

9.0 Summary of Effects

9.1 Introduction

The purpose of this section is to present a balanced display of overall benefits and costs associated with each resource area across each alternative. The summary presents both the monetary and non-monetary effects of the national and regional analyses developed for this Feasibility Study.

It should be emphasized that the national and regional displays are distinct accounting stances and cannot be added or subtracted from each other. With the exception of selected monetary estimates noted by an asterisk, all estimates are presented net of Alternative 1, existing conditions.

9.2 National Benefits and Costs

The first section presents a comparison of national benefits and costs, including:

- Biological impacts associated with each alternative,
- National economic development (NED) costs, and,
- National economic development (NED) benefits.

9.2.1 Biological Benefits

Table 9.1 presents a comparison of alternative results based upon data provided by NMFS and PATH using 1998 model results. None of the alternatives meets all of the jeopardy standards using 1998 PATH model results. Alternative 4 - Dam Breaching comes the closest to meeting all of the jeopardy standards for both spring/summer and fall chinook (e.g., this alternative meets 5 out of 6 standards). The dam retention alternatives come relatively close to meeting all of the jeopardy standards, with the exception of the 48-year recovery standard for fall chinook.

However, PATH is continuing to refine the model, using new information on key variables related to delayed mortality (the D factor), ocean conditions, and ocean harvests, among other variables. These modifications are having an affect on model results for fall chinook. According to the **PATH Decision Analysis Report for Snake River Fall Chinook** (September 1999):

- **“All hydrosystem actions meet survival standards** (probabilities of exceeding survival escapement thresholds are greater than 0.7), regardless of what is assumed about the estuary/ocean survival rate of transported fish.
- **All drawdown actions meet recovery standards** (probabilities of exceeding recovery escapement thresholds are greater than 0.5) regardless of what is assumed about the estuary/ocean survival rate of transported fish. The drawdown action (A3) exhibited the most robust response across those uncertainties considered to date, and produced higher recovery probabilities (as well as higher average spawning escapements) than other actions. This conclusion is sensitive to assumptions about adult upstream survival.
- For each hypothesis about relative survival of transported fish, **there is a non-breaching action (actions which do not involve drawdowns of dams) that meets the recovery standard**, although there is no single non-breaching alternative option that meets recovery standards under all assumptions about the relative

survival of transported fish. If transported fish are assumed to have high relative survival (i.e., high D), maximizing transportation will achieve recovery standards. If transported fish are assumed to have low relative survival (i.e., low D), then retaining current system configuration and allowing all smolts to migrate in-river achieves the recovery standards. **Non-breaching actions are not as robust to the current level of uncertainty in relative survival of transported fish as are drawdown actions.**” (Page 8)

The 1999 model results are not available in the same format as the 1998 model results reported in Table 9.1.

Table 9-1. Ability to meet the NMFS Jeopardy standards for survival and recovery based upon 1998 PATH model results (median values presented)

Biological Benefits	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Spring/Summer Chinook				
Survival in 24th year (standard is 0.70)	0.67	0.65	0.66	0.69
Recovery in 48th Year (standard is 0.50)	0.48	0.45	0.46	0.84
Survival in 100th year (standard is 0.70)	0.79	0.78	0.79	0.89
Fall Chinook				
Survival in 24th year (standard is 0.70)	0.85	0.85	0.81	0.93
Recovery in 48th Year (standard is 0.50)	0.22	0.22	0.28	1.00
Survival in 100th Year (standard is 0.50)	0.83	0.83	0.78	0.98

Source: NMFS, PATH

9.2.2 NED Costs

NED costs include the following cost categories:

- Implementation costs for the fish-related improvements (e.g., the construction and acquisition costs, annual costs for operation, maintenance, repair, replacement, rehabilitation, and monitoring and legally required mitigation costs). For more detail, the reader is referred to the chapter on implementation and avoided costs.
- NED Costs, which are any existing National Economic Development (NED) costs that would be incurred as a result of implementing the dam breaching alternative, notably:
 - additional costs to provide power by the next least costly form of power generation (described in the hydropower chapter),
 - additional transportation costs to shift barge-transported commodities to other truck, rail and barge systems (described in the transportation chapter), and,
 - additional construction/O&M costs for irrigation and water supply systems (described in the water supply chapter).

All costs presented in Table 9-2 are net of alternative 1, the base case. NED costs associated with alternative 2, Maximum Transport of Juvenile Salmon, and alternative 3, Major System Improvements, are lower than under base case conditions, by \$12.0 million and \$2.6 million, respectively at a discount rate of 6 7/8%. The NED costs associated with alternative 4, Dam Breaching, are estimated to be \$359 million higher than under the base case conditions per year for 100 years, under the same discount rate.

Table 9-2. Summary of NED Costs net of the Base Case (\$1,000s of dollars)

Description of NED Costs	Alternative 2	Alternative - 3	Alternative – 4
Implementation Costs			
@6.875%	3,457	(5,931)	(48,787)
@4.75%	2,556	(4,376)	(35,498)
@0.0%	663	(1,390)	(8,298)
Power			
@6.875%	8,500	8,500	(271,000)
@4.75%	8,500	8,500	(267,500)
@0.0%	8,000	8,000	(263,500)
Transportation			
@6.875%	-	-	(24,034)
@4.75%	-	-	(25,249)
@0.0%	-	-	(28,330)
Irrigation/Water Systems			
@6.875%	-	-	(15,424)
@4.75%	-	-	(10,746)
@0.0%	-	-	(2,241)
Total			
@6.875%	11,957	2,569	(359,245)
@4.75%	11,056	4,124	(338,993)
@0.0%	8,663	6,610	(302,368)

Source: Economics Appendix chapters

Using the 1999 NMFS/PATH results, which as discussed above will increase the biological output associated with the dam retention alternatives, will not impact net NED costs, because these cost estimates are not sensitive to biological output.

9.2.3 NED Benefits

NED benefits include the following cost categories:

- Avoided costs, which include operations, maintenance, repair, replacement, rehabilitation of existing infrastructure that would be avoided under alternative conditions (e.g., existing power systems, navigation locks, and other like costs that occur under the dam retention alternatives but not under the dam breaching alternative). These costs, which are presented in the implementation/avoided cost chapter, are treated as a benefit in the following table because they can be avoided under the dam breaching alternative.

- NED Benefits, which include any existing National Economic Development (NED) benefits that would accrue as a result of implementing alternatives, notably:
 - additional recreation benefits from drawdown conditions for anglers from enhanced fisheries and to users of the free flowing river (described in the recreation chapter), and,
 - additional commercial fishing benefits in the river and in the ocean and recreation benefits occurring outside of the Lower Snake River system (described in the anadromous fish chapter).

All benefits presented in Table 9-3 are net of alternative 1, existing conditions. NED benefits associated with alternative 2, Maximum Transport of Juvenile Salmon, and alternative 3, Major System Improvements, are higher than under base case conditions by \$2.2 million, at a discount rate of 6 7/8%. The NED benefits associated with alternative 4, Dam Breaching, are estimated to be \$113 million higher than under the base case conditions per year for 100 years, under the same discount rate.

Table 9-3. Summary of NED Benefits net of the Base Case (\$1,000s of dollars)

Description of NED Benefits	Alternative 2	Alternative – 3	Alternative – 4
Avoided Costs			
@6.875%	-	-	29,178
@4.75%	-	-	29,343
@0.0%	-	-	29,050
Recreation			
@6.875%	2,030	2,080	82,000
@4.75%	1,940	1,970	62,120
@0.0%	1,420	1,180	61,022
Commercial Fishing			
@6.875%	160	161	1,593
@4.75%	176	174	2,064
@0.0%	198	188	3,486
Total NED Benefits			
@6.875%	2,190	2,241	112,771
@4.75%	2,116	2,144	93,527
@0.0%	1,618	1,368	93,558

Source: Economics Appendix chapters

Using the 1999 NMFS/PATH results, which as discussed above will increase the biological output associated with the dam retention alternatives, will not impact avoided costs since they are based on the costs of operating the existing systems and are not sensitive to biological output. However, using the 1999 model results will reduce NED benefits associated with alternative 4, Dam Breaching, because relatively more fish are projected for the dam retention alternatives resulting in a smaller biological difference between the dam retention and dam breaching alternatives.

9.3 Tribal Benefits and Costs

This section presents a summary of tribal effects. The estimated increase in tribal harvest is based upon 1998 model results. As with NED benefits, using the 1999 model results will increase the harvest for alternatives 1, 2 and 3 and reduce the difference between dam retention and dam breaching alternatives.

Table 9-4. Summary of Tribal Effects

Description of Tribal Benefits	Alternative 1	Alternative 2	Alternative - 3	Alternative – 4
Non-monetary Effects				
	There is substantially more unemployment and lack of well being in LSR area tribal communities than in the area population as a whole. Much of this can be inferred to stem from loss of tribal salmon harvests, which were a part of the treaties that the tribes signed in the mid- to late 1800s. In addition, flooding resulting from construction of the Lower Snake River dams displaced some tribal members.			
Estimated increase in tribal harvests resulting from action	-----7%-----			29%

Source: Tribal Circumstances Chapter of the Economic Appendix, Meyer Resources, Inc.

9.4 Passive Use Value Estimates

This section presents a summary of the passive use (or existence) values for salmon recovery and survival and for the creation of a free-flowing river. Economists recognize that there is a benefit associated with knowing that the resource exists even if no use is made of it. There are, however, disagreements about how to measure passive use values. The Economic Appendix used a benefit transfer approach. The reader is referred to Passive Use Values chapter of this appendix for more information. It should be noted that passive use values are not considered to be NED benefits.

The passive use values associated with salmonid recovery and survival in the Snake River were estimated to range from \$66 million to \$879 million per year, with a middle range between \$142 and \$508 million per year.

The passive use value of a free flowing Snake River was estimated at \$420 million per year.

The passive use values for salmon recovery and survival are based upon the 1998 model results on a per fish basis. As with NED benefits and tribal harvests, using the 1999 model results will reduce the difference between dam retention and dam breaching alternatives and hence will decrease the difference in passive use values for salmon between dam retention and dam breaching alternatives. However, the passive use values associated with the free flowing river will not change because they are not sensitive to biological output.

9.5 Regional Benefits and Costs

The Regional Economic Development (RED) account addresses regional economic impacts in terms of jobs and income resulting from the alternatives under consideration. Impacts on employment and income include direct, indirect (e.g., inter-firm purchases) and induced (e.g., purchases by employees of affected firms) effects. The job totals reported below are estimates of total impacts and include both full- and part-time employment.

9.5.1 Regional Impacts associated with Alternatives 2 and 3

Regional impacts under alternatives 2 and 3 are expected to be relatively minor and limited to those associated with changes in implementation costs, avoided cost and anadromous fish harvest.

9.5.2 Regional Impacts associated with Alternative 4

Regional impacts associated with Alternative 4, Dam Breaching, consist of both short-term, construction-related impacts lasting less than ten years, and long-term impacts that would continue after implementation of the alternatives.

9.5.2.1 Short-term Impacts

Construction activities resulting from breaching the four dams would result in the creation of approximately 20,790 temporary jobs in the lower Snake River region during the first ten years of project implementation. This activity would generate a temporary increase in personal income of about \$677 million or an average annual income of \$32,548 per job. Major construction projects would include replacement power facilities (7,652 jobs in construction of replacement power plants and transmission lines) and new grain elevators (6,992 jobs), among other construction projects. See Table 9-5.

Table 9-4. Summary of Short-term Employment Impacts under Alternative 4, Dam Breaching

Construction Projects	Employment
Loading Facilities	6,982
Power	5,572
Transmission	2,080
Road Improvement Projects	1,972
Implementation of Dam Breaching	1,293
Water Wells	1,175
Rail Improvement Projects	872
Water Pumps	844
Total Short-Term Jobs	20,790

Note: Short-term jobs occur within the first ten years of the project implementation during the construction phase and then are discontinued

Source: Regional Impact Chapter of the Economic Appendix

9.5.2.2 Long-term Impacts

Lower Snake River Region Impacts. In the long-run the lower Snake River region would gain 2,277 jobs with an annual average wage of \$22,266. These jobs would mainly be associated with the operation of replacement power facilities and recreation activities. The lower Snake River region would, however, lose 2,988 jobs with an annual average wage of \$33,066. The lost jobs would be mainly associated with Corps' operations and farmland irrigated from Ice Harbor reservoir. The average annual income in the lower Snake River region in 1995 was \$32,088. This estimated net change in long-term jobs is a loss of (711) jobs.

Pacific Northwest Region Impacts. Changes in anadromous fish harvest would result in the creation of approximately 286 additional long-term jobs in the Pacific Northwest, British Columbia, and Alaska. However, reduced spending associated with increased power rates would result in an additional 2,382

long-term jobs being lost in the Pacific Northwest. This estimated net change in long-term jobs in the PNW Region would be (-2,096), which represents less than 0.1 percent of total Pacific Northwest employment in 1995.

Combined Lower Snake River and Pacific Northwest Region Impacts. The combined impact in the Lower Snake River and Pacific Northwest regions is a net loss of (-2,807) long-term jobs.

Table 9-4. Summary of Short-term Employment Impacts under Alternative 4, Dam Breaching

Employment Sectors by Area	Job Gains	Employment Sectors by Area	Job Losses
Lower Snake River Region			
Power O&M Transmission	884	Recreation Cruise	(83)
Recreation Tourism	934	Irrigated farms	(1,579)
Recreation Anglers (Snake River Region)	459	Corps Operations	(1,326)
Subtotal	2,277		(2,988)
net impact			(711)
PNW Region			
Recreation and Commercial Fish Harvest	286	Reduced Spending due to Increased Electricity Rates	(2,382)
Subtotal	286		(2,382)
net impact			(2,096)
Combined regional & statewide impacts	2,563		(5,370)
net impact			(2,807)

Note: Long-term jobs occur after project implementation and continue throughout the study period (e.g., for 100 years)

Source: Regional Impact Chapter of the Economic Appendix

9.6 Social Impacts

The majority of communities in the lower Snake River region are small rural towns that have low to moderate economic diversity. These communities primarily rely on the agricultural and wood products sectors, even though they have declined as a source of regional employment and income over the past decade.

9.6.1 Alternatives 2 and 3

Alternatives 2 and 3 would have little effect on the existing social and economic environment for the majority of the communities within the region. Some communities, particularly those located up river, (e.g., Lewiston, Orofino, and Riggins), would be adversely affected by lower probabilities of salmon recovery. Continued federal oversight and uncertainty about the future of the four dam may also have negative social effects on some communities.

9.6.2 Alternative 4

Breaching the four dams would change the physical and economic environment of the lower Snake River region. Communities located upriver of the four dams (e.g., Lewiston, Orofino, and Riggins) would likely experience net employment gains as a result of expected increases in recreation and tourism associated with a free-flowing river, and to a lesser extent increased fish runs. Communities located within the six counties located adjacent to the lower Snake River reservoirs (e.g., Pomeroy, Colfax, and Clarkston) would likely experience a net decrease in employment due to decreases in Corps employment and increased pressure on family farms caused by increased transportation, storage, and handling costs for agricultural products.

Communities located downriver of Ice Harbor dam (e.g., Pasco, Kennewick, and Umatilla) would likely experience employment loss if farms presently irrigated from Ice Harbor reservoir go out of business. These losses would be partially offset by expected increases in transportation- and power generation-related employment.

Communities would likely adjust to these changes over time. New individuals and businesses seeking new opportunities may replace those that have been displaced. Displaced human and capital resources may be employed in their next best use within the community. This type of adjustment does, however, take time and would vary by community. Community size has been identified as a critical factor affecting a community's ability to adapt to change, with smaller, less diverse communities tending to respond less favorably.

Many of the community level impacts would be caused by the loss of irrigated agriculture on Ice Harbor reservoir and increased grain transportation costs. These impacts could be minimized or partially eliminated by mitigation spending to modify existing irrigation pumps and spending to expand rail capacity in the region - or directly subsidizing affected firms.