

RESEARCH TECHNICAL COMPLETION REPORT
Project B-037-IDA

DECISION ALTERNATIVES FOR USE, REGULATION, AND
CONSERVATION OF THE WATER AND RELATED
LAND RESOURCES OF THE HELLS CANYON
REACH OF THE SNAKE RIVER

by

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in cooperation with

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submitted to the

Office of Water Research and Technology
U.S. Department of Interior
Washington, D.C. 20240

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This project was supported in part by funds provided by the U.S. Department of Interior, Office of Water Research and Technology as authorized under the Water Resources Research Act of 1964.

Idaho Water Resources Research Institute
University of Idaho
Moscow, Idaho

John S. Gladwell, Director

RESEARCH REPORT
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BESTION ALTERNATIVES FOR USE, REGULATION, AND
CONSERVATION OF THE WATER AND RELATED
LAND RESOURCES OF THE HELLS CANYON
REACH OF THE COLORADO RIVER

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In cooperation with

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John S. Clark, Director

FOREWORD

The Idaho Water Resources Research Institute has provided the administrative coordination for this study and organized the team that conducted the research. It is the Institute policy to make available the results of significant research on water and related land resources conducted in Idaho's universities and colleges. The Institute neither endorses nor rejects the findings of the author. In this study a strong effort has been made to make the study as interdisciplinary and inter-agency as possible within the constraints of time and funding that were available. The Institute does recommend careful consideration of the accumulated ideas and information by those who will be weighing the various considerations for use, regulation and conservation of the water and related land resources in the Hells Canyon reach of the Snake River.

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The author wishes to acknowledge the support of the Office of Water Research and Technology of the U.S. Department of the Interior through the matching grant funding of Project B-037-IDA, short titled WR-Hells Canyon. The project was carried out under the supervision of Dr. John S. Gladwell as Director of the Idaho Water Resources Research Institute. The cooperation of engineering staff of Idaho Power Company for providing certain operating information was helpful in analyzing the problem. The comments from and opening of working files of both the Corps of Engineers' office at Walla Walla, Washington and Regional Office of the U.S. Bureau of Reclamation was a great assistance, as was the supplying of special flow data records by the U.S. Geological Survey from Boise, Idaho. Most of all the help of the staff of the Idaho Department of Water Resources has been a major contribution to seeing that the study met a practical goal. Three people of the staff need special mention: D. C. Clapp, A. C. Robertson and R. Sutter.

The experience of appearing before the congressional hearings on the Hells Canyon National Recreation Area made the project a more realistic

and rewarding effort.

Very special thanks must go to graduate students Jeffrey Coffin and Larry Coupe for their efforts. Their M.S. theses stand as worthy contributions in their own right, and this report has drawn heavily from their findings. Thanks is expressed to E. W. Trihey, Greetis Berry and Julia Liddell for the administrative and secretarial assistance.

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The experience of appearing before the congressional hearings on the Falls Canyon National Recreation Area made the project a very realistic

TABLE OF CONTENTS

	Page
ABSTRACT	1
INTRODUCTION	2
DESCRIPTION OF THE AREA	3
HISTORY OF AREA AND ISSUES	9
ONGOING ACTIVITIES AND CONSIDERATIONS	23
INTERRELATIONSHIP BETWEEN ACTIVITIES AND CONSIDERATIONS	36
IMPACT OF CONSIDERATIONS	37
OPTIONS FOR THE FUTURE	40
CONCLUSIONS AND RECOMMENDATIONS	44
REFERENCES	46
APPENDIX	pp. 1 - 119
(Reproduced as separate volume. Available upon request.)	

LIST OF FIGURES

	Page
Figure 1. Detailed Map of Significant Features of Hells Canyon Reach of Snake River	4
Figure 2. General Map of Region	5
Figure 3. Matrix showing relative impact relationships between considerations that are important in planning for the conservation, development and management of water and related land resources of the Hells Canyon Reach - Snake River	38

1

2

3

4

5

6

7

8

9

10

Page 113

1

2

3

4

5

ABSTRACT

This report is an attempt to identify various considerations that are being made and will be made in choosing the alternatives that should be acted upon in the planning, development and conservation of the water and related land resources of Hells Canyon reach of the Snake River. A history of the area and issues involved has necessarily been presented. Once the considerations have been identified, a subjective analysis follows, discussing the interrelationship between paired considerations. A scaling has been made of the impact of one consideration on another consideration in a positive or negative sense. A novel graphic matrix has been used to present the interrelationship between considerations.

The overall impact of these considerations on the State of Idaho, the Pacific Northwest region and the nation has been presented along with a spectrum of possible options for planning for development and conservation of the water resources of the Hells Canyon reach of the Snake River. An extensive bibliography of related information has also been compiled for reference. The report attempts to put forth planning information that will be useful to decision makers in setting forth an acceptable solution to the water resource conservation and development of the area.

INTRODUCTION

Idaho as a state is continually faced with a multitude of natural resource decisions. Foremost among those decisions is the determination of the development, conservation and management of the resources that this generation will provide succeeding generations. In determining what should be done with the resources, decisions makers are forced to allocate water and related land resources to accomplish short and long range goals. The decision maker historically made the decisions in an arena of an apparent abundance of resources. Times have changed, resources are no longer abundant and in most cases potential uses are in direct conflict with one another. In Idaho, the recently adopted State Water Plan identifies the critical and most important areas of concern with respect to water and related land resources. Basic to virtually all water problems and solutions are considerations in Hells Canyon reach of the Snake River. The resources are limited, the potential uses are numerous, the conflicts are great, the public is concerned and decision makers must manage the resources and set priorities for their use.

In order to make informed decisions, this report is dedicated to establishing the historical perspective of Hells Canyon, describing the existing and potential resource considerations, describing inter-relationships of considerations, allocations and activities, and identifying Idaho options for decision makers.

DESCRIPTION OF THE AREA

The geographic area under consideration in this report is that reach of the Snake River from the backwaters of Brownlee Reservoir to the Snake River's confluence with the Clearwater River. This will be referred to as the Hells Canyon reach of the Snake River. Naturally the upstream watershed above the Hells Canyon reach of the Snake River has much to do with considerations and allocations that have been and are to be made by decision makers. Likewise, the downstream positions of the river system below Lewiston, Idaho, greatly influence considerations, activities, and allocations that have and are occurring, and that will occur with regard to water and related land resources in the Hells Canyon reach of the Snake River. Figure 1 gives a general map of the significant features of the immediate area and Figure 2 gives a general map of the entire region showing the relative positions and locations of those land areas and communities most affected by the activities in the Hells Canyon reach of the Snake River. For purposes of this report, the area is classified into three distinct zones. The first zone is the reach from Weiser to Hells Canyon Dam, which is characterized by a development zone of hydroelectric projects where it appears resource decisions have been made with development as the major concern. The second zone is the reach now administered as the Hells Canyon National Recreation Area from Hells Canyon Dam to Forest Service boundaries just downstream from the mouth of the Salmon River. This reach is characterized as a stretch wherein preservation of the free flowing nature of the river and various unique environments has been the major concern. The third zone is the reach from the northern boundary of the Hells Canyon National Recreation Area to Lewiston, Idaho. This reach, the study river zone, is characterized by growing recreational use, navigation to the remote inner zone, and the fact that most of it is still under study for possible inclusion as part of the National Wild and Scenic River system.

Development Zone

In this zone the Snake River cuts its way into the deep canyon gorge for which Hells Canyon is famous. Upstream from Weiser the streambed has

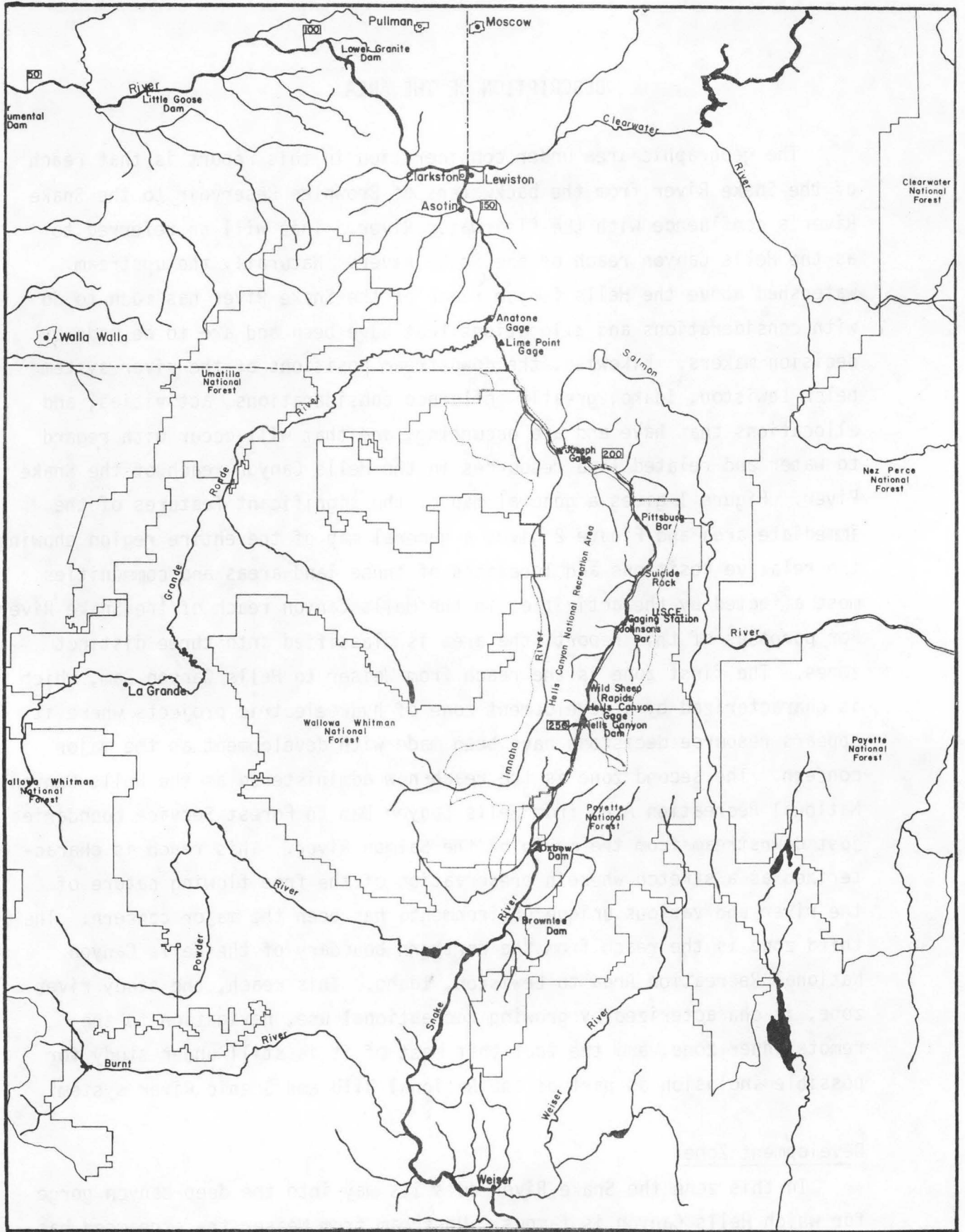


Figure 1: Detailed Map of Significant Features of Hells Canyon Reach of Snake River.

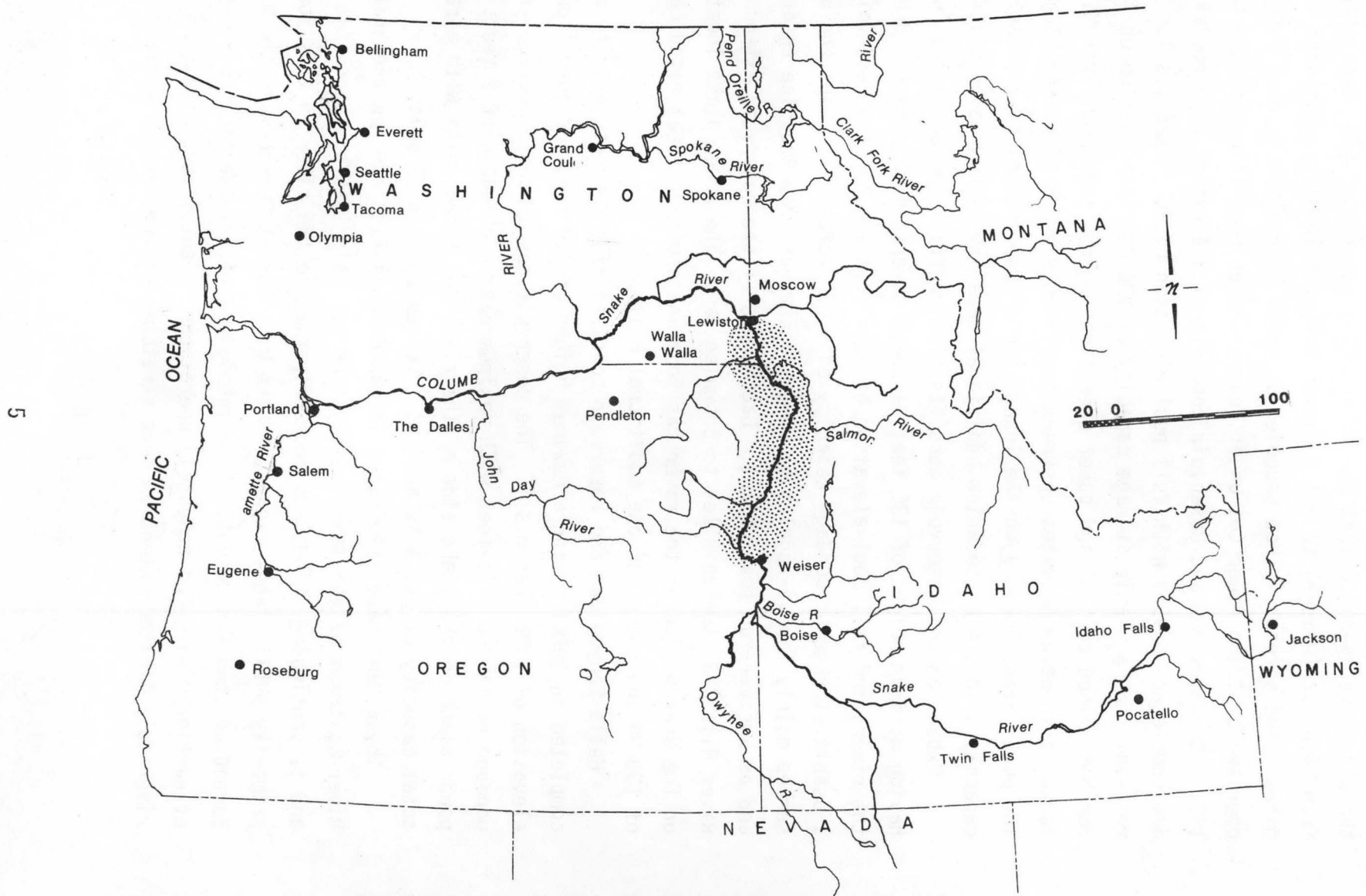


FIGURE 2. General Map of Region

an average slope of 2.0 feet per mile. From Weiser to Hells Canyon Dam the slope averages 5.8 feet per mile. This stretch of the river extends from Mile 352 (Weiser) to Hells Canyon Dam at Mile 247, a distance of 105 miles. The stretch is now occupied by three hydroelectric dams owned and operated by Idaho Power Co. under Federal Power Commission License No. 1971. Brownlee Dam and Reservoir consists of a 400-foot high rockfill dam completed in 1959 with full pool elevation of 2077 feet m.s.l. The reservoir has a usable storage capacity of 974,000 acre-feet which is used for both flood control and power operations. From the dam, River Mile 285, backwaters extend 58 miles upstream to within 9 miles of Weiser, Idaho. The power plant located on the Idaho side of the channel has an installed capacity of 360.4 MW to which additional capacity is now being added.

Oxbow Dam and Reservoir consists of a rockfill dam completed in 1961 having maximum height of 180 feet, a power diversion through the Oxbow of the river, and full pool elevation of 1805 feet m.s.l. The reservoir has a usable storage or pondage capacity of 5,000 acre-feet. Thus the project serves mainly for re-regulating power discharges from Brownlee reservoir and as a river-run power plant. Backwaters of the reservoir extend from River Mile 273, twelve miles to Brownlee Dam. The power plant located on the Oregon side of the river has four units with a total rated capacity of 190 MW and space for one additional unit.

Hells Canyon Dam and reservoir consists of a concrete gravity dam completed in 1968, having a maximum height of 320 feet and normal pool elevation of 1688 feet m.s.l. The reservoir has a usable storage or pondage of 11,200 acre-feet with maximum design drawdown of 5 feet. The power plant on the Idaho side of the river has three units with a rated total capacity of 391.5 MW and space for an additional unit.

These dams have eliminated the anadromous fish runs on the Snake River upstream of the dams. Mitigation for this loss has been initiated and is continuing. The land areas riparian to the river in this zone are primarily public lands managed by the U.S. Forest Service and the U.S. Bureau of Land Management. Some inholdings of private land exist by virtue of earlier mining and homestead operations. Access roads traverse the river to a limited extent on most stretches of the river. Recreational

facilities have been developed under provisions of the F.P.C. license. A rather popular fishing activity has developed as a part of the recreation provisions of the dam projects. A minimum residential community has developed in the area with most of it being centered at Pine Creek, Oregon near Oxbow Dam.

Hells Canyon National Recreation Area

This area of the Hells Canyon reach of the Snake River is in the deep gorge portion of canyon which is 8000 feet deep from rim to stream channel bed. There are no roads along the river but two access roads lead down to the river, one at Doug Bar on the Oregon side of the river, the other at Pittsburgh Landing on the Idaho side of the river. Two major tributaries enter in this stretch, the Imanaha River from Oregon and the Salmon River from Idaho. The river is now protected under Public Law 94-199, 89 Stat. 1117, which established the Hells Canyon National Recreation Area, to preserve the natural beauty, and historical and archaeological values of the canyon. This involves protecting portions of land under wilderness status, portions under national recreation status, and portions under the National Wild and Scenic River system. The portion of river from Hells Canyon Dam to the mouth of the Salmon River drops 9.8 feet per mile indicating why this section of the canyon has been so zealously sought for hydroelectric development. During the decades of the 40's, 50's, and 60's, much controversy developed over various schemes for harnessing the potential power.

Most of the land adjacent to the river is owned by the federal government. A few remote ranches have carried on grazing livestock operations since the turn of the century. Some of these inholdings of private land are now being acquired by purchase by the U.S. Forest Service. Limited recreation "boating camps" have been operated in the canyon. The river has navigational status from Lewiston at Mile 140.0 to Johnson's Bar at River Mile No. 230 under authorization of the Rivers and Harbors Act of 1902 and 1935.

Anadromous fish return to this section of the river and are captured for spawning and artificial reproduction in Idaho hatcheries. Sturgeon,

a rare fish species that make their home in this stretch of the river, are protected under laws jointly administered by the states of Idaho and Oregon.

Recreational use of this section of the river is very limited. The canyon walls are precipitous, in many places, affording majestic scenes of rocky grandeur. The river itself has numerous rapids and two of these, Wild Sheep Rapids and Granite Rapids, are normally impossible to navigate by jet boats. The river is becoming very popular for floating with large rubber rafts.

License provisions of the Idaho Power Company dams state that the project shall be operated in the interest of navigation to maintain 13,000 cfs flow a minimum of 95 percent of the time in the Snake River at Lime Point (River Mile 1.72), when determined by the Chief of Engineers to be necessary for navigation. Regulated flow less than 13,000 cfs will be limited to the months of July, August and September. The minimum plant operations will be 5000 cfs at Johnson's Bar, at which point the maximum variation in river stage will not exceed one foot per hour.

Study River Zone

In this zone the river is still entrenched in a deep canyon, but the canyon walls slope away more gradually, with the exposed rock changing primarily to basalt. The average slope of the river from the Salmon River to Lewiston is 4.5 feet per mile. Under Section 5(a) of Hells Canyon National Recreation Area Act (PL 94-199) the segment of the river from the north boundary of Section 1, T. 5 N., R. 47 E., Willamette meridian to the town of Asotin, Washington is placed under provisions of the Wild and Scenic Rivers Act (82 Stat. 905) for study as to possible inclusion in the National Wild and Scenic River system. This study is now in progress under the administration of the U.S. Bureau of Outdoor Recreation.

A road runs along the river from the Grand Ronde to Clarkston, Washington. Limited roads have access from the Idaho side of the river. Most of the riparian land in this reach of river is privately owned. At Lime Point, slightly downstream from the mouth of the Salmon River, there is a large lime deposit that has been considered for exploitation

of the mineral resource. At one time, the U.S. Corps of Engineers had authorization by Congress for the construction of Asotin Dam for hydro-electric development. This was deauthorized by the Hells Canyon National Recreation Area Act. Thus this section of the river remains in a status where decisions remain undefined as to how the resources will be used and managed.

HISTORY OF AREA AND ISSUES

The history of the area begins with the geologic history. Important events in the geologic history of Hells Canyon reach of the Snake River according to Cook (1954) were marine sedimentation in upper Triassic Age characterized by the formation of shales and limestone. This was followed in the Jurassic Age by intrusions of gabbro. At the beginning of the Cretaceous Age there was strong folding and faulting with metamorphism of gabbro to granodiorite and volcanic rocks to greenstone. Intrusions were then formed of quartz diorite and there was widespread metalization. The Cretaceous Age ended and the Tertiary Age began with regional uplift and erosion. Eruptions of Columbia River basalt occurred in the Tertiary period causing the folding, faulting and uplift of the Seven Devils and Cuddy Mountains. The quarternary Age was characterized by rapid erosion, possible glaciation and the formation of the modern Snake River.

Prehistory was represented by the inhabiting of the canyon by Indians as evidenced by the camp sites and many pictographs on the protected rock faces of rock walls and natural cave sites. The archaeology of the canyon has not been studied to any great extent, but the numerous sitings indicate the entire reach is rich in archaeological remains.

White man's history in the area according to Bailey (1943) began with the ill fated Hunt party that tried to go through the somber depths of this canyon in 1811. The group had to abandon a plan to go down through the river canyon.

Twenty-three years after the failure of the Hunt party to negotiate Hells Canyon, Captain Benjamin L.E. Bonneville, an army officer involved in the fur business, undertook the trip through the canyon. He, likewise,

failed to make it through. In his memoirs, Captain Bonneville stated:

"Nothing we have ever gazed upon in any other region could for a moment compare in wild majestic and impressive sternness, with the series of scenes which here at every turn astonished our senses and filled us with awe,"..(Bailey,1943).

The next important recorded attempt through the canyon was a trip to Boise and return to Lewiston recorded in the Golden Age newspaper of Lewiston, Idaho, under date of 1862 (Bailey, 1943). This trip sponsored by a Captain A.P. Ankeny included Charles Clifford, Washington Murray and Joseph Denner. The group followed an old immigrant road up the Powder River on the trip to Boise. The return trip is most significant because it was made by a raft constructed to navigate the river. The account recorded and quoted by Bailey is unusual, since it gives such an optimistic picture of the navigability of the river:

"They found nothing in the river to impede navigation whatsoever, and pronounced it feasible at any season of the year unless if it be ice. The examination of the river shows the fact that the Snake River is navigable for steamers and will be much safer for travel than the river from Lewiston to the mouth of the Snake River... A new route will now be opened for steam, the results of which cannot now be foretold. We shall penetrate Nevada and Utah by steam."

There was, however, a small note of caution:

"But a few more suns will rise and set before the shrill whistle of the steamer will reverberate along the banks of the noble river."

This account does not agree with a story Bailey tells of the trip of the steamer Norma, made by W. P. Gray as master and pilot of a boat that was 165 feet long and 35 feet wide. It had several damaging mishaps to the hull during the downriver trip. The crew was very much against going on through. The Norma arrived in Lewiston May 24, 1895. They mentioned stopping at a ranch at Sheep Creek where there was an orchard. Apparently ranching had started in the 1870's and flourished up through the 1930's.

House Document 190 of the 73rd Congress reports that in 1891 the steamboat Norma operated between Ballards Landing (Mile 265) and Huntington, Oregon (Mile 325) serving the Seven Devils mining region; however,

it made only a few trips. The Imnaha, a small steamboat, was built in 1903 to operate between Lewiston and the mines near the mouth of the Imnaha River. This boat was wrecked after a few trips and replaced by one named Mountain Gem. The Gem was in service until the mines closed about a year later.

In 1915, regular launch service from Lewiston upstream to Johnson Bar was started and has continued to the present time serving the ranches along the river and taking tourist groups into the canyon.

During 1911, according to Hoyt (Hoyt, 1924), engineers of the Northwestern Railroad Company, a subsidiary of the Oregon Short Line Company, made a location survey for a railroad between Homestead, Oregon and Lewiston, Idaho. Before completing the work, the party lost the personal effects of all the men and nearly all the boats.

Interest in the potential for power production has been long and sustained. Earliest mention of studies is found in a report by the Office of the State Engineer, Oregon (Lewis, et al., 1916) that lists five projects in the Snake River reach covered by this report. The sites were Coon Hollow Project, Mountain Sheep Project, Cherry Creek Power Project, Salmon River Tunnel Project and the Asotin Project.

In 1920, the topographic branch of the Geological Survey made a map of the river from Huntington, Oregon to Lewiston, Idaho. From this, a set of 17 maps were published (U.S. Geological Survey, 1923). W. G. Hoyt, a hydraulic engineer, accompanied the expedition and studied the power potential. In 1924 he published a report entitled, "Power Resources of Snake River Between Huntington, Oregon and Lewiston, Idaho" (Hoyt, 1924). The report gives an excellent summary of some sixteen sites that were studied. The only developed site was at Oxbow where the Idaho Power Company had started construction in 1907. This has now been superseded by a new run-of-river plant at Oxbow. Hoyt listed the Salmon River tunnel project as a possible development.

Fredrick H. Fowler, a member of the American Society of Civil Engineers, described a Salmon River Tunnel Project capable of 200,000 horsepower estimated at \$96.08 per hp (Fowler, 1923). This apparently was very similar to the Oregon State Engineer's study.

In 1928, a German firm expressed interest in a Salmon River diversion to the Snake River for production of power. A flow and storage permit were reported to have been issued to A. G. Liebman in 1928 (Bailey, 1943). Delay of six months in furthering the project in its initial stage was attributed to the refusal of a Stanfield, Oregon rancher to give an option on land necessary to control the tunnel site. The power was to have been used for electrometallurgical treatment of ore and the development of synthetic metals. Liebman transferred his holdings to the Idaho Electro-Chemical Company of Arizona in 1929.

An important early study is an investigation by Corps of Engineers authorized under the Rivers and Harbors Act of 1927. This report on the Snake River and its tributaries (U.S. Congress, 1933) was responsible for certain plans that were later adopted in planning and design reports of the 1940's.

Water Development History

While the actual time period of water resource development in Hells Canyon is relatively short, the history of the controversy related to the development is quite involved. The Hells Canyon reach of the Snake River, located on the Middle Snake, was first discussed in real seriousness in federal water resources plans for the region in the late 1940's. For the next two and half decades, opposition was expressed very strongly, often bitterly, on both sides of several issues, with Hells Canyon, the deepest canyon in North America, lying in the middle. The primary issues went essentially from federal versus non-federal construction of dams in the canyon to non-federal construction versus non-construction of dams. The current status of the "battle" is substantially a compromise--some non-federal dams have been built, but several others that had been planned have now been prohibited by federal law. It appears very likely that the development in the canyon will not extend beyond its present level for some time into the future. However, the battle has not ceased.

Early Controversy

As mentioned above, the early "disputers" on both sides cited a need

for dam construction, but they disagreed on who should build the dams. The discussions began with the federal plans released in the late 1940's. A water resources plan for the Columbia River Basin, of which the Snake River Basin is a large part, was one of the Corps of Engineers' "308" Reports. The report for the Columbia was completed in 1931, and proposed ten dams on the Columbia proper (U.S. Congress, 1931). The major plan, though, much more basin-wide, was completed in 1948. This report, also made by the Corps, included (a) existing projects, (b) projects underway, (c) additional projects forming a main control plan for early development, (d) proposed future projects, and (e) additional potential projects (Bessey, 1964, p. 9). Mention was made of a proposed federal Hells Canyon Dam, a high dam to provide storage for control of floods and for generation of power.

The U.S. Bureau of Reclamation also wrote a large report at about the same time (Bureau of Reclamation, 1949), in which they proposed construction of a similar high Hells Canyon Dam primarily to benefit irrigation interests. They desired to generate power at the dam and use revenues thus obtained to subsidize irrigation projects in southern Idaho. These two studies and plans, the Corps' and the Bureau's, had been done independently, with a minimum attempt to coordinate. In 1948, however, there was a major flood on the Lower Columbia River, after which President Truman directed the Departments of Interior and Army to work together on Columbia Basin planning. The agencies adopted an agreement in April, 1949 such that with respect to the Snake, the Bureau would be responsible for development above the Salmon River confluence, and the Corps would be responsible for development below (Bessey, 1964, p. 21). The Army portion, which consisted primarily of four navigation-power dams on the Lower Snake, was authorized by Congress in 1950, but the Bureau's plan, including Hells Canyon Dam, failed to be authorized.

The Idaho Power Company (IPC) had plans for eventually building five run-of-river projects on the Middle Snake, plans which were later changed to build one storage reservoir and two run-of-river hydro plants. In 1947 and 1948 there had been a fight in the Oregon state government over amendment of a 1931 state law permitting the state to recapture private power dams without going through condemnation proceedings. The amendment was

supported by eastern Oregon counties, which had been told by Idaho Power that the company would proceed with Oxbow Dam if the bill were passed. The legislature passed the bill and then overrode the governor's veto; but when the Oregon Grange and others succeeded in getting the bill as a referendum in the general election of 1948, the voters rejected it by a large majority (Weatherby, 1968, p. 47). Despite this loss, the company still sought construction of Oxbow and applied to the Federal Power Commission (FPC) to do so in late 1950.

A very diverse group of government agencies, citizen groups, and other organizations joined the FPC proceedings as interveners, either favoring Idaho Power's application or opposing it. At the start of the struggle, the opposing sides (within the FPC hearings or publicly outside the proceedings) were the following:

Favoring the federal plan (the high dam at Hells Canyon) -

organized labor at national AFL-CIO, state and local levels; a number of farm groups such as the Farmers' Union at national, state, and local levels; Oregon and Washington state and subordinate granges and some local granges in other states; some regional and national supply cooperative; some local chambers of commerce; national, regional, and local public and cooperative power association; public utility districts; the widely-represented regional Hells Canyon associations; some individuals and groups in state government; a majority of the Pacific Northwest delegation in the U.S. Congress; and, until 1953, the federal Departments of Interior and Agriculture.

Opposing federal development -

the U.S., state, and some local chambers of commerce, the National Association of Manufacturers; the Farm Bureau Federation at national, state, and local levels; some local units of the grange; the Idaho State Reclamation Association; some water-users groups; the governors of Idaho and Washington (Jordan and Langlie); and the privately-owned utilities, especially Idaho Power Company. (Bessey, 1964, p. 28)

President Truman was also among those opposing private development of the canyon. He had originally asked the Corps and the Bureau to work jointly on developing the river, and as noted earlier, the Bureau's Hells Canyon Dam proposal failed to receive Congressional authorization. Still, the Administration fought Idaho Power's efforts for its low-dam project because

the President believed "that the site called for a high dam to ensure more power, adequate storage, and full resource development" (Moss, 1967, p. 175). The federal Departments of Agriculture and Interior officially intervened in the FPC hearings, trying to dissuade the FPC from licensing the private project. When the Eisenhower Administration entered in 1953, however, matters changed significantly. In his inaugural address, Eisenhower set forward a policy of "partnership," pledging assistance to private enterprise. The Secretary of Agriculture withdrew almost immediately as an FPC intervener, and the Secretary of Interior withdrew that department's opposition in May.

With the loss of Interior as an ally, the several regional organizations felt the need for a national organization to continue the fight. The various groups, mostly public power, labor, and farm groups, combined resources in May, 1953 to form the National Hells Canyon Association (NHCA), headquartered in Portland (Weatherby, 1968, p. 89). Also in May, 1953, Idaho Power Company revealed its three-dam plan, making application to the FPC for Brownlee and Hells Canyon Dams. The three-dam plan provided for two run-of-river plants and a one-million-acre-foot multiple-purpose reservoir upstream. In contrast, the one-dam plan had a high dam located near the site of the proposed downstream power plant of Idaho Power, with a reservoir extending as far upstream as Idaho Power's three reservoirs and containing approximately 3.88 million acre-feet of storage.

The position of the interveners (i.e. NHCA) was based on sections 7(b) and 10(a) of the Federal Power Act (49 Stat. 838). Section 7(b) requires the FPC to deny a license for any project that would be better undertaken by the United States and then to recommend development of the project to Congress. Section 10(a) requires the FPC to license only projects best adapted to a "comprehensive plan for improving or developing a waterway or waterways for the use or benefit of interstate or foreign commerce, for the improvement and utilization of water-power development, and for other beneficial public uses, including recreational purposes...". The proponents of the federal plan argued that the high Hells Canyon Dam was a "better" plan than Idaho Power's, since it would provide lower-cost power than private development, thus greatly aiding the regional

economic development. They also said it was much better adapted to a comprehensive plan for the Basin since the Bureau of Reclamation and Corps of Engineers had each included the high dam as a significant unit of their existing comprehensive plans for the Columbia system. Moreover, construction of the Idaho Power three-dam project would preclude later development of the federal plan.

Idaho Power defended its case by asserting that "(1) expanding load requirements made immediate construction under its three-dam plan imperative. (2) Its project was, in fact, a multiple purpose development. (3) It was best adapted to a comprehensive plan for the development of the basin. (4) No facts justified a finding under the Federal Power Act that development should be undertaken by the U.S. (5) The project was economically feasible. (6) It could be financed and construction could proceed quickly." (Bessey, 1956, p. 684) They also argued that the one-dam project had not been properly evaluated, and that if it had been, it would have been found economically unsound and infeasible.

In the state of Idaho, the primary concern had always been (in the southern part of the state, at least) to make certain that no project would have any interference with "upstream rights" to Snake River water for irrigation and other beneficial uses. A state permit granted to Idaho Power for its project stated that the rights it had to water were subject to the condition that the project should be operated so as not to conflict with future upstream diversion and use (Bessey, 1956, p. 687). Initially, the Idaho interests did not oppose the federal project since it would have brought reclamation benefits and supposed protection of upstream water rights. In fact, official comments of the governors of the several Columbia Basin states were generally favorable to the federal "main control plan" at the end of the 1940's (Bessey, 1964, p. 25). Later on, however, despite inclusion in the Congressional bills of language protecting the upstream rights, "the governors of Idaho have continued to oppose that legislation." (Bessey, 1956, p. 687)

The Federal Power Commission hearing process involves an Examiner for the Commission listening publicly to the arguments for and against issuance of a license to the applicant. The Examiner then offers a decision on

whether to grant the license or not, and passes his decision on to the Commission. The whole Commission then issues its final, binding decision, considering the evidence given by both sides and giving due weight to the decision of the Examiner. In the Idaho Power case, where the FPC had decided to consider all three dams as one single project (FPC Project No. 1971), the Examiner found that the federal dam was superior in most respects. But he also felt that Congressional authorization would be very unlikely, so he recommended that the FPC plan be licensed. The final FPC decision was issued in August, 1955. It agreed with the Examiner that the project should be licensed, but they did not agree that the federal project would be a better one.

The essence of the Commission's decision was that Idaho Power's project would be better suited to the comprehensive plan of development than the high Hells Canyon Dam project would be. They found fault with the interveners' economic reasons for federal Hells Canyon superiority. They noted (FPC 1955, 14 FPC 59) no provision in section 7(b) of the Act that federal development should be recommended if it could provide lower-cost power. They further noted, "if the supplying of power at the lower costs resulting from Federal development should be considered as a decisive factor, there would be few cases involving major power projects where private power could be licensed under the Act..." The comparisons in value were made almost entirely on an economic basis, and the FPC emphasized that such comparisons should be made based on the same means of financing, either private financing or federal financing for each project. The interveners had attempted to compare the projects based on federal financing for the federal plan and private for the private plan, a comparison which "would be of little value in determining which plan would be more economic for either Federal construction or private construction." The Commission thus found that power considerations, which accounted for 85% of the total benefits under either plan, had a higher benefit: cost ratio with the three-dam plan (Federal Power Commission, 1955, 14 FPC 59).¹

The Commission also looked at each of the projects with respect to navigation, recreation, irrigation, and flood control benefits, and effects

¹Federal Power Commission cited hereinafter as FPC.

on fish and wildlife. Navigation benefits were seen as relatively insignificant, economically, when compared with the overall benefits of either plan, and they were "so similar in amount as to have no discernible effect." It was felt that the federal project, with its greater size, would probably attract more out-of-state visitors, but that good access roads would make either area an important recreation attraction, so again they were comparable. While the federal dam project was intended to benefit farmers through subsidization of irrigation costs, the Commission felt that the matter of subsidies (whether and in what manner) was for Congress to decide, so this benefit was disregarded.

The Commission also considered the Corps of Engineers' reliance on high Hells Canyon as part of the Corps' so-called main control plan to control floods on the Lower Columbia. The FPC noted that Brownlee Reservoir, containing about one million acre-feet of storage, when combined with other dams in the Snake Basin, would total about 8.5 million acre-feet, about two-thirds of the average annual flow of the Snake River at Weiser at that time. In addition, they noted that the Department of the Army had no objections to Idaho Power's offering less storage than originally planned, and the Corps had, in fact, offered license conditions to the FPC under which Brownlee should be operated for flood control purposes. The Commission thus felt that the IPC plan was consistent with the Army's present plans to control floods on the Columbia River.

As for the fish and wildlife aspect, both plans were judged as likely to have adverse impacts, especially on anadromous fish. The Commission estimated that about five million dollars would be required to be spent for a fishery program. Thus, the Commission stated that "the public purposes such as flood control, navigation, and recreation could be effectuated to about the same extent under either plan of development." Finally, the private plan would serve these public purposes at no expense to the United States (FPC, 1955, 14 FPC 62).

As was expected, the interveners did not agree with the Commission's decision. They petitioned the FPC for a rehearing, which the FPC denied. They then appealed to the United States Circuit Court of Appeals, maintaining their position that the federal project was superior under

Sections 7(b) and 10(a) of the Federal Power Act. The court unanimously upheld the FPC decision, not wishing to judge what they considered a technical matter. The next step was a filing with the U.S. Supreme Court for a writ of certiorari. The High Court denied the writ in 1957, refusing to review the case, with no reason given.

With apparent confidence that the appeals would be denied, Idaho Power had begun constructing Brownlee Dam in November 1955. Oxbow was started in the summer of 1958, and Brownlee was completed in the fall of 1958. Oxbow was completed in 1961. Construction of Hells Canyon Dam, started in 1964, was complete in 1968.

After issuance of the FPC license in 1955, IPC, which had made applications for permits for its three dams with the Oregon Hydroelectric Commission, appeared at a public hearing considering the permits. The company took the position that it did not need a state license since it had already obtained one from the FPC, which had jurisdiction. However, the company wished to maintain proper relations with the state. Opponents said that a state license was required, and the state Attorney General believed state law was being violated by IPC's start of construction at Brownlee. A precedent case was later discovered, however, which upheld the company's claims.

The Hells Canyon associations, particularly the National Hells Canyon Association, faded from existence after 1957. However, they did manage to muster a large letter-writing campaign in 1957 which probably helped to bring about passage in the U.S. Senate of a bill in favor of high Hells Canyon Dam. The bill later died in committee in the House, and with it the Association's hopes of halting construction of Idaho Power Company's three-dam hydroelectric complex.

Ten years later, however, some one-dam advocates took consolation in the fact that Idaho Power had been forced to change its plans from its original five run-of-river dams. Thus they considered their time and money had not all been for a losing cause (Weatherby, 1968, p. 88). Though this was the end of attempts to stop that project construction, it was not by any means the end of disputes over Hells Canyon.

Later Controversies

After construction of the three dams was "cleared" for Idaho Power, the largest thorn in the company's side was probably its requirement, under FPC orders, to mitigate adverse effects on anadromous fishes in the Snake River. The fish problem may have been the start of the "environmental" concern for Hells Canyon. The problem was that the dams blocked the migration of salmonid fishes, which swam downstream to the sea as smolts and back upstream a few years later as adults to spawn. Article 35 of its FPC license required the company to provide for fish-handling facilities to conserve these fish runs. The company was also to act accordingly upon recommendations from the Secretary of the Interior, the conservation agencies of Idaho and Oregon, or the FPC itself relative to the fish problem. They were also required to pay a portion of the annual costs of the Idaho and Oregon Fish and Game Commissions with respect to operation and maintenance of related fishery facilities.

In November 1956, the Department of Interior submitted recommendations to the FPC for construction of fish conservation facilities, followed in the summer of 1957 by a letter recommending specific fish-handling facilities. In February 1958, the FPC issued an order prescribing a net to be placed across Brownlee Reservoir with skimming and trapping devices to capture migrating fish and permit their passage around the dams. The net idea apparently worked poorly, and in October 1963 Idaho Power Company, the U.S. Fish and Wildlife Service, and the fish and game agencies of Idaho, Oregon, and Washington jointly urged the FPC to amend its earlier order. The FPC did so two months later when it ordered that the net be abandoned, that a hatchery be constructed by Idaho Power on the Rapid River, a tributary of the Salmon River, and that the company make provisions for transportation of spawning fish and/or their eggs (Bessey, 1964, p.38). The Rapid River hatchery, as well as a few other hatchery facilities on the upper salmon and Snake Rivers, have had limited success, but to date have sustained the salmon runs to some extent.

A development closely related to the "Hells Canyon battle" was a series of hydroelectric developments proposed by power companies other than Idaho Power to be constructed downstream from IPC's Hells Canyon Dam.

Pacific Northwest Power Company (PNPC), a coalition of four private utilities based in Washington and Oregon, filed an FPC application for a preliminary permit for two dams called Pleasant Valley and Mountain Sheep (see Figure 1). The three-year preliminary permit was issued, but a license was denied by Commission order in January 1958. The last day of its three-year permit period, PNPC filed a license application for a high dam at the Mountain Sheep site. The FPC called for a hearing on the application, and six days before the scheduled hearing, an application for another dam called Nez Perce was received from Washington Public Power Supply System (WPPSS), a group of eighteen municipalities. The two applications were mutually exclusive, so the Commission provided a single hearing for both of them, which ran during late 1960 and 1961. The Presiding Examiner's initial decision, in late 1962, was to grant PNPC's license and deny WPPSS's. This was followed by a petition from the Secretary of Interior to intervene in the proceedings in order to urge development by the federal government. The Commission did, however, decide to grant the PNPC license and deny the WPPSS one, an order which was appealed by the Secretary of Interior to the Circuit Court of Appeals and the U.S. Supreme Court. The Supreme Court, in a significant decision of June 1967 remanded the case to the FPC so it could reconsider two principal questions: private versus federal development, and development versus non-development (Udall v. FPC, 1967, 387 U.S. 428).

The Supreme Court decision, written by Justice Douglas, opened the way for individuals and groups with strong environmental concerns to begin making their case for preserving the canyon, i.e. not permitting any more development beyond what Idaho Power had already done. The Hells Canyon Preservation Council, one of the more active of the groups, was incorporated in 1967 "for the specific, single purpose of saving the world's deepest river canyon from being drowned by additional dams" (Hells Canyon Preservation Council, 1975, Newsletter Preface).¹ The Council published a newsletter three or four times a year between 1967 and 1975 to inform members about the issues pertinent to Hells Canyon, to report the progress of the various Hells Canyon bills in Congress, and to encourage active

¹Hells Canyon Preservation Council cited hereinafter as HCPC.

participation by its members. The Council gave its first annual award, given to "leaders of American public opinion who have taken up our cause," to Justice William O. Douglas for his writing of the Court's 1967 opinion in Udall v. FPC (HCPC, 1973).

When the PNPC-WPPSS case went back to the FPC for further hearing, the two power entities agreed to join forces and make a single application for a Middle Snake project. They applied for any one of three alternative developments in the reach between Hells Canyon Dam and the Grande Ronde River. Shortly thereafter, in late 1968, the Department of Interior sought to join the project also, which would have required legislation from Congress. Before that occurred, however, the new administration's Secretary (Hickel) withdrew the Department from consideration for the three-way coalition and even proposed a moratorium on dam-building. With the continuation of the hearings, the Presiding Examiner again recommended issuance of a license for a Pleasant Valley-Mountain Sheep project, but he also recommended that construction not begin before September 12, 1975, so that studies could be made on including the Middle Snake River as a component of the National Wild and Scenic Rivers System. In February 1975 the Commission released a draft environmental impact statement on the project (FPC, 1975), in compliance with the National Environmental Policy Act. Congressional action later killed all consideration for the project.

Several bills had been introduced into both houses of Congress since about 1968 by several of the representatives of the Pacific Northwest states. Idaho Senators Church and Jordan introduced a moratorium bill in 1968 and 1969 with little success, but it passed the Senate in 1970. The bill, intended to permit exploration of all possible alternatives and prevent construction until exploration was complete, subsequently failed in the House. Re-introduction in 1971 was also fruitless. Two bills introduced in 1970 proposed designating the stretch of the Snake in question a National River to be administered by the Secretary of Agriculture. Oregon Senator Packwood introduced a bill in the Senate, and Representative Saylor of Pennsylvania introduced a separate bill in the House. Neither was successful, including a re-introduction of Packwood's bill in the Senate in 1971. Several other bills in 1972, 1973, and 1974 attempted to create

a national forest parklands area or a national recreation area, but none was immediately successful. However, on the last day of 1975 passage was secured for an act establishing the Hells Canyon National Recreation Area (89 Stat. 1117), which was later signed by the President. A principal provision of the law creating the National Recreation Area (NRA) prohibits construction of any further development within the area, which cancelled the PNPC-WPPSS project.

Hells Canyon National Recreation Area Action

The law which created Hells Canyon National Recreation Area was a great victory for "environmentalists." They had tried for many years to obtain a legal prohibition against further Hells Canyon dam-building. The Act designated certain lands along the Snake River below Hells Canyon Dam as wilderness, certain other lands in the vicinity as the NRA, and other neighboring areas as wilderness study areas. In addition, portions of the Snake and Rapid Rivers were designated as Wild or Scenic Rivers. The tentative boundaries of the NRA in relation to existing and previously-proposed hydroelectric dams in the vicinity, are shown in Figure 1. The Act directs the Federal Power Commission not to license any project within the recreation area. It also directs the Secretary of Agriculture to determine final boundaries for the various areas, and to administer the area as a whole. Some protection is offered to the upstream irrigation and power interests, however. The law states that it shall not "in any way limit, restrict, or conflict with present and future uses of the waters of the Snake River and its tributaries upstream from the boundaries of the Hells Canyon National Recreation Area created hereby." Also, "no flow requirements of any kind may be imposed on the waters of the Snake River below Hells Canyon Dam..." under the Act (89 Stat. 1118).

ONGOING ACTIVITIES AND CONSIDERATIONS

It is important to enumerate and identify the activities and considerations that are ongoing with the water and related land resources in the

Hells Canyon reach of the Snake River. To facilitate this enumeration, groupings have been made under the following nine categories: scientific and historical, recreation, navigation, flood control, agriculture, energy production, fish and wildlife, water quality control, and institutional activities. Each grouping will be discussed separately.

Scientific and Historic Consideration

The scientific and historic consideration (A)* includes three principal factors or subconsiderations--geology, archaeology, and history. A significant feature of the canyon is its deep gorge which provides an opportunity for scientific inquiry into geologic events, eras, and geologic processes. Because Indians formerly occupied the canyon over a period of prehistory, the archaeological sites along the river offer opportunity for future study if not destroyed by vandalism or by water impoundments. The old canyon ranches, abandoned mines, and ruins of early white man's habitations offer opportunity for historical study and a chance to display and preserve early western history. This promises to be a continuing consideration.

Recreation

Recently recreation has become very significant in thrusts of activities and considerations. This is well expressed in the action of Congress (PL 94-199) establishing the Hells Canyon National Recreation Area which is designated as a major consideration (B₁) under the recreation grouping of activities. This is relatively new in establishment (1975), and provides for national recognition under the federal statute. It is ongoing and formative in its development and promises to be a continuing consideration.

The second major consideration under the recreation grouping is the wild and scenic river designation established for the stretch of the Snake River from Hells Canyon Dam to the Forest Service boundary near the

* These letter symbols have been used for a convenient short identification of the considerations and are used in a later matrix presentation and to provide a cross-reference.

Washington-Oregon state boundary (B₂). Even though the designation was established under the Hells Canyon National Recreation Area Act (PL 94-199), the stretch of river will be administered under provision of the Wild and Scenic Rivers Act (PL 90-542). This represents a unique use and preservation of that stretch of the river. It obligates the Forest Service as administering agency to define the corridor boundaries and to develop certain management plans. These activities are in a developing process and the wild and scenic river consideration promises to be a continuing one.

The third major consideration under the recreation grouping is designation of the stretch of the river from the Hells Canyon National Recreation Area downstream boundary to the town of Asotin as a study category river (B₃) under provisions of the Wild and Scenic River Act. This has obligated the Federal government to study this section of the river for possible inclusion under the National Wild and Scenic River system. This is now an ongoing study assigned to the Bureau of Outdoor Recreation of the U.S. Department of Interior. As such, it has a limited life and will result in either a rejection or acceptance of the stretch of the river into a national system. It is a separate and identifiable consideration that has definite impact on local people, the state, the region and the nation.

The fourth major consideration under the recreation grouping is reservoir recreation (B₄). This is an activity that is already established on the reservoirs behind Brownlee Dam, Oxbow Dam and Hells Canyon Dam. Recreation activities on the downstream reservoirs, such as Lower Granite Reservoir, have much concern of people who reside in the area as well as visitors. This recreation activity on the lower river reservoirs has a spillover effect into the Hells Canyon reach of the river. The reservoirs within the Hells Canyon reach in the development zone are relatively new and somewhat remote from population centers. However, the consideration of reservoir recreation promises to become of increasing importance and complexity for management.

Navigation

The grouping of navigation considerations represents one of the oldest concerns for water. The first consideration is navigation servitude (C₁),

which is not a use exactly, but a status of policy that the Federal government has long claimed. This is the claim that the Federal government has made on all navigable rivers to the right of use of the river for navigation purposes without compensation to the states, riparian land owners or water users. This derives from the commerce clause of the U.S. Constitution which states, "The Congress shall have power... (3) To regulate commerce with foreign nations and among the several states... ."

This action of navigation servitude has been backed by many court cases and authorizations established under rivers and harbors acts. Responsibility for administration of navigation servitude is vested primarily in the Corps of Engineers, but the U.S. Coast Guard exercises certain prerogatives with regard to safety on rivers. Navigation servitude is a continuing type consideration, and as commerce increases on the Snake River system, navigation servitude promises to be more important and brought into play in decision making.

The second consideration under the navigation grouping is the navigation above Asotin, Washington (C₂). It represents a separate concern in that it is the reach above which barge transportation and major channel improvement has not been exercised. Currently navigation includes commercial boat service for mail and shipping of supplies to ranches along the river, plus growing recreational boating activity. Navigation is important because in many cases it is the only access into the canyon. It is a continuing concern of the public and is growing in importance. Supporters of this activity have been strong in asking for a change in licensing provisions of minimum flows from the Idaho Power Company dams.

The third consideration under the navigation grouping is the navigation below Asotin, Washington (C₃). This is an activity and concern that had a long history in water development of bringing slack-water navigation to Lewiston, Idaho. It is now an established fact of commerce and shows signs of growing in importance. Already shipping has exceeded earlier forecasts of tonnage. This will be a continuing concern and is integrally connected with the decisions of regulation within the Hells Canyon reach of the river.

Flood Control

The grouping of flood control considerations into a separate category is from the viewpoint of a long established purpose of water resource development. The necessity for upstream impoundments has been utilized to control floods in the Snake River and to make a contribution to flood control at locations in the Lower Columbia River. The first consideration is the flood control operation of Brownlee Reservoir (D_1). This is an impoundment within the Hells Canyon reach of the river that has a specific flood control function and obligation. Under the plan for power development accepted by the Federal Power Commission from Idaho Power Company, a storage capacity of 1,426,700 acre-feet was developed extending backwater $57\frac{1}{2}$ miles up the Snake River from the Brownlee Dam. Live storage of 1,000,000 acre-feet was to be made available for flood control use if and when required. The reservoir level elevation was not to be higher than elevation 2034 by March 1 of each year to provide about 500,000 acre-feet of storage capacity for flood control at that time of year. Although development of Canadian storage on the main Columbia River has made flood control less an issue downstream from the Hells Canyon reach of the river, the flood control operation of Brownlee will continue to be a part of the operating plan for the river and will receive continuing consideration. Since the operating condition is subject to review from time to time by the Corps of Engineers, there may be changes in the pattern of flood control operation.

The second consideration under the flood control grouping is flood control operation of upstream reservoirs (D_2). This includes all the major reservoirs such as Jackson Lake, Palisades Reservoir, Ririe Reservoir, American Falls, Lucky Peak Reservoir, and Owyhee Reservoir. All of these upstream reservoirs' operations and flood control releases have an impact on the flows through the Hells Canyon reach of the Snake River. Although some of the control is for local protection near the particular dam, the integrated releasing of water from these reservoirs for flood control purpose will continue to be a consideration in flow regulation through the Hells Canyon. Such regulation will require more accurate and sophisticated runoff forecasting.

Agriculture

The grouping of considerations under the heading of agriculture represents a major water use in the state of Idaho and also in the Pacific Northwest region. The concern for water for agriculture has historically had priority that is strongly defended. The first consideration under agriculture is existing ranching within the canyon (E_1). The agriculture that has developed within the canyon is livestock ranching that has persisted since the late 1800's. It has depended on river boat navigation for communication and supply. Demands from the public for more access and lower grazing pressures make it difficult for ranching to continue. Concurrently, interest in recreational home sites within the canyon and desire by some to provide more support for wildlife makes ranching questionable as a continued future consideration.

The second consideration under the agriculture grouping is the concern for existing upstream agriculture (E_2). Much of the economy in Southern Idaho is built around irrigated agriculture that is supported by diversions from the Snake River and its tributaries. In general, this practice has contributed to stability of flow through the Hells Canyon and has actually increased the minimum flows. This agricultural practice promises to continue, but it may be possible to change the pattern to obtain increased local efficiency and thereby alter flow manipulation. Southern Idaho irrigation has required an extensive system of storage reservoirs. The operation of these reservoirs has been dictated by water rights that license the uses and the irrigation demands. Such priority of use is statutorily supported and well established, indicating a tendency for limited change on existing lands.

A third consideration under the agricultural grouping is the potential for upstream agriculture (E_3). There has been a consistent expansion of irrigated agriculture. Land proposed for irrigation has been identified, applications have been filed for water permits, and negotiations are in progress under the Carey Act and Desert Land Act for land acquisition. Increased diversion of water from the upper Snake River will naturally diminish flows through the Hells Canyon reach of the river. The pressure to develop will continue, but can be affected greatly by economic restraints,

policies of public land agencies, and policies like the Idaho Water Plan.

A fourth consideration under the agricultural grouping is potential for agricultural development in Oregon and Washington (E_4). Irrigation at downstream points in Oregon and Washington has likewise been expanding and any depletion in flow by upstream diversions for consumptive use tends to jeopardize the potential in the downstream states. This threat promises to continue as a consideration and will be a political decision that will need to be faced before a compromise or compact between states is reached.

Energy Production

The grouping of considerations for energy production has been a subject of a long and complicated conflict, and with the emphasis on the energy crisis in our country, the concern appears to be increasing. The first consideration is the Federal Power Commission license of Idaho Power Company dams (F_1). This license has specified certain limitations for operating power releases through Hells Canyon Dam. The efforts of groups in the Lewiston-Clarkston area to have the license changed to allow for higher minimum flows has so far met with no change. However, temporary waivers were permitted this year (1977) to accommodate problems caused by the drought. This license is the governing stipulation of the Federal Power Commission and is an active part of the management of the water resource in the Hells Canyon reach of the Snake River. Attempts to change it will no doubt continue.

The second consideration under the energy production grouping is existing power production within the canyon (F_2). The Idaho Power Company investment in the three power plants and the expansion of energy capacity at Brownlee Dam were bitterly argued in Congress and in the public political arena of the Northwest. The production represents a very large portion of Idaho Power Company's operating capability. The use of Idaho Power's plants for more peaking capability will grow and the operation will often conflict with some downstream uses. The economics of peaking is important as a low priced source of power for energy users in the area. Increased irrigation development upstream will reduce the production of the canyon plants.

The third consideration in the energy production grouping is existing upstream power production (F_3). This is represented by a combination of private power dams like C.J. Strike and Swan Falls and public projects like Anderson Ranch and Palisades power plants. The operation of these plants affect the timing of flows through Hells Canyon and provide energy for operation of some of the significant irrigation developments. The percentage of upstream power is decreasing in relation to the total capacity of the area. Its significance may lessen unless new low-head hydro developments are fostered.

The fourth consideration in the energy production grouping is upstream potential power (F_4). Studies of potential power opportunities at dams on the Snake River, at Swan Falls, Guffey, Shoestring, Lynn Crandall, Scriver Creek, and Salmon River power dams afford a possibility for considerable power development and an unknown number of low-head power sites exists that could be built, as a more conservation-minded alternative. However, present restrictions of wild and scenic river status and public opposition to dams indicates this consideration is very much undecided and indefinite. There is a potential for development and as power becomes more scarce and more expensive by alternative means, this consideration will keep cropping up for reappraisal. The real value of low-head hydro or all upstream power potential has never been separately identified in total nor separately displayed as an alternative for a future energy source.

The fifth consideration under the energy production grouping is the Lower Snake power dams (F_5). This involves the four federal dams, that have provided slack water navigation to Lewiston, Idaho, which at the same time serve as run-of-river power dams. The power interests will continue to want to keep flows through these dams as high as possible to maintain energy production at a viable level.

The sixth consideration under the energy production grouping is the Lower Columbia power dams (F_6). These dams are similar to the Snake River dams in that they serve navigation and act as run-of-river power installations. The idea behind them is to produce as much power as possible with the upstream regulation of the Snake River system. The Upper Columbia River flows and reservoir regulation influences production of power on the

Lower Columbia River much more than Snake River operation so considerations for the Lower Columbia power dams will continue to have a lesser role in the operations through Hells Canyon.

The seventh consideration under the energy production grouping is the concern for potential power within the reach (F_7). This involves the fact that the stretch below Hells Canyon Dam offers the physical possibility of building additional dams and developing additional hydro-energy production. There even exists the potential for replacing existing Hells Canyon Dam with a higher dam. Present laws prohibit more impoundments for power development, so this consideration may only be a moot point at present. A long advocated scheme of developing power by tunneling from Salmon River to Snake River may likewise not be feasible under present restraints of the Hells Canyon National Recreation Act.

The final consideration under the energy production grouping is concerned with pumped storage potential (F_8). As the need for peaking power in the region becomes more acute, pumped storage hydroelectric development is now being planned for development. The Hells Canyon reach of the river has several favorable sites. These sites may be restricted in the Hells Canyon National Recreation Area, but since the lower impoundment already exists, the possibility of developing the power resource will continue to be a consideration. The fluctuations in levels of reservoirs caused by the rapid release of water on the generating cycle will be a deterrent to acceptability of this energy source.

Fish and Wildlife

The purposes of the Hells Canyon National Recreation Act are very definitely set up to protect and enhance the fish and wildlife resources of this unique reach of the Snake River; therefore the considerations for these resources represent an important grouping that has much public support.

The first and most obvious consideration is the concern for the anadromous fishery (G_1). When the Idaho Power Company dams were constructed, the upstream movement of the anadromous fish run was disrupted. There has been strong effort to sustain the run up to Hells Canyon Dam and to provide some mitigation for the loss. The future will bring even greater

efforts to preserve and protect the salmon runs in the canyon reach of the river.

The second consideration under the fish and wildlife grouping is the concern for the resident fishery (G_2). There is a population of sturgeon in the river which has become recognized as an endangered species. Although fishing to keep and utilize these fish has been continued, it is an important aspect of retaining a particular fish species. Also important is the bass and trout fishery that is resident to the river. A part of this consideration includes the managed reservoir fishery in the power dam reservoirs which has become a significant interest for many river visitors. Certainly the popularity of the sport fishery will continue as a strong activity within the reach of the river under analysis.

A third consideration of the fish and wildlife grouping is the concern for wildlife (G_3) concentrated along riparian lands of the river. This includes big game animals such as mountain goats, deer, bear and elk, as well as water fowl and upland game birds--all of significant interest to hunters. The conflict with ranching livestock operations has continued for some time, but a lessening of economic viability of livestock ranching within the canyon probably will mean less conflict in the future. The conservation thrust and a strong concern for environment indicates continued consideration for wildlife in the Hells Canyon.

A fourth consideration of the fish and wildlife grouping is Idaho Power Company mitigation (G_4) of fish and wildlife losses sustained by the development of the three FPC licensed hydroelectric dams. When construction was initiated, the extent of environmental impact was not known, nor was the extent of mitigation that would be necessary. A system for passing migrant fish downstream did not work satisfactorily and special hatcheries had to be constructed. Thus, mitigation has been an evolving consideration which must continue to be monitored and reevaluated as time passes.

A fifth consideration of the fish and wildlife grouping is mitigation of losses in the Lower Snake River (G_5). This mitigation is to make up for losses sustained in water development projects between Lewiston and the mouth of the Snake River. Although this is downstream of the Hells

Canyon reach of the Snake River, the impact of actions in the Hells Canyon are very direct on the lower part of the river. The losses and their administration are different than those of Idaho Power Company mitigation, because the development is totally federal, navigation is being provided and much of the adjacent land is in private ownership. Action is now in progress to rectify and in part mitigate the losses caused by dam and lock development which may involve constructing a hatchery in the Hells Canyon reach of the Snake River. This will be a continuing consideration.

Institutional Activities

This grouping involves considerations that are not necessarily uses of the water and related land resources, but are concerns that are being expressed as public policy or the actions of specific organizations and entities concerned with water resources in the Hells Canyon reach of the river.

The first consideration in this grouping is the Columbia River compact negotiations (I_1). For more than two decades, attempts have been made to negotiate a compact between states of the Columbia River Basin stipulating use and management of water resources. This means of making decisions on important policy and operating programs for river use has been provided for under the Federal Constitution and has been used in several river basins. Although such a compact has not reached ratification status, much interest and hope exist for the development of a suitable compact. The Hells Canyon reach of the river is the logical base for negotiations between Idaho, Oregon, and Washington, and represents an important reference from which to measure and define the limits for use and conservation of the resources. Hopefully, compact negotiations will continue to be a viable alternative and will soon reach a status of ratification and implementation.

The second consideration in institutional activities grouping is the upper basin citizens' insistence on a subordination clause (I_2) in licenses and water rights legislation. Basically the language upper basin interests have insisted on being in licenses and authorizing project and

recreation area legislation, protects the option of the upper basin water users to retain a right to divert water for present and future use. This is best exemplified by the language of Section 6 of the Hells Canyon National Recreation Act that states the following:

No provision of Wild and Scenic Rivers Act (82 Stat. 906) nor this Act, nor any guidelines, rules or regulations issued hereunder, shall in any way limit, restrict, or conflict with present and future use of the waters of the Snake River and its tributaries upstream from the boundaries of the Hells Canyon National Recreation Area created hereby, for beneficial uses, whether consumptive or non-consumptive now or hereafter existing, including but not limited to, domestic, municipal, stockwater, irrigation, mining, power, or industrial uses.

This is often referred to as the protection of areas of origin of the water resource. This will be a continuing desire and claim of the citizens of the upper portions of the Snake River.

The third consideration under the institutional activities grouping is the Idaho Water Plan (I₃). This action, authorized as a function of the Idaho Water Resources Board, has defined certain objectives for planned development of the water resources of the state. It has set broad goals for the use of the waters of the state and forms a basis for limits of desirable diversions and limits of irrigation development. This all bears on flow regulation and management of the water and land resources in the Hells Canyon reach of the river. Aspects of the Idaho Water Plan will increasingly be referred to as a basis for decisions for water resource use, conservation and preservation. The certainty and extent of how and what the Idaho Water Plan will be is yet an unknown.

The fourth consideration under the institutional activities grouping is the Washington state policy on stream maintenance flows (I₄). Recent attempts by the Washington state legislature to prescribe a minimum discharge for flow of the Snake River at Clarkston, Washington, has been resisted by interests in Idaho. This will continue to be a matter of conflict between the respective entities.

A fifth consideration under the institutional activities grouping is the Oregon state policy of preservation of Hells Canyon (I₅). Recently the Oregon State Water Resource Board reversed its early support of

development of the stretch of the Snake River below Hells Canyon Dam for hydro production. Instead, it announced a policy supporting preservation of the free flowing status of the river that is claimed in common with Idaho. This consideration appears to be a status that will remain, but the very fact that there was a reversal in position indicates that the future may offer some opportunity to express a different policy.

A sixth consideration under the institutional activity grouping is the Corps of Engineers - Columbia River and Tributaries study (I₆). This ongoing planning study has been authorized in the Pacific Northwest and assigned to the Corps of Engineers. It has a completion date of 1979, but these comprehensive review reports (sometimes referred to as "308" reports) have periodically been restudied by the Corps of Engineers. This study is a present concern and promises to provide input for future decisions with regard to the water and related land resources.

A seventh consideration under the institutional activity grouping is the Pacific Northwest River Basins Commission Comprehensive Coordinated Joint Plan (I₇). This planning effort, directed by the Pacific Northwest River Basins Commission, is a regional study that is involving input from all federal agencies and from the states through study teams. The Plan has a target completion date of 1979, and the authorizing legislation of the commission (PL 89-80) stipulates that the commission will have a continuing responsibility for water resources planning. Thus, actions from that organization should have a continuing impact on the decisions associated with the river in the Hells Canyon reach.

An eighth consideration under the institutional activity grouping is interbasin transfers (I₈). In the early 1960's there were numerous grandiose schemes proposed for interbasin transfer of water from the Snake River and Columbia River. The Colorado River Project Act (PL 90-537) has prohibited the study of such schemes by federal agencies. However, this moratorium on study comes to an end in 1978, so proposals and schemes for interbasin transfers of Snake River waters are apt to be a continuing threat to upstream interests.

The ninth and last consideration under the institutional activity grouping is the Reserved Rights Doctrine (I₉). This is the claim that

federal reserve land and Indian reservation lands have the right to the use of waters arising on federal reserve lands. The claim is most explicitly enunciated in the Winters' Doctrine which is concerned with Indian claims to water rights. Because there are extensive federal reserve lands both within the Hells Canyon reach of the Snake River and in the upstream areas, it is obvious that the water rights claims made for federal reserve lands will have much to do with planning and management of the water and related lands in the area.

INTERRELATIONSHIP BETWEEN ACTIVITIES AND CONSIDERATIONS

It is important for future planning, management, and operation of the water resources of the Snake River through the Hells Canyon reach that the interrelationships between various present and future considerations be understood. These considerations have been identified and defined in the previous section.

Here an attempt is made to point out the interrelationships that exist between them. It should be noted that a consolidation of some of the factors or aspects that make up the major considerations has already been presented. It was decided that a matrix would most graphically illustrate the relationships between the considerations.

First a study was made of these interrelationships and they were put down in descriptive word form. An example of this effort is presented below:

"B₂F₁ Hells Canyon Wild and Scenic River compared with Hells Canyon F.P.C. License

Designation of wild and scenic river status to a portion of the river below Hells Canyon Dam appears to have a minor negative impact on the FPC license of the Hells Canyon Dam in that it tends to provide opportunity for more public visitation and awareness of adverse effects of license provisions (such as the 5,000 CFS minimum). It may result in public pressure for changes on license provisions. Likewise, it brings another management agency, the U.S. Forest Service, into a more active role concerning the water and related land resources. ..."

It should be noted that this is a subjective evaluation that is given a word scaling value indicating whether a consideration has major positive impact, positive impact, minor positive impact, negligible impact, minor negative impact, negative impact, or major negative impact. A comparison was made for all the considerations; that is, each consideration was compared with each of 35 other considerations and evaluated for its impact. These word evaluations are very voluminous so they are not reported in this publication. The detailed word evaluation is available on request as an Appendix to this report.

In order to show the results of these individual comparisons a matrix has been prepared that graphically indicates the impact each consideration has on the others. A thick black bar signifies a major positive impact of one consideration on the other; a medium black bar, a positive impact; a thin black bar, a minor positive impact; and no bar a negligible impact. A thin grey bar indicates a minor negative impact; a medium grey bar, a negative impact; a thick grey bar, a major negative impact. This is shown in Figure 3.

Though this is a subjective evaluation by the authors, it was made in as objective manner as they could put forth. Further elaboration of the matrix is anticipated which would allow for subjective quantification. Obviously some considerations are more important than others; therefore, the matrix could be used in decision-making by weighting certain considerations more than others.

IMPACT OF CONSIDERATIONS

Though the previous section summarizes the interrelationships between the various considerations in the form of a matrix, it also seems appropriate to aggregate these considerations and identify their impacts in a more summary manner. This will be presented by first identifying the impact on the State of Idaho, then the impact on the region (the Pacific Northwest) and finally the impact on the nation.

Impact on the State of Idaho

The consideration for scientific and historical factors appears likely

It should be noted that this is a subjective evaluation and is given a word scaling value indicating whether a consideration has major positive impact, positive impact, minor positive impact, negligible impact, minor negative impact, negative impact, or major negative impact. A comparison was made for all the considerations; that is, each consideration was compared with each of 15 other considerations and evaluated for its impact. These word evaluations are very subjective so they are not reported in this publication. The detailed word evaluation is available on request as an appendix to this report.

In order to show the results of these individual comparisons a matrix has been prepared that graphically indicates the impact each consideration has on the others. A thick black bar indicates a major positive impact; a thin black bar indicates a minor positive impact; a medium black bar indicates a moderate positive impact; a thin grey bar indicates a minor negative impact; a medium grey bar indicates a moderate negative impact; a thick grey bar indicates a major negative impact. This is shown in Figure 3.

Though this is a subjective evaluation by the author, it was made in an objective manner as they could not further elaborate on it. The matrix is anticipated which will allow for subjective evaluation. Obviously some considerations are more important than others; therefore, the matrix could be used in determining by weighting certain considerations more than others.

IMPACT EVALUATION

Though the previous section summarizes the interrelationships between the various considerations in the form of a matrix, it also seems appropriate to separate these considerations and identify their impacts in a more summary manner. This will be presented by first identifying the impact on the State of Idaho, then the impact on the region (the Pacific Northwest) and finally the impact on the nation.

Impact on the State of Idaho

The consideration for scientific and historical factors appears likely

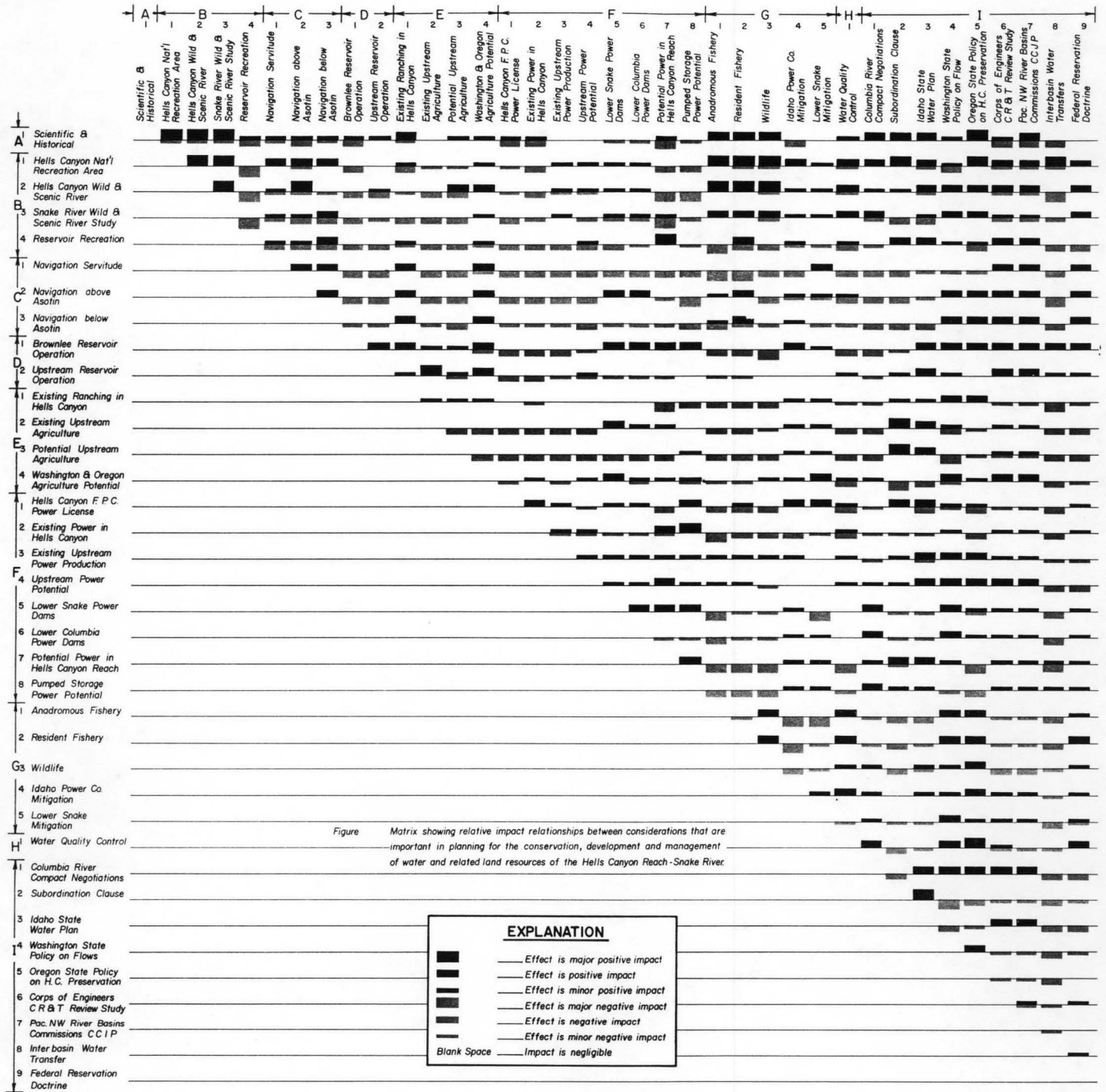
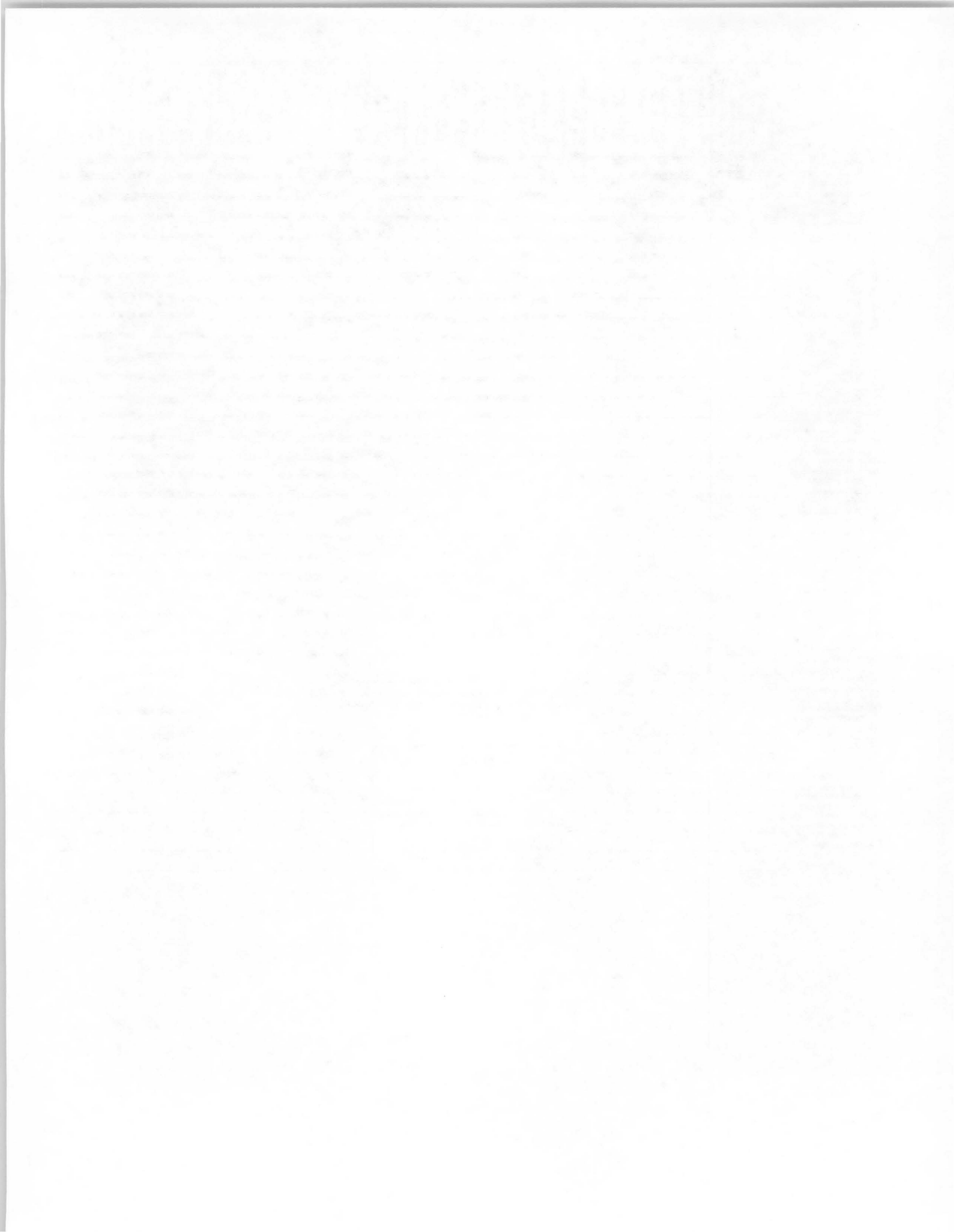


Figure Matrix showing relative impact relationships between considerations that are important in planning for the conservation, development and management of water and related land resources of the Hells Canyon Reach-Snake River.



to limit any full construction type development. This is true also of the considerations for Hells Canyon National Recreation Area, the functioning of the Hells Canyon Wild and Scenic Rivers section of the Snake River, and the study status of the stretch of river down to Asotin, Washington. Concern for recreational and environmental considerations will certainly tend to preserve the natural surroundings and relative solitude, which many Idaho citizens have indicated they desire.

Navigation servitude appears to threaten and limit any future construction type development but at the same time there appears to be a potential to make more use of resources if navigation is fostered with Federal support.

Irrigated agriculture stands to be limited if restraints of preservation and higher minimum flows are required to meet recreationists' interests.

Power production and potential power development will probably be limited if greater consumptive use withdrawals are made for irrigation. Flood control can likewise be jeopardized by heavy emphasis on recreation, navigation, and power production.

Wildlife and fishery resources will be enhanced within the Hells Canyon stretch of the river by the considerations for recreation, for the wild and scenic rivers, for navigation and concern for water quality control. Institutional concern for a Columbia River compact, preservation of the subordination clause in national recreation area legislation, and consumation of the Idaho State Water Plan all appear likely to have positive impact on the State. The planning studies of the Corps of Engineers and the Pacific Northwest River Basins Commission also should have positive values for Idaho.

Institutional considerations like interbasin water transfer, federal reserve lands claims to water rights, and policies of downstream states favoring setting minimum flows appear to have a negative impact on the State as a whole.

Impact on the Region

The impacts on the State carry over and affect the region in a like manner but the various considerations have a lesser role to play in

regional development and conservation. In general, most considerations for preserving scientific and historical aspects of the river, recreational considerations, navigation and flood control, agricultural development, fish and wildlife, and water quality control are favorable in their impact on the region. Certain thrusts of consideration for energy aspects have conflicting impact on the region.

Consideration for a negotiated compact for managing and allocating the water resources between the states appears to have a strong advantage and desirability for the region. However, preserving the subordination clause, protecting upstream rights and allowing the continued depletion of river flows, has definite limiting impact on the region. Negative to well being of the region are the considerations of interbasin transfers and exercising the reserved lands claim to water rights. The definition of an Idaho State Water Plan has a positive impact on regional planning; however, certain claims to water flows may restrict full development in the region.

Impact on the Nation

The considerations that are important in activities and decisions on the water and related land resources of the Hells Canyon reach of the Snake River generally appear to have a positive impact on the nation. Even such a consideration as interbasin water transfer might be a necessary action to meet a national need. Certainly preserving scientific and historical items such as geologic features, archaeological sites, and historical features has value in the national scheme for preserving culture and enhancing the social well-being of people.

OPTIONS FOR THE FUTURE

The alternatives that might be considered in deciding on the use, conservation and regulation of the water and related land resources of the Hells Canyon of the Snake River are many and varied, but an appraisal now indicates the following as significant and worthy of specific attention in the near future:

1. A compact between the Columbia River basin states that would make a binding allocation of the water depletions that might be made by each state.
2. Extensive new upstream irrigation development.
3. Very limited amounts of new irrigation depletions.
4. Increased storage upstream of Hells Canyon in surface reservoirs or in underground aquifers.
5. More extensive power development of the river.
6. Pumped storage development adjacent to existing impoundments and a major thermal energy park.
7. Interbasin water diversions to points outside the Columbia River basin.
8. Revised operation of the reservoirs above Hells Canyon reservoir.
9. More restrictive wilderness areas and stricter enforcement of preservation of the free flowing stretches of the river system.

1. Compact between States for Allocation of Water

Up to the present, no restraint has been imposed by any state or section of the river basin on consumptive use depletion of the river's flow. Yet it is obvious that continued consumptive use depletion could be adverse to the well being of the river, and to the many functions the water resource performs. Compacts and treaties have been made in other basins and in sections of the basin shared with Canada. A well planned decision of the consumptive use limits of depletions of river flow in each state would do much to help bring stability to the region and to provide an equitable basis for administering and regulating the river. Obviously, such a decision must be based on careful hydrologic studies that will stand the scrutiny of the public and allow for changing conditions of use and need. Primarily, this will call for patient and trustful statesmanship between the states and the federal agency representatives.

2. Extensive New Upstream Irrigation

Consistent trends of the past point to the possibility of extensive

new upstream irrigation developments. The land is available; however, the water will be limited and favorable economics of such action may not continue as an incentive. The cost of energy and favorable prices for agricultural production will greatly influence the viability of this option. Naturally, development cannot occur with all the environmental amenities now present being retained.

3. Limited New Irrigation Depletion

An option that might be exercised if a concern for the environment and a limited energy production were favored, would be the limiting of new irrigation depletions especially in the upstream portions of the basin. From an economic viewpoint, a strong case might be put forth allowing development in the lower elevations of the basin and allowing for more preservation of land resources in an undeveloped state in the upstream areas.

4. Increased Upstream Storage

Even though there is extensive surface storage and much natural underground water storage, there are some advantages, hydrologically, to providing more storage. Increased storage would smooth out the variation in peaks of flood flows and raise the minimum flows.

New storage would require impoundment sites and would result in a loss of some resources, as well as other adverse effects in parts of the river system. Providing this storage in the unfilled interstices of groundwater aquifers by ground water recharge has been advocated. This option holds much promise, but the evaluation of the benefits, costs and feasibility is a technically challenging problem. A study by Fortier (Fortier, 1975) is worthy of review in this regard. Certainly innovative techniques that are yet untried would need to be used.

5. Power Development of the River

Several engineering possibilities exist for developing the power potential of the Hells Canyon reach of the Snake River. One is a high dam at the present Hells Canyon Dam that would flood out existing plants, but provide much more capacity and storage. This could enhance the production

of power in downstream power plants. For years there has been talk of a high dam at the Nez Perce site that would provide storage control to both the Snake River and the Salmon River. This could also provide much regulation to enhance downstream power production. Another power development scheme that has been discussed even longer is to utilize a tunnel from the Salmon River below Riggins to a power plant on the Snake River. Another possibility is a power dam or dams in the reach below the Hells Canyon National Recreational Area downstream boundary. This might be in the form of low head hydroelectric developments. All of these appear to have limited possibility, since existing national legislation tends to prevent such development. However, the economic value of hydropower may change the situation.

6. Pumped Storage Development and an Energy Park

Studies by the Corps of Engineers, Idaho Power Company, and Larry Coupe on this research, point to the possibility of utilizing existing impoundments for the lower reservoir and creating new upper reservoirs that would provide for pumped storage peaking power plants. Coupe's study also suggests the possibility of a thermal power plant development nearby that would create a large energy park. This naturally cannot occur without some sacrifice and loss of environmental amenities. However, it may be the most economical and yet least damaging to the environment.

7. Interbasin Water Diversions

A long discussed option advanced by the water short citizens of the Southwest has been the possibility of transbasin diversion of water from the Snake River or the Columbia River to use in Arizona and California. A comprehensive summary of these schemes was made earlier by the author (Warnick, 1968). A study of the matrix presented in Figure 3 shows transbasin diversion as highly negative when compared with the many other considerations now apparent. The threat of diversion still remains, but from a national standpoint there is doubt as to whether it is best to move people or water.

8. Revised Operation of the Upstream Reservoirs

With the Canadian storage now essentially complete on the Upper Columbia River and with the advent of better ability to forecast river flows, an option might be exercised allowing more liberal operation of the flood control space in upper river reservoirs and operation of the reservoirs for carryover for irrigation water supplies that allows less protection for the very worst droughts. Coffin's M.S. thesis on this project presents the idea that a change in regulation could provide more favorable power releases. According to Coffin's study, this might include a reregulation of flows downstream from Hells Canyon Dam. Robertson likewise has suggested this in testimony before hearings in 1977 on requests by Idaho Power Company for a waiver of flow minimums. This will require more careful hydrologic studies and evaluations of power values under alternative pricing schemes and changes in the hydro-thermal power production of the future. Likewise, it might require changing licensing provisions as now practiced by the Federal Power Commission.

9. More Restrictive Wilderness and Preservation Enforcement

Not the least of options is the possibility of providing more wilderness areas that are administered with stricter non-use provisions as well as stronger enforcement of preservation efforts in wild and scenic river stretches, and tighter limitations on water quality standards. This environmental thrust to provide more natural conditions is receiving much support and appears to be a continuing desire. The degree to which this environmental concern should be exercised is the real question. Also, how to evaluate it within the economic framework and the political arena stands as an important need of the immediate future.

CONCLUSIONS AND RECOMMENDATIONS

The planning, development, and conservation of the water and related land resources of the Hells Canyon reach of the Snake River will require facing the complexity of the many considerations. These considerations have been enumerated and identified in a descriptive manner. A study of

the interrelationships between the various considerations and a subjective quantification has been made. Figure 3 in this report is an attempt to graphically portray the interrelation between each one consideration and all the others. This graphical matrix is recommended to the reader for careful study. Refinement of the scaling of the relationship can be argued, but first a beginning point must be established. The matrix should be used as a tool to analyze the future consequences of making certain commitments of the resources involved.

This document along with a study of the extensive bibliography should serve to help decision makers understand the consequences of setting certain policies toward development, toward environmental protection, and toward conservation of the water resources in the area. It should also help in dealing with many institutional problems that are now apparent.

The challenge is to plan for the future and not let water-use happen by chance and by ignorance of the probable impacts. Several options have been identified; they are not all-inclusive but they represent a spectrum of the choices that should be weighed and the trade-offs that should be evaluated if wise decisions are to be made.

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