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Refinement of Recreation Value Estimates on the Upper Clark Fork River

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TABLE OF CONTENTS

SUMMARY

This paper provides an update and brief review of "A Preliminary Estimate of the Value of Recreational Use on the Upper Clark Fork and Its Tributaries." The latter was completed by the author in February, 1981 and was based on a recreation use survey undertaken by Carol Hagmann in 1978-79 (Hagmann, 1979) and on traffic surveys on Rock Creek by the Lolo National Forest (1959-1980). The value of the surveyed visits was estimated using the travel cost methodology. The details of the method and estimate will not be repeated here as it is well documented in the earlier 60 page study (Duffield, 1981).

The basic finding of the updated analysis is that in constant 1984 dollars, the estimated annual value of recreation on the Upper Clark Fork in 1978-79 was \$300,000 to \$470,000 (see updated Table 8). The latter includes use on the main stem Clark Fork from Milltown to Warm Springs Creek and on three tributaries: Flint Creek, Warm Springs Creek and the Little Blackfoot (Table 1, Duffield, 1981). In addition, a more preliminary estimate of the annual value generated by use of Rock Creek is \$945,000 to \$1,590,000.

As described below, the the present net worth of use on the Upper Clark Fork is \$7.5 to \$11.5 million and on Rock Creek \$25 to \$42 million (Updated Table 10).

A major conclusion of the review is that the estimates presented are conservative, and could well be low by a factor of ten (primarily for failure to quantify preservation values associated with indirect use (See Table 1). In the time since the Clark Fork study was completed, there have been two other major studies that quantify the recreational value of specific water resources in Western

Updated Table 8

Summary of Annual Estimated Recreation

Benefits in the Upper Clark Fork in 1978-79

(1984 Dollars)

River Section	Average (Resident) $/visit	Estimated Annual Value: Resident	Non-resident	Total
Conservative Estimate:				
Rock Creek	6.12	495,000	449,700	944,700
Clark Fork	4.85	255,500	49,000	304,500
TOTAL	5.72	750,500	498,700	1,249,200
High Estimate:				
Rock Creek	10.28	832,500	756,200	1,588,700
Clark Fork	5.77	304,000	164,100	468,100
TOTAL	8.49	1,136,500	920,300	2,056,800

NOTES: See Table 8 (Duffield, 1981).

Updated Table 10

Present Worth of Recreation Benefits

on the Upper Clark Fork

(1984 Dollars)

River Section	Present Worth		
	Resident	Non-Resident	Total
Conservative Estimate:			
Rock Creek[1/]	13,142,000	11,940,000	25,082,000
Clark Fork[2/]	6,242,000	1,197,000	7,439,000
TOTAL	19,384,000	13,137,000	32,521,000
High Estimate:			
Rock Creek[1/]	22,103,000	20,077,000	42,180,000
Clark Fork[2/]	7,427,000	4,009,000	11,436,000
TOTAL	29,530,000	24,086,000	53,616,000

NOTES:

1/ Present worth factor based on a 4.31% real discount rate and benefits escalating at 4% annually for 20 years and constant thereafter (time horizon is 50 years).

2/ Discounted at 4.31% and escalating at 1% annually for 50 years.

Table 1

Conservative Assumptions

in Updated Analysis

Assumption	Impact on Estimate
A. Annual Value Estimate	
1) Use of variable costs of automobile to derive travel cost instead of all variable trip expenses.	Decrease by a factor of 2.
2) Use of travel cost per passenger mile instead of per vehicle.	Decrease by a factor of 2.7.
3) Use of variable cost of auto instead of full costs of auto.	Decrease by a factor of 2.2.
4) Exclusion of winter visits on Little Black-foot, Flint Creek, and Warm Springs Creek due to lack of sample.	Decrease by about 25% based on Clark Fork.
5) Exclusion of 43% of non-resident visits from all estimates.	Decrease of 15% to 20%.
6) Valuing non-resident visits the same as resident.	Unknown.
7) No estimate of preservation value by indirect users.	Low by a factor of 2 to 10.
8) Use of only log-linear estimates for the high instead of some semi-log as in conservative.	High is low by 10% for Clark Fork.
B. Present New Worth (PNW)	
9) Assumption that benefits grow only with population at 1% and not due to increased participation or greater value per visit.	Annual increase of 3% instead of 1% increases PNW by a factor of 4.92 on the Clark Fork.
10) Use of a 4.31% real discount rate instead of the 3.0% rate used by the Northwest Power Planning Council.	Use of 3.0% would increase PNW on Clark Fork by 29%.

Montana: "A Flathead River and Lake Estimate" (Sutherland, 1982) and "Kootenai Falls and China Rapids" (Duffield, 1982). Compared to these more extensive studies, which benefited from survey data explicitly collected for travel cost analysis, the updated Clark Fork estimate are low but in the same general range (Table 2).

Table 2

Comparison of Recent Travel Cost Estimates
for Water Based Recreation

Estimate	Year of Estimate	Dollars/visit (original)	Dollars/visit (1984 dollars)
A. General Water Based Recreation			
Flathead River & Lake (Sutherland, 1982)	1982	6.59	6.96
Kootenai Falls (Duffield, 1982)	1981	5.51-9.51	6.04-10.43
Clark Fork	1979	3.21-3.82	4.85-5.77
Rock Creek	1979	4.05-6.81	6.12-10.28
B. Fishing			
Idaho-Coldwater (Sorg et al 1983)	1983	23.35	24.09
National Average (Vaughan and Russell, 1982)	1982	19.49	20.60

The basic conclusion here is that the updated values are methodologically sound, but conservative estimates of the recreational value of the Upper Clark Fork.

In the remainder of the paper the revised estimates and the comparative analysis will be presented in somewhat greater detail.

Revised Annual Values

The revision and update reported here could potentially have addressed both basic methodology and parameters. For example, the regional model developed by Sutherland (1982) could be applied to the Clark Fork or cross-sectional data now available to the Montana Department of Fish, Wildlife and Parks (DFWP) could have been used to apply a more sophisticated model to the Clark Fork. However, because the methodology originally applied (a multi-equation travel cost model) is sound and because of resource and time constraints, fundamental methodological revisions were not undertaken. Accordingly, the discussion here is largely limited to a discussion of updated parameters.

The most important parameter for the annual value estimate is the cost of travel. For example, based on the most current US Department of Transportation estimates (D.O.T., 1984) the cost of owning and operating an intermediate size car is now 27.8¢/mile. This is approximately 60% higher than in the summer of 1978 when the bulk of Hagmann's (1979) survey was undertaken. However, an important point here is that from the standpoint of updating the study, the original database on use continues to limit any revision or update to an estimate of recreational value in 1978-79. For example, between January 1979 and April 1984, the consumer price index for gasoline increased by 79% while the overall CPI increased by 51%. It is not possible, without additional survey data, to determine how recreationists have reacted to this apparent real increase in the price of gas. It is possible in fact that technological innovation (fuel economy) and/or changing preferences more than compensate for the basic price/substitution effect.

The basic revision and updating that is possible in this context are of two sorts. First of all, the basic travel cost parameters used to estimate the model could be changed. The cost of travel used on the summer survey estimates for adults was 8.3¢/mile (Duffield, 1981). This is a combination of 3.3¢/passenger mile for variable cost of operating an automobile plus 5.0¢/mile for travel time cost. By contrast, some studies apparently use the vehicle variable cost, instead of dividing by the number of passengers (here, 2.7 passengers/vehicle). (Duffield, 1984.) In addition, there is now some evidence that the variable costs of travel perceived by recreationists include other recreation-related expenses. Clawson (1966) long ago noted that the variable cost of operating an automobile averages only 25% of trip expenses. Specific to Western Montana, the author's study of Kootenai Falls (Duffield, 1982) showed a variable cost to travel per passenger mile of 14¢ in 1981 or around 11¢/mile in early 1979 dollars. This suggests that the value used of 3.3¢ may be low by a factor of three. On the other hand, the value of travel time included here (at one-third of the wage rate) represents conventional methodology (WRC, 1979), but is a parameter which is still being investigated. There is a possibility that the cost of travel time to recreationists may be on net around zero due to the enjoyment of recreational travel (Duffield, 1984). The conclusion here is that the original 8.3%/passenger mile is in the correct range, but probably on net low. Accordingly, it was decided to continue to use this value for the sale of having conservative and defensible estimates.

To conclude, rather than undertake a complete change of model parameters, it is more useful to explicitly quantify the effect of each conservative assumption. This was previously noted in reference to Table 1. (The discussion to this point has described items 1 through 3 in Table 1, any of which could increase values by a factor of two or more.)

While the revised study remains necessarily an estimate of 1978-1979 use, it is possible to undertake a revision of a second sort. That is simply to put the value estimates on current dollar terms. The basic reference is Table

8 (Duffield, 1981). Most of the values were originally estimated in summer, 1978 dollars, but some were early 1979. Again, to be conservative, the change on nominal terms was taken from January 1979 (CPI of 204.7) to April, 1984 (CPI of 308.8) or a 51% increase. This factor was used to generate the updated Table 8 (above).

In addition to choice of parameters, a major issue in the original study was the problem of multiple destination visits. Unfortunately, Hagmann's survey did not determine which visitors had recreation on the Clark Fork as the main purpose of their trips. This introduces ambiguity into the value estimates since it cannot necessarily be presumed that the apparent costs of travel are all being incurred for a visit on the Clark Fork. The approach taken was to develop a "conservative" and a "high" estimate. In the conservative estimate visits by Montana residents traveling more than 150 miles were counted at zero value. In addition, non-resident origins were not used to develop the travel cost demand curves and, based on Hagmann's "Reasons for Visit" analysis (See Duffield, 1981), only 57% of non-resident visits were included. These visits were included at the average value for resident visits, on the reasoning that once in the general area, non-residents will on average face the same range of choices and travel costs as residents. For the high estimate, all resident visits (even those from more than 150 miles away) were counted, and visits at private campgrounds were included as "non-residents," but only 57% of non-residents continued to be included and at average resident visit values (See notes to Table 8).

Lacking better survey data, it is difficult to improve on this methodology. However, the basic arbitrariness of this approach needs to be recognized. The approach of using a "cutoff" mileage (here 150 miles) has been used in a number of studies (e.g. Smith, 1980) and is quite defensible for estimating resident values. The problem is more with nonresidents. On the Upper Clark Fork (excluding Rock Creek), the assumptions in the conservative estimate are such that only 16% of the total value is attributable to non-residents. In short, for the more important estimate here (the Upper Clark Fork) the treatment of non-resident (likely multiple destinations) is not of great significance in any case (see updated Table 8). The Rock Creek estimates, on the other hand, are quite sensitive to the treatment of nonresident use.

Another perspective on the multiple destination problem is provided by the recent analysis on Kootenai Falls (Duffield, 1982). Here multiple destination visitors were explicitly identified, and only the travel costs they perceived as attributable to their visits were included. The net result was for travel cost values that were somewhat higher, but similar to the Clark Fork estimates (Table 2). While one would expect different resources to generate different values, it is encouraging to find that three quite different travel cost studies, using separate databases, and on three different waters (Flathead, Kootenai, Clark Fork) all generate visit values in the \$5 to \$10 range (Table 2). Given the limitations of the Hagmann survey data (which was not collected for purposes of a travel cost analysis), the similarity of the revised estimates to the more recent Flathead (Sutherland, 1982) and Kootenai (Duffield, 1982) estimates provide a strong measure of validation for the Clark Fork values.

It is also of interest to contrast the Western Montana studies of general water-based recreation (which includes a number of activities such as sight-seeing, picnicking floating, etc.) with studies specific to fishing. A very recent study in Idaho (Sorg <u>et al</u>, 1983) and a comprehensive national study (Vaughan and Russell, 1982) indicate that the value of a day spent fishing is around \$20 for the average water (Table 2). Hagmann found that about 25% of the visits to the Clark Fork were for fishing or float fishing. Valuing these visits at around \$20 and even taking all other visits at zero value results in a further quite conservative justification for the average of $5 a visit estimated on the Clark Fork (Table 2). The higher values estimated on Rock Creek are consistent with this since Rock Creek gets a higher share of the apparently more valuable fishing visits (versus picnic visits, for example).

To conclude, comparison with other studies provides a measure of external validation for the Clark Fork values presented in updated Table 8.

Revised Present Net Worth

In the original study, present net worth estimates were derived based on a federal discount rate of 7 3/8%. The trend used to forecast use on Rock Creek was the actual historical trend for that stream of 4%/year. Lacking better information, use on the Upper Clark Fork was assumed to increase at the forecast rate of population growth in Missoula County (1.24%). The latter is conservative since use may obviously also grow due to increased participation. In addition, independent of changes in physical use, the value per visit may grow due to changing preferences. This value was assumed constant in the original study. Needless to say, present worth estimates are very sensitive to discount rate, assumed trend, and the time horizon. The latter was set at 50 years in both the original and present study, though an infinite stream would also be appropriate for this renewable resource.

The original discount rate of 7 3/8% is a nominal rate tied to federal long-term debt. For the Kootenai Falls environmental impact analysis, Larry Nordell (Economist, Montana Department of Natural Resources and Conservation) estimated a more appropriate real discount rate of 4.31% (Nordell, 1982). Since inflation is not included in the forecast recreation values, the latter (real) rate is more appropriate. Even a 4.31% rate may be conservative. The Northwest Power Planning Council has been using a 3% real rate in all of its resource analysis. For purposes of this analysis, the 4.31% rate was used.

For a trend in use, 4% was again used on Rock Creek, with a rather arbitrary cutoff due to assumed congestion in year 20. After this point, values were assumed constant. A complete analysis of carrying capacity and congestion costs would obviously be useful here.

The trend in use on the Upper Clark Fork was again tied to population growth. Based on 1980 census data, Montana Department of Commerce county level projections forecast a 1.21% annual growth rate for Missoula County and .87% for the state (Montana Department of Commerce, 1981). About half of all estimated benefits on the Upper Clark Fork are attributable to Missoula County residents (Duffield, 1981). Accordingly, an approximate average rate of 1% was used in the update. The resulting PNW estimates are presented in updated Table 10.

It is important to note that using only population growth for the Upper Clark Fork increase in recreational use is conservative. Unfortunately, there is no long-term database on use for this area. One indicator of change in use is, of course, Rock Creek where growth in use has been about double the regional population growth. Another indicator is the long-term trend in use at Glacier Park. Between 1970 and 1981, use at the park was up 3.4% annually, while Western Montana and Pacific Northwest populations grew at only 1.6% and 2.2% respectively (Duffield, 1982). For comparison with other uses or values of the Clark Fork, a present net worth or a life cycle analysis is appropriate. The fact that recreation values and use are likely to increase substantially over time can be very central to such comparisons (e.g. Krutilla, 1976).

Conservative Assumptions

The effect of the conservative assumptions on trend and discount rate are quantified in Part B of Table 1. Using a 3% rate instead of 4.31% would increase the Upper Clark Fork PNW estimate by 29%. However, using an increased trend of 3% instead of 1% (based, for example, on Glacier Park or Rock Creek) would increase the PNW estimate for the Upper Clark Fork very substantially, by a factor of five (Table 1).

Most of the other conservative assumptions relating to Part A (annual value estimate) of Table 1 have been previously discussed: travel cost parameters and treatment of nonresident use. In addition, several other specifics may be noted. Because Hagmann did not sample the Little Blackfoot, Warm Springs Creek, or Flint Creek for the September to May (winter) period, this use was assumed to be zero. Based on the winter/summer ratio on the main stem Clark Fork, the use estimate may be low by about 25%. Another methodological choice was selection of the travel cost equation specification. As noted in table 1 (item 8), the high estimate would be about 10% higher if the semi-log specification was used for cases where it provided the best fit.

Finally, the most important limitation of this study is that the preservation values associated with indirect use have not been quantified (item 7 in Table 1). The travel cost method is limited to measurement of direct (on site) use. However, a number of recent studies indicate that non-users and users may also value <u>the idea</u> that the Clark Fork is available as a recreation resource. These indirect uses are generally classed as option, existence, and bequest uses relating respectively to the value placed on maintaining the option of future use, the idea that the reiver is there, or the value placed on protecting the river for <u>future</u> generations.

These values may be very significant. Sutherland (1982) estimated a total preservation value on the Flathead of $97 million of which only 11% was direct use based on travel cost and the contingent valuation (interview) method. Similarly, a study of the South Platte in Colorado (Greenley <u>et al</u>, 1981) found that direct use was only about 40% of the total value of protecting that river.

Similar results have been obtained in a study of the preservation of Colorado wilderness areas (Walsh et al, 1984). If such a study had been undertaken on the Upper Clark Fork, it seems likely that including indirect use would increase the river's estimated value by a factor of two to ten (Table 1).

The basic conclusion of this report is that the updated estimates presented are valid and conservative measures of the recreational value on the Upper Clark Fork.

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