National Park Service
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Economic Values of National Park System Resources Along the Colorado River:

A Proposal for Estimating Magnitude and Significance

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0. Introduction

The Colorado River Steering Committee contacted the Environmental Quality Division early in 2005 for assistance in estimating the economic values of National Park System resources along the Colorado River. These economic values are needed for purposes of planning and for participation in water resource allocation decisions affecting the operations of National Park System units along the Colorado River. These decisions also affect the visiting public and surrounding local economies. In April 2005, the Environmental Quality Division presented a proposal to the Steering Committee for producing these estimates. That proposal was structured in the following four phases.

- ***Phase I:*** Produce a white paper that: 1) summarizes how different operating scenarios are determined along the Colorado River, 2) describes the types of economic values provided by National Park System resources along the river, and 3) presents a recommended approach to estimating relevant economic values of National Park System resources along the Colorado River.

- ***Phase II:*** Conduct an analysis of existing literature and data relevant to the economic values of National Park System resources along the Colorado River, synthesize the existing literature and data to present as complete a set of economic values as possible for National Park System resources along the river, and identify data gaps that must be filled using original research techniques.

- ***Phase III:*** Conduct original research to fill the data gaps identified in Phase II.

- ***Phase IV:*** Integrate the information from Phase II and Phase III to comprehensively estimate the economic values provided by National Park System resources along the Colorado River, relate estimated economic values to existing hydrologic models of the Colorado River system in order to evaluate the impact of alternative operating scenarios on National Park System resources, and compare the economic values provided by National Park System resources along the river to other economic values associated with the Colorado River (e.g., hydropower, water storage, irrigation water uses, urban water uses).

Phase I of this project was authorized by the Steering Committee and funded by the Water Resources Division through a Cooperative Ecosystem Study Unit task agreement with the University of Montana. On October 25, 2005, principal investigator Dr. John Duffield presented the draft white paper to the Steering Committee for consideration. The white paper was then finalized on April 17, 2006. This paper summarizes that white paper.

1. Economic Values of National Park System Resources

1.1 What Economic Values are Important?

There are many services provided by National Park System resources along the Colorado River. These include cultural, historical, recreational, and ecological services. A measure of the significance of these services to the public is their economic value. Like the resources they describe, economic values have different dimensions and manifest themselves in different ways. These economic values are broadly categorized by economists as welfare measures and regional impacts. These are described below.

Welfare measures reflect the wellbeing people derive from resources. These are the costs and benefits that constitute a cost-benefit analysis for a regulatory action, for example. Welfare measures can be further broken down by their association with established markets. ***Market values*** are associated with resources that are traded in established markets. Examples of these values include power revenues from the sale of hydropower and the costs paid by farmers for irrigation water. ***Non-Market values*** on the other hand are not associated with established markets. Examples of non-market values include the benefits obtained from scenic views enjoyed at a national park and trout fishing in a river.[1] National Park System units along the Colorado River have many resource uses that are not allocated in established markets, and therefore have significant non-market values.

Welfare measures can also be broken down by their association with the direct, on-site use of resources. ***Use values*** are associated with the direct, on-site use of resources by people. The benefits derived from camping, fishing, and wildlife viewing are examples of use values. ***Non-Use values*** are not associated with direct, on-site resource use. Rather, those values obtain from the knowledge that resources exist, or will be preserved, in a given state (i.e., the motives of existence and bequest).[2] Non-use values are particularly relevant to the management of National Park System resources given the mandates of the Organic Act and the Redwood amendment of the General Authorities Act. Those mandates establish the fundamental purposes of the National Park System as conserving park resources and values, and providing for their enjoyment by the public. The conservation of park resources and values directly relates to non-use values through the motives of existence and bequest. Non-Use values also relate to the public enjoyment of park resources and values since the public includes both people who directly experience parks on-site and those who enjoy them from afar.

The other broad category of economic values, ***regional impacts***, reflects the level of local economic activity that is associated with a particular resource use. For example, boaters on a lake purchase gas, stay at hotels, and eat at restaurants. The revenues generated by

[1] While entrance fees may be charged at a national park, and anglers incur costs to fish, fees are typically not charged for each scenic view observed at a park or for each fish caught while fishing.

[2] The dichotomies of market vs. non-market and use vs. non-use are not mutually exclusive.

these market transactions further reverberate through the economy in a domino effect of spending by supporting businesses and households. Such impacts are experienced in the form of jobs, sales revenues, and tax revenues. Regional impacts measure fundamentally different values than welfare measures. However, they are often the most visible indicators of economic value and reflect significant importance by local communities.

All of these economic values (market and non-market values, use and non-use values, and regional impacts) are important since they describe different dimensions of the interaction between National Park System resources and the public. That is, it is important to consider all these values in order to fully understand the importance of National Park System resources. This importance is described below.

1.2 Why Estimate Economic Values?

The economic values of National Park System resources along the Colorado River should be estimated because of their significant implications for resource management. This significance is demonstrated in three ways.

First, use values demonstrate the linkage between resource quality and local economic activity. Visitors are drawn to national parks because of the quality resources they offer. This demand is reflected in the use values derived by visitors from the direct, on-site use of park resources. This demand also generates visitor spending in local communities, which yields jobs, sales revenues, and tax revenues. Those regional impacts, in turn, influence resource management decisions due to their salience with local communities. The key point in this linkage is that the quality of park resources directly affects local economic activity through visitor demand. Therefore, estimates of use values and regional impacts are both indictors of the effectiveness of resource management.

Second, non-use values demonstrate the national significance of park resources. As noted above, non-use values are particularly relevant to the management of National Park System resources. A demonstration of that relevance is provided by an earlier study of non-use values in Grand Canyon National Park (Welsh et al. 1995). That study was conducted as part of the analysis of operating alternatives for Glen Canyon Dam in the 1990s. Relying on that study, a National Academy of Sciences analysis compared economic values associated with three of the dam operation alternatives for hydropower revenues, recreation use values, and non-use values (National Research Council 1996). This study concluded that national non-use values were as much as two orders of magnitude greater than the associated foregone hydropower revenues (Table 1). That is, the non-use values swamp the foregone hydropower revenues for the alternatives examined, and have tremendous allocative significance in management decisions.

Table 1
Annual Economic Values Associated with Alternative Glen Canyon Dam Operations (Million Dollars)

Flow Alternative	Foregone Hydropower Revenues	Recreation Use Values	-----Non-Use Values----- National	Hydropower Marketing Area
Moderate Fluctuating Flows	$36.7 - $54.0	$0.4	$2,286.4	$52.2
Low Fluctuating Flows	$15.1 - $44.2	$3.7	$3,375.2	$50.5
Seasonally Adjusted Steady Flow	$88.3 - $123.5	$4.8	$3,442.2	$81.4

Source: National Research Council (1996)

Third, both use and non-use values indicate the significance of park resources vis-à-vis other resource uses. The total economic value of a resource is the sum of its use and non-use values. It is this total economic value for National Park System resources that is relevant for comparison to other values of resource use such as those for hydropower and irrigation. This is primarily due to the two National Park System fundamental purposes of resource conservation and public enjoyment. Such a comparison is important to establish the relative merit of National Park System concerns in Colorado River management decisions as they affect the economic values associated with park resources, the visiting public, and surrounding communities. Credible estimates of total value would enable park managers to fairly represent their resources where such representation has not been previously possible.

The linkages of all economic values to resource management and resource quality are illustrated below in Figure 1. This figure indicates that resource quality affects visitor demand and national significance, which are measured by use values and non-use values, respectively. Use values directly stimulate regional impacts in the form of jobs, sales revenue, and tax revenue. Both use and non-use values are directly relevant in a cost-benefit analysis of river management alternatives vis-à-vis other resource uses such as hydropower and irrigation. Regional impacts and cost-benefit analysis are both relevant inputs to water resource management decisions. The demonstration of these linkages and the fair representation of park resources among competing uses are not possible without the estimation of all economic values associated with National Park System resources.

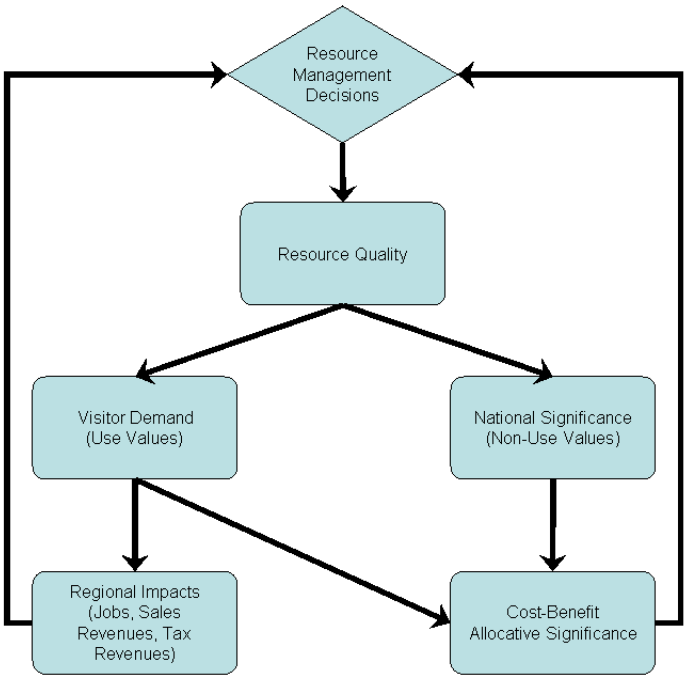

Figure 1: Linkages between Resource Quality, Economic Values, and Resource Management

2. Proposal for Estimating Economic Values

Duffield (2006) prepared a proposal for estimating the economic values of National Park System resources along the Colorado River. That proposal is organized along the four-phase structure described above, and is summarized below. Since Phase I has already been implemented, this summary begins with the next phase to be completed, Phase II.

2.1 Methods

Phase II - Review existing literature and data: This phase of the project involves collecting all existing and available data and studies that are relevant to the estimation of economic values for National Park System resources along the Colorado River. Much of the relevant economics literature has already been collected and summarized for the Phase I white paper. However, additional data on park visitation and dam and reservoir operations would be collected from the National Park Service and Bureau of Reclamation. That data would include management documents and technical reports. Additionally, relevant data and studies for resources and settings that are similar to those found along the Colorado River would be surveyed to identify possible value estimates

for use in benefits transfer analyses.[3] This information would then be synthesized to present as complete a set of economic values as possible for National Park System resources along the Colorado River. This analysis would also identify data gaps that must be filled using original research techniques.

Phase III - Conduct original research: This phase of the project involves filling the data gaps identified in Phase II. These gaps likely would include geographic areas that have not been previously studied as well as those that have been studied but need updating. For example, Bishop, Boyle, and Welsh (1987) estimated regional impacts and recreation use values in the Colorado River below Glen Canyon Dam. However, that study is limited geographically and is also dated.

It is proposed that original research efforts for this project be focused on the major two-reservoir and river corridor system that includes Glen Canyon National Recreation Area, Grand Canyon National Park, and Lake Mead National Recreation Area. This study area is where most of the hydropower is produced along the Colorado River, and where most of the water-related visitor use occurs. This study area is also significant in that it marks the location where the allocation of water between the upper and lower basin states of the Colorado River occurs. Finally, this area has national and international significance which is relevant to non-use values.[4]

This phase includes three survey efforts. First, a survey would be conducted to estimate recreation use values in the study area using a Random Utility Maximization model. This approach would require surveying within the study area as well as in other areas that are major substitutes to it. Major substitutes would likely include Black Canyon of the Gunnison National Park, Curecanti National Recreation Area, Dinosaur National Monument, Canyonlands National Park, and popular floating sections on the Green, Upper Colorado, and San Juan rivers. Survey respondents would be recruited by a combination of on-site visitor contacts and random digit dialing. Surveys would be implemented by a combination of mail and phone methods.

The second and third survey efforts would be conducted to estimate non-use values along the Colorado River and on a national scale. Welsh et al. (1995) found significant differences between the non-use values held by people within the Glen Canyon Dam hydropower marketing area and those held by people nationally. Therefore, a similar stratification is recommended for this project. For each area, a survey would be conducted to estimate non-use values for the study area using Conjoint Analysis. This approach is considered state of the art and is indorsed by the National Research Council (2005). These surveys would be implemented by phone or Internet-based methods, or a combination of the two approaches.

All three survey efforts would involve the use of focus groups in the development of survey instruments, and would rely on professional survey research firms. Peer review of

[3] Benefits transfer involves using economic values that have been previously estimated and reported in existing studies to address similar issues in other contexts.

[4] For example, Grand Canyon National Park was designated a World Heritage Site by the United Nations in 1979.

survey instruments, sampling designs, and reports would be required. Additionally, all three survey efforts would require information collection review and approval by the Office of Management and Budget (OMB).

Phase IV - Integrate and communicate results: This phase involves integrating the information from Phase II and Phase III to estimate welfare measures and regional impacts for National Park System resources along the Colorado River. This integration would relate estimated economic values to existing hydrologic models of the Colorado River system to evaluate the impact of alternative operating scenarios on park resources. In particular, a user-friendly analysis tool would be produced to enable park staff to calculate the changes in economic values of park resources that are associated with alternative operating scenarios. Finally, the results of this project would be communicated through two documents: 1) a technical document detailing the methods, data, and results of the project, and 2) a non-technical document describing the results in terms that are understandable and relevant for the general public.

A much more detailed description of this proposal is given in Duffield (2006).

2.2 Schedule

The scheduled proposed by Duffield (2006) is presented in Table 2. That schedule involves a total of approximately three to three and a half years for project completion, depending on the time required for information collection review by OMB. For planning purposes, a total of seven months was initially assumed for that review. However, substantially more time might be required. While OMB review would impact the timing of Phase III and Phase IV, no such review would be required for Phase II of the project.

Table 2. NPS Colorado River Project Timetable

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Phase II (5 months)					Phase III						
2	Phase III cont. (21 months)											
3	Phase III cont.		Phase IV (10 months)									
4	Potential OMB delay of up to 7 months											

2.3 Budget

The budget proposed by Duffield (2006) is presented in Table 3. This budget assumes that the project would continue to be implemented through the Cooperative Ecosystem

Study Unit task agreement with the University of Montana, and incorporates a 17.5 percent overhead rate.

Key personnel for this task agreement would include Dr. John Duffield, Dr. David Patterson, and Mr. Chris Neher. Subcontracts would include peer review and survey data collection. These budget amounts and the scope of work in this proposal have been approved by the University of Montana.

A detailed itemization of this budget is given in Duffield (2006).

Table 3
Proposed Project Budget

Item	Phase II	Phase III	Phase IV	Total
Direct Costs				
Labor	$91,111	$486,610	$220,532	$798,252
Travel	$720	$51,452	$1,440	$53,612
Subcontracts	$4,500	$228,000	$13,500	$246,000
Operations		$43,000		$43,000
Subtotal	$96,331	$809,062	$235,472	$1,140,864
Indirect Costs	$16,858	$141,586	$41,208	$199,651
Total Costs	$113,189	$950,647	$276,679	$1,340,515

3. Conclusions

This report summarized the white paper prepared under Phase I of the Colorado River Economic Values project (Duffield 2006). Economic values that are relevant to National Park System resources were discussed, and a rationale for estimating them was presented. Finally, the proposal for estimating these values by Duffield (2006) was summarized along with some possible alternatives to that proposal. The proposal summarized is rigorous, involves a principal investigator with a proven track record, and will yield results that are defensible and publishable for maximum credibility. Nevertheless, flexibility exists to accommodate the needs of potential partners.

4. References

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