Economic Benefits of Conserved Rivers: An Annotated Bibliography

Rivers, Trails & Conservation Assistance Program

National Park Service
June, 2001

NATIONAL PARK SERVICE
DEPARTMENT OF THE INTERIOR

Economic Benefits of Conserved Rivers: An Annotated Bibliography

Rivers, Trails, & Conservation Assistance Program

National Park Service

June, 2001

ACKNOWLEDGEMENTS

The Rivers, Trails and Conservation Assistance Program would like to thank the following people for their efforts, comments and edits:

Chris Brown; National Park Service, Washington, DC
Mark Brown; National Park Service, Washington, DC
Don Elder; River Network, Washington, DC
Cherri Espersen; National Park Service Washington, DC
Dan Haas; National Park Service, Seattle Support Office
Corita Jones; National Park Service, Washington, DC
Angie Tornes; National Park Service, Wisconsin Field Office

Technical Advisor
Roger Moore, PhD. North Carolina State University

Contributing Authors
Beth Porter, Shannon Collier, Mirtha Becerra, and Jennifer Schulz

Cover Design
National Business Center, US Department of the Interior
Washington DC

TABLE OF CONTENTS

About the Rivers, Trails and Conservation Assistance Program

The Rivers, Trails and Conservation Assistance Program (commonly known as Rivers & Trails) is a community resource program of the National Park Service that helps local partners build healthy communities across the country in a variety of ways. Rivers & Trails is a unique and innovative program that works at the grassroots level with citizen groups and state and local governments to restore nearby rivers, preserve valuable open space, and develop trail and greenway networks. For a list of Rivers & Trails program offices, see page 27.

INTRODUCTION

Why an Annotated Bibliography?

As river conservation enters the new millennium, conservation advocates are increasingly faced with the challenge of demonstrating to local communities that protecting rivers is a sound economic investment as well as good environmental and social policy. Anecdotal information about increased recreation/tourism dollars, enhanced property values, and municipal savings in drinking water protection abounds. But how many documented studies with sound methodologies have actually been conducted to confirm these assertions? The National Park Service's Rivers, Trails and Conservation Assistance Program (hereafter referred to as "Rivers & Trails") conducted a literature search and concluded that there is little information that addresses the economic benefits of river conservation. Staff found that even the available information is not presented in a forum easily accessible to the general public.

The Economics of River Conservation: An Annotated Bibliography is an effort to document, enhance and share knowledge of the economic benefits of conserved rivers. It offers an extensive list of studies, papers, and articles on this subject, with summaries of their content. It is the authors' intent that the studies presented in this bibliography will get further recognition and increased use, and that researchers will continue to add to this body of knowledge through further study and documentation.

Methodology

In 1999, Rivers & Trails staff began searching for completed or yet to be published studies on the economic benefits of conserved rivers and related topics. With the help of the North Carolina State University library, staff accessed a wealth of electronic databases that contain studies on environment-related topics throughout the world. The primary databases that provided extensive resources were the US Department of Agriculture database (AGRICOLA), the Center for Agriculture and Biosciences International (CAB), Cambridge Scientific Abstracts (CSA), and the Water Resources Abstracts. Newspaper and periodical articles and scientific papers were identified from these and other related sources.

Requests for information were sent out via river-related list-serves as well as to Rivers & Trails staff nationwide. The libraries at the Department of the Interior and the National Center for Recreation and Conservation were scoured for applicable studies. Finally, the following agencies and organizations were contacted for information: Bureau of Land Management, US Forest Service, Federal Emergency Management Agency, America Outdoors, American Rivers, American Whitewater, the Association of State Floodplain Managers, the Izaak Walton League of America, and River Network.

When inquiries began to produce redundant results, Rivers & Trails staff ended the searching phase and began to evaluate the usefulness of what they had found. The approximately 300 studies collected were further screened to the final 56 titles that appear in this report with annotations. The screening process was accomplished by determining which studies met the following criteria:

annotations. The screening process was accomplished by determining which studies met the following criteria:

- Study relates specifically to the economics of river protection,
- Study publication date is within the last ten years, unless it is a unique or ground-breaking study,
- Study provides information that is potentially useful to citizen groups and/or local governments,
- Study is easily accessible via the Internet or public libraries.

Thirty-seven additional studies can be found in the appendix. These are related studies that may be useful, but did not meet all of the above criteria.

General Findings

The 56 annotated bibliographies were organized into the following nine categories: Floodplain Management, Instream Flow, Property Value, General Value to the Public, Recreation and Tourism, Water Quality, Wildlife/Habitat/Riparian, "How to…" and Removal of Unsafe/Obsolete Dams. The numbers and types of studies varied tremendously. The bulk fell into two main categories: Instream Flow and Recreation and Tourism. Use of the above noted criteria was critical in limiting these large numbers to a more manageable list. While the economic effect of dam removal is a burgeoning field of study, NPS staff found only a few studies on this topic. Because of the increased interest in this issue, much more data is expected to become available over the next few years. Only a handful of studies on property values, riparian areas, wildlife and habitat, and floodplain management were found which addressed the economic benefits of conserved rivers.

If readers are aware of recent, quality studies that meet the above criteria, but are not included in this bibliography please contact Beth Porter at **beth_porter@nps.gov**. We will maintain a file for possible future updates. Rivers & Trails' goal is to ultimately fill all knowledge gaps on this issue. In the meantime, program staff hope that the existing references will aid advocates and government officials in their work to protect our Nation's river systems.

The Economic Benefits of Conserved Rivers: An Annotated Bibliography

Rivers, Trails and Conservation Assistance Program
National Park Service

FLOODPLAIN MANAGEMENT

Cowdin, S. (Date unknown). Multi-objective Approaches to Floodplain Management on a Watershed Basis: A Framework for Assessing Benefits and Costs. California Department of Water Resources, Division of Flood Management and Division of Planning and Local Assistance.

This paper presents information on natural floodplain functions, their societal values, techniques to measure economic values, and methods for valuing floodplain functions. Methods discussed include: the value of production increase, replacement cost, avoided cost, opportunity cost, hedonic pricing, travel cost, and contingent valuation. Also addressed is the watershed approach to floodplain management and a case study on the Middle Creek Restoration Project at Clear Lake, California. A framework for creating a cost-benefit analysis for environmental management is provided.

Loomis, J. B. (1994). Determining Benefits and Costs of Urban Watershed Restoration: Concepts, Techniques and Literature Review. Fort Collins, CO: Colorado State University, Department of Agricultural and Resource Economics.

This study details the economic benefits that natural stream channel restoration can provide, including flood damage reduction, cost savings, and enhancement of the natural environment. Techniques for estimating flood damage reductions are identified.

Determination of Impacts from Flood Study Modifications, McAlpine Creek Watershed. Charlotte, North Carolina: Mecklenburg County Engineering and Building Standards (2000).

This study uses the preliminary NIBS/FEMA HAZUS Flood Estimation Methodology to estimate differences in potential flood damage based on original, revised, and projected floodplain maps. Mecklenburg County, North Carolina was used as an example for this procedure; study results support the effectiveness and applicability of this method and are reported in monetary terms.

Olsen, J.R., & Beling, P.A., et al. (1998). Input-output Economic Evaluation of System of Levees. Journal of Water Resources Planning & Management, 124 (5), 237-246.

Presented is a method to estimate the economic effects of flooding over a region of interacting floodplains and other lands by incorporating a Leontief economic input-output model. Authors discuss how the model is used, how to relate flood probabilities to output, and provide application examples.

INSTREAM FLOW

Amirafathi, P., Narayanan, R., Bishop, A. & Larson, D. (1985). A Methodology for Estimating Instream Flow Values for Recreation. Water Resources Planning Series, (UWRL/P-85/01). Logan, UT: Utah State University, Utah Water Research Laboratory.

This empirical study on the non-market value of instream flows focuses on the Blacksmith Fork and Little Bear River drainages in Cache County, Utah and on the Logan River in northern Utah and southern Idaho. A methodology is developed for estimating recreational benefits of instream flow when multiple sites are available.

Berrens, R.P., Ganderton, P., & Silva, C.L. (1996). Valuing the Protection of Minimum Instream Flows in New Mexico. Journal of Agricultural and Resource Economics, 2 (2), 294-308.

This empirical study uses a dichotomous choice contingent valuation method survey to estimate non-market values of instream flows in New Mexico rivers. Results indicate a public willingness to pay in order to protect minimum instream flows in New Mexico based primarily on benefits such as water quality, fish and wildlife habitat, and biodiversity.

Colby, B.G., Leones, J., Mullahy-Koenig, C., & Ryan, L. (1994). River Recreation and the Economy of Northern New Mexico. Tuscon, AZ: University of Arizona, Department of Agricultural and Resource Economics.

This study summarizes the economic impacts of whitewater rafting in northern New Mexico. The study estimates the growth in economic activity that an increase in summer river flows can bring to the local economy. Four factors are considered when determining total annual visitor expenditures generated by river running and how changes in these are attributable to changes in river flow: 1) Per person expenditures of river runners, 2) Total number of people rafting, 3) Proportion of those who come primarily to raft, and 4) Proportion of persons rafting who are nonresidents. Findings show considerable economic and environmental benefits in maintaining strong stream flows to provide for attractive recreational opportunities.

Daubert, J.T., & Young, R.A. (1981). Recreational Demands for Maintaining Instream Flows: A Contingent Valuation Approach. American Journal of Agricultural Economics, 63 (4), 666-676. Lexington, KY: American Agricultural Economics Association.

This study of the Cache la Poudre River in northern Colorado uses the contingent valuation method to estimate the value of instream flows to recreationists. The findings indicate that variation in instream flows strongly affects fishing and white-water recreation experiences. For instance, lower flow yields less recreational use of the river and lower willingness to pay for recreational uses.

Douglas, A., & Taylor, J. (1998). Riverine Based Eco-tourism: Trinity River Non-market Benefits Estimates. International Journal of Sustainable Development and World Ecology, 5 (2), 136-148.

Combinations of mail-in and telephone surveys were used to assess the net social benefits of increasing streamflows for the Trinity River in California. A cost-benefit analysis, involving the travel cost and willingness to pay methods, compares two riverine water resource allocation scenarios: 1) A market-oriented development use of the riverine water resource, and 2) An aquatic habitat and eco-tourism use of the water resource. The study argues that development use of the water resource is not sustainable, while the aquatic habitat provision is sustainable.

Duffield, J.W., Brown, T.C., & Allen, S.D. (1994). Economic Value of Instream Flow in Montana's Big Hole and Bitterroot Rivers. (No. RM-317). Fort Collins, CO: Rocky Mountain Forest and Range Experiment Station, USDA Forest Service.

This study estimates the economic value of recreation activities such as angling and boating, as well as preservation benefits along the Big Hole and Bitterroot Rivers in Montana. Contingent valuation surveys were used to determine the public's willingness to pay for instream flows and the contribution of instream flow to the value of recreation trips. The results indicate substantial economic value for maintaining instream flows above minimum levels.

Flug, M., & Montgomery, R.H. (1988). Modeling Instream Recreational Benefits. Water Resources Bulletin, 24 (5), 1073-1081.

This study proposes an alternative method for modeling the effect different river flows have on various recreational uses. The multi-objective decision theory, relating instream recreational preferences to river flow, includes determining, standardizing, and combining recreational benefit functions. Applied to the New River Gorge in West Virginia, the methodology examines different types of flow patterns resulting from reservoir regulations and its potential impact on instream flow.

Frymier, L.G., & Mitchell, C.H. (1997). A Comparative Analysis of Value Between Users and Non-users of the White River. Proceedings of the 1996 Northeastern Recreation Research Symposium March 31- April 2, 1996, on Lake George in Bolton Landing, New York. (pp. 79-81). Randor, PA: USDA Forest Service Publications Distribution.

This paper addresses the total economic value associated with protecting natural river flow levels of the White River in Vermont. The contingent valuation method was used to estimate changes in value associated with hypothetical river flow reductions. Results provide both a set of guidelines for how to best manage water resources in Vermont and an assessment of the significant amount of money White River users contribute to the Vermont economy.

Gonzalez, C., & Loomis, J.B. (1997). Economic Benefits of Maintaining Ecological Integrity of Rio Mameyes, in Puerto Rico. Ecology and Economy, 21 (1), 63-75.

This study uses contingent valuation surveys of Puerto Rican households to estimate residents' willingness to pay for preserving instream flows in the Mameyes and Fajardo Rivers. Results indicate that the annual base amount people are willing to pay is $11.33 million for the Mameyers, and $13.09 million for the Fajardo.

Leones, J. (1997). Measuring Regional Economic Impacts of Streamflow Depletions. Water Resources Research, 33 (4), 831-838.

This study of the Rio Grande near Taos, New Mexico, examines three factors that determine rafting revenues: per person expenditure levels, the importance of rafting as a reason to visit the area, and visitor numbers. It also estimates the local economic impacts of maintaining adequate river flow levels throughout the summer. Results indicate that recreational expenditures in the area are dependent on the levels of instream flow during the summer season. Maintaining higher water levels during mid-to-late summer was found to increase total economic impacts of the local rafting industry.

Loomis, J.B. (1998). Estimating the Public's Values for Instream Flow: Economic Techniques and Dollar Values. Journal of the American Water Resources Association, 34 (5), 1007-1014.

This study presents several case studies that use surveys and voting system techniques to estimate dollar values of environmental benefits. These techniques allow water managers to estimate how much the public is willing to pay for resource management. Results show that focusing on minimum instream flow is less efficient for resource managers than emphasizing the economically optimum amount of flow needed to support healthy fish populations and a quality recreation experience.

Loomis, J.B., & Creel, M. (1992). Recreation Benefits of Increased Flows in California's San Joaquin and Stanislaus Rivers. Rivers, 3 (1), 1-13.

California households were surveyed in order to estimate the monthly recreation benefits to anglers, wildlife viewers, and waterfowl hunters on the San Joaquin and Stanislaus Rivers. Results show that an increase in summer flows in California's San Joaquin River yields estimated recreation benefits in excess of $70 per acre-foot (with peak values in August). The model structure allows for estimating monthly values of water flow and may be useful in aiding instream flow decisions involving renewal of federal water delivery contracts and hydroelectric re-licensing decisions.

Narayanan, R. (1986). Evaluation of Recreational Benefits in Instream Flows. Journal of Leisure Research, 18 (2), 116-128.

Using the travel cost approach, demand for recreation and visiting habits based on stream flows are studied in order to propose a methodology for estimating instream flow benefits. The methodology is then applied to a case study area, the Blacksmith Fork of the Little Bear River, Utah. Total economic benefits of recreation in this area were estimated to be $8,064 with the marginal instream flow benefit estimated to be $0.42/acre-foot.

Narayanan, R., Larson, D., Bishop, A., & Amirfathi, P. (1983). An Economic Evaluation of Benefits and Costs of Maintaining Instream Flows. Water Resources Planning Series, (UWRL/P-83/04). Logan, UT: Utah State University, Utah Water Research Laboratory.

Demands for off-channel water use puts pressure on instream flows. This study examines the value of instream flows and their uses by looking at different management strategies and models. The researchers attempt to provide a basis for optimizing instream flow levels for competing environmental and economic uses. In addition, a modified travel cost approach is used to estimate recreation demand from sample data from the Blacksmith Fork of the Little Bear River, Utah.

ADJACENT PROPERTY VALUE

Epp, D.J., & Al-Ani, K.S. (1979). The Effect of Water Quality on Rural Non-farm Residential Property Values. American Journal of Agriculture and Economics, 61 (3), 529-534.

The authors use real estate prices to put a value on improvements in the water quality of small rivers and streams in Pennsylvania. Specific goals are: 1) to estimate the relationship between water quality and value of residential properties adjacent to small rivers and streams, and 2) to estimate the effect of various components of water quality, such as acidity, dissolved oxygen, biochemical demand, and nitrate/phosphate levels on the value of properties adjacent to small streams. Results indicate that water quality has a positive correlation with economic value of adjacent properties.

Kulshreshtha, S.N., & Gillies, J.A. (1993). Economic Evaluation of Aesthetic Amenities: A Case Study of River View. Water Resources Bulletin, 29 (2), 257-266.

This study employs market and non-market valuation techniques to estimate the value of aesthetic amenities that the South Saskatchewan River provides to residents of Saskatoon, Canada. Two major areas in which greater aesthetic amenities provide greater value are identified: ownership of property, and rental of private property. Findings indicate that aesthetic amenities provided by the river amounted to approximately 10 percent of the annual economic contribution the South Saskatchewan River makes to the city.

Leefers, L, & Jones, D.M. (1996). Assessing Changes in Private Property Values Along Designated Natural Rivers in Michigan. Lansing, MI: Michigan State University, Department of Forestry.

This comprehensive study examines property values and selling prices along areas with 'Natural River' designation in Michigan. The results reveal that property values and selling prices are indeed higher along areas with 'Natural River' designation. The study details the procedures used as well as the methods for data evaluation.

Rosner, M. H., & Barrows, L. R. (1976). Who Pays for the Wild Rivers?: An Analysis of the National Park Service's Wild Rivers Program on Property Taxes in Washburn County, (Cooperative Extension Service no. 110). Madison, WI: University of Wisconsin, College of Agricultural and Life Sciences.

Concern over land acquisition by the National Park Service (NPS) in Washburn County, Wisconsin is addressed. It is generally believed that higher property taxes result when land is removed from the tax base. However, the authors' findings suggest that the impact on property taxes of removing public lands from the tax base is negligible – an increase of only $0.01 per $1000.00. This small increase in property tax is because the tax-loss associated with NPS land acquisition was mostly made up through small increases in income and sales taxes and additional sources of revenue statewide instead of through local property tax increases.

GENERAL VALUE TO THE PUBLIC

Gordon, J.A., & Baker, S.L. (1995). The Buffalo National River: A Political and Socioeconomic Analysis. Harrison, AR: Buffalo River Stewardship Foundation.

A political and socioeconomic analysis of Arkansas' Buffalo National River looks at the economic impact of four pollutants and their effect on recreational activity. Evidence indicates that the "possible worst case" scenario, with pollution levels at a recorded maximum for each month of the year, would cause visitation to decrease by 44,000 visits per year, costing $7.1 million dollars in gross revenue. The study also investigates potential increases in pollution levels and describes the political orientation of the region. Results set out a framework for analyzing available policy options.

Huse, S. (1987). Norwegian River Protection Scheme: A Remarkable Achievement of Environmental Conservation. Ambio Ambocx, 16 (5), 304-308.

Norway's national river protection scheme and the complex issues that arise in the debate over natural resource conservation versus economic development are discussed. Efforts to set aside a number of representative river systems for purposes other than hydropower development have been one of the dominating environmental issues in Norway for the past few decades.

Koberstein, P. (1997). What's a River Worth? River Values, 8-12. American Rivers.

This article supports the claim that revitalized and protected rivers can produce quantifiable economic benefits. The Missouri, Columbia, and Blackfoot Rivers provide examples of how rivers can attract new small businesses and recreation and tourism dollars to communities. The purpose is to show that rivers provide economic benefits beyond those generated by industrial uses.

Loomis, J., Kent, P., Strange, L., Fausch, K., and Covich, A. (1999). Measuring the Total Economic Value of Restoring Ecosystem Services in an Impaired River Basin: Results from a Contingent Valuation Survey. Ecological Economics, 33 (2000), 103-117.

This paper quantifies willingness to pay for restoration of five ecosystem services: dilution of wastewater, natural water purification, erosion control, habitat for fish and wildlife, and recreation, along a 45-mile stretch of the South Platte River near Denver, Colorado. Household surveys were used to determine willingness to pay by giving individuals the hypothetical option to pay for protection of ecosystem services through higher water bill costs. Results indicate that those surveyed would pay an average increase of $21 a month ($252 annually) for the five ecosystem services.

Sanders, L.D, Walsh, R.G, & Loomis, J.B. (1990). Toward Empirical Estimation of the Total Value of Protecting Rivers. Water Resources Research, 26 (7), 1345-1357.

This study uses a statistical demand function to estimate Colorado residents' willingness to pay for river protection in the Rocky Mountains. Results suggest that the 'total value' of a river should include direct consumption benefits such as onsite recreation, as well as offsite preservation benefits such as information consumption (interpretation and education) with regards to river activities and resources. A sample of the general population reported a willingness to pay for (rather than forego) on or off-site uses. It is recommended that off-site values be included with the value of onsite recreation use when determining the total value of rivers to society.

Walsh, R.G., Sander, L.D., & Loomis, J.B. (1985). Wild and Scenic River Economics: Recreation Use and preservation Values. Fort Collins, CO: Colorado State University, Department of Agriculture and Natural Resource Economics.

This study uses the contingent valuation method (CVM) to estimate recreational use and low to no-use preservation values of Wild and Scenic Rivers in Colorado. Provided is a monetary comparison between recreation and preservation values for the eleven rivers that were studied for possible Wild and Scenic designation in Colorado.

What's a River Worth?: A Valuation Survey of the Ohio River Corridor. Ohio River Valley Water Sanitation Commission, National Park Service, and The Ohio River Basin Commission (1994).

This report provides an overview of the role and impact of the Ohio River in its economic, cultural, and environmental/natural resource dimensions. The authors estimated river-generated annual income, including the value of products shipped and income from events held along the river. Findings incorporate economic information on employment, tourism, urban benefits, recreation, and natural resources associated with the Ohio River.

RECREATION & TOURISM

American Rivers (1998). River of Promise: The Untapped Potential of Recreation and Tourism on the Missouri River. Washington, DC: American Rivers.

Authors offer alternatives to commercial navigation and dam operation along the Missouri River. Authors suggest that recreation and tourism should be allowed to generate more economic benefits on and along the river. The paper points out the ways in which recreation and tourism benefits are underestimated and describes techniques that measure their economic value.

Bowker, J. M., English, D. B. K., & Donovan, J.A. (1996). Toward a Value for Guided Rafting on Southern Rivers. Journal of Agriculture and Applied Economics, 28 (2), 423-432.

This study examines per trip consumer surplus associated with guided whitewater rafting on two southern rivers. Household recreation demand functions are estimated based on the individual travel cost model. Results indicate that average per trip consumer surplus estimates (between $89 and $286) depend on river quality and modeling assumptions.

Cordell, H. K., Bergstrom, J. C., Ashley, G. A., & Karish, J. (1990). Economic Effects of River Recreation on Local Economies. Water Resources Bulletin, 26 (1), 53-60.

This article discusses recreational expenditures in three National Park Service river recreation sites and the effects these expenditures have on local economic growth. The three sites studied are the Delaware Water Gap National Recreation Area in New Jersey and Pennsylvania, the New River Gorge National River in West Virginia, and the Upper Delaware Scenic and Recreational River in Pennsylvania and New York. Findings from an input-output model indicate that spending by visitors to river recreation sites stimulates growth and activity in corresponding local economies.

Douglas, A.J., & Harpman, D.A. (1995). Estimating Recreation Employment Effects with IMPLAN for the Glen Canyon Dam Region. Journal of Environmental Management, 44 (3), 233-247.

This study examines the economic implications of water-based recreational activities at the Lee's Ferry site on the Colorado River. Analyses estimate the job impacts of expenditures for recreation trips. Input-output models of water-based recreational activities were used, and conclude that the outdoor recreation sector of the economy is relatively labor intensive.

An Economic Impact Study of the Whitewater Resource of the Nantahala River Gorge on Swain County and the Surrounding Region. North Carolina Department of Natural Resources and Community Development, Asheville Regional Office (1982).

This study describes the economic impact of the Nantahala River Gorge on Swain County, North Carolina and the surrounding region. A secondary theme addresses economic impacts of flow fluctuation in the Nantahala River, giving specific attention to flow fluctuations caused by power generation (a manipulative factor). Results serve as a basis for evaluating the economic impact of the river; needs for further information and data for economic impact studies are identified.

English, D.B.K., & Bowker, J.M. (1996). Economic Impacts of Guided Whitewater Rafting: A Study of Five Rivers. Water Resources Bulletin, 32 (6), 1319-1328.

This article examines economic impacts of guided whitewater rafting on five rivers: the Nantahala in North Carolina, the Gauley in West Virginia, the Kennebec in Maine, the Middle Fork of the Salmon in Idaho, and the Chatooga in Georgia and South Carolina. Results suggest that economic impacts increase with length and remoteness of the river.

Loomis, J.B. (1989). A Bioeconomic Approach to Estimating the Economic Effects of Watershed Disturbance on Recreational and Commercial Fisheries. Journal of Soil and Water Conservation, 44 (1), 83-87.

This study estimates changes in value of recreational and commercial fisheries due to timber harvesting and road building in two national forests. A travel-cost method is applied to bioeconomic models of the fisheries in order to examine incremental changes in economic value under different levels of watershed disturbance. Results for the Siuslaw National Forest indicate that the loss of salmon and trout due to clear-cutting on 87 acres of forestland resulted in a $2 million dollar economic loss to recreational and commercial anglers over a 30-year period. Results indicate that timber harvesting in the Porcupine-Hyalite Wilderness study area in Montana resulted in a loss of $3.5 million in trout fishing over a 50-year period.

Loomis, J.B., & Peterson, G.L. (Date unknown). Economic Information in River Recreation Management. Fort Collins, CO: US Fish & Wildlife Service, US Forest Service.

This study presents a guide for identifying differences between financial – measurable revenue/sales value, and economic – intrinsic, option, existence and bequest values, of a river. Identified are economic measures that can be used to address various river management issues. A graphical analysis is used to demonstrate the need for economic efficiency measures, such as willingness to pay and consumer surplus, when evaluating economic Benefit Cost Analyses or in National Forest Planning. The study concludes with a discussion of two commonly used techniques to measure willingness to pay for river recreation and off-site preservation values of rivers.

REMOVAL OF UNSAFE/OBSOLETE DAMS

Chatterjee, P. (1997). Dam Busting. New Scientist, 154 (2082), 34-37.

This article examines the current trend of dam demolition campaigns in the US and elsewhere, with special focus on the Newport No. 11 in Vermont and the Ft. Edwards dam on the Hudson River in New York. Benefits of demolition are introduced, including restoration of salmon spawning, generation of income from fishing and tourism, and the cost of demolition relative to the cost of repair. Potential environmental hazards caused after demolition are discussed, including risks of environmental damage from silt, PCBs, and other heavy metals that may be washed downstream, potentially endangering wildfowl and fish species. The importance of safety and employment of correct engineering precautions to prevent such impacts is emphasized.

Elwha River Restoration Project: Economic Analysis. A Report to: The US Bureau of Reclamation, The National Park Service, and The Lower Elwha S'Klallam Tribe. Davis, California: The Elwha Project Human Effects Team (1995).

This technical report addresses the economic implications of dam removal on the Elwha River in Washington State. Analysis consists of comparisons between four restoration alternatives and a "no action" alternative. Outlined are techniques and methods of assessing economic impacts. Findings provide economic support for a restoration plan on the Elwha River that would require removal of two dams.

Loomis, J. B. (1996). Measuring the Economic Benefits of Removing Dams and Restoring the Elwha River: Results of a Contingent Valuation Survey. Water Resources Research, 32 (2), 441-447. Fort Collins: Colorado State University, Department of Agricultural and Resources Economics.

Using the contingent valuation method, two dams on the Elwha River in Washington are examined for possible removal. Such action could restore the ecosystem and anadromous fishery. A dichotomous choice voter referendum voter technique was used to estimate the mean annual value per household in three counties in Washington, as well as aggregate benefits to the residents of Washington annually (over 10 years). Results suggest that the general public is willing to pay to remove old dams that block salmon migration.

Millham, C. B. & Russell, R. A. (1971). On the Economic Impact of Large Diversions of Snake River Waters. Water Resources Bulletin, 7 (5), 925-934.

This study discusses benefits of the Snake and Columbia River diversions in Washington State and surrounding areas, and the magnitude of economic losses sustained by diverting water from these rivers to other geographic areas. A programming model is used to assess economic loss as related to varying volumes of river-water diversions from the Snake River. Findings conclude that continuous diversion is more costly than discontinuous diversion. The estimated economic losses only apply to water used for power generation or pollution abatement. Thus, the authors consider their results to be an underestimate of the total 'true' loss from diversion.

Small Dam Removal: A Review of Potential Economic Benefits. Arlington, VA: Trout Unlimited (In Press).

This publication describes many of the potential economic benefits associated with restoring fisheries and river health through the selective removal of small dams. Using examples of more than 20 removed small dams, it makes the case that removal is often much less costly than repair. Also described are issues that local decision-makers should consider when confronted with the question of repair versus removal. Giving equal attention to immediate and future costs and benefits of all dam removal/repair options is emphasized.

WATER QUALITY

Alaouze, C.M. (1999). An Economic Analysis of the Eutrophication Problem of the Barwon and Darling Rivers in New South Wales. Australian Economic Papers, 38 (1), 51-63.

This paper focuses on the economic implications of water quality on recreation values. An example of a 1000-km, toxic blue-green algae bloom which afflicted the Barwon and Darling Rivers in 1991 is used for discussion. This bloom occurrence was attributed to increased water use for irrigation, drought, and nutrient pollution (mainly phosphorus) from sewage treatment plants and other point sources. The cost of pollution function is unknown, but results suggest that if marginal costs of phosphorus removal are low, the equilibrium level of phosphorus at each location is likely to be below that which reduces the recreational value of the rivers.

Gramlich, F.W. (1977). The Demand for Clean Water: The Case of the Charles River. National Tax Journal, 30 (2), 183-194.

A survey of 165 families' willingness to pay in the metropolitan area of Boston finds that costs and benefits of swimmable water in the Charles River are nearly equal. Determinants of willingness to pay were isolated using regression analysis. An estimate of aggregate benefits from improving water quality was developed from the regressions and compared to resource costs. The range of estimates for aggregate benefits is $8.8-21.9 million, with an average of $15.4 million, with total aggregate costs at $16.7 million. Findings from interviews and questionnaires indicate that family income, education, proximity of home and workplace to the river, graduate student status, and probability of future residence were all positively correlated with willingness to pay. A variety of independent variables were considered for analysis.

Landry, C. (1998). Market Transfers of Water for Environmental Protection in the Western United States. Water Policy, 1 (5), 457-469.

This paper discusses the trend towards buying and leasing water rights for environmental protection as an important method for protecting river and stream flows in the western United States. This region has been experiencing an increasing number of market transfers of water to protect water quality, and fish and wildlife habitats. From 1990 to 1997, more than $37 million was spent to lease 2 million acre-feet of water for environmental protection. State and federal agencies are responsible for most market transfers, but activity on the part of private organizations in acquiring water for instream needs is increasing. Also examined are recent developments of instream flow marketing in the western United States. Market information including price and quantity of water traded was collected from market participants. The average purchase and lease prices for the region are $397 and $30 per acre-foot, respectively.

Magat, W.A., Huber, J., Viscusi, W. K., Bell, J. (2000). An Iterative Choice Approach to Valuing Clean Lakes, Rivers, and Streams. Journal of Risk and Uncertainty, 21 (1), 7-43.

This article introduces an iterative choice procedure for valuing the quality of inland waters, which breaks valuation into a series of component tasks. Respondents in Colorado and North Carolina assessed the value of water quality rated "good" by EPA standards, and it was found that the value of water increases with even a 1% increase in water quality. Study results noted differences in valuation of water quality for aquatic environment, edible fish, swimming, and for water that is cloudy, smelly, or polluted by toxins.

Postel, S. L. (1998). Allocating Fresh Water to Aquatic Ecosystems: The Case of the Colorado River Delta. Water International, 23 (3), 119-125.

This is a case study of the potential economic benefits of a revitalized and protected delta ecosystem. The unique biological assets of the Colorado River delta estuary discussed in this paper indicate that efforts to determine and satisfy water needs of a threatened aquatic environment are justified. Ways in which policy and legal reforms, economic incentives, and efficiency investments can help generate water supplies to rejuvenate and maintain a healthier delta ecosystem are discussed. Also discussed are priorities for delta restoration.

Whitehead, J. C., & Groothuis, P.A. (1992). Economic Benefits of Improved Water Quality: A Case Study of North Carolina's Tar-Pamlico River. Rivers, 3 (3), 170-178.

A contingent valuation survey is used to measure the economic benefits of reduced agricultural non-point source pollution in the Tar-Pamlico River in eastern North Carolina. Surveys show respondents are willing to pay for improved water quality. Survey participants' age, number of children, income, and expected use are related to their willingness to pay. Regression results suggest that for open-ended willingness to pay response data, the Tobit technique is preferred to the ordinary least squares method due to additional information contained in the Tobit decomposition. Results imply that aggregate benefits of improved water quality would be $1.62 million each year, and the majority of voters would support a program that would raise up to $1.06 million annually for water quality improvements.

WILDLIFE/HABITAT/RIPARIAN

Crandall, K. B., Colby, B. G., & Rait, K. A. (1992). Valuing Riparian Areas: A Southwestern Case Study. Rivers, 3 (2), 88-98.

A brief review of economic techniques, including the travel cost method, contingent valuation method, and local economic impact analysis, is presented and applied to sites with instream flows and riparian ecosystems. The paper focuses on a case study of Arizona's Hassayampa River Preserve. An examination of consumer surplus values for the site, with and without perennial stream flows, reveals a large potential loss of user benefits if streamflows diminish from steady perennial flows to intermittent seasonal flows. Results are useful to policymakers and managers of riparian areas and provide economic data to facilitate decisions regarding streamflows, land use alternatives, and riparian habitat preservation.

Lant, C. L., & Roberts, R. S. (1990). Greenbelts in the Cornbelts: Riparian Wetlands, Intrinsic Values, and Market Failure. Environment and Planning, 22 (10), 1375-1388.

Contingent valuation methods are used in this study to estimate recreational and intrinsic benefits of improved river-water quality in selected river basins of Iowa and Illinois. Findings indicate willingness to pay for river-water quality is related to income and recreational participation, but not to other spatial or socioeconomic variables. Intrinsic values are found to be expressible as economic values similar to those of other public goods. In many instances, intrinsic and recreational values together are larger on a per-acre basis than the production of agricultural commodities. The authors concluded that the purpose of programs like the Conservation Reserve Program should be enlarged from their present focus on soil conservation to include water quality, aquatic ecosystems, and intrinsic values.

Palone, R. S. and Todd, A. H. (editors) (1997). Section XII - Economics of Riparian Forest Buffers. In Palone, R. S. and Todd, A. H. (editors.), Chesapeake Bay Riparian Handbook: A Guide for Establishing and Maintaining Riparian Forest Buffers. USDA Forest Service (pp. 275-298). NA-TP-02-97. Radner, PA.

This section addresses economic values of forested streams. Discussions include nutrient removal, stream temperature, erosion control, flood protection, property value, pollution prevention, recreational greenways, and wildlife habitat. Included are site-specific examples of economic impacts of riparian forest buffers. One example from Fairfax County, Virginia showed a reduction of $47 million in costs related to storm water run-off by retaining riparian forest buffers and forested areas in the county.

Qui, Z. and Prato, T. (2001). Physical Determinants of Economic Value of Riparian Buffers in an Agricultural Watershed. Journal of the American Water Resources Association, 37 (2), 295-303.

The economic value of riparian buffers presented in this study is based on reducing agricultural nonpoint source pollution and providing stream habitat protection. Physical characteristics (such as hydrologic, topographic, land use, and soil attributes) of the Coldwater Creek watershed, Missouri were studied to determine areas of the watershed where construction of riparian buffers would be most cost-effective. Geographic information systems (GIS) were used to identify these target areas. Findings indicate that riparian buffers have the greatest benefit along streams and rivers in crop production areas. Areas where buffer zones cover longer stream stretches and more acreage tend to have greater benefits than those buffer zones that are cover shorter stretches and less acreage, respectively.

HOW TO…

Andersen, S.O., Eugster, G.J., & Diamant, R. (1995). Using Economics as a River Conservation Tool. River Voices, 6, 1. River Network.

This issue of *River Voices,* River Network's monthly newsletter, provides a wide variety of techniques, lessons, and case studies that address economics as a tool for conserving rivers. Presented are five approaches to economic analyses of rivers: river recreation economics, project evaluation economics, natural watersheds for sustainable futures, land development economics, and water and power pricing economics. Also outlined are four natural resource economic valuation techniques, including the contingent valuation method, travel cost method, hedonic price method, and economic impact analysis. One article includes a detailed description of how to create a formal economic study and develop data to meet various needs. Other articles give special focus to economic impacts of river-tourism, fisheries, hydropower, and flood control/mitigation.

Economic impacts of protecting rivers, trails, and greenway corridors: a resource book. Washington, DC: National Park Service, Rivers, Trails, and Conservation Assistance Program (1995).

This publication is a "how-to" guide that instructs the reader in ways to apply economic rationale and related analyses to support river, trail and greenway projects. Sections address real property values, expenditures by residents, commercial uses, tourism, agency expenditures, corporate relocation and retention, and public cost reduction and benefit estimation. Also included are instructions on how to use a consumer price index and a sample survey for economic studies on property values and user spending.

Sanders, L.D., Walsh, R.G, & McKean, J.R. (1991). Comparable Estimates of the Recreational Value of Rivers. Water Resources Research, 27 (7), 1387-1394.

This study demonstrates how the contingent valuation method (CVM) and travel cost method (TCM) are applied to the problem of estimating recreational benefits in a case study of rivers in the Colorado Rocky Mountains. The two methods are compared and assessed for validity. Findings determine that recreation benefits estimated by the alternative methods are equal in this case; therefore, either ordinary CVM or individual TCM may provide an approximation of the recreational economic welfare effects of river protection.

Tillinghast, B., Rasnford, K., Gangemi, J., & English, D. (1998). What's a River Worth? Journal of the America Whitewater, 38 (6), American Whitewater.

This detailed article compiles research on the following topics: trip expenditure surveys, random sampling procedures, and estimation of the value of recreation through economic valuation models. In addition, veteran river activist, Tom Christopher, provides anecdotal advice.

APPENDIX

Bhat, G., Bergstrom, J., Teasley, R. J., Bowker, J.M.. & Cardell, H.K. (1998). An Ecoregional Approach to the Economic Valuation of Land and Water-based Recreation in the United States. Environmental Management, 22 (1), 69-77.

Boon, P.J., Calow, P., & Petts, G.E. (1992). River Conservation and Management, Chichester, UK. John Wiley & Sons Ltd.

Brabrec, E. (1992). The Value of Nature and Scenery. Scenic America: Technical Information Series, 1 (3).

Carlson, J.L., & Palmer, S.C. (1997). Effects of Change in Instream Flows on Recreation Use Values: An Application of Benefits Transfer. Rivers, 6 (1), 32-42.

Crandall, K.B. (1992). Measuring the Economic Values of Riparian Areas: A Case Study. Arid Lands Newsletter, 32, 18-21. Tucson, AZ. University of Arizona, Department of Agricultural Economics.

Crompton, J.L. (1999). Economic Impact Analysis: Myths and Applications. Trends, 35 (3), 43-47. National Park Service & National Recreation and Park Association.

Crompton, J.L. (2000). The Impact of Parks and Open Space on Property Values and the Property Tax Base. Ashburn, VA: National Recreation and Park Association.

Daubert, J.T. (1979). Economic Benefits from Low-flow Regulations on Colorado Mountain Streams. Dissertation Abstracts International, 40 (7), 4149-4358.

Douglas, A. (1988). Annotated Bibliography of Economic Literature on Instream Flows. Washington, DC: US Department of Interior, US Fish and Wildlife, Research and Development.

Ellefson, P.V. (1970). Estimating user Benefits of Public Recreation Areas by Demand Curve Analysis. National Marine Fisheries Service. Washington, DC: National Oceanic and Atmospheric Administration.

Fling, M., & Montgomery, R.H. (1988). Modeling Instream Recreational Benefits. Water Resources Bulletin, 24 (5), 1973-1081.

Greenely, D.A., Walsh, R.G., & Young, R.A. (1982). Economic Benefits of Improved Water Quality: Public Perception of Option and Preservation Values. Studies in Water Policy Management. Boulder, CO: Westview.

Griffin, R.C., & Hsu, S.H. (1993). The Potential for Water Market Efficiency When Instream Flows Have Value. American Journal of Agricultural Economics, 75 (2), 292-303. Ames, IA: American Agricultural Economics Association.

Loomis, J.B., & Gonzales, C.A. (1997). How Certain are Visitors of Their Economic Values of River Recreation? An Evaluation Using Repeated Questioning and Revealed Preference. Water Resources Research, 33 (5), 1187-1193.

Loomis, J.B. (1997). Use of Non-market Valuation Studies in Water Resource Management Assessments. Water Resources Update, 109, 3-9. Carbondale, IL: The Universities Council on Water Resources.

Loomis, J.B., & White, D.S. (1996). Economic Values of Increasingly Rare and Endangered Fish. Fisheries Bethesda, 21 (11), 6-10.

Loomis, J.B. (1989). Test-retest Reliability of the Contingent Valuation Method: A Comparison of General Population and Visitor Responses. American Journal of Agricultural Economics, 71 (1), 76-84.

Loomis, J.B. (1982). Effect of Non-price Rationing on Benefit Estimates from Publicly Provided Recreation. Journal of Environmental Management, 14 (3), 282-289.

Mannesto, G., & Loomis, J.B. (1991). Evaluation of Non-price Rationing and In-person Contingent Value Surveys: Results of a Study of Recreational Boaters. Journal of Environmental Management, 32 (2), 177-190.

Matthew, P. J. (1999). Water Quality Objectives: A Tool to Ensure Environmental Protection and Wise Expenditure. Water Science and Technology, 32, (5-6), 7-14.

Mayfield, M.W. & DeHart, J.L. (1989). Whitewater Rafting in the Southeastern United States: Current Status and Constraints on Future Growth. Sport Place, 3 (3), 14-19.

Moery, E., Waldman, D. (1999). Joint Estimation of Catch and Other Travel-Cost Parameters-Some Further Thoughts. University of Colorado, Boulder.

Moore, R.L., Graefe, A.R., Gitelson, R.L., & Porter, E. (1992). The Impacts of Rail-trails: A Study of the Users and Property Owners from Three Trails. Washington, D.C.: National Park Service, Pennsylvania State University.

Newsome, D. H.; Stephen, C. D. (1999). What's it Worth? Improving Surface Water Quality. Water Science and Technology, 40 (10), 153-159.

Nolan, H.J. (1999). Economic Trends in Tourism Valuation. Trends, 35 (3), 38-42. National Park Service, National Recreation and Park Association.

Postel, M.G., Berry, N., Westcott, R., Kay, M., Franks, T., & Smith, L. (1997). The Economics of Low-flow Rivers. London, UK: E. & F. N. Spon Ltd.

Sanders, L.D., Walsh, R.G., & McKean, J.R. (1991). Comparable Estimates of the Recreational Values of Rivers. Water Resources Research, 27 (7), 1387-1394.

Shafik, N. (1994). Economic Development and Environmental Quality: An Econometric Analysis. Oxford Economic Papers, 46, 757-773.

Shelby, B. (1984). Estimating Monetary Clause for Use Permits on Western Rivers. Journal of Forestry, 82 (2), 107-109.

Smith, V.K. (1996). Estimating Economic Values for Nature: Methods for Non-Market Valuation. New Horizons in Environmental Economics. Brookfield, VT: Edward Elgar Publishing.

Sorg, C.F., & Loomis, J.B. (1986). Economic value of Idaho Sport Fisheries - an Update. North American Journal of Fisheries Management, 6, 494-503.

The Center for International Public Management. (1998). Thinking Green: A Guide to the Benefits and Costs of Greenways and Trails. Florida Department of Environmental Protection, Office of Greenways and Trails.

Walsh, R.G. (1980). Empirical Application of a Model for Estimating the Recreation Value of Water in Reservoirs Compared to Instream Flow. Colorado Water Resources Research Institute, Colorado State University, Completion Report. Available from the National Technical Information Service, Springfield, VA 22161 as PB81-170532.

Warpole, S. (1991). The Recreational and Environmental Benefits of the Ovens-King River System. Australian Parks and Recreation, 27 (4), 33-37.

Welle, P.G., & Baer, N.W. (1997). Uses, Attitudes, and Values of Recreation Participants on the Mississippi Headwaters. Journal of Applied Recreation Research, 22 (2), 123-156.

Wet, Wild, and Profitable: A Report on the Economic Value of Water-based Recreation in Vermont. (1997). Montpelier, Vermont: Northeast Natural Resource and National Wildlife Federation.

Whittaker, D., Shelby, B., Jackson, W., & Beschta, R. (1993). Instream Flows for Recreation: A Handbook on Concepts and Research Methods. Anchorage, AK: National Park Service.

GLOSSARY OF ECONOMIC TERMS

BENEFIT-COST ANALYSIS: A comparison of economic benefits and costs to society of a policy, program, or action.

BEQUEST VALUE: The value that people place on knowing that future generations will have the option to enjoy something.

CONSUMER SURPLUS: The difference between the actual price paid for a good, and the maximum amount an individual is willing to pay. Thus, if a person is willing to pay up to $3 for something, but the market price is $1, then the consumer surplus for that item is $2. This measure approximates and is bounded by the more technically precise measures of economic benefit, compensating variation or equivalent variation.

CONTINGENT CHOICE METHOD: Estimates economic values for an ecosystem or environmental service. Based on individual's tradeoffs among sets of ecosystems, environmental services or characteristics. Does not directly ask for willingness to pay; inferred from tradeoffs that include cost as an attribute.

CONTINGENT VALUATION METHOD (CVM): CVM is used when trying to determine an individual or individuals' monetary valuation of a resource. The CVM can be used to determine changes in resource value as related to an increase or decrease in resource quantity or quality. Used to measure non-use attributes such as existence and bequest values; market data is not used.

DAMAGE COST AVOIDED, REPLACEMENT COST, AND SUBSTITUTE COST METHODS: Estimate economic values based on costs of avoided damages resulting from lost ecosystem services, costs of replacing ecosystem services, or costs of providing substitute services.

DEMAND FUNCTION: The mathematical function that relates price and quantity demanded for goods or services. It tells how many units of a good will be purchased at different prices. The market demand function is calculated by adding together all of the individual consumers' demand functions.

ECONCOMIC IMPACT ANALYSIS: Used to estimate how changes in the flow of goods and services can effect an economy. This method is often used in estimating the value of resource conservation.

ECOSYSTEM SERVICES: Beneficial outcomes, for the natural environment, or for people, which result from ecosystem functions. Some examples of ecosystem services are harvesting animals or plants, clean water, or scenic views. In order for an ecosystem to provide services to humans, some interaction with, or at least some appreciation by, humans is required.
EXISTENCE VALUE: The value that people place on simply knowing that something exists, even if they will never see it or use it.

EXTERNALITIES: Uncompensated side effects of human actions. For example, if a stream is polluted by runoff from agricultural land, the people downstream experience a negative externality.

HEDONIC PRICE METHOD: Estimates economic values for ecosystem or environmental services that directly affect market prices of some other good. Most commonly applied to variations in housing prices that reflect the value of local environmental attributes.

MARKET DEMAND CURVE: A curve showing the amount all persons or units in a market are willing and able to buy at each price level. It is derived by the horizontal summation of all the individual demand curves at each price level of all those in the market.

MARKET PRICE METHOD: Estimates economic values for ecosystem products or services that are bought and sold in commercial markets.

NON-USE VALUES: Also called "passive use" values, or values that are not associated with actual use, or even the option to use a good or service.

OPPORTUNITY COST: The cost incurred when an economic decision is made. This cost is equal to the benefit of the most highly valued alternative that would have been gained if a different decision had been made. For example, if a consumer has $2.00 and decides to purchase a sandwich, the economic cost may be that consumer can no longer use that money to buy fruit.

TRAVEL COST METHOD (TCM): TCM is used to estimate monetary value of a geographical site in its current condition (i.e. environmental health, recreational use capacity, etc.) by site-users. Individuals or groups report travel-related expenditures made while on trips to single and multiple recreational sites. Market values are used.

USE VALUE: The use value of a good (say, X) is the maximum amount of other goods willingly paid for acquiring good X.

VALUE ADDED: The value added to a good after it has gone through a stage in the production process.

WILLINGNESS TO PAY: The amount in goods, services, or dollars that a person is willing to give up to get a particular good or service.

Source(s): River Network's *River Voices*, vol. 6, no. 1. Spring 1995; Ecosystem Valuation, Retrieved June 2, 2001 from the World Wide Web: http://www.ecosystemvaluation.org; and Economic Definitions, Retrieved June 11, 2001 from the World Wide Web: http://www.economicstudents.com/definitions/htm.

RIVERS, TRAILS & CONSERVATION ASSISTANCE PROGRAM CONTACT INFORMATION AND OFFICE LOCATIONS

Alaska Region

Alaska
Rivers, Trails and Conservation Assistance
National Park Service
2525 Gambell Street
Anchorage, AK 99503-2892
Fax (907) 271-1782

Intermountain Region
Colorado, Montana, Wyoming
Rivers, Trails and Conservation Assistance
National Park Service
P.O. Box 25287
Denver, CO 80225-0287
Fax (303) 987-6676

New Mexico, Oklahoma
Rivers, Trails and Conservation Assistance
National Park Service
P.O. Box 728
Santa Fe, NM 87504-0728
Fax (505) 988-6123

Texas
Rivers, Trails and Conservation Assistance
National Park Service
2.308 Goldsmith Hall
School of Architecture
The University of Texas
Austin, TX 78712-1160
Fax (512) 471-5040

Arizona
Rivers, Trails and Conservation Assistance
National Park Service
Western Archeological and Conservation Center
1415 North 6th Avenue
Tucson, AZ 85705
Fax (520) 670-6525

Utah
Rivers, Trails and Conservation Assistance
National Park Service
324 South State, Room 218
PO Box 45155
Salt Lake City, UT 84145-0155
Fax (801) 539-4250

Midwest Region

Ohio, Indiana
Rivers, Trails and Conservation Assistance
National Park Service
2179 Everett Road
Peninsula, OH 44264
Fax (330) 657-2955

Michigan
Rivers, Trails and Conservation Assistance
National Park Service
9922 Front Street
Empire, Michigan 49630
Fax (231) 334-3135

Wisconsin
Rivers, Trails and Conservation Assistance
National Park Service
310 W. Wisconsin Avenue
Room 100-E
Milwaukee, WI 53203
Fax (414) 297-3660

Chicago Field Office
Rivers, Trails and Conservation Assistance
National Park Service
77 W. Jackson, W-15NPS
Chicago, IL 60604
Fax (312) 886-0168

Iowa, Kansas, Nebraska, North Dakota, South Dakota
Rivers, Trails and Conservation Assistance
National Park Service
1709 Jackson Street
Omaha, NE 68102-2571
Fax (402) 221-3465

Minnesota
Rivers, Trails and Conservation Assistance
National Park Service
111 East Kellog Blvd.
St. Paul, MN 55101-1256
Fax (651) 290-3815

Arkansas, Southern Illinois, Missouri
Rivers, Trails and Conservation Assistance
National Park Service
2100 Locust Street
2nd Floor – North, Suite 1200
St. Louis, MO 63103
Fax (314) 436-9215

Northeast Region

Connecticut, Massachusetts, Rhode Island
Rivers, Trails and Conservation Assistance
National Park Service
15 State Street
Boston, MA 02109
Fax (617) 223-5164

New York City
Waterways & Trailways
Ranaqua, 1 Bronx River Parkway
Bronx, NY 10462
Fax (718) 430-4658

Vermont
Rivers, Trails and Conservation Assistance
National Park Service
Marsh-Billings-Rockefeller National Historical Park
54 Elm St
PO Box 178
Woodstock, VT 05091
Fax (802) 457-3405

New Hampshire
Rivers, Trails and Conservation Assistance
National Park Service
P.O. Box 3176
Manchester, NH 03105
Fax (603) 641-5660

Maine
Rivers, Trails and Conservation Assistance
National Park Service
14 Maine Street, Suite 302
Brunswick, ME 04011
Fax (207) 798-4790

Upstate New York
Rivers, Trails and Conservation Assistance
National Park Service
Roosevelt-Vanderbilt NHS
4097 Albany Post Road
Hyde Park, NY 12538
Fax (845) 229-0739

Maryland, Virginia
Rivers, Trails and Conservation Assistance
National Park Service
410 Severn Avenue, Suite 109
Annapolis, MD 21303
Fax (410) 267-5777

Pennsylvania, New Jersey, Delaware
Rivers, Trails and Conservation Assistance
National Park Service
200 Chestnut Street, Third Floor
Philadelphia, PA 19106
Fax (215) 597-0932

Western Pennsylvania
Rivers, Trails and Conservation Assistance
National Park Service
338 East 9th Street
Homestead, PA 15120
Fax (412) 464-4417

West Virginia
Rivers, Trails and Conservation Assistance
National Park Service
c/o West Virginia University
Division of Forestry
P.O. Box 6125
Morgantown, WV 26506-6125
Fax (304) 293-2441

Rivers, Trails and Conservation Assistance
National Park Service
P.O. Box B
Harpers Ferry, WV 25425
Fax (304) 535-4020

Pacific West Region

Idaho, Oregon, Washington
Rivers, Trails and Conservation Assistance
National Park Service
909 First Avenue
Seattle, WA 98104-1060
Fax (206) 220-4161

Hawaii
Rivers, Trails and Conservation Assistance
National Park Service
P.O. Box 1331
Wailuku, HI 96793
Fax (808) 242-6737

Northern California, Nevada
Rivers, Trails and Conservation Assistance
National Park Service
600 Harrison Street, Suite 600
San Francisco, CA 94107-1372
Fax (415) 744-4043

Southern California
Rivers, Trails and Conservation Assistance
National Park Service
570 W. Avenue 26, Room 175
Los Angeles, CA 90065
Fax (323) 226-9235

California Hydro Program
650 Capitol Mall, Suite B-300
Sacremento, Ca 95814
Fax (916) 930-3616

Southeast Region
(www.nps.gov/sero/rtca)

Alabama, Georgia, Kentucky, North and South Carolina
Rivers, Trails and Conservation Assistance
National Park Service
Atlanta Federal Center, 1924 Bldg.
100 Alabama Street, SW
Atlanta, Georgia 30303
Fax (404) 562-3282

Tennessee
Rivers, Trails and Conservation Assistance
National Park Service
424 Georgia Avenue, Suite 2B
Chattanooga, TN 37403
Fax (423) 266-2558

Louisiana, Mississippi
Rivers, Trails and Conservation Assistance
National Park Service
365 Canal Street, Suite 2400
New Orleans, LA 70130
Fax (504) 589-3851

Florida
Rivers, Trails and Conservation Assistance
National Park Service
Historic Herald Square
531 South Pineapple Avenue, #8
Sarasota, Florida 34236
Fax (941) 373-9067

National Office
Rivers, Trails and Conservation Assistance
National Park Service
1849 C Street, NW
MS-3622
Washington, D.C. 20240
Fax (202) 565-1204