5-1966

A History and Economic Analysis of the Hyrum Reclamation Project

Douglas Eldon Brinley
Utah State University

A HISTORY AND ECONOMIC ANALYSIS OF THE HYRUM RECLAMATION PROJECT

DOUGLAS ELDON BRINLEY

1966

A HISTORY AND ECONOMIC ANALYSIS

OF THE

HYRUM RECLAMATION PROJECT

by

Douglas Eldon Brinley

A thesis submitted in partial fulfillment
of the requirements for the degree

of

MASTER OF SCIENCE

in

Economics

Approved:

_____
Major Professor

_____
Head of Department

_____
Dean of Graduate Studies

UTAH STATE UNIVERSITY
Logan, Utah

1966

ACKNOWLEDGMENTS

The Utah State Agricultural Experiment Station, under the direction of Dr. Kenneth W. Hill, in the spring of 1964 agreed to support a series of studies relative to federal reclamation projects in the state of Utah. These studies were under the direction of Dr. Leonard J. Arrington. I would like to express my sincere appreciation to Dr. Arrington for his encouragement and help.

I would also like to thank Dr. Allen D. LeBaron of my Graduate Committee for his critical review of the thesis; Professor Evan B. Murray, Head of the Department of Economics for his helpful suggestions; and Dr. O. E. Larson, formerly Director of Region Four of the Bureau of Reclamation, for clearing up many difficult points.

Others who assisted materially in this study included John Jensen, economist for the Logan office of the Bureau of Reclamation, and Paul Sant and Alden Orr of the Salt Lake City office of the same agency. President William P. Leatham of the South Cache Water Users' Association was most patient in answering questions relative to historical points of interest and current operational procedures connected with the Hyrum Project.

Finally, to my wife, Geri, for her patience and support in fulfilling this assignment, I extend a husband's gratitude.

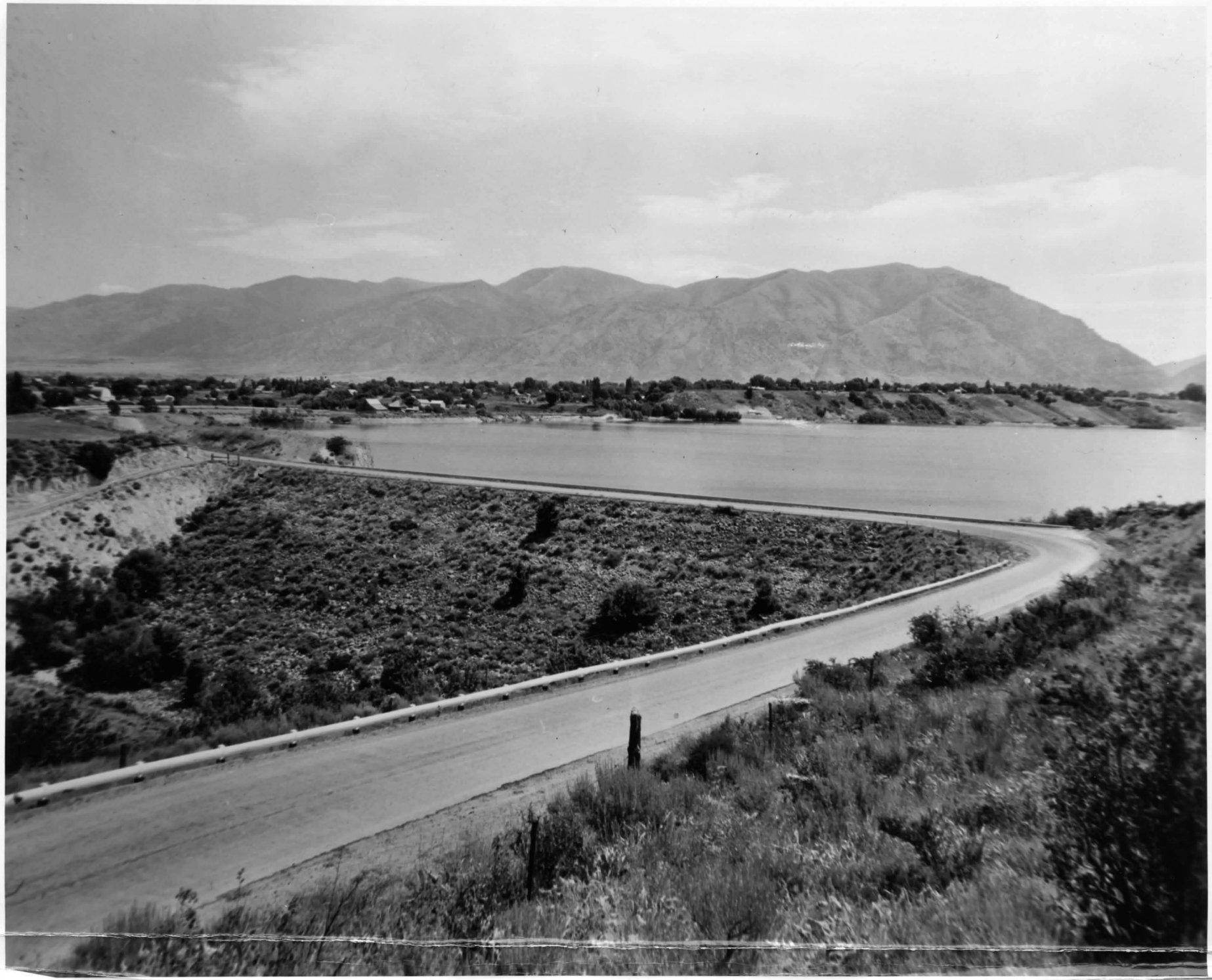
Douglas Eldon Brinley

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Figure Page



Photograph of Hyrum Project

CHAPTER I

HISTORICAL INTRODUCTION

The Reclamation Act of 1902 was signed into law under the hand of President Theodore Roosevelt on June 17 of that year, culminating years of efforts to involve the federal government in reclamation projects. Prior to this Congress had enacted a variety of land laws designed to encourage private enterprise to develop the land and water resources of the nation, but had resisted using federal funds to construct reclamation works. The early land laws, however, served only as a temporary satisfaction to Western settlers, and Congress finally yielded to the pressure for assistance.

Undoubtedly much of the credit for passage of the 1902 law was due to the man who ascended to the Presidency through McKinley's assassination. As a youth Theodore Roosevelt spent several years ranching along the North Dakota-Montana border and undoubtedly understood the problems of the arid West better than any of his predecessors.[1] In his autobiography he records, "The first work I took up when I became President was the work of reclamation."[2]

From a small beginning under his administration the Bureau of

---

[1]Roy E. Huffman, Irrigation Development and Public Water Policy (New York: The Ronald Press Company, 1953), p. 26.

[2]Theodore Roosevelt, Theodore Roosevelt, An Autobiography (New York: Charles Scribner's Sons, 1927), p. 394.

Reclamation has moved from single-purpose irrigation works to the planning and construction of giant multi-purpose water resource development projects.

In the development of reclamation several interesting events have transpired that are of historical and current interest.

Irrigation

Irrigation is one of the oldest practices of civilized man: countries in Asia, Africa, and Europe have remains of irrigation of unknown antiquity. Hieroglyphic records of the Pharaohs of the 12th dynasty indicate it was practiced in Egypt as early as 2500 B.C.[3] Although most of this type of irrigation was a natural outgrowth of using overflows from the Nile or other rivers, the inhabitants diverted the water through channels to other areas of land and thus practiced irrigation.

In the United States the history of reclamation prior to 1900 is predominantly a history of irrigation, which in turn is practically synonomous with Western development. The Mormon pioneers under the direction of Brigham Young are generally given credit for its initiation in the modern period. This was not the first irrigation practiced in America, however, as traces of extensive and well-built irrigation systems have been discovered dating back to the time of early Spanish conquerors and colonists. Ruins throughout Arizona, New Mexico, Colorado,

---

[3] The American Peoples Encyclopedia (20 vols.; Chicago: The Spencer Press, inc., 1951), IX, 383.

and California attest to earlier practices.[4] It is also said that several tribes of aboriginal Indians such as the Basket Makers, Cliff Dwellers, and Pueblos were aware of irrigation methods.[5]

As to the Mormon experience in the West, Golzé records:

> Actually, the afternoon of July 23, 1847, was the true date of the beginning of modern irrigation. It was on that afternoon that the first band of Mormon pioneers built a small dam across City Creek near the present site of the Mormon Temple and diverted sufficient water to saturate some 5 acres of exceedingly dry land. Before the day was over they had planted potatoes to preserve the seed. The following day, July 24, more were planted at about the time the Mormon president, Brigham Young, approached the site of the future city by the side of Salt Lake.[6]

From this simple beginning they built a fairly complex system which, although not known for its engineering qualities, was adequate for their purposes. Removed from the settled areas of the United States, the Mormons were forced to make irrigation a success or perish. By improvisation and mutual cooperation they developed a practical system and set the basic pattern for other Western states to follow. As to their success, Golzé continues:

> By trial and error they improved their irrigation systems until today they are among the finest in the United States. Their laws for appropriation of water and its priority of use have been a pattern to other Western States. The Mormons by nature and by Church rule operated as a co-operative community. The Mormon system of issuing shares for water and attaching the water right to the land are basic in irrigation control today. The numerous mutual companies which flourished before the advent of federal irrigation

---

[4]Charles H. Brough, Irrigation in Utah (Baltimore, Md.: The Johns Hopkins Press, 1898), pp. 1-2.

[5]Alfred R. Golzé, Reclamation in the United States (New York: McGraw-Hill Book Company, 1952), p. 2.

[6]Ibid., p. 6.

> largely followed the pattern of the Mormon development in Utah. . . . notwithstanding the poor engineering and lack of experience, early irrigation in Utah was extremely successful.[7]

Other private ventures developed as the West expanded and soon there were other colonies besides the Mormons practicing irrigation--notably the Greeley Colony in Colorado, publicized and financed by Horace Greeley of the New York Tribune.[8]

In southern California, a cooperative known as the Anaheim Colony, composed of German immigrants from the San Francisco area, settled southest of Los Angeles. In 1871 another group settled on the Santa Ana River east of the Anaheim Colony and organized a similar cooperative known as the Riverside Colony. These two settlements are known to have practiced irrigation--the latter group receiving recognition for its orange and citrus production.[9]

Federal Participation

As previously noted, Congress resisted as long as possible efforts to participate in direct financial aid. Rather, its policy had developed as a process of encouraging private enterprise initially through a series of land laws designed to make it easy for the early settlers to obtain land. Thus, laws such as the Homestead Act of 1862, the Desert Land Act of 1877, and the Carey Act of 1894, were expressions of a liberal national land policy. The philosophy of the laws was that when settlers could

---

[7]Golze, pp. 7-8.

[8]David Boyd, "Irrigation near Greeley, Colorado," U.S. Geological Survey Water Supply and Irrigation Paper 9 (Washington, D.C.: Government Printing Office, 1897), p. 6.

[9]Golzé, p. 10.

secure land cheaply, it would allow them to invest to some extent in its development, including simple irrigation projects. For many years crude dams formed by falling trees across a stream, or digging part of the river bank away in order to divert water to thirsty lands, were the chief forms of irrigation. However, as larger and more complex projects were required through the years to serve an expanding population, and it became necessary to use the land more intensively, private capital was not willing to undertake the increasing costs. It was not a profitable short-term venture, and private resources were not drawn to this type of investment. It was argued that only the national treasury could stand the expenses necessary to build adequate dams for water storage and power projects. With continued pressure for federal assistance and a reluctance on the part of the private sector to participate, Western interests did not have to wait long to win their point.

The Reclamation Act of 1902

Agitation for federal support continued as the various land laws failed to provide what Westerners felt was an adequate water development program. The issue became important enough to enter the political arena by the turn of the century--appearing in the form of a plank in both the Democratic and Republican platforms.[10] Roosevelt had serious intentions of carrying out this section of his party's promises. In his first message to Congress following his election, he stated:

---

[10]Benjamin Horace Hibbard, A History of the Public Land Policies (Madison, Wisconsin: The University of Wisconsin Press, 1965), p. 440.

> The pioneer settlers on the arid public domain chose their homes along streams from which they could themselves divert the water to reclaim their holdings. Such opportunities are practically gone. There remain, however, vast areas of public land which can be made available for homestead settlement, but only by reservoirs and main line canals impracticable for private enterprise. These irrigation works should be built by the National Government.[11]

Although the idea was not original with Roosevelt, this sentiment voiced by the President of the United States paved the way for national legislation.[12] Hearings before Congressional committees were opened and Western Congressmen took the opportunity to emphasize the merits of reclamation to the nation. Reclamation, however, was not without opposition. The arguments against it involved three basic points:

1. The United States had no constitutional right to get involved in the business of irrigation; therefore, it should be left to local control.

2. Agricultural competition from the West would hurt Eastern farm interests and therefore it would compound the farmers' problems.

3. The burden of expense was to be shared by the United States as a whole rather than the West to whom nearly all the benefits would come. This was a fundamental question: Was it fair to tax citizens in the East and South to pay for projects that would benefit Western settlers? Many did not think so.

The first two arguments were countered by liberal interpretations of the Constitution and assurances of Western Congressmen that there was

---

[11]Hibbard, p. 440. (Italics supplied.)

[12]In the preceding year, eleven reclamation bills had been introduced in Congress.

no cause for alarm concerning agricultural surpluses. Any surplus farm commodities, it was argued, could be exported.

The taxation issue was not so easily settled. Congressmen from the South and East portions of the country decried the enormous spending that would follow passage of such a law--greatly benefiting the West, while they paid the bill. Opposition based on this argument almost led to defeat, but the Reclamation Act managed to clear both legislative bodies and was signed into law on June 17, 1902, by the President.

Immediately following passage of the Act, reclamation work was placed under the direction of the Geological Survey because it had gathered extensive information on prospective reservoir sites in connection with its work. The Survey had been commissioned in 1888 to make a study of the Western States relative to

> . . . the natural advantages for the storage of water for irrigating purposes with the practicability of constructing reservoirs together with the capacity of the stream and the cost of construction and capacity of reservoirs and such other facts as bear on the question of storage of water for irrigation purposes.[13]

Due to the foundation laid by this agency, twenty-five projects were authorized within the first five years following passage of the act.[14] The Reclamation Service was separated from the Geological Survey in

---

[13]U.S. Department of the Interior, First Annual Report of the Reclamation Service (Washington, D.C.: Government Printing Office, 1903), p. 49.

[14]U.S. Department of the Interior, Bureau of Reclamation, Reclamation Handbook: Conservation Bulletin No. 32 (Washington, D.C.: Government Printing Office, 1942), p. 23.

1907, and functioned as a separate unit until 1923 when Secretary Hubert Work set up the present Bureau of Reclamation.

Subsequent Modifications

In the 1902 Act, Congress authorized the Secretary of the Interior to proceed with the construction of a reclamation project when he was satisfied that the project users could repay the construction costs to the United States in the following 10-year period. However, this time period proved to be too brief to allow the landowners time to benefit from increased productivity before their repayments began. This provision was soon amended. Other changes have been necessary as the Act has become functional, though the 1902 law remains as the basic legislation. Several agencies have been created within the past two decades to define and implement policies relating to water resource planning. Some of the more important changes that have occurred include the following:[15]

1. A number of privately-owned lands that were settled prior to passage of the Act were lacking an adequate water supply. In order to include them under the federal irrigation program, the Act of February 21, 1911 (usually called the Warren Act), authorized the sale of excess water from reclamation projects to these landowners in an effort to supplement the water supply outside federal projects.

2. To meet the repayment difficulties experienced by many of the

---

[15]See Reclamation Handbook for a discussion of many of these acts. Also U.S. Department of the Interior, Bureau of Reclamation, Federal Reclamation Laws Annotated (2 vols.; Washington, D.C.: Government Printing Office, 1958).

settlers, the Reclamation Extension Act of 1914 was passed, lengthening the repayment period from ten to twenty years.

3. The Fact Finders' Act of December 5, 1924, provided for an indefinite period of repayment with the annual charge based on 5 percent of a 10-year average of crop returns. This plan was an attempt to correlate land productivity with the ability to pay.

4. In May of 1926 the Omnibus Adjustment Act repealed the crop-value repayment plan of the Fact Finders' Act and substituted a 40-year payment plan.

5. During the period 1933 to 1940, Congress appropriated large sums of money for the construction of public works projects throughout the United States in an effort to combat the depression. These funds were granted to such agencies as the Federal Emergency Relief Administration and the Works Progress Administration. Also, in 1933, the National Industrial Recovery Act was passed, allocating funds to the Public Works Administration for reclamation work. Other adjustments were made as Congress provided repayment relief to water users by granting a moratorium on charges during the 1931-1940 period.

6. The Reclamation Project Act of 1939 contributed a number of important modifications in reclamation planning. Because the depression had caused many projects to fall behind in their repayment schedules, this law re-instituted the provision of basing the annual repayment on the value of crops produced on the land.[16] Perhaps even more important, it recognized the value of other factors in preparing feasibility studies and cost allocations. The cost of constructing multiple-purpose

---

[16]An explanation and example of this plan is given in Chapter V.

Reclamation projects was to be shared according to their various benefits. To irrigation was allotted that share of the construction cost which could be repaid by the farmers within 40 years with no interest charge. Similarly, a proportionate share was to be borne by power (to be repaid with interest at not less than 3 percent), municipal water (also reimbursable because it is revenue producing), while some costs allotted to flood control and navigation were non-reimbursable. This paved the way for many multiple-purpose projects that have since been completed.[17]

7. By the Act of August 14, 1946, another category of non-reimbursable costs was included. This Act authorized the allocation of part of a project's construction costs to the conservation of fish and wildlife resources.

8. In that same year, 1946, the Federal Inter-Agency River Basin Committee was established in order to correlate water resource planning among the various government agencies. A Subcommittee on Benefits and Costs was appointed to formulate principles of project evaluation. Their report, commonly known as the "Green Book," was an early attempt to define exactly what constitutes project benefits and costs.[18]

9. The Bureau of the Budget, in order to promote a greater uniformity in evaluation standards as a part of its financial practices,

---

[17]Section 9(a) permits the Secretary of the Interior to make a classification of reimbursable and non-reimbursable costs--a new concept in reclamation. Prior to this action, the law required all expenses to be repayable.

[18]Federal Inter-Agency River Basin Committee, Subcommittee on Benefits and Costs, Proposed Practices for Economic Analysis of River Basin Projects (Washington, D.C.: Government Printing Office, 1950).

prepared Circular A-47 to advise the agencies on the benefits and costs it would weight more heavily in project evaluation.[19]

10. The most current directive concerning reclamation planning policies was the publication of Senate Document No. 97 during President John F. Kennedy's term of office.[20] In addition to identifying more clearly the benefits and costs attributable to a federal project, this document is designed to

> . . . establish Executive policies, standards, and procedures for uniform application in the formulation, evaluation, and review of comprehensive river basin plans and individual project plans for use and development of water and related land resources.[21]

The scope of reclamation work has been expanded to include a number of social services which include the construction and operation of storage and diversion works, water carriage and distribution systems, pumping and hydroelectric plants, and structures for the storage and diversion of water for such uses as power generation, industrial uses, irrigation, flood control, fish and wildlife conservation, recreation, and pollution abatement. All of these considerations are a part of the nation's water resource development program devoted to the conservation of one of nature's more valuable resources.

---

[19]U.S. Bureau of the Budget, Circular A-47, December 31, 1952.

[20]U.S. Congress, Senate Document 97, The President's Water Resources Council, Policies, Standards, and Procedures in the Formulation, Evaluation, and Review of Plans for Use and Development of Water and Related Land Resources, 87th Cong., 2d Sess., 1962.

[21]Ibid., p. 1. See Appendix A for a discussion on benefit-cost analysis.

CHAPTER II

EARLY SURVEYS AND PROMOTIONS

They Hyrum Project is located in northern Utah near the Cache County seat of Logan, and includes lands bordering the towns of Hyrum, Wellsville, and Mendon, Utah. The primary features of the project include a dam and reservoir on the Little Bear River, and three canals that total slightly more than 20 miles in length. Its principal purpose is to provide supplemental irrigation water to 6,800 acres of fertile land.[1]

This project is the result of several investigations relative to the improvement of water utilization in Cache County. A report prepared in 1922 entitled, "Report on the Utilization of the Land and Water Resources of Cache Valley, Utah," stimulated interest and concern over the insufficient water supply.[2] Beginning with this report, and until the final approval of the project in 1933, various county, state, and federal agencies worked together to devise a feasible method of increasing the supply of irrigation water in Cache Valley. This chapter will discuss some of the events that transpired in the early

---

[1]The major part of the project lands were dry-farmed prior to its construction and therefore the water made available to these lands would be considered primary. However, some of the land had access to water rights--particularly lands under the Hyrum Irrigation Company east of the present reservoir. The supplemental terminology prevailed although areas west of the reservoir (Sterling Bench, for example) should be considered as having received a primary water supply.

[2]Samuel Fortier and Walter W. McLaughlin, "Report on the Utilization of the Land and Water Resources of Cache Valley, Utah," typescript, Office of the Bureau of Reclamation, Logan, Utah, 1922.

history of the Hyrum Project through the "1931 Plan," which was the project's actual format.

Early History

Although various fur trappers--Jim Bridger among the more notable--visited Cache Valley as early as 1824, the valley was not permanently settled until the latter 1850's. In 1855, Brigham Young sent an expedition to Cache Valley to pasture cattle belonging to the Mormon Church. However, it was necessary to abandon the project when most of the cattle were frozen during the severe winter of 1855-1856.[3]

In 1856 a group of Mormon settlers came into Cache Valley under the leadership of Peter Maughan. They established a settlement originally called "Maughan's Fort," but later renamed Wellsville. This initial success encouraged others to make their home in the valley and by 1859 there were approximately 150 families scattered among the towns of Logan, Richmond, Mendon, Providence, and Smithfield.[4]

Numerous springs and streams graced the valley and it was natural that these early pioneers should settle nearby. Many of them no doubt had witnessed the first irrigation attempts in the Salt Lake Valley and were eager to experiment in their new surroundings. In fact, Professor Ricks records in 1857, "While the seeds were germinating, the settlers dug ditches with rude shovels to bring water to irrigate their crops."[5]

---

[3]Joel E. Ricks (ed.), The History of a Valley: Cache Valley, Utah-Idaho (Salt Lake City, Utah: Deseret News Publishing Company, 1956), pp. 29-30.

[4]Ibid., pp. 38, 42.

[5]Ibid., p. 36.

Early Water Investigations

The population of Cache Valley increased from approximately 2,000 to 27,000 inhabitants during the 1860-1920 period. With this influx of people it became apparent that the existing water supply would not be adequate to satisfy all of the agricultural needs. Especially disturbing was the shortage of late summer water. When water was needed most for rapidly maturing crops, streams and springs slacked to a mere trickle. It was evident that something needed to be done to insure an adequate water supply for the entire spring and summer.

By 1902 the need of augmenting the water supply had become serious enough to provoke the United States Reclamation Service to make a study of the water needs of the valley and recommend ways of solving the shortage. George L. Swendsen, an engineer for this agency, filed an interesting report which proposed several plans for conveying water from the Bear River into the eastern part of Cache Valley.[6] The three proposals he suggested were variations of an idea to bring Bear River water from the north end of the valley by overland, gravity-flow canals. However, an analysis of the surveys taken in response to his suggestion indicated that each of these plans was impractical because of the distance and cost that would be involved in their construction.

Swendsen's investigation seems to be the earliest official study of the water needs of Cache Valley. After this initial report, little

---

[6]A complete report of his findings may be found in the First Annual Report of the Reclamation Service (Washington, D.C.: Government Printing Office, 1902, pp. 272 ff.

progress was made until Samuel Fortier and Walter W. McLaughlin, irrigation engineers for the United States Department of Agriculture, compiled a study which they published in 1922. This report revived the valley's interest in increasing the supply of irrigation water.[7] Much of their time was spent measuring the water flows of various streams throughout the year. Table 1 (taken from their report) reveals a lack of water during the later summer months--the same problem that had been observed earlier. The drop in water flow by the end of the summer was critical.

After a fairly complete survey and discussion of the water potential of the valley, the engineers concluded:

> . . . that the proper course to take in view of all considerations is to devise ways and means of building the upper Twin Bridges Reservoir on Logan River and protect as far as possible for subsequent use, the reservoir site on Little Bear River just south of Hyrum.[8]

It was their opinion that the majority of the growing population would settle near the city of Logan and therefore a reservoir serving that area was most logical, preserving the waters of the Little Bear River for future use. The earlier idea of George Swendsen (conveying water from the Bear River into the eastern part of the valley) was not considered.

Although no definite action came as a result of their report, it did encourage the Cache Valley Water Users' Association to petition the Utah Water Storage Commission in March of 1923 for assistance in

---

[7]Fortier and McLaughlin, "Report on the Utilization of the Land and Water Resources of Cache Valley, Utah." Survey work was done as early as 1918.

[8]Ibid., p. 72. Twin Bridges is located approximately 19 miles east of Logan, in Logan Canyon. The Logan River passes through this area.

Table 1. Water flow of important streams in Cache Valley from June 1 to September 15 (measured in second-feet)

Date		Blacksmith Fork South Side	Blacksmith Fork North Side	Spring Creek (Providence)	Logan River	Summit and Birch Creeks	High Creek	Little Bear East Fork	Little Bear South Fork
June	15	145	70	25	400	60	55	60	74
	30	145	70	16	400	43	37	42	44
Average flow		145	70	20	400	51	46	51	59
July	1	145	50	16	380	37	25	38	36
	15	105	50	14	282	26	15	34	34
	30	105	50	11	222	20	14	29	29
Average flow		118	50	14	294	28	18	34	33
August	1	95	50	11	205	18	14	23	27
	15	95	50	10	187	16	11	25	26
	30	93	50	10	161	13	10	25	26
Average flow		93	50	19	184	16	12	25	26
September	1	90	50	10	159	13	10	22	25
	15	90	50	10	132	10	9	22	25
Average flow		90	50	10	145	12	10	22	25

Source: Samuel Fortier and Walter McLaughlin, "Report on the Utilization of the Land and Water Resources of Cache Valley, Utah," typescript, Office of the Bureau of Reclamation, Logan, Utah, 1922.

developing a program for a more effective utilization of the valley's water resources. As a result, the state of Utah joined with the Bureau of Reclamation in a cooperative investigation. They agreed to share equally in the costs and $10,000 was allocated for the study. Cache County provided $2,500, or one-half of the amount contributed by the State.[9]

The findings of this study were similar to those made earlier. There was an abundance of water during the spring when runoff from the melting snows provided plenty of water, but late in the summer a serious shortage developed. A solution obviously lay in building storage works within the valley to supply water for the entire growing season. Green's report further suggested water be stored in two reservoirs on the Little Bear River in the south end of the valley. One (the Hyrum Reservoir) would have a capacity of approximately 16,000 acre-feet and be constructed on the main or south fork of the Little Bear River; the second (the Procupine Reservoir) would be built to a capacity of about 10,000 acre-feet and be placed on the east fork of the Little Bear. The latter would supply water for lands from Avon to Hyrum, while the Hyrum Reservoir would supply water for the area west to Wellsville and Mendon. In addition, it was proposed to build a canal north from the Hyrum Reservoir to the Logan River. This would allow water from the Logan River to be conveyed farther north by use of the existing Logan northern canal and its extensions to Franklin, a city in southern Idaho. To accomplish this

---

[9]Department of the Interior, Bureau of Reclamation, "Report on the Cache Valley Project of the Salt Lake Basin Investigations Utah," by William M. Green, Engineer, typescript, Office of the Bureau of Reclamation, Logan, Utah, 1924, p. 21.

required the construction of approximately 40 miles of new canals in addition to two reservoirs.[10]

The engineer in charge of this investigation, William M. Green, was convinced that with the existing water sources, enough water could be stored in the two reservoirs to develop up to 60,110 acres of the valley area; that the project was feasible from an engineering standpoint; and that from an economic viewpoint the increased value of the lands resulting from the addition of an increased water supply contributed economic stability. His recommendation was that the Cache Valley Project be undertaken.[11]

This report, together with its conclusions, was presented to the Bureau of Reclamation and to the Utah State Water Storage Commission. These agencies suggested three additional studies:

1. Investigate the possibility of building one reservoir at Paradise, Utah, large enough to provide water for the entire valley. This would require only one dam and reservoir rather than two.

2. Investigate the possibilities of re-allocating the water so that water from the Porcupine reservoir could be used on the land west of the Little Bear River in addition to the east bench as previously outlined.

3. Test the Hyrum site for geological faults or defects.

Funds for this additional work were provided from previous allocations not spent on the initial investigation, and another appropriation of $5,000 shared equally by the county and the Utah State Water Storage

---

[10] Ibid., p. 87.

[11] Ibid., pp. 113-114.

Commission. The field work for this investigation was completed during the fall of 1925 and the spring of 1926.[12]

The results of the survey of the Paradise Reservoir site indicated that the maximum storage capacity available was 10,000 acre-feet, or about the same capacity as the Porcupine Reservoir. Therefore, no advantage in replacing the previously proposed sites with one in Paradise was evident. The foundation at the Paradise site was found to be inferior and it was concluded that canals extending from Paradise to the farmlands would probably be more expensive because of the terrain.[13]

An investigation indicated that the use of water from the Porcupine Reservoir to water lands west of the Hyrum Reservoir was no more advantageous than using the latter.

In geological tests made at the site of the Hyrum Reservoir indications were that the land area was satisfactory and its capacity was 20,000 acre-feet.[14] William Peterson, Director of the Utah Experiment Station at Logan, concurred in this decision as a result of a survey he made in July of 1926. He reported:

> The whole condition indicates a very satisfactory dam site. The dam site is an excellent one in contour. In conclusion, it appears to me that the formation, the contour and the material with which to build are satisfactory, and perfectly safe to build the dam to the highest level proposed.[15]

---

[12]Department of the Interior, Bureau of Reclamation, "Supplemental Report on the Cache Valley Project of the Salt Lake Basin Investigations, Utah," by William M. Green, typescript, Office of the Bureau of Reclamation, Logan, Utah, October 1926.

[13]Ibid., p. 9.

[14]Ibid.

[15]Ibid., p. 44.

Given a negative report on the Paradise site, attention was concentrated on completing details of the Hyrum and Porcupine portions of the project. In 1928, Associate Engineer of the Bureau of Reclamation, E. O. Larson, submitted a report summarizing the engineering and cost data of these divisions.[16]

During this period other projects within the state were also vying for reclamation funds. The decision of choosing the next project fell to the Utah State Water Storage Commission. During the summer of 1928 the Commission visited various projects throughout the state. Since reclamation funds were to be appropriated in July of 1929, it was important that the Commission recommend its choice to the Bureau of Reclamation as soon as possible so that the necessary funds could be inserted into the Reclamation budget request. Local newspaper articles were written encouraging interested townspeople, farmers, the Chamber Commerce, the Farm Bureau, and businessmen to pledge their support for the project in order to convince the Commission of the need for the project. Following is a typical article in support of the project:

> The importance of this development to Cache Valley cannot be over-emphasized. Locally we need to keep in mind that under the plan as finally worked out, nearly 40,000 acres of choice lands on the west, south, and east sides of the valley will be benefited. About $3,000,000 will be spent in construction of reservoirs and canals, which money will largely go to local people for labor. The costs per acre of land served with water are well within the economic gains that will be had. The sugar beet area of the county would be greatly enlarged and the production of hay and pasture for dairy animals very much increased. It offers the real opportunity for Cache Valley to take a big step forward.[17]

---

[16]Department of the Interior, Bureau of Reclamation, "Report on the Cache Valley Project of the Salt Lake Basin Investigations, Utah," by E.O. Larson, typescript, Office of the Bureau of Reclamation, Logan, Utah, August 1928.

[17]The Journal (Logan, Utah), October 15, 1928.

Despite the competition between projects within the state, there was an optimistic feeling that the local project would be chosen. The Logan Journal recorded, "Competition between these projects will naturally be keen, but a belief prevails here that when cost, acreage, and other features are considered, Cache County will still be in the running."[18]

On March 27, 1929, the Utah State Water Storage Commission made its decision. After receiving the recommendation of several water experts working for the Bureau of Reclamation who favored the Hyrum Project, it was proposed by Professor William Peterson of the Commission:

> . . . that the Utah Water Storage Commission recommend to the Bureau of Reclamation what is known as the Hyrum Project as the one to be adopted as the next unit of the Great Salt Lake Basin Project to be constructed; that the Bureau of Reclamation be requested to proceed with the necessary steps to have funds for building this project included in its budget request this spring for appropriation by the Congress for the coming year.[18]

Given the approval of the project by this body, the next step was to inform the landowners concerning details of the project. This process continued through the remainder of the spring and summer of 1929.[20] The Water Users' Association undertook to obtain the entire 20,000 acre-feet of water subscriptions by October 22, 1929, and report to the Utah Water

---

[18]The Journal, October 9, 1928.

[19]Minutes of the Utah State Water Sorage Commission, March 27, 1929, Salt Lake City, Utah, p. 6, MSS, Utah Water and Power Board, Salt Lake City, Utah.

[20]The chief engineer for the project, Mr. E. O. Larson, indicated that it was difficult to obtain funds for new projects at this time; thus it was called the Cache Valley Division of the Great Basin Project since appropriations were available to existing projects and their extensions. Therefore, a bid for government funds was made, the project chosen, and it remained the responsibility of the Water Users' Association to put the plan over to the landowners.

Storage Commission. Since the project included almost the entire valley--reaching as far north as the Idaho border and possibly beyond--a great deal of effort was required to complete this task.

Enthusiasm for the project grew. Communities throughout the valley sent representatives to various meetings to learn what benefits the project might have for them. Delegates came from as far north as Franklin, Idaho, to participate in the discussions.

However, there was trouble ahead. Indeed, the fact that the project was not approved until 1933 indicates that difficulties were to hinder its completion until the need was more strongly felt locally. It was quickly apparent that 20,000 acre-feet of water would not be subscribed very easily. Sensing that there must be a lack of understanding on the part of the people not to accept such a boon, a local newspaper editor decided to run several articles to help "spread the word" about the project. The following is an example.

> What is the Hyrum reclamation project? It is a government project which contemplates storing 20,000 acre-feet of water on the Little Bear River south of Hyrum. This stored water will be distributed through canals to irrigate land in Wellsville and Mendon and north of the east side of the valley to Smithfield, Richmond, Cove and perhaps Franklin, Idaho. It will also irrigate land in Hyrum and Paradise. There may be still other localities that will get water from this source. The area of land on which this water will be applied is estimated at about 20,000 acres.[21]

Despite many other articles written by prominent men in the community explaining some of the benefits of the project, subscriptions were far short of the goal. The Water Users' Association once more

---

[21]Cache Valley Daily Herald (Logan, Utah), October 11, 1929. There were two newspapers published in Logan during this period--the Logan Journal and the Cache Valley Daily Herald.

visited each farmer who had not subscribed, in an effort to impress him with the benefits that would come to him and the valley if the project were built. The water users requested another month in which to canvass the area and further inform those who were hesitant to participate. During the following month, federal, state, and local officials discussed the merits of the project. Some of the arguments set forth by various supporters can be identified as follows.

1. The economic future of the valley was tied to the water supply. More water would increase land valuations. In addition, more water would encourage a greater number of people to settle--bringing added population with its atendant growth and development to the communities in the valley. The project would easily pay for itself with an increased crop production resulting from a greater supply of water. Professor William Peterson, Director of the Extension Division at Utah State Agricultural College, a knowledgeable and enthusiastic proponent of the unit, spoke to many groups suggesting that the valley was practically at its saturation point in dairy cattle because of the lack of water to irrigate more land to grow alfalfa. He indicated that in dry years it was necessary to import large quantities of hay into the valley to feed the herds. He felt that the economic benefits from the project made it difficult to understand why so many were hesitating.[22]

2. Of the $1,600,000 considered necessary to complete the project, at least $1,000,000 would remain in the valley and provide work opportunities for local labor. Also, business firms stood to gain from the additional income and expenditures that would result.

---

[22] Ibid., November 3, 1929.

3. The government loan for the project was repayable over a 40-year period with no interest charged for the use of the money. Thus, the cost to the farmers for a dependable water supply was kept to a minimum.

4. Important officials of the state were supporting the project by expressing an interest in Cache Valley's development. For example, the governor of Utah, George Dern, enthusiastically supported the project and encouraged the people to work for its completion. He gave numerous speeches suggesting that if the project were not accepted at that time, it might never be offered again.

5. The project was to be an insurance against nature's failure to provide sufficient moisture. Past experience had shown that water shortages were not uncommon, and the reservoir would prevent economic losses due to the irregularities of climate.[23]

Despite extensive publicity of this type, the extra month failed to produce the necessary subscriptions. Two principal objections on the part of the landowners appear to be important in viewing the failure to subscribe the required number of water shares:

1. The individual landowners did not always agree with the water allottments designated by the state engineer. They felt that more water was allocated per acre than was justified and they were careful not to over-subscribe.

2. Many of those favoring the project's construction were not landowners, but businessmen who the farmers felt were pushing the project

---

[23] Ibid., October 27, 1929. The majority of the land was dry-farmed and therefore dependent on an adequate rainfall to provide water at crucial times. The water supply had not improved much since the late 1800's.

for their own self-interest. The landowners wanted the final decision to be left up to them.

The project officials again petitioned the Water Storage Commission for an extension of the subscription deadline to December 20, 1929. Some progress had been made since the previous report was filed and the Commission was in favor of granting more time.

The Bureau of Reclamation in Washington, D.C. notified the Utah State Water Storage Commission that funds were available for the Salt Lake Basin Project and that this money could be used whenever the Cache Valley Division was ready.[24] This announcement failed to stimulate the landowners to sign for more water subscriptions.

Though the December deadline was not met, many of the project supporters thought that the project had generated sufficient momentum to insure its construction. This optimism is reflected in the following brief comment reported of a meeting of the project backers:

> Others gave short talks in favor of the project and urged the water users to support the Hyrum unit by the speedy subscription of the necessary 20,000 acre-feet of water which will insure construction work on the mammoth reservoir beginning July 1, 1930.[25]

At this critical time, opposition to the project was voiced in the Cache Valley Daily Herald in an article signed by nine persons that appeared on the front page:

> We notice by the action of those interested in the Hyrum project that still more time is needed to put the project over. It seems to us that the promoters have had sufficient

---

[24]The money had been re-appropriated again as a part of the Great Basin Project in the Reclamation budget.

[25]Cache Valley Daily Herald, January 3, 1930.

> time, and that the time is now ripe to call a halt, and let the whole matter die.
>
> We think Professor William Peterson hit the nail on the head at the meeting Thursday when he said: "If the farmers of the valley do not want the project, then it ought not to go." It is evident that the farmers do not want it, otherwise the necessary water would have been signed up long ago. It is just as evident that the promoters, the engineers, and a mighty army of fellows who expect to make something out of the jobs and the project will afford the money that will be spent, are all for it and are dying hard. These fellows have everything to gain and nothing to lose, so why should they not be for it? What do they care for the farmer who will have to guarantee the project with a first mortgage on all he has?
>
> It is true the expending of over one million dollars will make some good business for Logan and other places, it will make some good jobs for a lot of people, but what about the farmer who eventually has to foot the bill? Of course, all of the promoters say it is a good thing. The fellows that are usually so long on advice are always short when it comes to paying the bills.
>
> We say it is evident the farmers of the valley do not want it, or the water would have been signed up long ago. Why spend any more time urging, coercing, appealing, almost using force to get more farmers in? Such tactics can spell nothing but failure. The time is more than ripe to let the matter drop.[26]

Another article of a similar tone bearing 18 signatures appeared in the January 13, 1930, issue. Undoubtedly these articles had an adverse effect upon those who were hesitant to accept the project.

From the optimistic reports in the local news media, it appeared that the project was ready for construction on a number of occasions; but, in reality, there was a wide divergence between what the project officials reported as valid subscriptions and what the Reclamation Bureau officials considered acceptable. Those backing its construction were continually over-estimating the number of shares, while the Bureau officials were aware that the project was not receiving the wholehearted support of the landowners. For example, by January 15, 1930, the Water Users'

---

[26] Ibid., January 9, 1930.

Association claimed a total of 20,179 acre-feet subscribed, 179 feet more than necessary to assure the project. This number was composed of 16,229 acre-feet sbuscribed by the landowners and irrigation companies, 2,000 acre-feet by various cities in the valley, and 1,950 acre-feet taken by several corporations throughout the valley. The following breakdown lists the reported subscriptions:

Subscriber	Number of acre-feet subscribed	
Landowners	11,329	
Richmond Irrigation Company	1,900	
Hyrum Irrigation Company	2,000	
Paradise Irrigation Company	1,000	
		16,229
Logan City	500	
Wellsville City	300	
Richmond City	500	
Smithfield City	500	
Franklin (Idaho) City	200	
		2,000
The Amalgamated Sugar Company	1,000	
Utah-Idaho Central Railraod Company	250	
Morning Milk Company	100	
Sego Milk Company	500	
Utah Packing Company	100	
		1,950
Total acre-feet subscribed		20,179

The chief engineer in charge of the project, E. O. Larson, indicates that the 20,179 acre-feet of reported subscriptions was not realistic.[27] Normally the Bureau of Reclamation made a policy of verifying in writing the subscriptions of each individual farmer in order to determine an

[27] Interview with Mr. E. O. Larson, Chief Engineer of the Hyrum Project, March 31, 1966.

accurate total count. This was to be done as soon as the Bureau felt there was enough support to justify this action. Recognizing that there was never sufficient support to do this, the Bureau did not undertake that step. It was obvious that the Water Users' Association inflated the number of stock subscriptions in an effort to push the project through.

When U.S. Reclamation Commissioner Elwood Mead visited the valley to review the status of the project in the spring of 1930, the subscriptions were presented to him for his review. He informed local officials that many of the subscriptions were not satisfactory and some were questionable. The business firms were disallowed. He explained:

> It is understood that these subscriptions were made at least in part to help secure the project rather than an urgent need for water by the subscribers, and while the spirit of the subscribers is commendable from the standpoint of trying to help secure the project, it must be realized that a federal irrigation project is for the purpose of supplying irrigation water to farm lands. . . . said subscriptions therefore, cannot be considered acceptable.[28]

The Commissioner was also critical of the cities' participation, indicating that past experience had shown that, although a few commissioners favored the project, they had no legal right to bind an entire city or community for such an obligation without public consent. Therefore, subscriptions by the cities were questionable. In stating his opinion concerning the progress of the project, Mr. Mead said:

> . . . when consideration is given to the fact that the project is a relatively small one, it would seem that if there are not enough farm lands in a farm community as large as Cache Valley desirous of taking water, it is questionable whether there is a sufficient demand for the project to warrant its undertaking.[29]

---

[28] Cache Valley Daily Herald, March 27, 1930.

[29] Ibid.

It was clear that more subscriptions from the landowners would be necessary in order to convince the Bureau of Reclamation that the project was needed. The Commissioner concluded his remarks with the following ultimatum:

> Response thus far evidenced has been disappointing and raises a serious question whether further expenditures should be made until such time as there is manifested a deeper interest on the part of the landowners of the proposed project. We are therefore directed to inform you that unless on or before May 15, 1930, subscriptions have been received for the necessary amount of water along the lines herein indicated, the activities of the Bureau will be diverted to other points where more interest by the landowners is manifested and where other conditions are more satisfactory from the viewpoint of the government.[30]

In addition to this development, another problem arose in April of 1930, when the Interior Department appropriation bill came before the Senate. The Hyrum Project was a part of that legislation and, as passed by the House, provided that the water users of the unit must organize an irrigation district to contract with the Bureau of Reclamation to repay the principal in twenty years. This meant that the irrigation companies within the Hyrum project were not eligible to negotiate a contract with the government. George M. Bacon, state engineer and secretary of the Utah State Water Storage Commission, asked Senator Reed Smoot to amend the bill, if possible, allowing the government to contract with a water users' organization and an irrigation district; also to amend the bill allowing a 40-year repayment plan rather than a 20-year plan for the entire project.

When this amendment was introduced into the Senate, the section providing for a 40-year repayment of the principal passed the Senate, but

---

[30] Ibid.

was referred to a conference committee because of objections raised in the House. The conference committee reached a compromise modifying the repayment period to 30 years. However, the Senate continued to reject the provision that the government be permitted to contract with irrigation companies. This meant that the entire project must be placed under an irrigation district organization. (The government wanted to be sure an organization had power to collect its assessments--irrigation districts have taxing powers.)

Meanwhile, additional efforts were made to obtain the required subscriptions. By May 10, five days before the deadline set by the Commissioner of Reclamation, it was reported that 18,000 acre-feet were subscribed. Since this brought subscriptions to within 10 percent of the required acreage, additional time was granted to secure the remaining 2,000 feet. During the following month it was reported that landowners between Wellsville and Hyrum wanted to be included in the project and subscribed 2,000 acre-feet. "The news will be good news to the members of the Cache County Water Users' Association which has worked so zealously for securing this project," reported the local newspaper.[31] Director Peterson, a member of the State Water Storage Commission who had worked hard and long for the project, returned from a visit to Washington where he advised the Reclamation Commissioner of the completion of subscription efforts.

> On every hand now the attitude in Washington is very favorable towards the Hyrum dam and reservoir construction and the Reclamation Service has $300,000 of the

---

[31] Ibid., May 24, 1930.

> $1,600,000 estimated cost of construction of reservoir and canal units, ready to be used in beginning the mammoth undertaking.[32]

One reason for the large number of subscriptions reported by the Water Users' Association is explained by the fact that some subscriptions which lay outside the project area had been included. A number of landowners living on the Sterling Bench near Wellsville wanted to participate in the project as did some landowners near the Idaho border. To satisfy these demands would have required four new canals totaling approximately 17 miles. (The 2,000 acre-feet previously mentioned was located in the Sterling Bench area.) In September of 1930, Commissioner Mead rejected this "1930 revision" for additional canals and the project was limited to the former plan. This meant that many of the reported subscriptions were not actually part of the project, and increased efforts were necessary--particularly in the north and east sections of the project--to obtain sufficient subscriptions.

In addition to the shortage of subscriptions based on the original project, the Commissioner questioned the value of forming an irrigation district. He decided that the best plan was to allow the Bureau of Reclamation to contract with a water users' association rather than an irrigation district because the size of the project did not warrant a district form of organization. The Commissioner advised the project officials that he would personally request Congress to approve this modification in the legislative session to convene in December.

Once again, the problem of obtaining valid subscriptions frustrated

---

[32] Ibid., June 14, 1930. Of course, the Reclamation Commissioner was not appraised of the progress of the project and therefore upon the favorable report by Director Peterson was optimistic.

the completion of the project. There was insufficient backing on the part of the landowners to subscribe for enough shares despite the best efforts of the supporters to have the project succeed. It required a major revision in the project plans and renewed effort to obtain subscriptions before it became a reality.

CHAPTER III

FINANCING AND CONSTRUCTION

Continued Promotional Activity

During the winter of 1930-1931, the Water Users' Association continued its efforts to subscribe the total water shares. The south and west sections of the project were progressing satisfactorily, but the north and east portions were not. A warning was issued by Professor George D. Clyde of the Utah State Agricultural College that a lack of snow cover during the winter might result in a serious water shortage the following summer, but this incentive was not sufficient to encourage more subscriptions.

By the middle of April 1931, the Bureau of Reclamation requested the landowners to make a decision. Commissioner Elwood Mead stated:

> The department will have funds ready to go ahead on the Hyrum project, just as soon as the water users agree on how the project should be conducted. When we make up the budget of the Bureau for next year, we should know whether or not sufficient progress has been made to assure the project.[1]

It soon became apparent that the north and east portions were not going to succeed in obtaining their share of subscriptions and an alternate plan began to develop--one that would serve the interests of the farmers in the south and west sections. On April 23, 1931, a report to this effect was presented to the Utah State Water Storage Commission advising them that landowners in the southern part of the valley were enthusiastic for some form of irrigation project. It was contended

---

[1] Cache Valley Daily Herald (Logan, Utah), April 17, 1931.

that enough landowners in these sections would subscribe to a project to justify building a reservoir of practically the same size. The chief engineer for the Bureau of Reclamation, E. O. Larson, immediately set to work to revise the previous plans and "create" another project for the southern end of the valley. The modification that resulted from this revision (known as the 1931 Plan) provided the format for the final project.

Since this revision eliminated the expensive canal north to Logan, the cost of the project was reduced from an estimated $1,600,000 to approximately $900,000. When this important consideration was presented to the Water Storage Commission, they expressed confidence that a project might yet be feasible.[2] The Commision decided that a meeting should be held in the valley to outline and explain the new proposal to prospective shareholders to determine the amount of local support this modification might generate.

A meeting was held for this purpose at Wellsville, Utah, on May 11, 1931, and was well attended by landowners. An explanation of the new scheme was presented to them, pointing out that 20 miles of new canals were needed, in addition to the 18,000 acre-foot reservoir.[3]

The organizational plan called for the formation of a water users' association from the existing irrigation companies. The companies were

---

[2]Minutes of the Utah State Water Storage Commission, April 22, 1931, MSS, Utah Water and Power Board, Salt Lake City, Utah, p. 2.

[3]Department of the Interior, Bureau of Reclamation, "Project History of the Hyrum Project, Utah, 1933," by D. J. Paul, mimeographed, Office of the Bureau of Reclamation, Logan, Utah, p. 2. Four thousand acre-feet was "dead water" because the outlet works of the dam were to be approximately 35 feet above the floor of the reservoir.

to use their canal systems and existing water rights as security for an interest-free government loan. Those lands not included in an irrigation company would form an irrigation district, having taxation powers to meet their project assessments.

Since the north and east sections were not participating, a review of the southern water subscriptions indicated that many more were needed. The revised project called for 14,000 shares and valid subscriptions amounted to only half of that figure.

The work of obtaining the necessary subscriptions continued through the spring and summer of 1931 with varied success. However, the former disparity between the subscriptions reported by the Water Users' Association and the shares the Bureau considered valid reoccurred. Optimistic newspaper reports gave the impression that the subscriptions were near completion several times when, in reality, difficulty was being experienced in securing the required amount.

The organizational plan which called for a water users' association and an irrigation district was sent to the Reclamation Commissioner for his approval. When no word of his decision had been received by early September 1931, President B. G. Thatcher of the Logan Chamber of Commerce wrote to Senators Reed Smoot and William H. King of Utah asking them to contact the Commissioner and urge his approval of the organizational plan for the project.[4]

A reply had not been received by the 24th of September and the

---

[4]One of the reasons prompting this plea was the fact that the depressed economy needed the positive effect that additional work provided by the project would have for the unemployed in the valley.

Chamber of Commerce decided to send the following telegram to the Reclamation Bureau to indicate the urgency they felt about the project:

> Our water users have already subscribed the amount of water needed to complete the project. They are now waiting for definite surveys to be made so the contracts may be entered into with the government. Trust you will urge your engineers to hurry up surveys.[5]

By October 1, 1931, the chief engineer, E. O. Larson, received authorization to proceed with the final survey work regarding the location of the canal system and review of the water allotments to insure the proper distribution of water among the landowners.

The month of October was busily spent in field work. In order to assist, the Chamber of Commerce provided an office for surveying crews to work at night so that they might complete their task as soon as possible.

The Chamber of Commerce also contributed funds for the completion of this work, as the cost of the surveying was divided between the federal government and the local agencies. Their hope was to complete all of the field investigations before the winter weather in order that construction could begin immediately as soon as weather permitted in the spring of 1932.

Much of the field work was completed by the first of January 1932. President B. G. Thatcher of the Chamber of Commerce optimistically reported to that body:

---

[5]Cache Valley Daily Herald, September 25, 1931. This quotation inicates the pressure by local supporters to push the project through despite the lack of subscriptions. The field work mentioned herein was necessary as water allotments and subscriptions had to be correlated before surveys for the canal systems could be completed. However, the Bureau wanted enough subscriptions to be taken to assure the project's construction before they spent a lot of time and effort in this work.

> I am now pleased to report to you that it has progressed to the point where the government has accepted the plan. Surveys have been completed, allotments of water made, and as soon as the water district has been formed and right-of-ways secured, the building of the project should commence.[6]

Congressional Consideration

It was necessary that Congress again appropriate funds for the project. However, the depression was beginning to have an effect on national spending and there were cutbacks in various government programs. For example, as it passed through the House of Representatives, the Department of the Interior bill was slashed by $20 million. This included a $7 million reduction in the appropriations for the huge Boulder Dam in Nevada.

Despite cutbacks in many projects, the Hyrum Dam was not affected--probably because it was part of a re-appropriation.[7] Senator Reed Smoot of Utah presented an amendment to the appropriation bill as it passed through the Senate recommending that the repayment period be extended from 30 to 40 years for the Hyrum Project. In addition, he suggested that the government be allowed to contract with water users' associations as well as irrigation districts. This bill, including its amendment, passed the Senate. This was an important step in finalizing the project, because the 30-year repayment period as well as the type of organization required to contract with the government had been objectionable to the

---

[6] The Herald Journal (Logan, Utah), January 9, 1932.

[7] There is some indication that the project may have run into trouble had not Senator Smoot been chairman of the powerful Senate Finance Committee. Despite cuts in many other projects and parings of the Bureau of Reclamation budget, the Hyrum Project passed both houses of Congress.

local farmers and some individuals felt that it had been the means of delaying the project in the past.

The bill passed the House of Representatives, but because other provisions of the general bill were controversial, it went to a conference committee for review. The bill cleared this committee and it appeared in April of 1932, that if the subscriptions had been completed, on the signature of President Hoover would have been necessary to begin construction of the Hyrum Project. However, valid subscriptions were not sufficient. By the 29th of September 1932, it was becoming embarrassing to the officials of the project. The Bureau was impatient.

> Commissioner Mead has written George M. Bacon, state engineer that he appreciates it takes time for water users of southern Cache Valley to make up their minds on the matter. The federal government has made the appropriation of $300,000 which is held for initial construction work as soon as plans are ready, and have the okeh of Uncle Sam. However, Commissioner Mead declares some decision should be reached soon as to whether or not Cache wants the reservoir project.[8]

The remaining subscriptions were not forthcoming and no final action was taken on the project in 1932.

The following year was more successful. Subscriptions gradually increased and final steps were nearing completion during the first part of January of 1933. The secretary of the Hyrum Project Water Users' Association (a temporary organization) filed with the county commissioners an index map of the reservoir and the canal system sites together with the descriptive plats of the lands included within the proposed Wellsville-Mendon Conservation District. In addition, Governor George Dern signed a petition for the organization of the conservation district

---

[8]The Herald Journal, September 29, 1932.

and it was also filed with the county commission. Legal steps were taken in connection with forming the district and it was approved in an election held on the 29th of May 1933.[9]

Although the project appeared to be nearing conclusion, prior experience called forth this caution from a local newspaper editor:

> There must be no relaxation toward the completion of the Hyrum dam project. Remember the project is not yet under construction. Until the government is spending its money in actual construction of the dam we should never relax one moment but continue to work toward its realization. The Hyrum dam is the bright spot on the horizon for Cache Valley.
>
> It will assure a greater diversification of farm products than ever before. It will provide an ample supply of late water. The wider the diversification of our farm products, the more stable will be our economic foundation. Instead of having three or four different crops, we should have eight or ten.[10]

The warning proved to be wise. In August of 1933 Congress placed the project in the emergency works group because of the continuing depression. Senator King, however, telegraphed from Washington his assurance that the project was near the top of the list of projects being considered and was confident that it would yet be accepted.

Public Works Administration Consideration

The Hyrum Project was one of two in Utah included in a preferred list of fifteen that Commissioner Mead presented to the Public Works Administration in Washington. There was some concern that it would be difficult to obtain the approval of the new Secretary of Agriculture, Henry A. Wallace, who had indicated that he was not in favor of any more

---

[9] D. J. Paul, Project History, 1933, p. 4.

[10] The Herald Journal, January 21, 1933.

of this type of project. He felt that part of his department's job was to cut down on agricultural surpluses and these projects would merely add to the problem.

Nevertheless, word was received on August 29, 1933, that the project had been approved by the Public Works Committee and that $930,000 had been set aside for immediate use on the dam.[11] The good news was relayed as follows:

> The administration said the $930,000 allotment for the Hyrum project was for a dam and reservoir on the Little Bear River near Wellsville, Utah, to augment the water supply of land in the Salt Lake Basin now depending on unregulated stream flow.[12]

Following the approval of the Public Works Committee, it passed to the Secretary of the Interior, Harold I. Ickes, for approval of the contract between the government and the water users under the project. Senator King again indicated that he was in constant touch with the officials of the department and confidently predicted that

> . . . just as soon as the attorneys finish the proposed terms that are to be embodied in the contract for construction the money will be released and bids will be advertised which will call for the construction of the project.[13]

Secretary Ickes approved the plan on the 19th of September 1933. The contract was returned to Logan to be signed by the local participants.

South Cache Water Users' Association

On September 30, 1933, the South Cache Water Users' Association was formed to replace the Hyrum Project Water Users' Association for

---

[11]The authority for these funds was granted under the provisions of the National Industrial Recovery Act of June 16, 1933.

[12]The Herald Journal, August 30, 1933.

[13]The Herald Journal, September 16, 1933.

the purpose of entering into a contract with the United States for the project. This association was composed of several irrigation companies and the Wellsville-Mendon Conservation District. The contract was approved by both the government officials and the new association and signed on October 9, 1933.[14] The terms of the construction contract contained the following provisions:

By the United States:

1. The United States shall build the Hyrum Reservoir to a live storage capacity of 14,000 acre-feet.

2. Hyrum-Mendon, Wellsville, and the Hyrum lateral canals shall be built to specifications agreed upon.

3. Total expenditure will not exceed $930,000.

By the South Cache Water Users' Association:

1. Construction cost was to be repaid in 40 equal annual installments beginning on December 1 following a notice that the works have been completed or that the sum of $930,000 has been expended.

2. The reservoir and canal system shall be operated by the Association which shall use its legal powers to collect from its members.

3. The association would negotiate for the purchase of all necessary right-of-way (although the costs would be paid by the United States as a part of the construction costs) except where condemnation proceedings were necessary--in which case it would be paid by the association.) (This was necessary in only 2 cases.)

4. The association must provide a competent superintendent, and shall operate the system in accordance with the Federal Reclamation Laws.[15]

Upon completion of the agreement in October, it was necessary for

---

[14]Paul, Project History, p. 28.

[15]Ibid., pp. 26-27.

the South Cache Water Users' Association to contract with the individual irrigation companies and the conservation district. In addition, the land for the reservoir site and canal right-of-ways had to be appraised and purchased. Since all the land was in private ownership, this process was very time-consuming because many of the lands had mortgages, liens, or were involved in estate problems which were difficult to resolve. This work was not completed until March 1934.

In November 1933, Commissioner Mead visited the Hyrum site and predicted that bids would be let within a three or four week period. He confirmed the fact that the money was available for construction and gave assurance that the project was nearing completion.

Earlier the water supply had been allotted to the existing irrigation companies and the conservation district in the following manner:

Table 2. Project subscription, 1932

Subscriber	Number of acre-feet
Hyrum Irrigation Company	3,300
Wellsville East Field Irrigation Company	1,200
Wellsville City Irrigation Company	600
Wellsville North Field Irrigation Company	415
Mendon Irrigation Company	250
Wellsville-Mendon Conservation District	8,235
Total	14,000

Source: United States Department of the Interior, Bureau of Reclamation, "Hyrum Project Utah, A Report on Ability of the Water Users to Repay Construction Costs to the United States," typescript, Office of the Bureau of Reclamation, Salt Lake City, Utah, March 1950, p. 5.

Prior to the formation of the South Cache Water Users' Association and the agreement with the United States government, a number of farmers objected to the water allotment proposed by the state engineer in the Wellsville-Mendon Conservation District totaling 8,235 acre-feet. Hearings were immediately held within the district, and on July 14, 1933, this allotment was reduced to 5,622.5 acre-feet. However, this quantity was not satisfactory and following negotiations, the district decided to subscribe for 6,125 acre-feet of water. A contract was executed for that amount on December 2, 1933.[16]

The Hyrum Irrigation Company subscribed for their assigned amount of 3,300 acre-feet while the Wellsville City Irrigation Company added 400 more acre-feet to their subscription, for a total of 1,000 acre-feet. The Wellsville East Field and Wellsville North Field Irrigation Companies decided not to participate in the project. Further trouble came when the Mendon Irrigation Company refused to amend their corporate charter which prevented them from entering such a contract. This meant that a total of only 10,425 shares were covered by subscription contracts at the beginning of 1934. (Bid had already been let in December 1933.) The Bureau of Reclamation required at least 80 percent of the total water be subscribed before consenting to construction. The 10,425 acre-feet represented only 75 percent.

---

[16]United States Department of the Interior, Bureau of Reclamation, "Hyrum Project Utah, A Report on Ability of the Water Users to Repay Construction Costs to the United States," typescript, Office of the Bureau of Reclamation, Salt Lake City, Utah, March 1950, p. 6.

Cache Valley Development Corporation

Rather than have the project fail at this late date, a number of citizens and business interests formed a corporation in order to participate in the project. This new company, the Cache Valley Development Corporation, was organized December 13, 1933, with President B. G. Thatcher of the Logan Chamber of Commerce as the president; H. J. Hatch, Frederick P. Champ, George B. Bowen as directors; E. T. Young as attorney; and Merlin R. Hovey as the secretary.[17]

Since this corporation did not have any land of its own, it subscribed for 700 acre-feet of water through the Wellsville City Irrigation Company and guaranteed payment of the annual assessment for these shares. The corporation subscribed capital by issuing stock. Each stockholder paid $50 per share, and 450 shares were sold for a total of $22,500. Table 3 lists the original stockholders.[18]

Since there was no land to pledge as security, the corporation purchased Consolidated Federal Farm Loan bonds valued at $25,000, and deposited them with the Bureau of Reclamation as collateral. Upon completion of this contract dated March 17, 1934, subscriptions were in the following form:[19]

Subscriber	No. of shares
Hyrum Irrigation Company	3,300
Wellsville City Irrigation Company	1,000
Wellsville City Irrigation Company and the Cache Valley Development Company	700
Wellsville-Mendon Conservation District	6,125
Total	11,125

[17]The Herald Journal, June 25, 1963.

[18]The disposition of these shares will be discussed in Chapter V.

[19]Department of the Interior, Bureau of Reclamation, "Project History of the Hyrum Project, Utah, 1935," By D. J. Paul, mimeographed, Office of the Bureau of Reclamation, Logan, Utah, p. 7. This total is slightly short of the 80 percent desired by the Bureau, but was acceptable.

Table 3. Stockholders of the Cache Valley Development Corporation

Original shareholders	Number of shares	Amount invested
Blair Motor Company	1	$ 50.00
Thatcher Brothers Banking Company	11	550.00
Bluebird Candy Company	1	50.00
Baugh Motor Company	1	50.00
Olof Nelson Construction Company	2	100.00
George W. Lindquist & Sons	1	50.00
Monson Meat Market	1	50.00
Cardon Jewelry	1	50.00
Shirley Mae Shop	1	50.00
Shamhart-Christiansen	1	50.00
Albert Thompson	1	50.00
Eccles Hotel Company	2	100.00
Budge Clinic	2	100.00
George B.Bowen	1	50.00
A. H. Palmer & Sons	1	50.00
Edwards Furniture Company	1	50.00
Lundstrom Furniture Company	1	50.00
Wilkinson and Sons	1	50.00
J. C. Penney Company	2	100.00
Utah Oil Refining Company	1	50.00
Levens Store	1	50.00
First National Bank	11	550.00
Cache Valley Banking Company	11	550.00
Borden Western Company	14	700.00
Morning Milk Products Company	60	3,000.00
Anderson Lumber Company	12	600.00
Sego Milk Products Company	30	1,500.00
California Packing Company	38	1,900.00
Union Pacific Railroad Company	50	2,500.00
Utah-Idaho Railroad Company	44	2,200.00
The Amalgamated Sugar Sompany	145	7,250.00
Totals	450	$22,500.00

Source: The Herald Journal, June 25, 1963.

During the negotiations for the above contracts, final specifications were issued for the dam and following completion of the contract by the Wellsville City Irrigation Company for the additional 700 acre-feet, notice to proceed was given to the contractor.

The project had been opened for bids at Ogden, Utah, on December 13, 1933, and the contract awarded to a Boise-based firm, J. A. Terteling and Sons for a low bid of $377,013.[20] The contract called for the completion of the project by March 1935.

Construction work began on March 26, 1934, two days before ground-breaking ceremonies were held at the damsite. At these festivities Governor Blood and members of the Utah State Water Storage Commission together with local supporters took part in the speaking and turning the first shovels of dirt.

Effects of the Depression

The project was finally built during a time of severe depression for the major part of the country. Yet, in the late 1920's, when prosperity had been "assured," it was difficult to convince the landowners that they should participate. Thus, it would appear that the depression helped stimulate sufficient interest in the proposal to insure its success. However, three observations can be made concerning the effect of the depression on the progress of the project.

1. Once the depression was under way, debt was to be avoided.

---

[20]This sum was for the construction of the dam and represented mainly labor and equipment costs. The government furnished cement and other miscellaneous materials valued at approximately $312,000. Thus the total cost for the storage system was $650,000.

Slack periods in the economy have a way of effecting downward changes in investment decisions of businessmen--particularly long-term investments. Undoubtedly this was true for a number of farmers. There was no assurance that crop prices would not continue to fall and thus if the obligation of project payments were added to his woes, it must be avoided. On the other hand, farmers sometimes try to increase their productivity to overcome falling farm prices and may have seen an increased water supply as a boon to this purpose. Thus, it is not clear exactly what effect the depression had on the project once it was underway.

2. The government was looking for projects on which to spend money to put the unemployed back to work. Funds were therefore available for worthwhile projects. However, in the case of the Hyrum Project, funds had always been available and consequently this was not a factor that slowed the construction of the project.

3. It appears that the principal reason for the delay in the progress of the dam can be traced to the disagreement as to what constituted a full water supply--and not the depression. The landowners and the state engineer could not agree on an allotment satisfactory to both parties.

The depression cannot, therefore, receive the blame for the delay in construction; neither can it be given credit for pushing it forward.

Drought

The years of 1931-1932 were dry years and the farmers were impressed with the fact that without an adequate water supply, they were gambling with Nature each year. This, probably more than any other

factor was responsible for the landowners finally subscribing as much as they did--leaving the remaining 700 acre-feet of subscriptions to be taken by the Cache Valley Development Corporation.

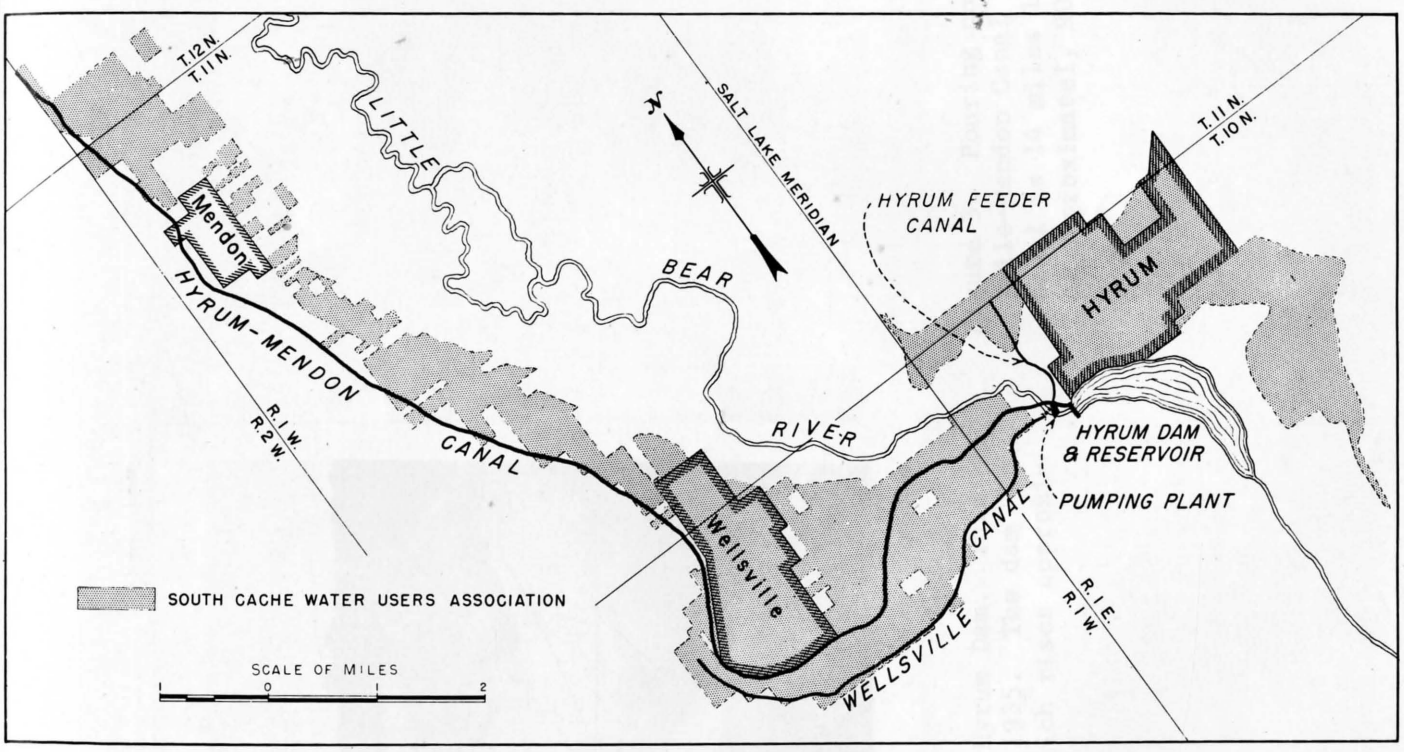
Construction Features

In its final form, the project included the Hyrum Dam, the Hyrum-Mendon Canal, the Wellsville Canal and pumping plant, and a lateral canal extending slightly over one mile from the diversion works of the dam to the Hyrum Irrigation Company's canal.

The dam is an earthfill structure containing approximately 430,000 cubic yards of earth and material. It rises 116 feet high and is placed in the path of the Little Bear River to create an artificial lake of some 18,000 acre-feet capacity. However, 4,000 acre-feet are not available for use. Water is diverted from the outlet works of the dam and is carried about 330 feet along the side of a hill in a bench flume to a diversion structure where the canal systems originate. The reservoir extends two and one-half miles behind the dam and is one-half mile wide. Approximately 480 acres of land are covered by the reservoir.

The Hyrum Feeder Canal is a small lateral that separates from the main diversion works and travels 1.3 miles north, discharging into the Hyrum Irrigation Company Canal.

The Hyrum-Mendon Canal, approximately 14 miles long, separates at the diversion works by means of an inverted siphon crossing the natural river valley and empties into an open canal on the far side. By means of gravity-flow, it carries a maximum of 90 second-feet to a distance of two miles north of the town of Mendon, providing irrigation water for lands along the way.



Hyrum project.

Figure 1. Hyrum Project showing Little Bear River, Hyrum Dam and reservoir, canal system, and lands under South Cache Water Users' Association.

☆ GPO : 1961 O—530191

Figure 2. Construction of the Hyrum Dam. This photo was taken on March 29, 1935. The dam is an earth-fill structure which rises approximately 116 feet high.

Figure 3. Pouring concrete for the Wellsville-Mendon Canal in July of 1935. This canal is 14 miles long and has a capacity of approximately 90 cubic feet per second.

Figure 4. This photograph shows all three canals of the Hyrum Project during the construction phase. From left to right: The Wellsville Canal system with a pipe running from the pumphouse to the canal across the valley; the Wellsville-Mendon Canal (inverted siphon); and the Hyrum Feeder Canal leading north to the Hyrum Irrigation Company Canal. Photo courtesy of the Bureau of Reclamation.

The Wellsville Canal diverts from the Wellsville pumping plant near the reservoir and traverses 5.4 miles. Its capacity is a maximum of 15 second-feet. It is necessary to pump the water by means of a water turbine because it supplies water to bench lands situated too high to be served by gravity from the reservoir. The water used to power the turbine is passed out the bottom of the pumping plant into the Wellsville East Field Canal in order to satisfy prior water rights existing below the dam.[21] The pump sends the water a distance of 1,000 feet where it discharges into an open canal for its journey to Wellsville and the surrounding area.

The construction contracts for the canals were awarded to two firms: J. A. Terteling and Sons Company, and to Knowlton and Rupert of Layton,

---

[21]Water rights along the Little Bear River were adjudicated in the First Judicial District Court of Utah in February 1922. The adjudication, known as the Kimball Decree, issued in the case of the Utah Power Company versus Richmond Irrigation Company et al, designates the priorities of all water rights on the stream. In this decision, the earliest rights were granted to the Wellsville Eastfield Canal & Irrigation Company which waters lands located below the reservoir. This irrigation company was granted a priority of April 1, 1860. The Hyrum Irrigation Company, which serves lands primarily above the reservoir, received an adjudication dated May 1, 1860--one month later. This means that the Wellsville company must be served first. Since the Hyrum Irrigation Company draws much of its water out of the south fork of the Little Bear River about 6 miles above the reservoir, it is required by this decision to let this water pass by to satisfy the earlier priority of the Wellsville company. To solve this problem, the Hyrum Irrigation Company purchased 3,300 acre-feet of water from the project and by means of exchange, this water drawn from the river is traded for water from the reservoir--accruing to the Wellsville company. However, when the stream flow slackens during the summer months, there is not enough water for the Hyrum Irrigation Company to receive its full share of 3,300 acre-feet of water and they do not receive their full value. In reality, because of this court decision, the Wellsville East Field Canal & Irrigation Company receives water without subscribing to the project. This water runs the turbine and passes out the bottom of the pump house into a canal that serves the Wellsville company.

Utah.[22] The total construction costs estimated by the Bureau of Reclamation are listed as follows:[23]

Pre-construction costs	$26,800
Storage System (reservoir and dam)	650,000
Canal Systems	219,800
Operation and Maintenance for first year	35,000
Total Estimate	$931,600

Construction work progressed normally. Minor changes were made as unforeseen problems developed. Some work was done by the Civilian Conservation Corps. A "stub camp" at Huntsville, Utah, provided labor for approximately two months. Most of this labor was used in various tasks including clearing the reservoir site of brush at no cost to the project.[24]

The construction work on the dam and reservoir was completed on August 10, 1935, a few months after the date specified in the contract. The delay was due to a time extension granted because of some modifications and six extra work orders issued in the construction process.[25]

The release of contract for the storage system was signed by the contractor and the government on September 12, 1935, with notification to the South Cache Water Users' Association by the Department of the Interior to take over the operation and maintenance of the project by May 1, 1936. The project was approved by the President of the United States on November 6, 1935.[26]

---

[22]D. J. Paul, Project History, 1935, p. 119.

[23]Ibid., p. 22. This cost was surprisingly accurate.

[24]Ibid., pp. 39-40.

[25]Ibid., pp. 20-21.

[26]United States Department of the Interior, Bureau of Reclamation, Reclamation Project Data (Washington D.C.: Government Printing Office, 1961), p. 277.

CHAPTER IV

ECONOMIC CONSIDERATIONS

In spite of numerous criticisms leveled at federal reclamation in the past years, it has generally been agreed that reclamation of arid lands through irrigation practices has been valuable--not only to the West where reclamation has been essential to economic development--but to the nation as a whole.[1] Those who formulated the original reclamation act felt that the benefits received from building irrigation projects outweighed the costs associated with their construction. Additional water, it was reasoned, would increase not only agricultural yields, but the added value of irrigated lands would enhance the farmer's position through crop diversification and increased property values. Also, an increased supply of water would insure an adequate agricultural base for the support of a greater population. In addition, increased farm production normally stimulates further economic activity in the form of expanded markets, as well as numerous processing and service industries.

Evaluation Criteria

As an increased number of reclamation projects have been proposed, there has been an obvious need for a more effective measure of project

---

[1]See John W. Haw and F. E. Schmitt, U.S. Department of the Interior, Report on Federal Reclamation to the Secretary of the Interior (Washington D.C.: Government Printing Office, 1935). For a more modern evaluation, see U.S. Department of the Interior, Bureau of Reclamation, Bureau of Reclamation Project Feasibilities and Authorizations (Washington, D.C.: Government Printing Office, 1957).

analysis and evaluation techniques relative to the satisfaction of economic criteria. For example, the questions might be asked: Which projects should be undertaken? What advantages are there to building one project rather than another? It is agreed that the nation's resources must be used wisely and the country cannot "afford" all of them simultaneously.

In the past decade and a half, progress has been made in this respect in what current economic literature refers to as "benefit-cost" analysis, which is an attempt to quantify a variety of benefits and costs associated with public works projects. This process is designed to measure primary benefits and costs (those that are tangible and quantifiable), and secondary benefits and costs (those that are less obvious and less tangible). Those projects yielding the highest benefits to society relative to costs, would normally--other things equal--receive first consideration as to construction. This analysis has been refined since the 1930's as better methods have been developed to justify and evaluate a project's contributions to the welfare of society, until currently its application has become integrated into public policy.[2]

When construction of the Hyrum Project was under consideration, the concept of benefits and costs was known, but its application was vague. This problem was recognized by a committee appointed to study reclamation problems in that period. They expressed the problem of analysis as follows:

---

[2]See Appendix A for a discussion of modern benefit-cost analysis.

> . . . an irrigation project should be undertaken only when the values created are greater than its costs (including the necessary margin for unforeseen contingencies). . . . Whether an expenditure of $5,000,000 . . . is warranted for irrigation of a (large) acre tract of new land should be capable of more satisfactory determination than either political demand or the insistence of local business and realty interest. Unfortunately, no factual basis for quantitative appraisal of regional, state, and national benefits is now available.[3]

Two methods which were used historically to examine a project as to its feasibility are discussed below:[4]

1. Project costs. Normally, after sufficient interest was expressed by a group of landowners to have some type of irrigation project built, the Bureau of Reclamation conducted initial surveys to determine preliminary feasibility. This analysis was based upon a number of factors including the availability of water resources and an estimation of costs for the project depending upon ana anlysis of engineering features, hydrology surveys, soil classifications, as well as material and labor costs. Based upon the total construction costs (including a margin for unforeseen expenses), these costs were submitted for review by the landowners and the Bureau of Reclamation officials.

2. The Farm Budget Method. This second phase was designed to measure the ability of the landowners to repay the cost of the project should it appear feasible, and called for analysis of typical farm budgets in the area--detailing anticipated income and expenses over a period of time--normally a year.

---

[3]Report on Federal Reclamation to the Secretary of the Interior, p. 100. (Italics applied.)

[4]U.S. Department of the Interior, Bureau of Reclamation, "Hyrum Project, Utah, A Report on Ability of the Water Users to Repay Construction Costs to the United States," mimeographed, Office of the Bureau of Reclamation, Salt Lake City, Utah, March 1950, p. 26 of preliminary study.

Income is estimated from such factors as the size of farm, soil types and land classifications, acreage allotments, crop yields and prices, livestock production and sales, as well as the amount of production consumed domestically. Farm expenses are examined as to typical investment requirements, operation and maintenance costs, labor costs, in addition to living expenses. From this data, a net "repayment income" is derived which gives an indication of the ability of the landowners to pay back the government. This sample represents the typical farm in the area with an average production function and income pattern.[5] The ability to repay is measured against the cost of the project relative to the length of time the project is to be repaid.

Of course additional criteria such as markets for agricultural products and livestock, processing plants, and transportation are important in any overall economic evaluation. Cache Valley fared well in these respects. Relative to transportation, two railroads, the Oregon Short Line (a branch of the Union Pacific Railroad) and the Utah-Idaho Central (electric) served the area. A central highway system connecting the area with extensive markets in the Great Salt Lake Valley passed through Wellsville, one of the project towns.

Located in the vicinity of the project were several agricultural processing plants. In addition to vegetable and milk processing companies in Wellsville, Hyrum, and Smithfield, a large sugar beet processing plant was located in Lewiston, Utah. Livestock markets in Ogden, Utah, provided an accessible center for buying or selling cattle, sheep, hogs, etc. Thus, it was felt that any increase in agricultural

---

[5]An example of the farm budget is presented in Chapter V.

output could be processed rather easily.[6]

If, after an investigation of this nature a project was considered feasible, upon the mutual agreement of the Bureau of Reclamation and an acceptable water users' organization, the project was submitted to Congress as a part of the annual proposed Reclamation budget.

Officials of the Bureau of Reclamation made a detailed study of the total costs of the Hyrum Project and of the ability of the landowners to pay the government interest-free loan over a 40-year period. From their analysis they concluded the project was feasible.[7] The project called for an expenditure of $930,000. Had the entire 14,000 acre-feet (14,000 shares of stock) been sold, the cost would have been $112.93 per acre. However, since only 11,125 shares of stock were subscribed, the actual cost of the project to the individual participants was higher than planned. With subscriptions of 11,125 acre-feet, and a project acreage of 6,800 acres, the actual cost was $136.76 per acre. The repayment period was limited to 40 years, thus requiring an annual payment of $23,250. Expressed as an annual cost per acre, including operation and maintenance costs, this amounted to approximately $4.94.

---

[6]For a description of the economy during this period and some of the historical development of Cache Valley, see Chapter X, "Transition to the Modern Era, 1880-1910," by Leonard J. Arrington, in The History of a Valley, Joel E. Ricks, ed., Cache Valley Centennial Commission (Salt Lake City, Utah: Deseret News Publishing Company, 1956), pp. 240-274.

[7]In a letter from the chief engineer for the Hyrum Project dated April 20, 1966, Mr. E. O. Larson told the writer: "I am afraid that the detailed studies I made for the Hyrum Project for the 1928 and 1931 reports have been lost or destroyed by this time." (The 1931 report was the project format). However, the project was considered feasible as indicated by the Bureau's willingness to undertake it.

A comparison of the planned costs and those that resulted from only 80 percent subscriptions is summaried in Table 4.

From these calculations it appears that a landowner would have to receive an addditional income of at least $4.94 from each acre of land in order to compensate him for the cost of the additional water

The question naturally arises: Has the project contributed an annual average of at least $4.94 for each acre of land to which the supplemental water supply was allocated? In an effort to measure whether this has been the case, two approaches can be taken:

1. Increased income. From various sources it is possible to determine the actual crop patterns and yields on the lands prior to the construction of the project. If the net value of crops grown prior to its construction is measured against the net value of crops in a period following the completion of the project, a supplemental water value can be determined by a comparison of crop patterns, yields and prices, in terms of total annual revenue. By accounting for price changes and natural farm production trends, it should be possible to make some valid conclusions as to the merit of the project.

2. Increased valuation of the lands. Irrigated lands are obviously more valuable than non-irrigated lands. This increased valuation should appear as a higher market price for the land, as represented in land sales. The results established in number 1 above may then be compared with the increased value of the lands--and if placed on an annual basis these values should be similar.

Table 4. Project costs--planned and actual

Acreage	Subscriptions[a]	Total project cost	Total cost per share	Annual cost per share[b]	O&M[c]	Annual average cost for supplemental water[d]
8,235	14,000	$ 930,000	$ 66.44	$ 1.66	$1.74	$ 4.28
6,800	11,125	930,000	83.60	2.09	1.74	4.94

[a]1 share = 1 acre-foot of water. (An acre-foot represents a depth of 1 foot of water over an acre of land.)

[b]40-year repayment period.

[c]Operation and maintenance costs.

[d]11,125 shares were subscribed. However, 700 acre-feet taken by the Cache Valley Development Corporation were not used on any land. The remaining 10,425 acre-feet were available for the project land area of 6,800 acres; thus, farmers using the water would subscribe to an average of 1.53 acre-feet for each acre of land. This represents the supplemental water supply. However, since the corporation was obligated to pay for their 700 acre-feet, the annual cost per share was divided among 11,125 subscriptions.

Source: U.S. Dept. of the Interior, Bureau of Reclamation, "Report on Cache Valley Division of Salt Lake Basin Investigations, Utah," typescript, Office of the Bureau of Reclamation, Logan, Utah, 1932, p. 32. O&M Costs--U.S. Dept. of the Interior, Bureau of Reclamation, "Hyrum Project Utah, A Report on Ability of the Water Users to Repay Construction Costs to the United States," mimeographed, Office of the Bureau of Reclamation, Salt Lake City, Utah, March 1950.

Procedure

Two time periods have been chosen in an effort to compare productivity before and after the water became a factor. The periods from 1930 to 1935, and 1939 to 1944 are used. This represents six years prior to the completion of the project and six years following.[8] Data for these tables are taken from several Reclamation publications, United States Bureau of the Census Reports for agriculture, as well as from private communication with several individuals who recall the land use prior to the project's construction. Table 5 indicates the average crop production on the project area during the period 1930-1935. Table 5 also indicates that the total value of crops on the area under the Hyrum Project prior to its completion was $72,021. If this total is divided by the total acreage (6,800), the gross average revenue per acre is $25.30 in terms of average prices for the period 1930 to 1935. However, for the purpose of this study, the base on which prices in both periods are compared is 1935-1939 = 100.[9] Using the approximate value of this index (89.67), the value of production in terms of the base is $28.63 per acre.[10]

In a re-evaluation of the project prepared by the Bureau of Reclamation in 1950 of the 1939-1944 period, the crop values per acre were

---

[8]The 1930-1935 period was a time of serious depression, while the 1939-1944 period found the nation at war--pushing up demand for agricultural products. Nevertheless, it is assumed that if changes in the price level can be accounted for, the two periods are comparable.

[9]Utah Agricultural Statistics Revised 1920-1962, Utah Resources Series 16, Agricultural Experiment Station, Utah State University, Logan, Utah, June 1963, p. 140. Base period of 1935-1939 = 100 is used.

[10]Ibid. This represents an average index computed by taking the agricultural price indices each year for the period 1930-1935.

Table 5. Crop production on the Hyrum Project, 1930-1935

Crop	Acreage percent[a]	Acres	Yields per acre[b]	Total production	Market prices[c]	Total revenue
Alfalfa	40.0	2,720	2.45 T	6,664 T	$ 8.58	$ 57,177
Pasture	16.3	1,108	--	--	20.18[d]	22,360
Wheat	24.6	1,672	20.66 Bu	34,544 Bu	.64	22,108
Barley	2.7	184	33.46 Bu	6,157 Bu	.48	2,955
Sugar beets	7.8	530	12.88 T	6,826 T	5.85	39,932
Seed crops	3.3	224	82.67 Lb	185 Cwt	12.06	2,231
Vegetables	3.0	204	--	--	69.03[e]	14,082
Fruit	1.2	83	--	--	107.11[d]	9,914
Oats	1.1	75	44.26 Bu	3,320 Bu	.38	1,262
Total	100.0	6,800				$172,021

[a]Percentages taken from How Reclamation Pays, p. 105. This contains a breakdown of crop distribution for 1935.

[b]Yields taken from agricultural census report.

[c]Prices are for State of Utah (see source listed below).

[d]Prices unavailable for this period; 1939-1944 average prices were used. Numbers have been deflated by appropriate price index.

[e]Price represents average per acre for county, 1930.

Source: U.S. Dept. of the Interior, Bureau of Reclamation, How Reclamation Pays (Washington, D.C.: Gov't. Printing Office, 1947), p. 105; U.S. Dept.of Commerce, Bureau of the Census, Fifteenth Census of the United States, 1930: Agriculture, (3 vols., Washington, D.C.: Gov't. Princint Office, 1932), II pp. 370-372; Utah Agricultural Statistics Revised 1920-1962, Utah Resources Series 16, Agricultural Experiment Station, Utah State University, Logan, Utah, 1963; U.S. Dept. of the Interior, Bureau of Reclamation, "Hyrum Project, Utah - A Report on Ability of the Water Users to Repay construction Costs to the United States," mimeographed, Office of Bureau of Reclamation, Salt Lake City, Utah, March 1950, p. 26 of the preliminary study.

$49.81 for the Wellsville-Mendon Conservation District, and $45.07 for the Hyrum Irrigation Company lands.[11] Since there are 4,300 acres within the district and 2,500 acres within the Hyrum Irrigation Company lands, the total average annual revenue amounted to $326,858. This represents a weighted average of $48.07 per acre. However, prices rose 33 percent during this period and when divided by a price index, the income per acre is reduced to $36.14.[12]

Following is a comparison of the crop values per acre over the two time periods:

Gross revenue per acre, 1930-1935	$28.63
Gross revenue per acre, 1939-1944	$36.14

Thus, the increase in value per acre attributed to the supplemental water supply was $7.51. Since the cost of the project was estimated at $4.94 per acre, it appears that the net revenue was $2.57. However, there are two considerations that may have given an upward bias to the $7.51:

1. The $7.51 does not account for improved technology in agriculture. In other words, had there been no increased water supply, it is probable that output might have increased due to improved agricultural methods, increased mechanization, better grades of seed and fertilizer, et cetera. However, no records for the county's agricultural productivity are available for this period. Census data reports for 1939 and 1944 (two

---

[11]U.S. Dept. of the Interior, "Hyrum Project, Utah," p. 26 of the preliminary study.

[12]This represents an average index computed by taking the agricultural price indices each year for the period 1939-1944 based on index calculations for all crops as presented in Utah Agricultural Statistics Revised 1920-1962, p. 1940.

of six years used in the study) suggest that some crops such as alfalfa and sugar beets increased slightly in yields, while wheat and barley remained practically the same. Data on other crops are not available.

2. The $7.51 represents an increase in gross income. Some increased costs would be associated with obtaining this additional income. However, since the water supply is supplemental rather than primary, the additional costs would not be significantly greater since it would require little more effort to work the land in terms of fuel, capital, seed, etc.[13] Some added expenses would result from irrigating and harvesting the larger yields, but no attempt was made to quantify this variable.

On the other hand, increased production of livestock and livestock products is not included and therefore the $7.51 is understated. If yields were greater on irrigated pasture and alfalfa lands (as the data indicate), there would be an increase in income due to greater dairy and livestock output because the need of purchasing commercial feed would be reduced. This would tend to offset some of the upward tendencies previously mentioned. However, it appears that when these considerations are weighed, the project was feasible in that it returned a greater income to the landowners than the cost they had to pay--the total revenue was greater than the total cost.

Increase in Land Valuation

One method that is available to check increases in net income per acre versus the project costs per acre lies in the change in market values of the land with an increased water supply. If the sale price of the land

---

[13] If a large percentage of the land were idle or fallow during the earlier period, then this assumption would not hold.

increased to reflect the increased net revenue due to an improved water supply, then it should reflect a change similar to that amount in land values. Four sources of information are available to study the land valuations:[14]

1. From the 1940 Census of Irrigation prepared by the U.S. Department of Commerce, the average value of irrigated land per acre for Cache County, Utah, was approximately $119. Upon adjusting to the 1939-1944 period by the use of index numbers, the average value per acre was $135.

2. The average assessed value per acre for irrigated lands within the Wellsville-Mendon Conservation District was approximately $62 per acre in 1940. This represented 50 percent of the normal value for 1940 or $122 per acre which was valued at $140 per acre after adjusting to the 1939-1944 price period.

3. A tabulation of land sales, as recorded in the county recorder's office, showed that 450 acres of irrigated land in the project area sold for an average of $180 per acre during 1946 to 1948. This was equivalent to $136 per acre after an adjustment in prices was made.

4. A landowners' questionnaire was circulated prior to the project asking them to estimate the value of land "with" and "without" the project. Of 2,665 acres tabulated from this survey, the average estimate for the fully irrigated land rose to $135 in contrast with the land values averaging $70 per acre. Since the farmers would have been thinking of $135 in terms of 1930-1935 dollars (approximately), the actual amount would have been much higher.

The study by the Bureau of Reclamation summarized the land value

---

[14]U.S. Department of the Interior, "Hyrum Project, Utah, " p. 26-27 of the preliminary study.

changes in the following manner:

> On the basis of information from these sources, it has been determined that the sale value of irrigated land for the 1939 to 1944 period would be approximately $140 per acre.[15]

This additional value represents an increased capitalization of the land which has the same wealth effect as an income flow to the farmer. Assuming the value of the land increased $70 as indicated by the above discussion, this $70 difference represented a capital gain that could not be realized until the lands were sold. However, if this money could have been invested at the current interest rate of 4.5 percent, the yield would have been an annual return of $3.15 per acre ($70 x .045). Thus, this represents an increase in wealth of $3.15 per acre each year.

Repayment of the Project with an Interest Cost

Was the Hyrum Project a good use of society's resources, or would it have been better to use these resources in another way? Some answers to this question can be obtained by assuming that the landowners had to pay an interest cost for the money loaned to them by the government. Whereas, the interest-free loan to the farmers actually amounts to a federal subsidy, if it can be shown that productivity was increased sufficiently to cover an interest rate typical of that period, then it might be considered as profitable an investment of society's resources as could have been hoped for in alternative uses.

The following analysis uses the contemporary interest rate of 4.5 percent as representative of the interest rate farmers would have paid

---

[15] Ibid.

during the period the dam was under construction.[16] The total average annual increase in productivity per acre amounted to $7.51. If the operation and maintenance costs of approximately $1.74 are subtracted from $7.51, the net benefits per acre expressed as an annual sum is $5.77. Thus, the total project area of 6,800 acres would normally produce an increase in revenue of $39,236 (6,800 x $5.77).

The total cost of the project was set at $930,000. If the farmers had to pay this amount back at an interest rate of 4.5 percent, the total annual payment for a 40-year period can be calculated by multiplying the total cost ($930,000) by the factor $\frac{i}{1 - (1+i)^{-n}}$, which represents an annuity whose present value is equal to 1.[17] Thus:

$$\text{Annual payment} = \$930{,}000 \times .05434315 = \$50{,}539$$

Since the total yearly net revenue of $39,236 is not sufficient to cover the annual cost of $50,539, the project does not measure up to the test of paying an interest cost.

In order to have the project break even, the interest rate would have had to drop to 2.79 percent which is associated with an annual payment of $39,236.[18]

---

[16]This interest rate was chosen because had the farmers not had to pay interest on a project loan, they could have paid some of their own debts. This rate was granted by Federal Land Banks during the period July 11, 1933, to June 30, 1935, at the time the project was built. See U.S. Dept. of Agriculture, Agricultural Statistics, 1957 (Washington, D.C.: Gov't. Printing Office, 1958), p. 601, footnote 2.

[17]This concept is similar to computing the annual payment for a long-term loan such as is used in home mortgages; the principal and interest cost is combined into one level annual payment over the contract period. This table can be found in any handbook of mathematical tables. For example, see Standard Mathematical Tables (Cleveland, Ohio: Chemical Rubber Publishing Company, 1959), p. 474.

[18]This interest rate is found by interpolating from the annuity tables to find the factor which when multiplied by the original cost yields an average annual payment of $39,236 and thus the interest rate associated with it.

CHAPTER V

EXPERIENCE IN THE POST-CONSTRUCTION ERA

The Hyrum Project was completed in August 1935, only after considerable effort was expended to subscribe 80 percent of the total 14,000 shares. Subscription goals were completed only after interested businessmen and citizens formed a private corporation to guarantee the payment of an annual assessment for 700 acre-feet of water (subscribed through the Wellsville City Irrigation Company because the corporation had no land on which it could be used).

Contractual Obligations

On October 9, 1933, the South Cache Water Users' Association signed an agreement to reimburse the government for its construction loan of $930,000, to be payable in 40 equal annual installments. The first payment was due December 1, 1938.[1] However, because of adverse agricultural conditions caused by the depression, this payment was deferred under the provisions of the Act of May 31, 1939, which granted relief to water users experiencing repayment difficulties.[2] The payments for the next three years (1939-1941), were delinquent, but were also deferred under the provisions of an amendatory contract negotiated between the Water Users' Association and the government on December 31, 1941.

---

[1]The storage system was completed in August of 1935, but the canals and pump house were not completed until early 1938.

[2]U.S. Department of the Interior, Bureau of Reclamation, Federal Reclamation Laws Annotated (2 vols.; Washington D.C.: Gov't. Printing Office, 1958), I, 572-573.

The new contract re-scheduled installments on a graduated basis of 40 years, the first payment falling due December 31, 1941.[3] Each of the first four payment (1941-1944) was $9,300. The following 27 installments were the same sum that had been specified in the original contract--$23,250, and the next six payments were to be $27,900. To complete the payments, the last three years were to be $32,550.

Payments after 1944 were subject to the "normal and percentage" plan instituted under the provisions of the Reclamation Project Act of 1939.[4] This provision is similar to the 1924 Fact Finders' Act, in that it related the annual payment to the value of crops produced on the land during the year. The installment is computed by using the percentage that the per acre crop value for a particular year exceeds or is less than a "normal" crop return. The normal return is a weighted average of the 10 highest per acre returns in the course of a 13-year period. The years for computation include the current year plus the preceding 12. For every percentage point that the crop value varies from the normal return, two percentage points are added or subtracted from 100 percent. This percent is multiplied times the payment specified in the contract. The data in Table 6 is presented to illustrate the computation of the 1945 payment.

In Table 6 the crop value for 1945 was set at $50.14 which is 8 percent greater than the "normal" return of $46.01. Thus, for every

---

[3]U.S. Department of the Interior, Bureau of Reclamation, Reclamation Repayments and Payout Schedules (Washington, D.C.: Gov't. Printing office, 1965), p. 153.

[4]Federal Reclamation Laws Annotated, p. 590.

Table 6. Crop data, 1937-1945[a]

Year	Net acreage in cultivation	Total crop return	Crop return per acre
1937	5,879	$ 199,616	$ 33.95
1938	5,934	207,705	35.00
1939	5,948	200,687	33.74
1940	5,945	194,909	32.79
1941	5,945	253,076	42.57
1942	5,993	308,690	51.51
1943	5,853	415,493	70.99
1944	6,089	385,646	63.33
1945	5,779	289,767	50.14
Normal	5,929	272,843	46.01

[a]The years 1935 and 1936 were not used because of an error in counting acreage. Nine years are used rather than the normal 10.

Source: U.S. Dept. of the Interior, Bureau of Reclamation, How Reclamation Pays (Washington, D.C.: Gov't. Printing Office, 1947), p. 104.

1 percent increase above the "normal" return, the annual installment is increased by 2 percent. The total payments for 1945 were 16 percent greater than the $23,250 specified in the contract, or $26,790.

Prior to 1945 the assessments of $9,300 were small enough that there was little problem of the water users meeting their obligation. During the period from 1945 to 1949, however, the annual payments were even higher than the contractual increase from $9,300 to $23,250, and the officials of the association found it difficult to collect the payment from the landowners. In computing the weighted average (which does not account for price changes), the lower crop values of the later years of the depression tended to undervalue the average, and when the higher crop prices of the war years boosted the crop values, the farmers had to

make an extremely high payment.[5] This caused a great deal of dissatisfaction among the water users, although they made their payments without default. Table 7 summarizes the difference between the contract payments and the actual payments due to the use of the normal and percentage plan in calculating the payment.

Table 7. Annual installments from 1941-1949

Year	Contract payment	Actual payment[a]	Cost per acre-foot of water	Cost of supplemental water (1.53 acre-ft/ac.)	O&M[b]	Total cost of supplemental water
1941	$ 9,300	$ 9,300	$ 0.84	$ 1.28	$1.74	$ 3.02
1942	9,300	9,300	0.84	1.28	1.74	3.02
1943	9,300	9,300	0.84	1.28	1.74	3.02
1944	9,300	9,300	0.84	1.28	1.74	3.02
1945	23,250	26,970	2.59	3.96	1.80	5.76
1946	23,250	26,970	2.59	3.96	1.85	5.81
1947	23,250	30,225	2.90	4.43	2.00	6.43
1948	23,250	27,900	2.68	4.10	2.10	6.20
1949	23,250	28,365	2.72	4.16	2.15	6.31

[a]After 1944, subject to "normal and percentage" plan.

[b]Estimated between 1945-1949; 1950 known to be $2.25.

Source: U.S. Dept. of the Interior, Bureau of Reclamation, "Hyrum Project, Utah, A Report on Ability of the Water Users to Repay Construction Costs to the United States," mimeographed, Office of the Bureau of Reclamation, Salt Lake City, Utah, March, 1950, p. 9.

Thus, it can be seen from the above table that the cost of the supplemental water (yearly maintenance costs included) was growing more expensive. The water users felt that this was unfair, particularly since only 80 percent of the total water was subscribed, and represented a smaller base

[5]Had the government used a price index to compute the annual payment, it might not have been such a severe jump in payments.

over which to spread the annual cost. (This fact also tended to keep out prospective shareholders because of the extremely high cost.) The board of directors of the Water Users' Association, after severe complaints by the landowners, requested the officials of the Bureau of Reclamation to make an investigation of the project's economic condition to see if this high cost was justifiable in terms of farm income.

A study was made by Bureau officials of the period 1939-1944 to determine the ability of the water users to repay the construction costs to the government.[6] The farm budget approach was used to measure the income and expenses of a typical farm in the project area. This investigation revealed that the water users were required to pay more than they could reasonably be expected to pay. An examination of a sample farm unit showed that landowners in the Wellsville-Mendon Conservation District area could bear a total cost of $6.40 (including operation and maintenance costs) and the land in the Hyrum Irrigation Company area could sustain a cost of $5.33. If the O & M (operation and maintenance) costs are subtracted, the payment ability falls to $2.31 and $2.55, respectively, for the district and company lands. Thus this survey indicated that the total project could pay approximately $18,000 per year for the supplemental water, plus operation and maintenance costs.[7]

At the conclusion of the report, two solutions were presented:

---

[6]U.S. Department of the Interior, Bureau of Reclamation, "Hyrum Project, Utah, A Report on Ability of the Water Users to Repay Construction Costs to the United States," mimeographed, Office of the Bureau of Reclamation, Salt Lake City, Utah, March 1950.

[7]O&M costs of $1.74 per acre amounts to an annual cost of $11,832 plus the $18,000 for principal. This totals approximately $29,832 which this study suggested the farmers could pay.

Table 8. Summary of annual repayment ability, 1939-1944, using the farm budget approach (farm = 45 acres)

	Hyrum Irrigation Company Division		Wellsville-Mendon Conservation Dist.	
Farm income				
Sale of crops	$ 1,034		$ 1,215	
Sale of livestock	1,664		1,664	
Farm products and housing used by farm family	457		461	
Total		$3,155		$3,340
Farm expenses				
Crop production	284		264	
Livestock production	186		142	
Interest, taxes, insurance, etc.	1,090		1,196	
Total		$1,560		$1,602
Net farm income		$1,595		$1,738
Allowance for family living expenses		1,355		1,450
Payment capacity - total		$ 240		$ 288
Per farm acre		5.33		6.40
Operation and maintenance charges for water/acre		1.64		1.80
Repayment ability - per farm acre		3.69		4.60
Per acre-foot of water[a]		1.51		1.69
For supplemental water (1.53 acre-feet/acre)		2.31		2.55

[a]Based on average beneficial water supplies of 2.44 and 2.71 acre-feet per acre, respectively, for the Hyrum and Wellsville-Mendon divisions.

Source: U.S. Dept. of the Interior, Bureau of Reclamation, "Hyrum Project Utah, A Report on Ability of the Water Users to Repay Construction to the United States," mimeographed, Office of the Bureau of Reclamation, Salt Lake City, Utah, March 1950, p. 13.

1. The Water Users' Association should be relieved of its responsibility for the unsubscribed water (2,875 acre-feet) and the repayment obligation associated with it. The contract should be amended to include this revision. The responsibility for the unsubscribed water would revert to the government until these shares of water were sold.

2. The association would retain responsibility for repayment of the entire project cost. A variable repayment schedule would continue to be used in calculating the annual payments--related to the ability to repay as determined by this recent study. This would require a base payment of approximately $18,000 depending on the variation of the crop value.

The first suggestion was not acceptable to the officials of the Bureau of Reclamation. On May 24, 1950, an amendatory contract revised the repayment schedule to provide a 47-year payment period, with all of the installments subject to the normal and percentage plan. The contract payments were to be as follows:[8]

1950 to 1970	$17,240
1971 to 1995	$16,155

The costs of this investigation requested by the water users amounted to $14,046, and was added to the total cost; therefore, the obligation was raised to $944,046 from the original $930,000. Because the annual payment varies according to the value of the crops, the project may or may not be paid off as scheduled over the 47-year period. The average payment has been $17,695 per year since the 1950 contract. Payments

---

[8] Reclamation Repayments and Payout Schedules, p. 153.

since 1962 have been approximately $20,000. If this trend continues, the length of time for repayment may be shortened.

Validity of the Crop Reports

Some individuals have questioned the validity of crop values reported by water users' associations using this type of computation to determine their annual payments.[9] It is, of course, to the advantage of the landowners if the crop values fall over time in order to lower the weighted average used to compuate the "normal" return, and thus lengthen the repayment period. This is a disadvantage of the variable repayment plan as far as the government is concerned because the landowners may tend to control the annual repayment by adjusting the actual crop values to correspond with their willingness to pay. A difficulty may arise, however, in a year of high yields when it would be difficult to adjust the crop yields enough to keep from paying an abnormally high payment that year. As long as the crop reports do not vary drastically from the normal return, no problem is likely to develop. The original intention of this thesis was to compare the crop values of the project before it was built and following its completion until the present time. However, there were two problems involved with such an undertaking: (1) the variables associated with improved agricultural technology over a 30-year period are subject to great change, and the difficulty of computing a marginal productivity for the supplemental water is extremely difficult to any degree of accuracy, and (2) Bureau of Reclamation

[9]For example, see Ivan S. Hobson, "Economic Analysis of the Provo River Reclamation Project" (unpublished Master's thesis, Brigham Young University, 1950), p. 2.

officials familiar with the Hyrum Project advised the writer that the crop reports were not sufficiently valid to warrant their use in an economic analysis of the project. For this reason, the approach used in Chapter IV using a shorter time period appeared to be the best way to measure the economic benefits of the project.

The Cache Valley Development Corporation

The Cache Valley Development Corporation, as previously mentioned, was a group of businessmen and private citizens who were anxious to have the project built. Thus, on December 13, 1933, the company was incorporated, and voted to subscribe for 700 acre-feet of water in the Hyrum Project to be used by the Wellsville City Irrigation Company in addition to their own 1000 acre-feet, if possible. In order to guarantee the annual payment for this water, it was proposed that stock be sold to obtain enough money to purchase government bonds and allow the interest from the bonds to pay the annual assessment. It was hoped that as soon as the unsold water was subscribed, the company could rid itself of its 700 acre-feet, sell the bonds, and repay those who had invested in the company. The corporation purchased $25,000 of Federal Land Bank Bonds, bearing 4 1/2 percent, which yielded $1,125 of annual income. Under the original repayment schedule of $23,250, the normal assessment for the corporation's 700 acre-feet (not including O & M charges) would have totaled $1,463. Since the income from the bonds was not quite sufficient to pay this sum, it was assumed that some bonds might have to be cashed as necessary in order to make the payments.

At a meeting of shareholders held on March 5, 1936, Mr. H. J. Hatch,

a director of the company, informed the owners that the bonds had been called by the government. Unfortunately, new government issues were bearing only 3 percent which yielded only $750 each year. Nevertheless, the corporation voted to buy government bonds at 3 percent. These bonds were held by the Bureau of Reclamation as security for the 700 acre-feet of subscriptions.

However, the depression changed the repayment schedule. Because of the moratorium granting relief to the water users, the corporation did not have to cash any bonds until 1945 when the "normal and percentage plan" became applicable. From that time forth, it was necessary to sell bonds occasionally to meet the company's obligations. Thus the corporation's total assets in bonds slowly drained away. On February 3, 1947, the secretary of the corporation notified the shareholders that the company's 3 percent bonds had been called by the government. Interest rates were 2 1/2 percent. (Because of this loss in interest income, the corporation tried to sell its 700 acre-feet, but could not do so.) The money received from the 3 percent bonds was re-invested in bonds yielding 2 1/2 percent and which were to mature in 1972. As the years passed, and the interest income continued to be insufficient to meet the annual assessment, the bonds were gradually sold. By 1951 the supply of bonds had fallen to $17,500. By February 1953, this amount had been reduced to $14,500, and in January 1960, the balance stood at $8,000.

February 16, 1957, a supplemental contract was signed between the Wellsville-Mendon Conservation District, the South Cache Water Users' Association and the government allowing the district to purchase 1,000

acre-feet of storage water.[10] In December 1960, the district purchased another 1,875 shares of water, which completed the entire 14,000 acre-feet of subscriptions.[11] On April 20, 1961, officials of the Wellsville City Irrigation Company agreed that they would assume payments of the annual assessment of 700 shares of stock held by the corporation. Thus, in April of 1961 the company was at last able to initiate action to dissolve the company and recover what they could from the remaining $7,000 of bonds. Mr. N. D. Salisbury of the First Security Bank of Logan, Utah, sold the bonds at a discount of 10.7 percent for a total of $6,213,93. This sum and the semi-annual interest from coupons totaled $6,301.43. This amount was distributed to the stockholders and represented 28 percent of what they had invested in 1933. The value per share was $14.00. Following is a list of shareholders and the dollar amounts they received from the company's liquidation (see Table 9, page 79).

The checks were mailed to the shareholders and the company was dissolved in June 1963. In a letter to the Secretary of State asking for instructions on dissolution, Secretary Hovey concluded the history of the corporation as follows:

> Since we have now served our purpose, the few remaining bonds will be returned to us. We desire to sell the bonds and pro rate the amount to the stockholders, or their representatives. It will not be much but a little better than nothing. This will be the first of any of the returns the stockholders have received of their money. The corporation was not organized for pecuniary profit.[12]

---

[10] U.S. Dept. of the Interior, Bureau of Reclamation, "Hyrum Project, Utah: Annual Project History, Calendar Years 1950-1959," mimeographed, Office of the Bureau of Reclamation, Logan, Utah, ca., 1959, p. 11.

[11] Ibid.

[12] Letter from Merlin R. Hovey, Secretary of the Cache Valley Development Corporation to the Honorable LaMont F. Toronto, Secretary of State, March 4, 1963.

Table 9. Distribution of assets among the shareholders of the Cache Valley Development Corporation, 1963

Shareholder	Number of shares	Total amount
Blair Motor Company, Salt Lake City	1	$ 14.00
Bluebird Candy Company	1	14.00
Western Investment Company	11	154.00
First National Bank	11	154.00
Frederick P.Champ	11	154.00
Baugh Motor Company	1	14.00
W. J. Nelson	2	28.00
Kenneth O. Lindquist	1	14.00
Chris Monsen	1	14.00
Cardon Jewelry	1	14.00
Mrs. Marianna Parkinson Musser	1	14.00
Mrs. A. F. Stockton	1/2	7.00
Mrs. Kate Christiansen	1/2	7.00
Albert Thompson	1	14.00
Eccles Investment Company, Ogden, Utah	2	28.00
Budge Clinic	2	28.00
Mrs. George B. Bowen	1	14.00
Val W. Palmer	1	14.00
Dr. Farrell Edwards	1	14.00
Lundstrom Furniture Company	1	14.00
George M. Wilkinson	1	14.00
J. C. Penney Company	2	28.00
Levens Store (A. Neuberger)	1	14.00
Bordens Milk Company	14	196.00
Carnation Milk Company	60	840.00
Anderson Lumber Company	12	168.00
Pet Milk Company	30	420.00
California Packing Corporation	38	532.00
Union Pacific Railroad Company	50	700.00
Amalgamated Sugar Company	189	2,646.00
Total[a]	449	$6,286.00

[a]Utah Oil Refining could not locate its share, and released their claim upon it.

Source: Names and amounts were taken from cancelled checks as found in the Minutes of the Cache Valley Development Corporation, Office of Charles P. Olson, Logan, Utah, past attorney for the organization.

Crop Patterns

Several important changes have occurred in the crop distribution on the project lands since 1930. Table 10 indicates some of these trends.

Table 10. Crop distribution by percent at intervals from 1930-1965

Crops	1930-35	1939-44	1945	1950	1955	1960	1965
Wheat and barley	27	22	31	37	32	35	37
Alfalfa	40	38	38	37	40	40	40
Pasture	16	14	12	16	17	15	15
Sugar beets	8	12	7	5	3	1	0.4
Vegetables (commercial)	3	7	7	8	11	2	0.5

[a]Only major crops shown. Others are less than 1 percent.

Source: Years 1930-1935, Table 5, Chapter III: 1939-44, Table 6, Chapter III; 1945, U. S. Dept. of the Interior, Bureau of Reclamation, How Reclamation Pays (Washington, D.C.: Govt. Printing Office, 1947), p. 105; for years 1950, 1955, 1960, 1965, crop survey data cards, office of the Bureau of Reclamation, Logan, Utah.

The table indicates that sugar beet production was increased during World War II, as were commercial vegetable crops; but they have now fallen to a very small amount. On the other hand, since 1955 small grain crops (wheat and barley) have replaced row crops, while forage crop acreage has has remained fairly constant. This is an interesting paradox.[13] Two reasons for this trend are presented below.

1. The effect of defense industries. The location of Thiokol Chemical Corporation in Brigham City, Utah, has caused a number of

[13]Normally with an adequate water supply more cash crops such as sugar beets, vegetables, etc., are grown.

farmers and members of farm families to accept employment there. In addition, Hill Air Force Base at Clearfield, Utah, and the Defense Depot at Ogden, Utah, have also drawn heavily from farm labor.[14] In order to accept employment in these industries (who have paid substantial wages to attract labor), it has been necessary to shift acreage away from those crops requiring more labor to other crops requiring less attention. Irrigation water can be turned into the fields in the early morning before going to work, and turned off upon returning home in the evening. Thus a large proportion of farms are owned by part-time farmers.

2. Many children of farm families have not chosen to remain or take over the farm. This has had a two-fold effect: (a) a shortage of labor has developed relative to farming crops needing extensive cultivation, weeding, fertilization, and harvesting, and farmers have shifted to crops that can be worked with less labor; (b) the average age of farmers in the project is higher and perhaps leisure has become more important in later years as their children have married and moved into industry or other vocations.[15]

Comparison with Preston Bench Project

As an example of the cropping patterns and the effect on the farm output, the following table compares the crop values of the Hyrum Project

---

[14]These comments are based upon interviews with officials of the Bureau of Reclamation, and several project farmers during the winter and summer of 1966. They are, of course, general comments, and are not applicable to the entire project area but may reflect some basic trends.

[15]This view was expressed in a number of interviews suggesting some truth in it. For example, less income would be required as children are gone, home and lands are paid for, etc.

Table 11. Crop values on the Hyrum and Preston Bench Projects, selected years

Project	Year	Total land area irrigated (acres)	Reported crop values (dollars)	Crop value per acre
Hyrum	1950	5,682	$340,674	$ 59.93
	1955	5,764	359,301	62.32
	1961	6,163	338,553	54.93
	1962	6,209	388,435	62.56
	1963	6,365	399,531	62.77
	1964	6,237	403,533	64.70
	1965	6,230	319,100	51.22
Preston	1950	4,150	303,197	73.06
	1955	3,733	300,671	80.54
	1961	4,061	343,885	84.68
	1962	4,165	350,234	84.09
	1963	4,054	369,846	91.23
	1964	4,065	383,370	94.31
	1965	3,962	349,804	88.29

Source: U.S. Dept. of the Interior, Bureau of Reclamation, "Hyrum Project Utah: Annual Project History, Calendar Years 1960-1964," mimeographed, Office of the Bureau of Reclamation, Logan, Utah, ca., 1965, appendix; U.S. Dept. of the Interior, Bureau of Reclamation, Reclamation Project Data (Washington, D.C.: Govt. Printing Office, 1961), pp. 277,612.

and the Preston Bench Project located approximately 30 miles north of the Hyrum Dam. The land and water characteristics should be somewhat similar.

Table 11 indicates that the crop values are much lower in the Hyrum Project than in the Preston Bench Project. There are at least two possible reasons for this differential:

1. The shift to less intensive crops and part-time farming has caused the values per acre to remain fairly constant in the Hyrum Project. This would indicate that the water is not being used as efficiently as

possible under the Hyrum Project because of the part-time farming.

2. The crop values in the Hyrum Project may not have been reported accurately and thus values per acre have remained relatively stable. However, since the cropping patterns have changed, as shown in Table 10, it does not mean that the per acre values on both projects should be the same, but perhaps the differential should not be as large. The Preston Bench Project is not subject to the normal and percentage payment plan and therefore there is no temptation to report inaccurate crop data.

Recreational Development

The Hyrum Reservoir has been used for swimming, boating, and water skiing for a number of years. The area along the shore has been a favorite picnic ground, although it has not been developed until recently. On May 3, 1960, a meeting was held of representatives from the Cache Chamber of Commerce, Utah State Park and Recreation Commission, State Road Commission, and the Cache County Commission to discuss the expansion of recreational facilities at the reservoir. The decision was made to build a boat launch and to investigate the possibility of creating a state park. The Utah State Park and Recreation Commission has since organized the Hyrum State Park--a pleasant picnic and recreational area that has averaged approximately 15,000 visitors a year since its institution.[16] In addition to these services, an annual planting of fish is carried out by the Utah Fish and Game Commission and the reservoir has become a favorite fishing spot for local sportsmen. No fees are charged for the use of

---

[16]U.S. Department of the Interior, Bureau of Reclamation,"Hyrum Project Utah: Annual Project History, 1960-1964," mimeographed, Office of the Bureau of Reclamation, Logan, Utah, ca., 1964, p. 6.

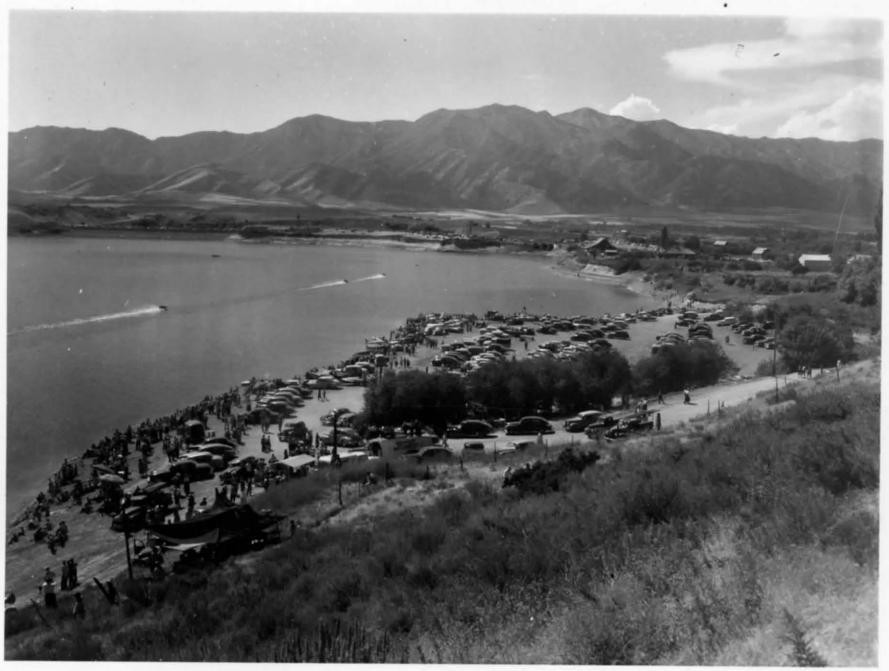


Figure 5. Recreation on the Hyrum Reservoir. This view is looking west toward the dam which can be seen in the upper left-hand corner.

Figure 6. This view is looking east to the mountains. The Little Bear River enters the reservoir through a section in the middle right background of the picture.

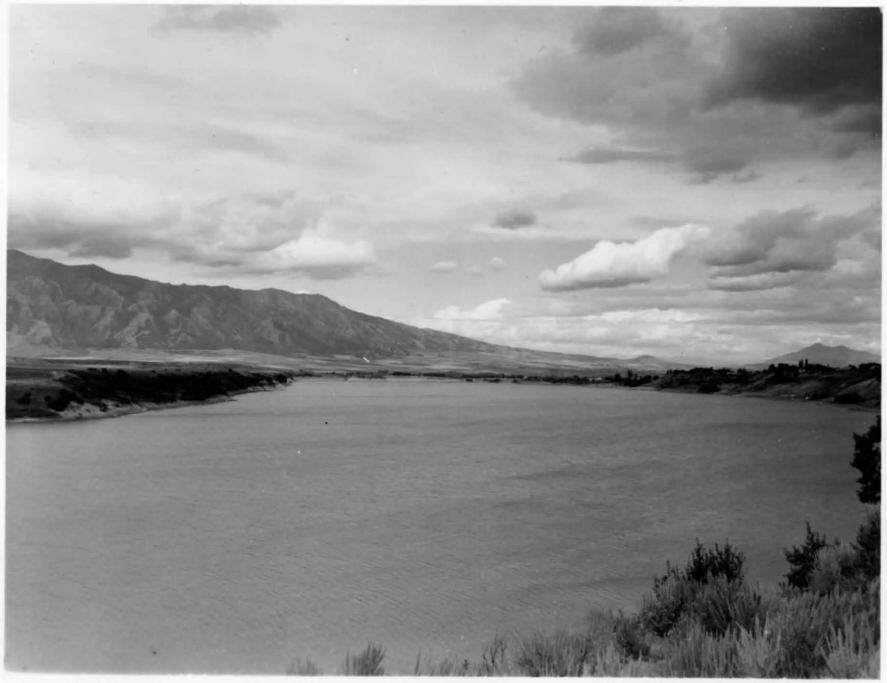


Figure 7. View of the Hyrum Reservoir looking west to the dam. Photograph was taken from the east bank.

Figure 8. Looking east from the opposite shore of the reservoir. Water has been drawn to allow riprap repair on the face of the dam.

Figure 9. This is a section of the Wellsville-Mendon Canal near Wellsville, Utah. The water depth is usually about 3 feet.

Figure 10. Looking downstream at Hyrum Dam spillway channel. Cracks have been cleaned out and later filled with mastic. December 1958.

Figure 11. Wellsville Canal Pumping Plant near Hyrum, Utah.

Figure 12. A view of the pumping plant penstock and outlet channel. This carries water to the pump house which sends the water across the valley into the Wellsville Canal. Pipe can be seen in background just prior to discharge into the Wellsville Canal.

these recreational facilities, and as of early 1966, no part of the project costs had been allocated to recreational expenditures as provided under reclamation law.

Conclusion

The Hyrum Reclamation Project has had an interesting history. Constructed during a time of serious depression, it has furnished farmers in the southern end of Cache Valley with a supplemental water supply. This water has contributed stability to agriculture within the area by eliminating one of the vagaries of Mother Nature--an undependable water supply. The handicap of losing the spring run-offs too quickly has been reduced by constructing a dam to trap this precious resource before it was lost. There has never been a year since its completion that it has not "filled and spilled." The project costs are being paid on schedule, with the final payment to come due somewhere around 1990. The Hyrum Project, though not large, will continue to furnish water for the enlarged production of Cache Valley.

BIBLIOGRAPHY

Public Documents

Federal Inter-Agency River Basin Committee, Subcommittee on Benefits Costs, Proposed Practices for Economic Analysis of River Basin Projects. 1950.

_____. Subcommittee on Evaluation Standards, Proposed Practices for Economic Analysis of River Basin Projects. 1958.

U.S. Congress, A Report by the Library of Congress Legislative Reference Service. Reclamation: Accomplishments and Contributions. 86th Cong., 1st Sess., January, 1959.

U.S. Department of Agriculture. Agricultural Statistics 1957. 1958.

U.S. Department of the Interior. First Annual Report of the Reclamation Service. 1903.

U.S. Department of the Interior, Bureau of Reclamation. Bureau of Reclamation Project Feasibilities and Authorizations. 1957.

_____. Federal Reclamation Laws Annotated. 2 vols. 1958.

_____. Reclamation Handbook, 1942.

_____. Reclamation Project Feasibilities and Authorization, Cumulative Supplement to the 1957 Edition, 1962.

_____. Reclamation Repayments and Payout Schedules, 1965.

U.S. House of Representatives, Committee on Interior and Insular Affairs, Accomplishments of Irrigation North Platte Project Wyoming-Nebraska. Committee Print No. 12, 1956.

U.S. Senate, The President's Water Resources Council. Policies, Standards, and Procedures in the Formulation, Evaluation, and Review of Plans for Use and Development of Water and Related Land Resources. Senate Document No. 97, 87th Cong., 2d Sess., 1962.

Books

Brough, Charles H. Irrigation in Utah. Baltimore: The Johns Hopkins Press, 1898.

Chandler, A. E. Elements of Western Water Law Revised. San Francisco: Technical Publishing Company, 1918.

Eckstein, Otto. Water-Resource Development. Cambridge, Mass.: Harvard University Press, 1961.

Golzé, Alfred R. Reclamation in the United States. New York: McGraw-Hill Book Company, 1952.

Haw, John W., and Schmitt, F. E. Report on Federal Reclamation to the Secretary of the Interior. Washington, D.C.: Government Printing Office, 1935.

Hibbard, Horace H. A History of the Public Land Policies. Madison, Wisconsin: The University of Wisconsin Press, 1965.

Huffman, Roy E. Irrigation Development and Public Water Policy. New York: The Ronald Press Company, 1953.

McKean, Roland N. Efficiency in Government through Systems Analysis. New York: John Wiley & Sons, Inc., 1964.

Ricks, Joel E. (ed.). The History of a Valley: Cache Valley, Utah-Idaho. Salt Lake City, Utah: Deseret News Publishing Company, 1956.

Thomas, George. Early Irrigation in the Western States. Salt Lake City, Utah: University of Utah, 1948.

Whitney, Orson F. Popular History of Utah. Salt Lake City, Utah: The Deseret News, 1916.

Reports

Fortier, Samuel and McLaughlin, Walter W. "Report on the Utilization of the Land and Water Resources of Cache Valley, Utah," typescript, Office of the Bureau of Reclamation, Logan, Utah, 1922.

U.S. Department of the Interior, Bureau of Reclamation. "Hyrum Project Utah, A Report on Ability of the Water Users to Repay Construction Costs to the United States." Mimeographed, Office of the Bureau of Reclamation, Salt Lake City, Utah, March, 1950.

_____. "Report on the Cache Valley Project of the Salt Lake Basin Investigations-Utah," by William M. Green, typescript, Office of the Bureau of Reclamation, Logan, Utah, 1924.

_____. "Supplemental Report on the Cache Valley Project of the Salt Lake Basin Investigations Utah," by William M. Green, typescript, Office of the Bureau of Reclamation, Logan, Utah, October, 1926.

_____. "Report on the Cache Valley Project of the Salt Lake Basin Investigations, Utah," by E. O. Larson, typescript, Office of the Bureau of Reclamation, Logan, Utah, August 1928.

_____. "Report on the Cache Valley Division of the Salt Lake Basin Investigation, Utah," by E. O. Larson, typescript, Office of the Bureau of Reclamation, ca., 1932.

_____. "Project History of the Hyrum Project, Utah, 1933," by D. J. Paul, mimeographed, Office of the Bureau of Reclamation, Logan, Utah, ca., 1934.

_____. "Project History of the Hyrum Project, Utah, 1935," by D. J. Paul, mimeographed, Office of the Bureau of Reclamation, Logan, Utah, ca., 1936.

_____. "Hyrum Project Utah: Annual Project History, Calendar Years 1950-1959," mimeographed, Office of the Bureau of Reclamation, Logan, Utah, ca., 1959.

_____. "Hyrum Project Utah: Annual Project History, 1960-1964," mimeographed, Office of the Bureau of Reclamation, Logan, Utah, ca., 1964.

Utah Water and Power Board. "Historical Background on Utah Water and Power Board Predecessor Organizations," mimeographed, Office of the Utah Water and Power Board, Salt Lake City, Utah, 1964.

Bulletins

Marginal Values of Irrigation Water. A linear Programming Analysis of Farm Adjustments to Change in Water Supply. Technical Bulletin No. 70. Colorado State University, Fort Collins, Colorado.

Maximizing Incomes from Sevier County Farms. Bulletin No. 451. Utah State University, Agricultural Experiment Station, Logan, Utah, 1965.

Department of Agricultural Economics. Utah Agricultural Statistics Revised 1920-1962. Utah Resources Series 16. Agricultural Experiment Station, Utah State University, Logan, Utah, 1963.

Miller, Stanley F., Boersma, Larry L., and Castle, Emery N. Irrigation Water Values in the Willamette Valley: A Study of Alternative Valuation Methods. Technical Bulletin No. 85. Agricultural Experiment Station, Oregon State University, Corvallis, Oregon, 1965.

Newspapers and Periodicals

Castle, Emery N., Elson, Maurice, and Gardner, Delworth. "Water Resources Development: A Review of the New Federal Escalation Procedures." Journal of Farm Economics, Vol. XLV, No. 4, November, 1963.

Cache Valley Daily Herald. 1930-1932.

The Herald Journal. 1932-1936.

The Journal. 1928-1929.

Unpublished Material

Arrington, Leonard J. "A Sourcebook on the Economic History of Cache Valley," Logan, Utah: Cache Valley Historical Society, 1956.

Hobson, Ivan S. "Economic Analysis of the Provo River Reclamation Project," (unpublished Master's thesis, Brigham Young University, 1950.

Mendenhall, B. L. "The Hyrum Project," typescript, Office of the Cache County Agricultural Agent, Logan, Utah, ca., 1936.

Minutes of the Utah State Water Storage Commission, 1929-1935, MSS, Utah Water and Power Board, Salt Lake City, Utah.

Other Sources

Personal interview with Mr. E. O. Larson, Chief Engineer of the Hyrum Project during its construction, March 31, 1966.

Personal interview with Evan O. Bankhead, Member of Board of Directors, South Cache Water Users' Association, May 2, 1966.

Personal interviews with William P. Leatham, President of the South Cache Water Users' Association, 1965, 1966.

APPENDIX A

BENEFIT-COST ANALYSIS

A Need for Criteria

An objective of economic analysis in the construction of any project similar to the Hyrum Dam is centered around the fundamental problem of using economic resources such as land, labor, and materials as efficiently as possible consistent with society's best interests. Scarcity of resources is an economic fact of life, and resources must be made to render their maximum benefit to society.

In a free enterprise system which is competitive and profit-oriented, resources are channeled to those uses which best satisfy the demands of the public. Economic survival depends upon efficient production. Business firms must close their doors or adjust their output if they fail to compete in the attempt to satisfy consumer demand. As if in a continuous election, the dollar votes of the public help decide what is to be produced, while the election returns--the profit or loss--communicates to the business sector its success in meeting the public's desires. Wages and salaries are based on economic contribution. Competition regulates the allocation process by forcing prices down to the lowest possible level consistent with a sufficient return to enable a firm to maintain its investment over the long run. A waste of resources could be disastrous.

A government, however, is not a profit-oriented agency; yet, because it plays an important part in determining where many of society's resources

are directed, unless an effective criteria is established to evaluate public projects, a substantial waste of resources might result.

As an individual consumer must make decisions as to how his "limited income" is to be spent, so must a similar decision be made by governmental units. This problem has become more accentuated as the demand for public funds has increased. There are always a number of alternative choices. Too often in the past, these choices were not dependent upon economic considerations, and for this reason officials of governmental agencies have grown more concerned about the establishment of satisfactory criteria on which to base spending decisions.

History of the Concept

Despite implications of "benefit-cost" analysis before the 1930's, it was in that decade that the terms came into full use. The Flood Control Act of 1936 required that feasibility of projects be defined as the point where "the benefits to whomsoever they may accrue, are in excess of the estimated costs."[1] This concept was extended to the Bureau of Reclamation by the Reclamation Project Act of 1939, which authorized irrigation projects if the increased revenue was great enough to pay the total project costs, excepting non-reimbursable items such as navigation, flood control, or the preservation of wildlife.

However, the interpretation of benefits and costs were not consistent among the agencies. Thus, in 1946, the Federal Inter-Agency River Basin Committee was formed to correlate the work of the various government organizations working on public projects. A subcommittee was appointed to study the concept of benefits and costs and recommend a

---

[1] Otto Eckstein, Water-Resource Development--The Economics of Project Evaluation (Cambridge, Massachusetts: Harvard University Press, 1961), p. 2.

plan of implementing it as a part of public policy. In May of 1950, the committee published a report setting forth a complete set of principles for project evaluation.[2] This report was revised in May of 1958 by the su bcommittee on Evaluation Standards of the Inter-Agency Committee on Water Resources.[3]

The most recent declaration of project evaluation policies and standards is contained in Senate Document No. 97, which enumerates the overall planning objectives and criteria that must be met in approving plans for the use and development of water and land resources.[4]

Benefits and Costs

Basically, the benefits of a project may be viewed as the quantity of goods and services which it produces, while the costs represent, in some sense, negative production or loss of goods and services. These benefits and costs are broken down into a number of different categories:[5]

Primary benefits are the values of products or services which are directly attributable to the project. In the case of an irrigation work

---

[2]Federal Inter-Agency River Basin Committee, Subcommittee on Evaluation Standards, Proposed Practices for Economic Analysis of River Basin Projects (Washington, D.C.: Government Printing Office, 1959).

[3]Federal Inter-Agency River Basin Committee, Subcommittee on Benefits and Costs, Proposed Practices for Economic Analysis of River Basin Projects (Washington, D.C.: Government Printing Office, 1950).

[4]U.S. Senate, The President's Water Resources Council. Policies, Standards, and Procedures in the Formulation, Evaluation, and Review of Plans for Use and Development of Water and Related Land Resources, Document No. 97, 87th Cong., 2d Sess., 1962.

[5]Ibid., p. 8-11.

such as the Hyrum Project, it amounts to the value of the added crop output due to the supplemental water supply. In a larger, multipurpose project, the value of electric power, and the value of an increased industrial water supply would be considered primary in addition to the increased crop production from irrigation.

Tangible benefits can be expressed in monetary terms based on actual market prices, or, the cost of alternative uses that would represent an equivalent value of goods and services.

Intangible benefits may be very realistic, but are not easily measured in monetary terms. An example of this type of benefit might be in the form of increased stabilization of the local or regional economy which provides a greater base to sustain a larger population.

Secondary benefits, which are very similar to intangible benefits, represent the increased value of goods and services which indirectly result from a unit's construction. Flood control is important in preserving lives and providing a sense of security in addition to any recreational benefits that occur; but, how does one ascribe values to these concepts in monetary terms?

Primary costs are representative of the value of the goods and services in terms of land, labor, and materials, that are necessary for building and operating a project. In the case of an irrigation facility, this is the actual cost of making the water available to the landowners.

Associated costs are over and above those costs included in the direct project costs, yet are necessary in order to make full use of the services of the facility. For example, landowners may have to

build ditches in order to bring water to their land, or build barns to house and feed livestock.

Secondary or intangible costs are similar to secondary and intangible benefits in that they are difficult to measure in monetary terms. How does not value the loss of a scenic view, or measure the cost of destroying camping areas which are to be used as reservoir sites? These values vary as individual capacities for enjoyment differ.

To the extent possible, these benefits and costs--both primary and secondary--are measured in market values. Although secondary benefits may be important in an economic justification of a project from a local or regional viewpoint, from a national, public point of view, such benefits usually have little significance in formulating the project.[6]

Benefit-Cost Ratio

On the basis of information concerning primary benefits, project costs, and associated costa, a benefit-cost ratio may be computed. Associated costs are first subtracted from the primary benefits, and the remainder is termed "primary benefits attributable to the project." The benefit-cost ratio is then computed by dividing project benefits by project costs.

A benefit-cost ratio of 1.3 to 1 would indicate that for every dollar of real social cost, the project yields $1.30 of real social benefits. In actual practice, if the ratio is greater than 1, the project is considered feasible.

---

[6]Federal Inter-Agency River Basin Committee, Proposed Practices for Economic Analysis of River Basin Projects, 1958, p. 10.

Benefit-Cost Ratio of the Hyrum Project

A ratio for the Hyrum Project relating annual benefits and costs may be computed by use of the following formula:[7]

$$\frac{B}{C} = \frac{B}{O + a_{iT} K}$$

where B represents the annual primary benefit

O = operation and maintenance costs

K = fixed investment

a_{iT} = annual capital charge per dollar of fixed investment and includes both the interest rate and amortization period

Since the Hyrum Project was built at no interest cost to the landowners, the $\frac{B}{C}$ ratio expressed at the annual rate can be computed as follows:

$$\frac{B}{C}^{8} = \frac{\$7.51}{\$1.74 + \$3.20} = \frac{\$7.51}{\$4.94} = \$1.52$$

This indicates that without an interest cost, the benefit-cost ratio is greater than 1; therefore the project would have been considered feasible.

However, when an interest rate of 4.5 percent is charged on the project loan, the $\frac{B}{C}$ ratio is:

$$\frac{B}{C} = \frac{B}{O + a_{iT} K}$$

or, re-writing in terms of actual numbers:

---

[7]For a derivation of this formula, see Eckstein, Water Resourse Development, p. 56.

[8]Since no interest rate was charged, the a_{iT} drops out of the equation.

$$\frac{B}{C}^{9} = \frac{\$7.51}{\$1.74 + .05434315\ (\$136.76)} = \frac{\$7.51}{\$9.17} = .82$$

Thus, were an interest rate changed for the government loan, the project would not have been considered feasible in that its benefit-cost ration was less than 1.

---

[9]The annual capital charge per dollar can be found by the use of any mathematical table entitled, "Annuity whose present value is equal to 1." In this problem, the time period is 40 years and the interest rate is 4.5 percent.