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Water Reallocation in the Willamette Basin — the Recreation Factor

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Since the Corps completed its major construction program in the mid-1980s, there has been a focus on changing operations of major systems such as the Missouri River, Columbia River, ACT/ACF (Alabama-Coosa-Tallipooosa/Appalachicola-Chattahoochee-Flint), and others. Reevaluations and changes in operations have resulted from changing water demands of stakeholders. In each water resource study, recreation use had to be considered in evaluating alternative operating plans. This article describes the use of recreation models developed under the Recreation Research Program (and the Natural Resources Research Program) to evaluate recreation as part of an effort to meet changing water demands in the Willamette Basin, Oregon. In Oregon, the public was asking questions such as:

- ***"What happens to recreation if more reservoir water is used for water supply or other needs downstream?"***
- ***"Can the economic importance of recreation to local businesses be determined and counted in deciding on a plan?"***
- ***"Can downstream water demands be met and reservoir recreation preserved at the same time?"***
- ***"If reservoir operations change, won't canoeing and other recreation downstream be adversely affected?"***

In response to those questions, models were developed to answer separate measures of the recreation experience including how to quantify recreation use, the economic value of recreation to the public, and the local impacts of recreation. This article explains how those models can be used to answer the "what happens to recreation" question.

"Why Change Reservoir Operations?"

National agencies such as the Corps develop water resources to support national interests—primarily economic development of the nation. Flood protection, navigation, recreation, and other functions of the Corps provide or support economic development and increased social benefits by providing flood protection to residential, urban, and agricultural lands and properties, recreational opportunities, and water quality and fish and wildlife benefits.

In recent decades, public water demands have been altered because of changes in recreation patterns, population distribution, water quality needs, fishery management, and endangered species protection. The growth projections (population, agricultural, and industrial) used for planning water resources development in this century have in

some cases resulted in water storage at a location distant from the population center that consumes the water. Population concentrations did not necessarily match the anticipated development and often the demand for water did not occur as predicted in some areas. For example, dry-land farming is practiced in some areas where irrigation was expected to support agriculture. Fortunately, changed water needs can be accommodated to a great degree by scheduling reservoir water releases and water management activities.

Willamette Basin Feasibility Study

The Willamette Basin Feasibility Study was initiated because of the circumstances described above—changes in water demand, and the need to evaluate reservoir operations. Reservoirs in the Willamette Basin, Oregon (Figure 1) are being evaluated to determine if they can be operated to better meet changing needs. The 11 operating projects (13 Corps dams)[1] in the Willamette Basin were constructed to reduce flood damage, generate hydropower, and benefit navigation, irrigation, recreation, water supply, water quality, and fish and wildlife (U.S. Army Engineer District, Portland 1991). Beginning in the 1940s, the 11 projects were completed, providing 1.6 million acre-feet of storage. Day-use and camping facilities were built at the lakes, and are managed by the Corps, U.S. Forest Service, State of Oregon, and county agencies.

State, county, local, and private entities have invested in parks, campgrounds, boat ramps, and other access points on the rivers affected by reservoir operations. The mainstem of the Willamette and its tributaries—Middle Fork, Coast Fork,[2] McKenzie River, and North and South Santiam Rivers—support extensive boating, fishing, and swimming opportunities.

Municipal water demands in the metropolitan Portland area, a recognized need to improve water quality in the Willamette River mainstream, unused agricultural storage, and changing requirements for endangered species prompted the reevaluation of reservoir operations. This reevaluation had to account for the effects to recreation caused by changes in reservoir

Figure 1. Willamette Basin Reservoirs

1 There are 13 dams, but 11 operating projects, because 2 dams serve as reregulation reservoirs (Big Clif dam below Detroit Lake and Dexter below Lookout Point Lake), and are not accounted as separate operating projects.

2 The Coast Fork of the Willamette was not included as a study reach by the Portland District.

releases or operations under plans developed in the Feasibility Study. Measures of recreation effects include reservoir and river visitation, economic value of recreation to the nation, and the impacts to local economies from recreation expenditures. The recreation component was reevaluated by the Waterways Experiment Station and cooperators at the University of Maine and New Mexico State University, with the assistance of the Portland District, U.S. Forest Service, and state of Oregon.

Recreation Study Methods

The important measures of recreation for the feasibility study—visitation, national benefits, and regional economic impacts—were evaluated through a number of models. Figure 2 shows the relationships between the surveys and data collection and the models and the evaluation measures. The first major undertaking in the study was the *Lakes and Rivers Recreation Survey*. As this survey was being implemented, data were collected for the reservoir visitation model and the approach for the rivers, an expert survey, was developed.

Developing a Recreation Model for the Willamette River Basin

The visitation model for Willamette Basin shows how recreation visits change as a function of operations, population, and costs. Baseline visitation information for all reservoir and river recreation sites had to be obtained; in this case 1996, the year of the survey, was the baseline. Visitation changes over a range of water conditions were determined by using historic data for the reservoirs and a river expert method for the river reaches.

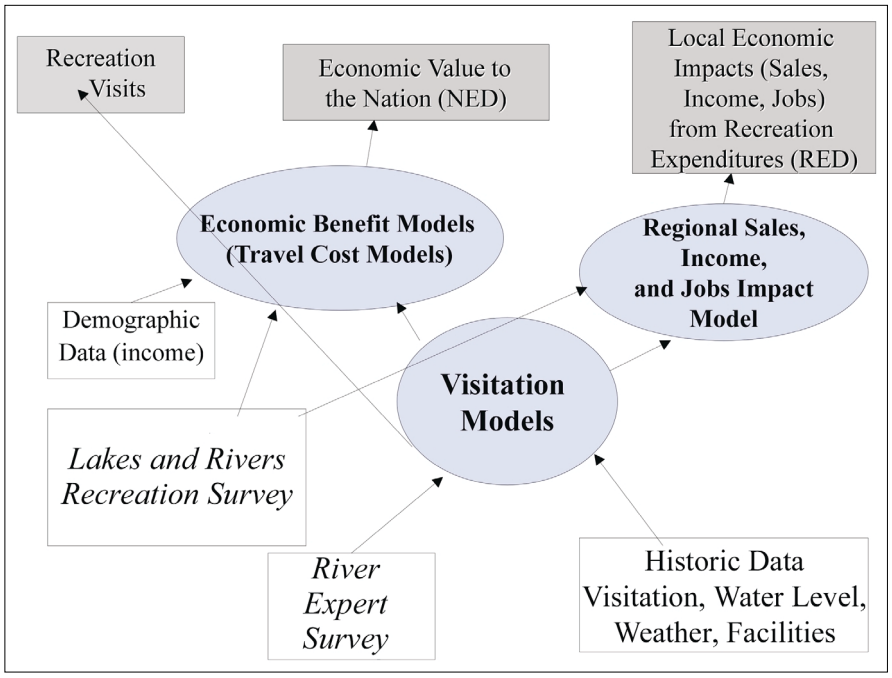

Figure 2. Relationships between surveys and data collection; models and evaluation measures

Estimating Baseline Visitation

The Lakes and Rivers Recreation Survey

A general population survey was undertaken after the 1996 recreation season to provide a baseline for visitation, identify how far visitors travel to use Willamette projects, and collect information on spending by recreation visitors. A telephone survey was conducted using random digit dialing for households within 150 miles of Willamette reservoirs. A total of 1,920 households were contacted in 33 counties in Oregon, southeastern Washington, and northern California. Phone survey respondents who had visited a project were asked to participate in a mailed survey to gather visitation information on specific reservoir and river sites. The mailed survey asked for information on numbers of visits to specific reservoirs and river reaches, recreation activities participated in, and length of recreation visits. An expenditures worksheet was included to obtain expenditure information on food, gas, lodging, and other expenses related to recreation trips (not durable goods, such as boats, that are intended for multiple trips). A total of 1,058 surveys were mailed and 603 useable surveys returned, for a 59-percent response rate.

Based on the survey responses, baseline visitation was estimated for the 16 reservoir and river sites. The 1996 visitation estimate for all study sites was 6.47 million day-use recreation days and 2.67 million overnight-use recreation days. The visitation estimates indicated that about half of all visitation (51 percent of day use and 35 percent of overnight use) occurred at the river sites.

Reservoir Visitation Model

The *Lakes and Rivers Recreation Survey* only provided detailed visitation data for 1996. The water levels in 1996 at the Willamette reservoirs were generally near optimal for recreation. The lack of variation in water levels in 1996 suggested that this year could not provide a valid model to predict the response of visitation to water level changes. Since one of the main objectives of the study was to estimate how visitation is affected by water levels, another approach was required.

The approach used follows the Regional Recreation Demand Model (RRDM) (Ward et al. 1996). To evaluate the demand and value of recreation at Corps reservoirs, the RRDM uses data on visitation, natural resources, and water levels to model recreation demand and economic benefits; that is, National Economic Development (NED) benefits.[1] The RRDM visitation models predict monthly day use and overnight reservoir visitation as a function of relevant variables (water levels, facilities, weather conditions, population, and other reservoir substitutes). Discussions of Willamette recreation patterns identified an additional potential determinant of recreation that was not required for the projects used to develop the RRDM—weather. While water levels are important, it was suggested that occurrence of days that are dry and warm enough for water contact recreation were an important determinant of recreation. In developing the Willamette Basin model, variables for both temperature (average monthly temperature) and precipitation (monthly precipitation) were initially included, using 12 years of hydrologic and visitation data.

Water level and other variables were used as predictors or independent variables to predict monthly visitation for the recreation season, May through September. Predictor variables that were initially used to test significance for visitation prediction are discussed briefly here:

- Water levels — Water levels were incorporated as the amount of the recreation pool available for recreation, percent full of the recreation pool (calculated as surface acres in month/recreation pool surface acres).
- Facilities — Availability of developed facilities for day use or overnight use. The facility variables proved insignificant in predicting visitation, perhaps because there is an excess of some types of facilities (e.g., picnic tables) so that the number of facilities is not a good indication of recreation demand.
- Weather variables — Monthly average temperature (degrees Fahrenheit) and monthly precipitation (inches) for the recreation season were included. Temperature was significant, but precipitation was not.
- Population–distance variable — For the projects, visitation from a county should be positively related to size of the population and negatively related to the distance to the project. This variable or index was significant for the day-use visitation model, but not for the overnight model.
- Substitute variables — Two substitute variables were used, a substitute variable for distance and size of other reservoir substitutes, and a substitute variable that is based on water levels of the other reservoirs. The first substitute variable (called hereafter the substitute index) is the one used in the RRDM. The second substitute variable considers the effect on visitation of the water levels (water level substitute index) of other reservoirs. This substitute index, based on water levels, is a critical consideration for this study, since all reservoirs are not drawn down at the same time. A drawdown priority has been established for alternatives, with Fern Ridge and Detroit Lakes, both popular recreation sites, being drawn down last.

The variables above were used to predict visitation at Corps reservoirs over the range of historic conditions, i.e., served as independent variables or independent predictors. The dependent variable is the total monthly visitation at Corps and U.S. Forest Service recreation areas, and county parks. While the Corps keeps monthly visitation data (day and overnight use) for recreation areas under its management, many camping and a few day-use areas at Corps projects are managed by the U.S. Forest Service. Oregon State Parks operates Detroit Lake State Park, ten state parks on the river stretches, and numerous

1 Briefly, NED benefits are contributions to the economic development of the nation, in contrast to Regional Economic Development (RED) benefits, the impact to local and regional economies from recreation trip expenditures.

boat ramps and access points along the rivers. The completeness and availability of visitation and facility data varied through years and across agencies (Corps, U.S. Forest Service, Oregon State Parks, and county parks). Monthly visitation data for the Corps were available from 1984 to 1995.

Variables included in the day-use historical visitation model explain 74 percent of the variation in visitation, while the overnight use model explains 45 percent of the visitation variation. In both models, reservoir water levels had a significant impact on visitation. For the weather variables, visitation increases with ambient temperature, but precipitation was not an important explanatory variable. Water levels at substitute reservoirs were also found to be important in explaining visitation. As water levels become drawn down, visitors are likely to go to a substitute reservoir.

The reservoir visitation models are used to predict visitation at each project under the water management alternatives as described below. Inputs are the monthly water levels defined by the alternatives. Monthly averages are used for the weather variables.

River Visitation Model

Developing a visitation model for rivers required a different approach because there were sparse historic visitation data for the rivers. When the recreation study began, river recreation was not included in the scope of study because of uncertainty of an approach, lack of visitation data, and limited funding.

To initiate development of river models, a series of surveys were implemented to establish the relationship of river visitation to river water levels. Telephone interviews and mail surveys with local river guides, outfitters, and other knowledgeable individuals were conducted. Separate surveys were created addressing each river stretch and one of three activities (fishing, whitewater boating, and nonspecialized day-use recreation such as picnicking or sightseeing). In the mailed survey, respondents identified the critical flow levels where recreation suitability, and thus visitation, changes. They were also asked to indicate the impact of river flows on visitation levels.

This approach for river recreation was based on river recreation literature, which suggested that the response of river visitation to water levels is normally defined using an inverted U-shaped curve (Shelby and Whittaker 1995; EA Engineering, Science, and Technology 1991). Recreation suitability curves for the McKenzie River are shown for fishing (Figure 3) and boating (Figure 4). The premise behind the curves is that there is not a single optimal flow, but rather a range of flows over which conditions are optimal for a particular type of recreation, such as fishing or whitewater boating (F_L to F_U). Below

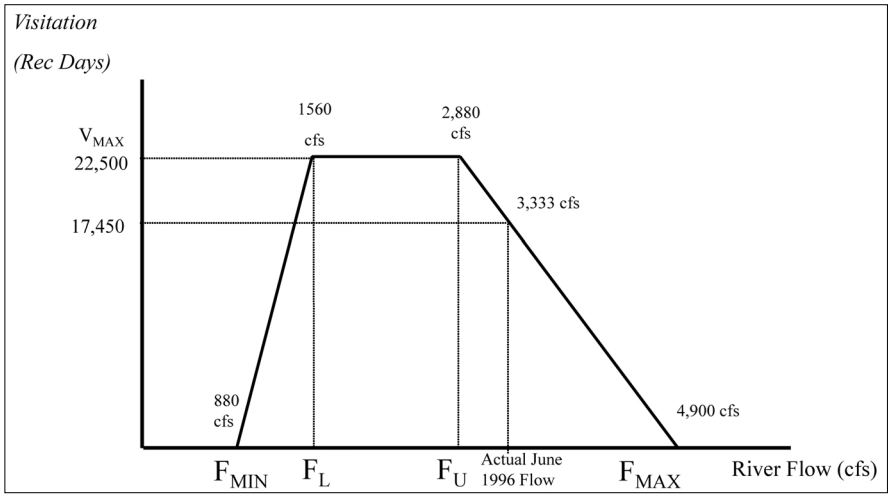

Figure 3. Recreation suitability curve, McKenzie River, June fishing

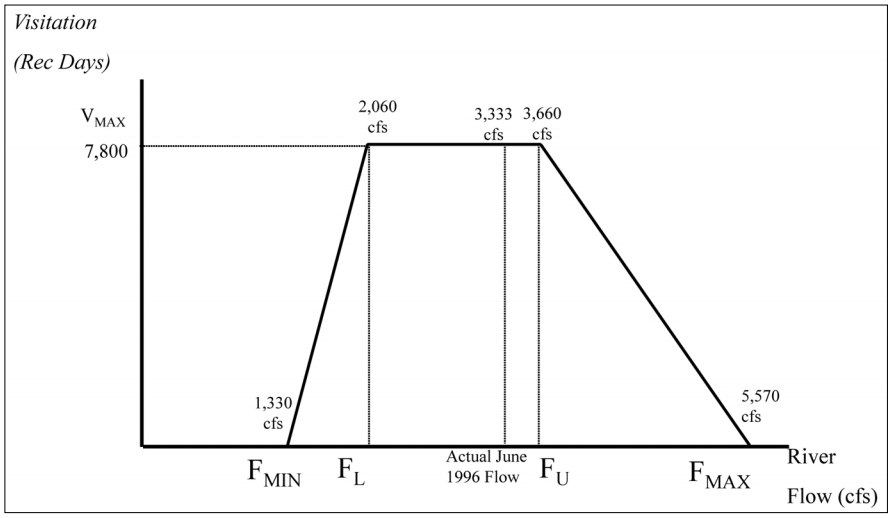

Figure 4. Recreation suitability curve, McKenzie River, June boating

this plateau, there is a minimal flow below which flow is too low for recreation (F_{MIN}) and a higher flow where conditions are too swift or deep for recreation (F_{MAX}). If flows are below F_{MIN} or above F_{MAX}, visitation for that activity is assumed to be zero. The figures show that boating is less sensitive to flow levels on the McKenzie; the optimal flow for boating has a wider plateau (Figure 4, from 2,060 to 3,660 cfs), and a higher F_{MAX} compared to fishing.

A total of 66 completed surveys were returned. Nearly all respondents indicated that flows were the most important or a very important factor in determining fishing and boating visitation. Most respondents (63 percent) indicated that flows were "an unimportant factor" with respect to nonspecialized river recreation, picnicking, and other riverside activities.

The river expert survey results were used to estimate visitation for alternatives, based on the suitability curves. For each river reach-activity combination, the four critical flow levels (Figures 3 and 4) were determined by averaging flows from the appropriate surveys. For a few river-activity combinations, no surveys were returned. In these cases, a model was developed to predict the critical flows, using all survey data.

Estimated monthly visitation for 1996 from the *Lakes and Rivers Recreation Survey* was used to establish V_{MAX}. For fishing on the McKenzie River, there were 17,450 rec days in June (Figure 3), and the actual average flow for June was 3,333 cfs. That flow corresponds to the descending (less than optimal) portion of the suitability curve. June visitation falls below V_{MAX}, which is estimated at 22,500 rec days, assuming a linear relationship. When alternatives are evaluated, the monthly flows from the alternative scenarios are used in this manner to estimate monthly visitation for each river-activity combination.

In the same way, June flows for 1996 were less than optimal for fishing, but that flow falls in the plateau range for boating (Figure 4). The 7,800 rec days boating are thus considered to be V_{MAX} for boating.

Economic Benefits — Value to the Nation

Travel cost models—using the cost of travel and time to infer willingness to pay and demand for recreation—were developed to estimate economic benefits. Four TCM's were estimated—separate models for day use and overnight use at reservoir and river locations. The TCM's estimate economic benefits from a zone of origin (counties in this case) to each recreation site as a function of travel costs (including the value of travel time), county demographics (income, average income, and average age), site facilities, and available substitutes. The *Lakes and Rivers Recreation Survey* provided data on the geographic distribution of visitors to each site.

The TCM's estimate average willingness to pay per recreation day for day users and overnight users to each site. The willingness to pay benefit estimates obtained from the travel cost models are multiplied by visitation predictions from the visitation models. For the reservoirs, the average economic benefit for day use was $2.40 per recreation day (1996 dollars), ranging from $1.35 at Fern Ridge Lake to $4.09 at Blue River Lake. Overnight benefits averaged $5.19 per recreation day, ranging from $3.43 at Fall Creek Lake to $11.17 at Detroit Lake.

Average benefits for day-use visitation on the river reaches were $3.86 per recreation day, ranging from $1.39 for the Willamette mainstem to $6.41 for the North Santiam River downstream of Detroit. For overnight visits to the rivers, the average benefit was $2.53 per recreation day, ranging from $1.71 on the Willamette River mainstem to $3.50 on the McKenzie River.

These results suggest that the reservoirs are more attractive for overnight use, perhaps because they have better facilities. However, for day use, average benefits for the rivers and reservoirs are similar, but vary across individual sites.

Regional Economic Impacts—Recreation Expenditures

The communities around the Willamette reservoirs and rivers are similar to towns near reservoirs in the nation—private campgrounds, lodging, and "mom and pop" bait and food operations have sprung up. Development of reservoir recreation and tourism has been identified as a key strategy for Willamette communities to recover from the loss of the timber industry. Visitor expenditure data on three Willamette lakes[1] were part of 12 projects nationwide used to

1 The three lakes (Fern Ridge, Cottage Grove, and Fall Creek) were grouped together as the Willamette Lakes, considered a single project, in the national survey of 12 projects.

develop spending profiles for Corps' recreation visitors (Propst et al. 1992). Expenditure questions were included in the *Lakes and Rivers Recreation Survey* to provide more complete and up-to-date information on visitor expenditures. Survey respondents were asked to provide a detailed list of their expenditures for their most recent trip to one of the 16 study sites (11 reservoirs, 5 rivers). The responses were used to develop four average expenditure profiles (day-use river visitors, overnight river visitors, day-use reservoir visitors, and overnight reservoir visitors). Average expenditures per recreation day ranged from $17.36 for overnight reservoir visitors to $26.29 for day-use river visitors.

Evaluation of expenditure impacts was expedited by the publication of the latest economic impact tool at the same time expenditure survey results became available. *Estimating the Local Economic Impacts of Recreation at Corps of Engineers Projects—1996* (Propst et al. 1998) provides a model in the form of a spreadsheet and database. The outputs are the total local sales, the increase in local income, and additional number of local jobs generated because of recreation expenditures. The spreadsheet input uses visitation estimates from the visitation models and the four average expenditures to estimate sales, income, and jobs.

Evaluation of Alternatives

Alternatives for changing the operations of the Corps' Willamette reservoirs are currently being formulated to meet water needs in the region. Alternatives are compared to baseline conditions (recent operating conditions) to evaluate the impact of the alternative in meeting water needs and on the evaluation criteria. For the Willamette Feasibility Study, the alternatives have four components:

- Flow augmentation for the Willamette mainstem, to meet minimum flows at Albany and Salem. All of the reservoirs release water to support flows on the mainstem.
- Minimum flow requirements for river reaches below each dam.
- Drawdown priorities between reservoirs to support recreation at the higher visitation reservoirs. Fern Ridge and Detroit are drawn down last.
- Individual elevation target for reservoir pools. Downstream fisheries and water quality are improved by release of upstream reservoir storage.

For each alternative, operating criteria are run in the hydrologic models for different hydrologic conditions. Table 1 shows the recreation impacts for the 1991 to 1994 hydrologic conditions.

The major output of the hydrologic models are the monthly reservoir and river water levels. The water levels are used in the visitation models to predict monthly visitation to reservoirs and rivers. The monthly visitation, travel distances, and expenditure profiles are used in the economic models (Figure 2). Alternative recreation evaluation criteria are visitation, national economic benefits (NED), and local economic impacts—local sales, income, and jobs caused by recreation expenditures, the regional economic development (RED) benefits.

Listing of the Steelhead Trout and Chinook Salmon—The Fish Alternative

As alternative formulation was starting in 1998, the National Marine Fisheries Service (NMFS) published a notice to list the steelhead trout and chinook salmon as threatened species throughout the Willamette Basin. This action resulted in the alternative formulation process being suspended, until a recovery plan for steelhead and salmon can be developed by biologists in NMFS and Oregon Department of Fish and Game.

During the summer of 1999, minimum flow criteria for steelhead and salmon were agreed on for Willamette streams. These criteria ensured larger flows in the rivers during April and May. The intent is to improve in-river habitat conditions during downstream migration of the juvenile steelhead during April and May and upstream migration of adult chinook salmon in June.

Table 2 shows a portion of the flow targets for comparison to baseline. Using the minimum flow criteria as a so-called fish alternative, hydrologic models produced the reservoir and river levels that result from these criteria for 4 years, 1991 to 1994. The hydrologic conditions—precipitation and reservoir inflow—for 1991 to 1994 were used to develop baseline water level estimates. The water levels were used in the recreation visitation models to estimate visits, and the estimated visits were used in the economic benefits and regional economic models to estimate economic benefits and local sales, income, and jobs. Visitation, economic benefits, and economic

Table 1. Summary of Baseline and Fish Alternatives													
		1991			1992			1993			1994		
Evaluation Measures	Site Type	Base-line	Fish Alter.	Change	Base-line	Fish Alter.	Change	Base-line	Fish Alter.	Change	Base-line	Fish Alter.	Change
Total Estimated Visitation (Millions of Rec Days)	Reservoirs	4.48	4.64	0.16	3.97	3.24	-0.73	4.47	4.74	0.27	4.23	3.46	-0.77
	Rivers	3.62	3.88	0.26	3.13	3.38	0.25	3.64	3.82	0.18	3.60	3.68	0.08
		8.1	8.52		7.1	6.62		8.11	8.56		7.83	7.14	
Total Rec Day Change (Mil. Visits)				0.42			-0.48			0.45			-0.69
Total Economic Value to the Nation (NED Benefits)	Reservoirs	20.96	21.57	0.61	18.5	13.05	-5.45	20.98	22.02	1.04	19.85	13.62	-6.23
	Rivers	9.25	10.09	0.84	7.84	8.81	0.97	9.21	9.56	0.35	9.36	9.58	0.22
		30.21	31.66		26.34	21.86		30.19	31.58		29.21	23.2	
Total NED Change ($M)				1.45			-4.48			1.39			-6.01
Total Local Sales ($M) (1996 $)	Reservoirs	64.16	66.65	2.49	57.42	48.23	-9.19	64.05	67.89	3.84	61.04	51.62	-9.42
	Rivers	55.58	59.83	4.25	48.68	52.49	3.81	54.66	56.63	1.97	56.56	57.45	0.89
		119.74	126.48		106.1	100.72		118.71	124.52		117.6	109.07	
In Local Sales ($M)				6.74			-5.38			5.81			-8.53
Total Local Income ($M (1996 $)	Reservoirs	36.72	38.14	1.42	32.86	27.6	-5.26	36.66	38.85	2.19	34.93	29.54	-5.39
	Rivers	31.81	34.24	2.43	27.86	30.04	2.18	31.28	32.41	1.13	32.37	32.88	0.51
	Combined	68.53	72.38		60.72	57.64		67.94	71.26		67.3	62.42	
Total Change in Local Income ($M)				3.85			-3.08			3.32			-4.88
Total Local Jobs (Full-time Equiv.)	Reservoirs	1,822	1,892	70	1,633	1,369	-264	1,819	1,928	109	1,735	1,467	-268
	Rivers	1,575	1,699	124	1,380	1,491	111	1,554	1,607	53	1,607	1,632	25
	Combined	3.397	3,591		3,013	2,860		3,373	3,535		3,342	3,099	
Total Change in Local Jobs				194			-153			162			-243

impact projections for the baseline condition and the fish alternative are summarized in Table 1.

Comparison of Alternatives

Fish and subsequent alternatives are evaluated by comparing the total effects of water operations under that alternative with the baseline effects, over the period of years of operation. In looking at 1991, this evaluation shows that the fish alternative produces a total of 4.64 million recreation days (M rec days) at the reservoirs and 3.88 M rec days on the river reaches. This total of 8.5 M rec days is 420,000 more than the baseline (4-percent increase for reservoirs and 7-percent increase for rivers).

This level of visitation for the fish alternative produces increases in all of the economic measures. Total economic benefits—value of recreation to the nation (NED benefits)—was $31.66 M for the fish alternative, an increase of $1.45 M over baseline conditions of $30.2 M. Economic impacts to local economies—local sales, income, and jobs—increased by $6.74 M, $3.85 M, and 194 jobs, respectively.

From a national standpoint, the visitation and economic measures discussed above are important. The total NED or economic benefit of recreation increased by 5 percent,

Table 2. Minimum Flow Targets for the Willamette River at Salem (cfs)		
Period	**Base Condition**	**Fish Alternative**
April 1-15	6,000	21,500
April 16-30	6,000	18,500
May 1-15	6,000	15,000
May 16-31	6,000	15,000
June 1-15	6,000	12,500
June 16-30	6,000	8,500
July 1-15	6,000	6,000
July 16-31	6,000	6,000
August 1-15	6,000	6,000
August 15-31	6,000	6,000
September	6,500	6,500
October	6,500	6,500

but this increase was the result of river recreation benefits increasing by 9 percent while reservoir benefits only increased by 3 percent. For the 5-percent increase in total visitation (rec days), visitation increased 7 percent for the river recreation (260,000 rec days) versus 4 percent (160,000 rec days) for the reservoirs.

The local "mom and pop" restaurant along a river or the bait shop next to a reservoir may be interested in how the visitation and economic effects break down for the reservoir and river reaches. Local sales, income, and jobs increased overall by 6 percent, with the effects resulting from reservoir trips increasing by 4 percent, only half of the effect from river trip spending, 8 percent.

Comparing Recreation Impacts During "Dry" Years

When the operating criteria for steelhead and salmon were announced, the immediate question was "how severe will recreation impacts be if the flows are required even during "dry" years?" It might be difficult to meet requirements during dry years. April and May are the reservoir refill period and meeting the elevated target flows in those months may prevent refilling some or all of the reservoirs. Meeting the June targets could force drawing down of the reservoirs earlier than under baseline conditions. The 1991 to 1994 data (Table 3) support this.

From a hydrologic standpoint, the 1991 to 1994 water years

Table 3. Summary of Normal and "Dry" Year Impacts

Parameter		Normal Water Years			"Dry" Water Years		
		Baseline Operating Conditions	**Fish Alternative Operations**	**Change from Baseline Ops.**	**Baseline Operating Conditions**	**Fish Alternative Operations**	**Change from Baseline Ops.**
Estimated Visitation (Millions of Rec Days)	Reservoirs	4.48	4.69	+0.22	4.10	3.35	-0.75
	Rivers	3.63	3.85	+0.22	3.37	3.53	+0.17
Total Impact (M Rec Days)		8.11	8.54	+0.44	7.47	6.88	-0.58
Estimated Economic Value to the Nation (NED Benefits)	Reservoirs	20.97	21.80	+0.83	19.18	13.335	-5.84
	Rivers	9.23	9.83	+0.59	8.60	9.195	+0.60
Total NED Change ($M)		30.20	31.62	+1.42	27.78	22.53	-5.24
Local Sales ($M (1996 $))	Reservoirs	64.11	67.27	+3.17	59.23	49.925	-9.305
	Rivers	55.12	58.23	+3.11	52.62	54.97	+2.35
Total Local Sales ($M)		119.23	125.50	+6.28	111.85	104.895	-6.955
Local Income ($M (1996 $))	Reservoirs	36.69	38.50	+1.81	33.90	28.57	-5.325
	Rivers	31.55	33.33	+1.78	30.12	31.46	+1.345
Total Change in Local Income		68.24	71.82	+3.58	64.01	60.03	-3.98
Local Jobs	Reservoirs	1,821	1,910	+90	1,684	1,418	-266
	Rivers	1,564	1,653	+89	1,494	1,562	+68
		3,385	3,563	+178	3,178	2,980	-198

contain 2 years of normal rainfall, snowpack, and reservoir inflow—1991 and 1993—and two "dry" years. Combining the normal and "dry" years (Table 3) shows that the answer to the question is "the recreation impacts are very severe" if the flow requirements are met. The "dry" year conditions cause overall reductions in visitation, economic benefits, and local economic impacts. The impact of "dry" years on recreation is more adverse for reservoir recreation. Rivers show positive gains over baseline conditions, even in the "dry" years; minimum flows for fish provide minimum flows for recreation. There is a substitution effect during "dry" years; the required flows for the fish deplete reservoirs, making rivers more accessible and attractive.

Table 3 shows that reservoir recreation is reduced on average by 750,000 rec days (-0.75 M rec days) compared to baseline. The required minimum flows of the fish alternative result in an increase of 170,000 rec days (+0.17 M). Total economic benefits (NED) are reduced by $5.24 M, a loss of $5.84 M for reservoir recreation and a gain of $600,000 (+$0.60 M) for river recreation. Sales, income, and jobs for the local economy are reduced by 6 percent, but these losses fall differentially—15-percent reductions resulting from reservoir trip spending and a 4-percent increase in local impact from river recreation expenditures.

Summary

The listing of the steelhead trout and chinook salmon by NMFS near the time when final alternatives were being formulated is indicative of the complexities of Corps efforts to reevaluate operations to meet future water needs. These reevaluation or reallocation studies have multiple stakeholders with sometimes-competing water demands. It takes a number of years to determine existing and future demands on water, and the people involved change during the planning process.

In this planning environment, available tools for recreation evaluation have met the needs of the stakeholders for information to compare alternatives:

- Estimating recreation visitation at reservoirs and river reaches helps public, Federal, state, county, and local interests see how recreation use changes under different alternatives and under the normal and extreme—in this case "dry" year hydrologic conditions.
- To determine the value of recreation to the nation, NED benefits are accounted through the travel cost benefit estimates.
- Economic impacts to local and regional business near the reservoirs and rivers are evaluated based on sales, income, and jobs by the expenditure surveys and RED impact analysis.

Addition of the river recreation analysis the year after initiation of the study is another example of the complexities of these studies. Corps research and model development for recreation has focused on reservoir recreation, covered by the RRDM. But, the results of the *Lakes and Rivers Recreation Survey* showed that over half of the day use and 35 percent of the overnight recreation took place on river reaches.[1] Building on previous river recreation work in the Willamette (Shelby and Whittaker 1995; EA Engineering, Science, and Technology 1991), an approach to evaluating river recreation was developed, under very limited funding and timing constraints.

Where Do We Go From Here?

A steelhead and salmon recovery plan is scheduled for completion in the spring of 2000. This will enable the Portland District and the study partners to formulate alternatives to meet study objectives, while protecting the steelhead. The Corps will continue to reevaluate its operations to see what changes need to be made to meet the future needs of our customers. The RRDM approach continues to develop as an effective way to compare alternatives for basinwide multi-reservoir projects. The flexibility of the approach has been demonstrated as in this case, including weather as a determinant of visitation, and incorporating the river reaches affected by reservoirs into the analyses.

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The Pendulum Swings!

by Darrell Lewis, Headquarters

Over the past 19 years that I've been associated with the U.S. Army Corps of Engineers Recreation Program, many of you have heard me talk of the "pendulum" that controls the fortune of the Corps recreation program. During some of the difficult times of low priorities and reductions in people and funds, I talked about the value of the resources and my view that we were not headed for extinction. I know some joked about my "unfounded optimism." I was convinced that the Corps' vast resource base and its huge constituency were too significant for the recreation program to just cease to exist. The public's strong preference for water-based recreation is well-documented, and **we are the nation's leading provider of water-based outdoor recreation.**

I've reported to you in earlier issues of RecNotes that Corps leadership has committed to strengthening the Corps Recreation Program. Now, I'd like to discuss both our current situation and future directions.

State of the Program

While there are notable exceptions, the 2,487 recreation areas managed directly by the Corps have suffered for years from the combination of under-funding and steadily increasing use. This combination has taken its toll on both the quality of customer service we provide and on the natural resources that support these activities. Our facilities are wearing out from the combined impact of heavy use and inadequate maintenance. Even more significantly, the Corps Recreation program has not kept up with the many changes occurring in the field of outdoor recreation. Frequently, modern equipment doesn't fit the outdated Corps facility. Too often, our visitor centers are dated and lack the spark to catch the visitor's interest. Nor have we adjusted to the diversification that has occurred in the nation's population. Our focus group discussions with Hispanics, Blacks, and Asians have documented that our recreation facilities clearly **do not** meet the needs of today's diverse population. Due to funding limitations, we have not fulfilled our responsibility to make our facilities and programs accessible to persons with disabilities.

Future

Due to budget rule constraints, I'm not able to provide much detail on what the future holds for the Corps Recreation Program, but I can assure you that the conditions I've described above are not acceptable to our leadership. I can also assure you that leadership is committed to rectifying the situation. As we prepare to enter the next millennium, we are hard at work on the solutions. We are committed to providing recreation opportunities that meet the needs of present users, underserved populations, and future generations.

My advice—stay tuned . . . and pitch in to support the various efforts that surface. This next year (or is it millennium?) promises to be an exciting one!

Recreation Management Support Program

by Dr. H. Roger Hamilton, Engineer Research and Development Center

Research and development in support of the Corps of Engineers' outdoor recreation management program has been conducted at the U.S. Army Engineer Research and Development Center since 1976. This activity was organized under a direct-allotted research program, funded and managed through the Civil Works Directorate of Research and Development. The program was originally called the Recreation Research Program, was later changed to the Natural Resources Research Program, and finally, was changed again, back to the original name.

The Recreation Research Program was abolished at the end of FY98 and a new program was established under the O&M General appropriation to provide research and technical support to Headquarters and field offices. The new program is known as the Recreation Management Support Program (RMSP). It includes research and other functions needed to support the management of recreation resources at Corps water resources projects.

Mr. David Wahus, CECW-ON, is the Program Manager, with oversight from the perspective of the national recreation program. Mr. Scott Jackson, CEERD-EN-R, is Project Manager with oversight of the technical aspects of research and development. A Recreation Leadership Advisory Team comprised of representatives from projects, Districts, and Divisions has been formed to support strategic planning for the recreation business program and serve in an active advisory role to the Chief, Natural Resources Management Branch. The team consists of 15 voting members (8 Division, 4 District, and 3 project representatives) and 2 nonvoting members (the program manager and the project manager). They will meet semiannually each fiscal year to evaluate all proposals for funding in the RMSP and recommend priorities to HQUSACE (CECW-ON). Voting team members will normally serve 4-year terms. The Chair serves a 2-year term.

The initial team has been identified, although all positions have not yet been filled. Current team members are:

Voting Members

- Mr. Tom Peek, Center Hill Lake, Nashville District - Chair
- Mr. Don Dunwoody, Northwestern Division
- Mr. Brad Keshler, South Atlantic Division
- Dr. Mike Loesch, Great Lakes and Ohio River Division
- Ms. Elisa Pellicciotto, Southwestern Division
- Mr. Joe Sigrest, Mississippi Valley Division
- Mr. Phil Turner, South Pacific Division
- Mr. Mike Lee, Pacific Ocean Division
- Mr. John Marnell, Tulsa District
- Ms. Susan Shampine, Albuquerque District
- Mr. Dan Troglin, Portland District
- Ms. Sandra Campbell, Hartwell Lake, Savannah District
- Mr. Jim Carver, Enid Lake, Vicksburg District.

Members to be Determined

- North Atlantic Division
- District in North Atlantic Division

Nonvoting Members

- Mr. David Wahus, HQUSACE
- Mr. Scott Jackson, Engineer Research and Development Center

The team will meet each autumn for a strategic planning session. High-priority issues will be identified and priorities will be established. Each team member is responsible for obtaining input to the program from home offices, regions, and stakeholders, as appropriate. Issues of high priority will be assigned a field proponent and a research representative. They will develop a proposed study plan for consideration at the spring team

meeting. Statements of need and proposed study plans will be presented and reviewed at the spring meeting. The spring meeting will result in recommendations for new starts for the following fiscal year and any minor adjustments required for the ongoing work and the long-range work plan.

Two meetings have been held. Team members were installed and a Chair was elected at the spring meeting in Washington, DC, in June 1998. Ongoing work in the program includes assessment of economic impacts of private boat docks and marinas, conclusion of the study regarding recreational needs of ethnic populations, and recreation trends analyses. The team has recommended study plans for investigating recreation benefits and the recreation infrastructure to assess the need for rehabilitation and modernization. Continuing research relative to ethnic populations and customer satisfaction surveys, as well as updating the Visitor Estimation and Reporting System, are under consideration.

It is critical that field offices participate in the planning process. The RMSP is intended to solve recreation-related issues that occur throughout the organization. Anyone who has a problem or issue that requires resolution beyond their capabilities should make their team representative aware of it.

Guidance on the RMSP was published on 1 October as Chapter 15 in Engineer Regulation 1130-2-550 and Engineer Pamphlet 1130-2-550.

Calendar of Events

April 11-13, 2000	Recreation Management Support Program, Leadership Team Meeting, Washington, DC.

RMSP

RECREATION MANAGEMENT SUPPORT PROGRAM

RECNOTES

RECREATION MANAGEMENT SUPPORT PROGRAM

This bulletin is published in accordance with AR 25-30. It has been prepared and distributed as one of the information dissemination functions of the Environmental Laboratory of the Engineer Research and Development Center at the Waterways Experiment Station. It is primarily intended to be a forum whereby information pertaining to and resulting from the Corps of Engineers' nationwide Natural Resources Research Program can be rapidly and widely disseminated to Headquarters, and Division, District, and project offices as well as to other Federal agencies concerned with outdoor recreation. Local reproduction is authorized to satisfy additional requirements. Contributions of notes, news, reviews, or any other types of information are solicited from all sources and will be considered for publication so long as they are relevant to the theme of the Recreation Management Support Program, i.e., to improve the effectiveness and efficiency of the Corps in managing the natural resources while providing recreation opportunities at its water resources development projects. This bulletin will be issued on an irregular basis as dictated by the quantity and importance of information to be disseminated. The contents of this bulletin are not to be used for advertising, publication, or promotional purposes. Citation of trade names does not constitute an official endorsement or approval of the use of such commercial products. Communications are welcomed and should be addressed to the Environmental Laboratory, ATTN: D.J. Tazik, U.S. Army Engineer Waterways Experiment Station (CEWES-EV), 3909 Halls Ferry Road, Vicksburg, MS 39180-6199, or call AC (601) 634-2610.

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