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Economic Values of National Park System Resources Within The Lower Colorado River Basin:

A Compilation of Existing Data and Proposal for Future Work

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1. 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 to better understand how water allocation decisions affect the integrity of the resources and values 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).

Phases I and II of this project have been completed through a Cooperative Ecosystem Study Unit task agreement with the University of Montana (Duffield 2006; Duffield, Neher, and Patterson 2007). Phase III of this project is currently underway, but funded only through the study design stage. This report explains the valuation concepts addressed by this project, describes known economic values of National Park System resources within the Lower Colorado River Basin, and outlines how the project can be completed.

2. Economic Values of National Park System Resources

2.1 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 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. Like market values, non-market values describe the tradeoffs people make in order to enjoy a particular resource or activity.

Welfare measures can also be broken down by their association with the direct use of resources. ***Direct use values*** are associated with the immediate, generally on-site use of resources by people. The benefits derived from camping, fishing, and wildlife viewing are examples of direct use values. ***Passive use values*** are independent of these direct resource uses. 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] Passive 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 passive use values through the motives of existence and bequest. Passive use values also relate to the public enjoyment of park resources and values since the public includes both people who directly experience parks and those who appreciate 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

[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 direct use vs. passive use are not mutually exclusive.

on a lake purchase gas, stay at hotels, and eat at restaurants. The revenues generated by these market transactions 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, direct use and passive 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.

2.2 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, direct 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 direct use values derived by visitors from the immediate, generally 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 direct use values and regional impacts are both indictors of the effectiveness of resource management.

Second, passive use values demonstrate the national significance of park resources. As noted above, passive 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 passive 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 the economic values associated with three of the dam operation alternatives (National Research Council 1996). Specifically, the Academy examined the hydropower revenues, direct recreation use values, and passive use values of these operating alternatives. This study concluded that national passive use values were as much as two orders of magnitude greater than the associated foregone hydropower revenues (Table 1). That is, the passive 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	Direct Recreation Use Values	-----Passive 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 direct use and passive 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 direct use and passive 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 quality and resource management are illustrated below in Figure 1. This figure indicates that resource quality affects visitor demand and national significance, which are measured by direct use values and passive use values, respectively. Direct use values stimulate regional impacts in the form of jobs, sales revenue, and tax revenue. Both direct use and passive use values are 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.

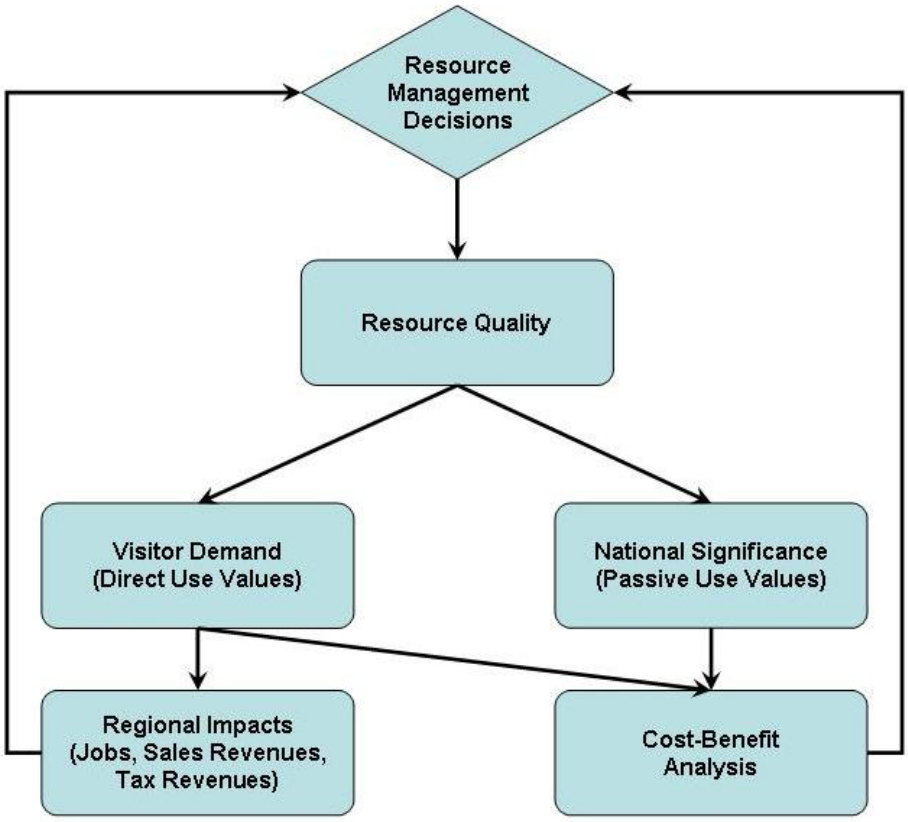

Figure 1: Linkages between Resource Quality, Economic Values, and Resource Management

2.3 Economic Values in the Lower Colorado River Basin

Some estimates of the economic values described above exist for parks in the Lower Colorado River Basin. While these estimates do not cover all relevant uses or locations and are sometimes dated, they do illustrate the magnitudes of values that can be expected for park resources. A compilation of known economic value estimates for the entire Colorado River was prepared by Duffield, Neher, and Patterson (2007) during Phase II of this project. The economic values included in that compilation for the Lower Colorado River Basin are summarized below. In particular, economic values for Grand Canyon National Park and Lake Mead National Recreation Area are presented. Those two parks have significant visitation, which demonstrates the public demand for these resources (Table 2).

The significance of the regional impacts associated with these resources is illustrated in Table 3. The annual direct spending reflects spending by visitors only, while the annual total spending accounts for visitor spending plus spending by supporting businesses and households. The employment figures are numbers of full and part-time jobs.

Table 2
National Park System Resources
In the Lower Colorado River Basin

Park	Waters	2008 Recreational Visits
Grand Canyon NP	Colorado River	4,425,314
Lake Mead NRA	Colorado River Lake Mead Lake Mojave	7,601,863

Source: National Park Service (2009).

Table 3
Regional Impacts of National Park System Resources
In the Lower Colorado River Basin

Park	Annual Direct Spending (million $)	Annual Total Spending (million $)	Total Employment (jobs)
Grand Canyon NP	298.43	434.01	7,812
Lake Mead NRA	176.82	232.64	6,052

Source: Duffield, Neher, and Patterson (2007).
Spending figures are millions of 2003 dollars. Employment figures are numbers of full and part-time jobs.

The significance of the direct use values associated with these resources is illustrated in Table 4. These values reflect the quality of park resources and the value visitors realize from their use.

Table 4
Direct Use Values of National Park System Resources
In the Lower Colorado River Basin

Study	Description	Estimated Direct Use Values ($ per trip)
Bishop et al. (1987)	Grand Canyon NP float boaters	$430 - $3,000
Hammer (2001)	Grand Canyon NP floaters	$157 (private) $368 (commercial)
Martin (1982)	Lake Mead NRA fishing	$643 - $887
Duffield & Neher (1999)	Grand Canyon NP visitors	$142

Source: Duffield, Neher, and Patterson (2007)
Direct use values are in 2005 dollars.

The significance of the passive use values associated with these resources is illustrated in Table 5. These values also reflect the quality of park resources. However, these values are held by the public in general, regardless of whether they visit a park.

Table 5
Passive Use Values of National Park System Resources In the Lower Colorado River Basin: Estimates for Glen Canyon Dam Flow Scenarios

Flow Scenario	National ($ per household)	Western United States ($ per household)
Moderate Fluctuations	$17.74	$29.05
Low Fluctuations	$26.19	$28.25
Steady Flow	$26.91	$38.02

Source: Duffield, Neher, and Patterson (2007)
Passive use values are in 2005 dollars.

Finally, Duffield, Neher, and Patterson (2007) give their opinions as to the adequacy of existing economic value estimates for the purpose of describing the significance of park resources in a defensible manner. Those opinions are given in Table 6.

Table 6
Is Sufficient Information Available Now to Describe the Significance of Park Resources In the Lower Colorado River Basin?

Park	Produce Regional Impacts?	Produce Direct Use Value Estimates?	Produce Passive Use Value Estimates?
Grand Canyon NP	YES	DATED	DATED
Lake Mead NRA			
Lake Mead	NO	NO	NO
Lake Mojave	YES	NO	NO

Source: Duffield, Neher, and Patterson (2007).

The information in the tables above suggests that substantial economic values are attributable to the management of National Park System resources in the Lower Colorado River Basin. Yet, Duffield, Neher, and Patterson (2007) indicate that much of the information needed to defensibly describe the significance of park resources in that basin is either dated or unavailable. Therefore, a current valuation effort is recommended to fill in these gaps. The section below describes how those gaps can be filled.

3. Proposal for Estimating Economic Values

As noted in the introduction above, Phases I and II of this project have been completed, and Phase III has been funded through the study design stage. What remains to finish this project is to implement the remaining stages of Phase III and to implement Phase IV.

It is proposed that original research efforts for this project continue to 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.[3]

Phase III includes two survey efforts. First, a survey will be conducted to estimate direct recreational 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 will 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. Surveys will be implemented by a combination of mail and phone methods.

The second survey effort will be conducted to estimate non-use values on a national scale. A survey will be conducted to estimate non-use values using Conjoint Analysis. This approach is considered state of the art and is indorsed by the National Research Council (2005). This survey will be implemented by phone.

Both survey efforts will involve the use of focus groups in the development of survey instruments, and will rely on professional survey research firms. Peer review of survey instruments, sampling designs, and reports will be required. Additionally, both survey efforts will require information collection review and approval by the Office of Management and Budget (OMB).

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

4. References

Duffield, J. W. "Economic Values of National Park System Resources Within the Colorado River Watershed." Report prepared for the National Park Service, April 17, 2006.

Duffield, J., C. Neher, and D. Patterson. "Economic Values of National Park System Resources Within the Colorado River Watershed: Phase II." Report prepared for the National Park Service, August 2007.

National Park Service. "Statistical Abstract 2008." Denver, CO: National Park Service Social Science Program, Public Use Statistics Office, 2009.

National Research Council. *River Resource Management in the Grand Canyon.* National Academy Press, Washington, DC, 1996.

National Research Council. *Valuing Ecosystem Services: Toward Better Environmental Decision Making.* The National Academies Press, Washington, DC, 2005.

Welsh, M. P., R. C. Bishop, M. L. Phillips, and R. M. Baumgartner. "GCES Nonuse Value Study." Draft final report, prepared by RCG/Hagler Bailly, Inc., Madison, WI, 1995.