economics so an appropriate rights-based benefit cost analysis must address them.

106. Federal common law has recognized public ownership of natural resources. *See id.* at 515. Current state and federal court decisions tend to support the notion of public ownership rights. *See id.* at 519. Further, under the common law concept of a public trust doctrine, the government is deemed to hold title to natural resources in trust for its citizens. This doctrine has the potential to create enforceable legal rights for private citizens to enforce the public's interest in natural resources. *See* Frona M. Powell, *The Public Trust Doctrine: Implications for Property Owners and the Environment*, 25 Real Est. L.J. 255, 257-58 (1997). Exceptions to the common law recognition of public ownership of natural resources do exist, however, as illustrated by the legal use of "public" resources for private grazing and mining purposes. *See* Levy & Friedman, *supra* note 21, at 521-22. The Endangered Species Act, with its mandate for species protection and citizen suit provisions, appears to suggest some recognition of existence value for the public and a sense of public ownership of natural resources. Regulations related to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) originally required the public trustee to select the lesser of either restoration costs or diminution of value of the resources at issue. *See* 42 U.S.C.A. §§ 9601-9675 (West Supp. 1998). New parallel regulations giving greater weight to restoration were, however, adopted by both the Department of the Interior (DOI) and the National Oceanographic Atmospheric Administration in response to judicial decisions. *See, e.g.*, *Ohio v. United States Dep't of the Interior*, 880 F.2d 432 (D.C. Cir. 1989); 43 C.F.R. § 11.83 (1998). The DOI also appears now to acknowledge the appropriateness of WTA as the measure of public ownership of natural resources. *See* Levy & Friedman, *supra* note 21, at 514-15.

107. *See* discussion *supra* Part II.C.

The Role of Rights in Benefit Cost Methodology

J. Summary of Application of the Proposed Methodology

The following chart summarizes the application of the proposed methodology to a benefit cost analysis of the major interests impacted by proposals to alter hydroelectric operations and facilities.

INTERESTS	BENEFITS	COSTS
Hydropower Licensee		Use WTP based on commercial value and limited legal rights
Electricity Consumers		For commercial consumers, use WTP based on commercial value; for private consumers, use WTA for significant price increases to represent the loss
Commercial Navigation		Use WTP based on commercial value
Irrigators & Other Water Users		Use WTP to reflect the commercial value of the water; use WTA to reflect any loss of way of life/psychological expectation
Commercial Fishing	Use WTP to reflect net long-term gain in commercial value	
Tribal Fishing	Use WTA to reflect net long-term restoration of legal right and psychological expectation; use WTP for any commercial value	
Sport Fishing	Use WTA to reflect restoration and psychological expectation of a way of life; Use WTP for commercial value of associated businesses	
Recreation and Tourism	Use WTP for commercial value of new business opportunities; for users of new recreational opportunities, use WTA to reflect psychological expectation and restoration of a previous loss	Use WTP for commercial value of lost business opportunities; for existing recreational users, WTA should reflect psychological sense of loss
Existence Value to the Public	Use WTP and consider divergence between WTP and WTA weighted by extent of psychological expectation (which should reflect the sense of a loss restored and the impact of substitution possibilities)	

K. *Significant Impacts of the Proposed Methodology*

Consideration of legal rights and psychological expectations has significant impacts on the measurement of values in a benefit cost analysis by requiring the application of the willingness to accept (WTA) value for those with rights who suffer loss or experience losses restored. In addition, legal rights and psychological expectations are important to the economic standing issue of whose interests and goods are included in the analysis, particularly the inclusion of tribal rights and existence value. The treatment of these issues can dramatically affect the outcome and reliability of the benefit cost analysis, as values may be miscalculated and relevant interests may be excluded from the analysis. In general, an appropriate rights-based consideration of benefits and costs will lead to an increase in the calculation of the net benefits of dam modifications and other salmon restoration proposals.

IV. ANALYSIS OF CURRENT STUDIES IN LIGHT OF PROPOSED METHODOLOGY

The analyses originally undertaken to evaluate the building of hydroelectric projects on the Lower Snake River showed that the dams did not pass a benefit cost test. As we have noted, these analyses were performed without mention of rights, tribal or otherwise, fishing values, existence values, or species or habitat values.¹⁰⁸ Had consideration been given to any of these sources of value, the arguments for not building the dams would have been all the stronger. But they have been built. Now, as fish preservation and restoration have become important, consideration is being given to breaching dams on the Lower Snake River and modifying operations at other Snake and Columbia River dams.

At least ten studies, in various stages of completion, include elements of benefit cost analysis of salmon recovery efforts on the Snake and

108. See *supra* note 15 and accompanying text; see also Asami Miyata, *Changes in Valuation of the Environment in Benefit Cost Analysis: A Case of Four Lower Snake Dams* (1999) (unpublished M.P.A. thesis, Univ. of Wash.) (on file with authors) (citing Keith C. Peterson & Mary E. Reed, *Controversy, Conflict and Compromise: A History of the Lower Snake River Development* (1995); Mary E. Reed, *A History of North Pacific Division, U.S. Army Corps of Engineers* (1991)). As noted previously, the original analyses also failed to consider issues of uncertainty. According to Gary Ellis of the U.S. Army Corps of Engineers, the ongoing Lower Snake River Feasibility Study includes a section on uncertainty. See Comments on a Draft of this Article by Gary Ellis, U.S. Army Corps of Engineers (June 7, 1999) (on file with authors).

Columbia Rivers.¹⁰⁹ One cannot report either comprehensively or definitively on these studies, as most are incomplete. But if past reports, current studies, drafts of forthcoming studies, and the guidelines used by the Army Corps of Engineers are any indication, legal rights and psychological expectations and the distinction between valuing gains and losses in terms of WTP and WTA will be largely ignored. In general, the studies simply use the WTP as the measure of costs and benefits for all interests and ignore key interests, particularly tribal rights and existence value.

These issues are evident in one of the few completed reports, Lansing's analysis of restoring the Lower Snake to a free-flowing river.¹¹⁰ He concludes that removal of the four Lower Snake River dams is supported by his benefit cost analysis. The study fails to distinguish between the use of WTP and WTA for any of the interests addressed. He focuses only on costs and savings associated with power generation, mitigation of impacts on salmon, navigation, and irrigation. In doing so, he gives no consideration to rights. The study fails to address the effects on tribes or recreation and does not consider the existence value of salmon, a free-flowing river, or the like. On balance, an appropriate rights-based consideration of benefits and costs, incorporating all interests and the using WTA to recognize legal rights and psychological expectations, would likely lead to an increase in the calculation of the net benefits of dam removal, at least as calculated by Lansing.¹¹¹

109. See Government Accounting Office, *Potential Economic Costs of Further Protection for Columbia River Salmon* (1993); Joel R. Hamilton & Norman K. Whittlesey, Cost of Using Water from the Snake River Basin to Augment Flows for Endangered Salmon, Paper Presented Before the Reg'l Science Ass'n Meeting (Feb. 26, 1996); Harza Northwest, Inc., U.S. Army Corps of Engineers, *Salmon Decision Analysis: Lower Snake River Feasibility Study* (1996); Daniel D. Huppert & David L. Fluharty, Nat'l Marine Fisheries Serv., *Economics of Snake River Salmon Recovery* (1996); Daniel D. Huppert et al., Northwest Power Planning Council, *River Economics: Evaluating Trade-Offs in the Columbia River Basin Fish and Wildlife Program* (1999); Philip S. Lansing, Oregon Natural Resources Council Fund, *Restoring the Lower Snake River: Saving Snake River Salmon and Saving Money* (1999); U.S. Dep't of Energy, *Columbia River System Operating Review Final Environmental Impact Statement* (1995); Gardner M. Brown Jr. et al., Washington State Dep't of Ecology, *Estimated Economic Benefits of Regulations to Improve Washington State Fisheries* (1999) (unpublished, on file with authors); Daniel D. Huppert, *Snake River Salmon Recovery: Quantifying the Costs*, (Nov. 2, 1998) (unpublished, on file with authors); John Loomis, U.S. Army Corps of Engineers, *Lower Snake River Juvenile Mitigations Feasibility Study* (1999) (unpublished, on file with authors).

110. See Lansing, *supra* note 110.

111. Concerns have been raised regarding other aspects of Lansing's analysis, a subject that is beyond the scope of this Article.

A notable exception to the tendency to ignore these critical issues appears to be the Corps's ongoing Lower Snake River Feasibility Study. In response to an early draft of this paper, Gary Ellis of the U.S. Army Corps of Engineers indicates that the feasibility study now includes a section on tribal circumstances and covers existence values in a portion of the Recreation Study. While the analyses of these issues are not specifically calculated as part of the benefits and costs, they are discussed in an effort to provide information to decisionmakers.¹¹² The inclusion of these issues appears to indicate both the continued development of more sophisticated benefit cost methodologies and changes in environmental values.

A. *Distinguishing Between WTP and WTA*

The importance of choosing between the use of willingness to pay (WTP) and willingness to accept (WTA) as the measure for certain interests is demonstrated in Loomis's draft work on recreational benefits. Loomis notes:

The U.S. Water Resources Council (1983) which governs the conduct of benefit cost analyses by federal agencies such as the U.S. Army Corps of Engineers (COE) requires that benefits to the visitor be measured as the . . . net willingness to pay (WTP). . . . The economics profession also recommends net WTP as the conceptually correct measure of benefits for benefit cost analysis.¹¹³

This last sentence is incorrect. Current literature on this subject is voluminous and its conclusions are generally quite opposite of the above statement that the WTP is in all cases the correct measure.¹¹⁴ The main support for the use of the WTP is limited to practical considerations—namely that it is easier to calculate. While calculation of the WTA values may pose practical difficulties, incorporation of these values where appropriate is essential for accurate and comprehensive benefit cost analysis. As noted previously, such calculations have been found to be as

112. See Comments on a Draft of this Article by Gary Ellis, U.S. Army Corps of Engineers (June 7, 1999) (on file with authors).

113. U.S. Water Resources Council, *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* (1983). The conclusions of the U.S. Water Resources Council rely on the work of Sassone & Schaeffer and Loomis & Walsh.

114. Loomis's citation is to an outdated textbook that has never been well regarded.

much as nineteen times greater.¹¹⁵ Thus, the use of WTA in appropriate circumstances to recognize the existence of legal rights or psychological expectations generally leads to much higher calculations of project benefits and costs and can significantly alter the results of the benefit cost analysis.¹¹⁶

B. Recognition of Tribal Rights

As in Lansing's analysis, few of the current studies address the issue of tribal rights.¹¹⁷ From a rights perspective, tribal interests should receive economic standing in recognition of their legal rights and psychological expectations. As noted previously, treaties have been interpreted as a reservation of legal right and the tribes have a strong sense of psychological expectation to the existence and harvest of the salmon. Using the WTA value to represent the tribes' legal rights, psychological expectations, and the restoration of these rights and expectations will result in significantly greater benefit calculations of proposals to protect and restore salmon.

C. Accounting for Existence Values

As noted previously, important issues arise with existence values.¹¹⁸ whose existence values should the analyst include, for which goods should the analyst calculate existence values, and when should the willingness to accept (WTA) be used rather than the willingness to pay (WTP)? Determination of which individuals and goods to include in measuring existence values and the appropriate use of WTA for existence values will, in many cases, be determinative of the benefit cost outcome. Resolution of these issues is critical, yet it has been substantially neglected in the various reports. Two studies highlight the challenges associated with measuring existence values and demonstrate

115. See *supra* note 22 and accompanying text.

116. In response to an early draft of this paper, Loomis indicates the potential of revising his work to take into account the appropriate use of WTP and WTA. See Comments on a Draft of this Article by John Loomis (June 9, 1999) (on file with authors).

117. The Corps's ongoing Lower Snake River Feasibility Study includes a section on tribal circumstances that includes tribal viewpoints regarding the various alternatives discussed in the study. See Comments on a Draft of this Article by Gary Ellis, U.S. Army Corps of Engineers (June 7, 1999) (on file with authors).

118. See discussion *supra* Part III.I. In addition, there exists the practical problem of accurate measurement.

the impact of including existence values and resolving these challenges can have on the outcome of the analyses. Clearly there remain issues of standing with respect to existence values: for whom are existence values measured and what goods are considered to have existence value.¹¹⁹

Huppert estimates the existence value associated with dam removal on the Lower Snake based on calculations for the Pacific Northwest, speculating that the high value is unlikely to be greater than \$204 million per year.¹²⁰ Loomis, however, estimates existence value using values for the Pacific Northwest and California, resulting initially in much higher existence value estimates of approximately \$1040 million per year.¹²¹

Loomis's study points to a second issue related to the inclusiveness of existence value. Existence value is calculated for the predicted increase in salmon as well as for returning the Lower Snake to a free-flowing river, independent of any effect on salmon populations.¹²² This demonstrates how the inclusion of all potential classes of existence value is likely to further impact the outcome of benefit cost analyses associated with dam modifications.

Existence values also require consideration of the distinction between the use of willingness to pay (WTP) and willingness to accept (WTA). As noted previously, if restoration of salmon and a free-flowing river are properly regarded as the restoration of a loss in recognition of psychological expectations of the public, then the WTA measure should be used. The resulting values will likely be significantly higher than those calculated using a WTP measurement.¹²³

The importance of properly accounting for questions of economic standing and correctly measuring existence value using willingness to accept (WTA) can hardly be overestimated. How the issues are resolved will have a significant impact on the results of any benefit cost analysis.

119. Any economic argument for dam removal or modification would be made much stronger by the inclusion of existence values. The differences between Huppert's, Loomis's and McKean's analyses are important and are issues of legal and economic standing. See discussion *supra* Part II.E.

120. See Daniel D. Huppert, *Snake River Salmon Recovery: Quantifying the Costs* 11 (Nov. 12, 1998) (unpublished, on file with authors).

121. See Loomis, *supra* note 110. This figure has been revised by Loomis to \$96 million per year. The revision is based on the assumption that without dam removal, salmon numbers will remain stable. If the assumption is made that salmon numbers will continue to decline without dam removal, the revised estimated existence value is \$732 million per year. See Comments on a Draft of this Article by Gary Ellis, U.S. Army Corps of Engineers (June 7, 1999) (on file with authors).

122. The study calculates \$1040 million for salmon and \$420 million for a free-flowing river.

123. See discussion *supra* Part II.C.

The failure of studies to use the proposed rights-based methodology means the benefit cost analyses will not provide an accurate and comprehensive assessment of the true impacts of the proposed salmon recovery efforts. The analyses will therefore fail to provide accurate and useful information to decisionmakers as they assess the trade-offs of the proposed actions.

V. CONCLUSION

Benefit cost analyses of proposed alterations to hydroelectric projects as part of salmon protection efforts should address both legal rights and psychological expectations in order to result in comprehensive and accurate assessments from which to make informed decisions. Proper consideration of rights affects the measurement of benefits and costs by requiring the distinction between willingness to pay (WTP) and willingness to accept (WTA) values. The generally higher values associated with WTA measurements are warranted in cases where the interests have either legal rights or psychological expectations. In addition, consideration of rights alters the determination of whose interests and what goods are to be included in the analysis. Proper consideration of these issues has the potential to significantly affect the outcome of the analysis and influence the decisionmaking process. In the case of proposals to alter Northwest hydroelectric projects in an effort to restore salmon, the net benefits of such efforts are likely to be significantly higher under a proper rights-based analysis.

These issues are not trivial ones. Insofar as benefit cost analyses do not address them, the analyses contribute less to the appropriate public discussion required as the public and decisionmakers may not have adequate information from which to assess the true trade-offs of alternative actions.

